SOP_SYSTEM_UNSAFE_ACIS_PHASE2

PARTICIPANTS: OC, CC, Systems, Mechanisms, PCAD, SOT Engineers

OVERVIEW: This procedure describes the actions to be taken by the FOT in the event that ACIS has not been safed in a high radiation environment. This procedure should be run after SOP_OPS_ACIS_UNSAFE_PHASE1. It is assumed that FOT/SOT Engineers are available in the OCC, and that real-time contact is available for at least 2-3 hours, but that back-orbit data from the last pass may not yet be available.

SUMMARY: Perform actions to recover from any single failure which results in the SIM TT being at > -25,000 steps in a high radiation environment.

There are 3 discrete entry points for this procedure:
A: S/C is not in Safe Mode, and there is no indication of a mechanical stall
B: SIM telemetry indicates that a mechanical stall may have occurred
C: S/C is in Safe Mode, and there is no indication of a mechanical stall

All three cases should be easily distinguishable.

A mechanical stall is indicated when both the TT Stall Counter and Overcurrent Counter are greater than zero. Mechanism thermal conditions that would allow a motor stall to occur without overcurrents are considered to be very unlikely.

This procedure has 10 steps, which will be used in various orders and combinations depending on the cause of the failure. The flowcharts should be used to determine the exact sequence of this procedure. Three of these steps are described by external procedures (referenced below) which the OC will need to have available if there is a chance they will be needed.

CONSTRAINTS: N/A

INITIAL CONDITIONS: SIM is in unexpected position
Loads must be halted

EHS DISPLAYS: F_ MAIN, M_SIMTABLE, M_OTG

GRETA DISPLAYS: A_1NOC, A_PROCTABLE, EHS_M_OTG

COMPS: None

SCRIPTS:

O_SCSCTRL	M_SW_LETG_RETR_B
I_SAFEINST	M_SW_HETG_INSR_B
A_MECH_CONFIG	M_LETG_RETR_B_SCS
A_MECH_RECONFIG	M_HETG_INSR_B_SCS

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PROCEDURES:

SOP_MECH_SEA_RESET_RESPONSE
SEP_MECH_PREPARE_SWAP_SEA
SOP_MECH_SWAP_SEA
SEP_MECH_PREPARE_SIM_TAB2_CROSSING
SOP_MECH_SIM_TAB2_CROSSING
SOP_MECH_SEA_WARM_RESET_RESPONSE
SEP_MECH_SIM_TSC_STALL_RECOVERY
SOP_CCDM_SWAP_SI_RCTU_ATOB
SOP_MECH_SIM_XLATE

COMMAND LOADS

LOAD NAME	CHECKSUM, if SCS
AA_DEAD60193.CLD	24F3787
MA_4OLETGRE_241.CLD	C86FB07
MA_4OHETGIN_242.CLD	C86F907
MA_LMV153_200.CLD	501D656
MA_LMV2MC_222.CLD	501E304
MA_HINS160_200.CLD	701D65A

DISABLED COMMANDS: 4LOLGBDS

COMMAND SYSTEM:

Clear To Send Mechanism	= TIME
CAR Processing	= Enabled
FSV Processing	= Disabled
Output Format	= NRZM
Minimum Time Delay (sec)	= 3
CAR Time-out (sec)	= 40
FSV Time-out (sec)	= 45
Blocking Factor	= 90

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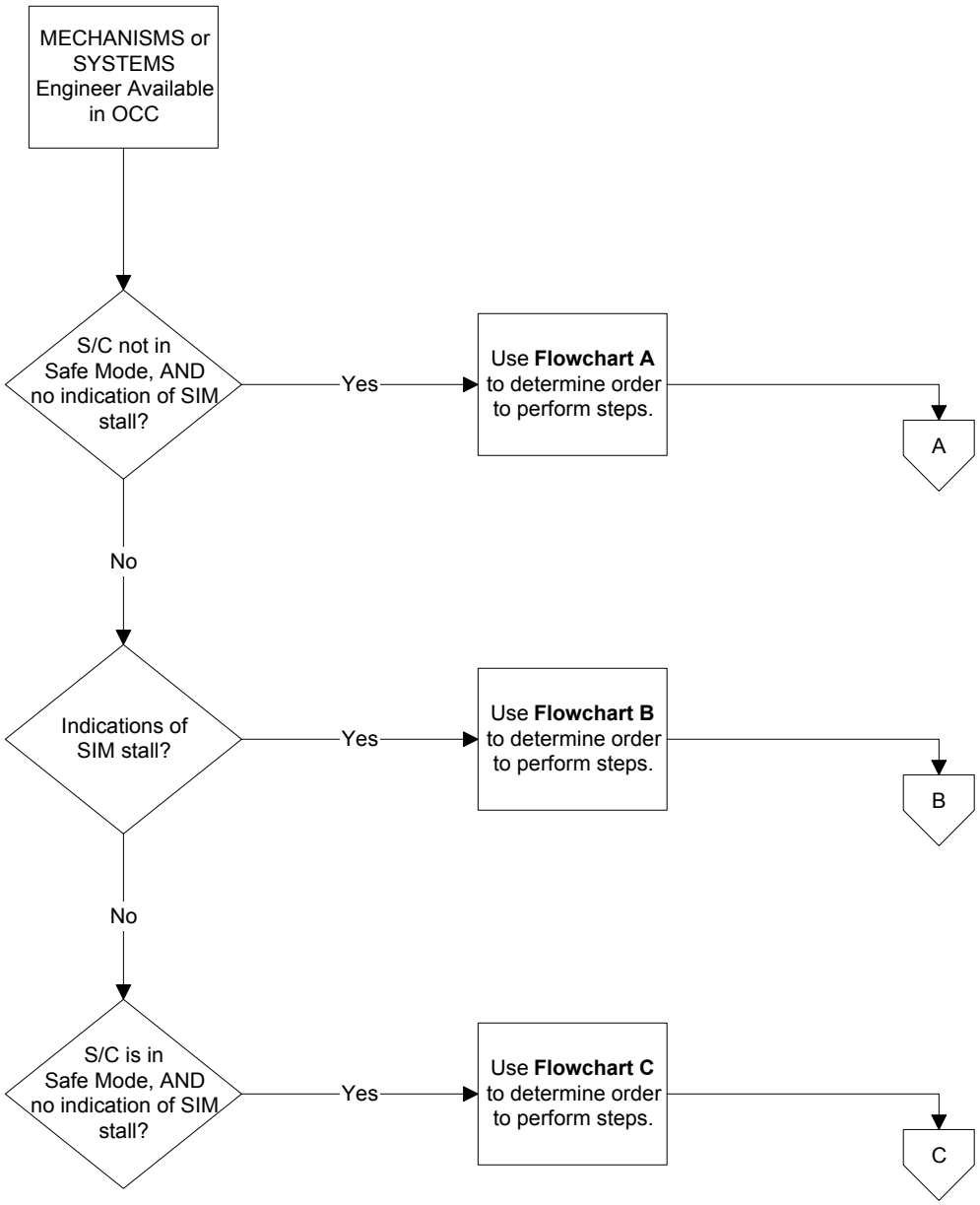
FLOWCHARTS:



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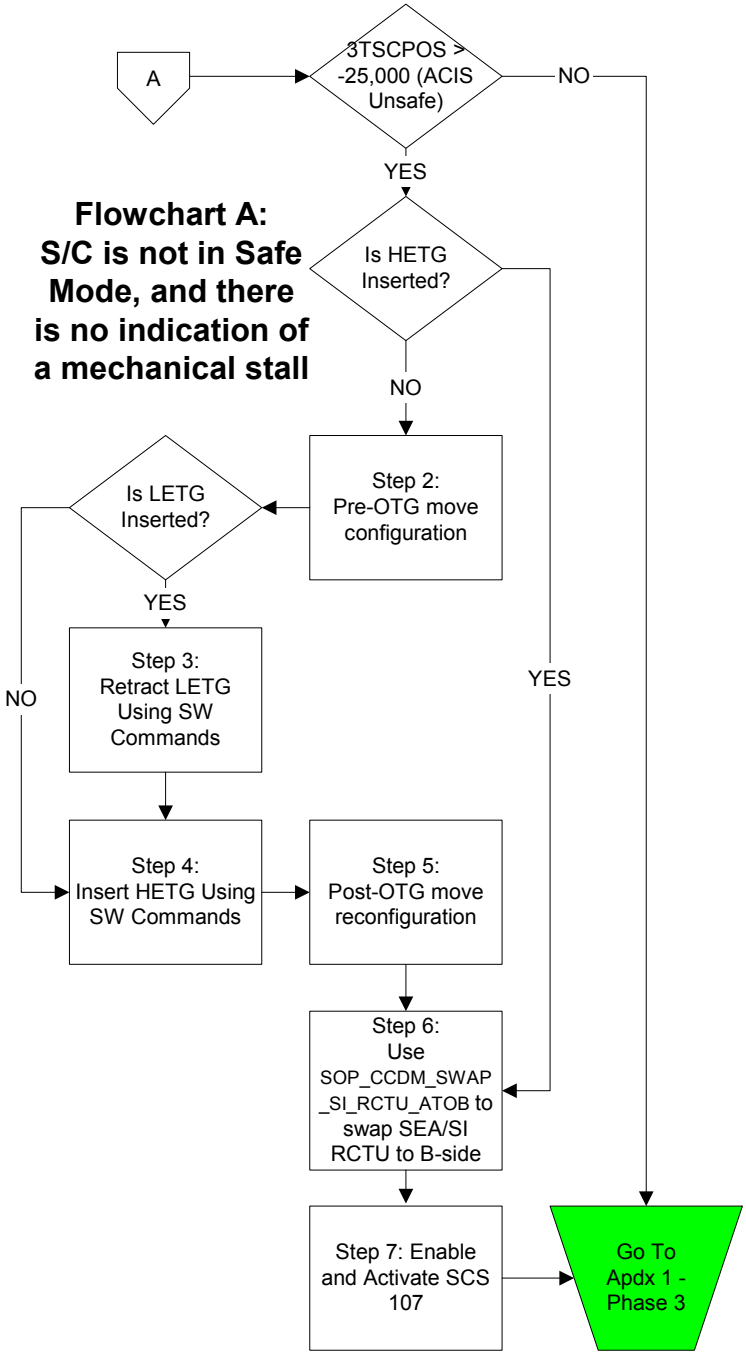

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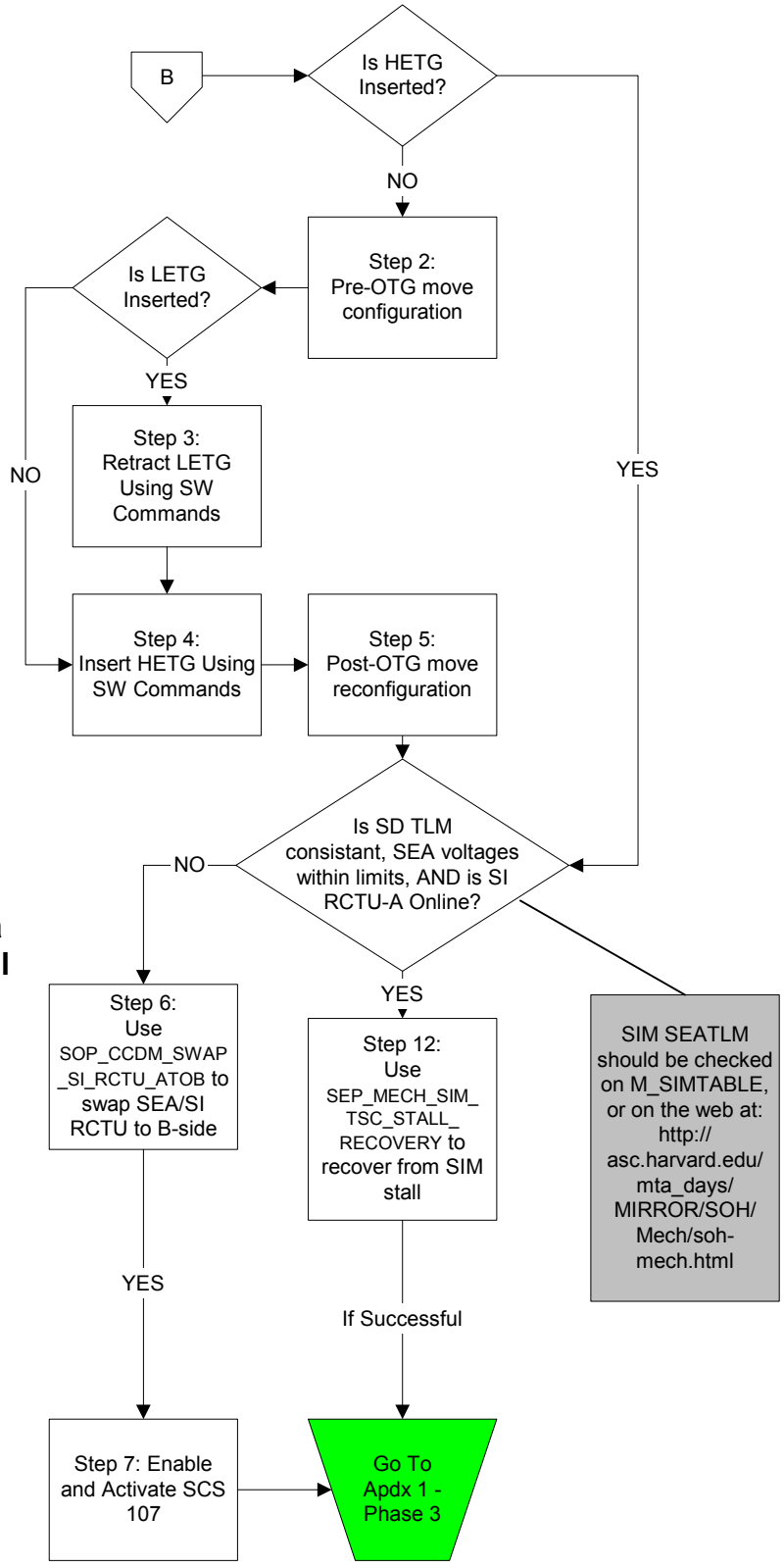
Flowchart B: SIM telemetry indicates that a mechanical stall may have occurred



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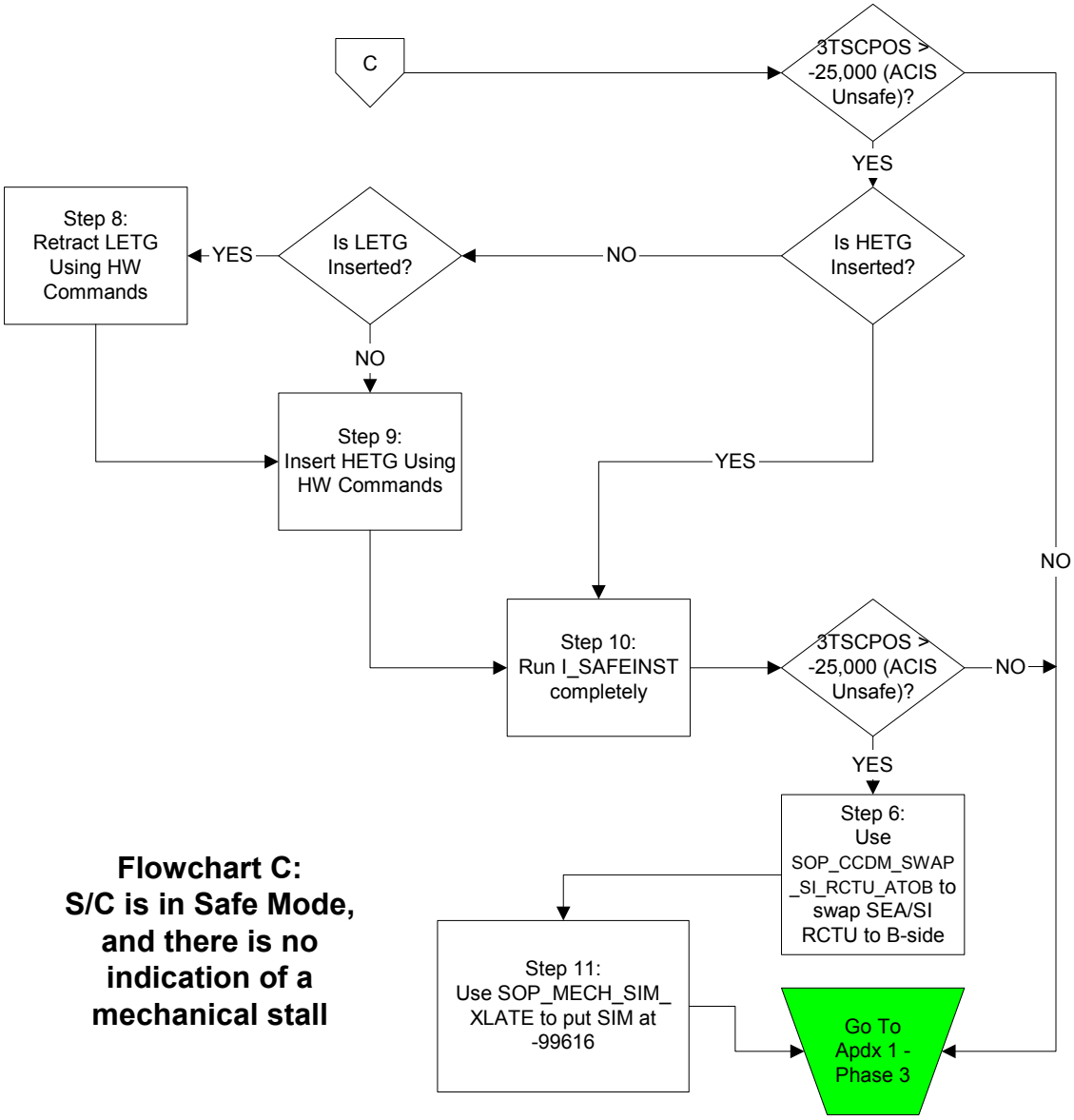

Flowchart C: S/C is in Safe Mode, and there is no indication of a mechanical stall

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1.0 DETERMINE WHICH FLOWCHART DICTATES STEPS

****---------- NOTE ----------****

There are 3 discrete entry points for this procedure:

A: S/C is not in Safe Mode, and there is no indication of a mechanical stall
B: SIM telemetry indicates that a mechanical stall may have occurred
C: S/C is in Safe Mode, and there is no indication of a mechanical stall

This procedure has 10 steps, which will be used in various orders and combinations depending on the cause of the failure. The flowcharts should be used to determine the exact sequence of this procedure.

A mechanical stall is indicated if BOTH the stall counter and overcurrent counter are greater than zero.

MSID	DESCRIPTION	DISPLAY	VALUE
3SMOTSTL	SIM TT Stall Counter	M_SIMTABLE.dsp	
3SMOTOC	SIM Over Current Counter	M_SIMTABLE.dsp	

****----------****

1.a If spacecraft is not in Safe Mode, and there is no indication of a mechanical stall refer to Flowchart A for proper sequence of steps to be used in this procedure.

1.b If SIM telemetry indicates a mechanical stall may have occurred refer to Flowchart B for proper sequence of steps to be used in this procedure.

1.c If spacecraft is in Safe Mode, and there is no indication of a mechanical stall refer to Flowchart C for proper sequence of steps to be used in this procedure.

OC Confirm with Mechanisms or Systems Engineers which Flowchart should be used to determine order of steps.

2.0 PRE-OTG MOVE CONFIGURATION

****---------- NOTE ----------****

This step will configure the spacecraft for OTG motions. It will disable momentum unloading and the momentum monitor, as well as put the spacecraft in NMM.

It is assumed Chandra will be in Normal Point Mode when exiting this procedure. PCAD may choose to execute a CAP in place of Step 2.

Only perform this step after verifying the proper sequence of steps from the appropriate Flowchart.

****----------****

2.a Command EPS Subformat

OC Select EPS subformat.

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2.b Uplink and Activate Dead Man Load

OC Uplink command load AA_DEAD60193.CLD (60 minute timer).

OC Use script O_SCSCTRL to enable and activate SCS 193.

2.c Command Norm Subformat

OC Select NORM subformat.

2.d Disable PCAD Monitors and go to NMM

OC Begin the following script: A_MECH_CONFIG.

2.d.1 Script will pause at initial WAIT.

OC Resume script.

2.d.2 Script will uplink command AONMMODE.

Verify telemetry:

MSID	Description	Verified
AOPCADMD = NMAN	PCAD Mode	

OC Resume script.

2.d.3 Script will uplink command AOMUNLDS.

Verify telemetry:

MSID	Description	Verified
AOAUTUNL = DISA	Auto-unloading Enable/Disable	

OC Resume script.

2.d.4 Script will buffer command AOFUNCDS AOPCADSD=32.

OC Uplink buffer.

Verify telemetry:

MSID	Description	Verified
AOPSSCMM = DISA	Momentum Monitor Process	

OC Resume to end of script.

2.e Return to flowchart to identify which step should be proceeded to next.

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****---------- WARNING ----------
****
You must reference the proper Flowchart to determine which step should be performed next.
****----------****

3.0 LETG RETRACTION BY SW COMMAND

****---------- NOTE ----------****
This step will retract the LETG using software commands.

Only perform this step after verifying the proper sequence of steps from the appropriate Flowchart.
****----------****

OC Uplink command load MA_4OLETGRE_241.CLD

OC Begin the following script: M_SW_LETG_RETR_B.

3.a Script will pause at initial WAIT.

Verify Telemetry:

MSID	Description	Verified
4HPOSARO > 79	HETG A-Side Potentiometer	
4HPOSBRO > 79	HETG B-Side Potentiometer	
4LPOSARO < 10	LETG A-Side Potentiometer	
4LPOSBRO < 8	LETG B-Side Potentiometer	

OC Resume script.

3.b Script will uplink command 4MC5AEN and 4MC5BEN.

Verify Telemetry:

MSID	Description	Verified
4M5IRAX = ENAB	MCE A: +5 Volt Conv Inh Relay Monitor	
4MP5AV = 5.0 ± 0.5	MCE A: +5 Volt Monitor	
4M5IRBX =ENAB	MCE B: +5 Volt Conv Inh Relay Monitor	
4MP5BV = 5.0 ± 0.5	MCE B: +5 Volt Monitor	
4M28IRAX = DISA	MCE A: +28 Volt Conv Inh Relay Mon	
4MP28AV = 0.0 ± 0.5	MCE A: +28 Volt Monitor	
4M28IRBX = DISA	MCE B: +28 Volt Conv Inh Relay Mon	
4MP28BV = 0.0 ± 0.5	MCE B: +28 Volt Monitor	
4HEXRAX = DISA	MCE A: HETG Execute Relay Status Monitor	
4HLORAX = ENAB	MCE A: HETG Hardware Lockout Relay Status Monitor	
4HRLSA = NRET	MCE A: HETG Limit Switch 1A Monitor (Retracted)	
4HILSA = NINS	MCE A: HETG Limit Switch 2A Monitor (Inserted)	
4HEXRBX = DISA	MCE B: HETG Execute Relay Status Monitor	
4HLORBX = ENAB	MCE B: HETG Hardware Lockout Relay Status Monitor	

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4HRLSB = NRET	MCE B: HETG Limit Switch 1B Monitor (Retracted)	
4HILSB = NINS	MCE B: HETG Limit Switch 2B Monitor (Inserted)	
4LENLAX = DISA	MCE A: LETG Enable Logic Status Monitor	
4LEXRAX = DISA	MCE A: LETG Execute Relay Status Monitor	
4LLORAX = ENAB	MCE A: LETG Hardware Lockout Relay Status Monitor	
4LRLSA = NRET	MCE A: LETG Limit Switch 1A Monitor (Retracted)	
4LILSA = INSR	MCE A: LETG Limit Switch 2A Monitor (Inserted)	
4LENLBX = DISA	MCE B: LETG Enable Logic Status Monitor	
4LEXRBX = DISA	MCE B: LETG Execute Relay Status Monitor	
4LLORBX = ENAB	MCE B: LETG Hardware Lockout Relay Status Monitor	
4LRLSBD = NRET	MCE B: LETG Limit Switch 1B Monitor (Retracted)	
4LILSBD = INSR	MCE B: LETG Limit Switch 2B Monitor (Inserted)	

OC **Resume script.**

3.c Script will uplink command 4MC5BDS

Verify Telemetry:

MSID	Description	Verified
4M5IRBX = DISA	MCE B: +5 Volt Conv Inh Relay Monitor	
4MP5BV = 0.0 ± 0.5	MCE B: +5 Volt Monitor	

OC **Resume script.**

3.d Script will uplink command 400TGPRT

Verify Telemetry:

MSID	Description	Verified
4OOTGDAS = SEC	OTG DATA SOURCE	

OC **Resume script.**

3.e Script will uplink command 4OOTGEN

Verify Telemetry:

MSID	Description	Verified
4OOTGMEF = ENAB	OTG MOTION ENABLE FLAG	

OC **Resume script.**

3.f Script will buffer and send commands COENASX COENAS1=241 and COACTSXCOACTS1=241, COACTS2=0

Verify Telemetry:

MSID	Description	Verified
4OOTGMTN = RETR	ACTION (INSERT/RETRACT SELECTED GRATING)	

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4OOTGSEL = LETG	SELECTED GRATING	
4M5IRAX = ENAB	MCE A: +5 Volt Conv Inh Relay Monitor	
4MP5AV = 5.0 ± 0.5	MCE A: +5 Volt Monitor	
4M5IRBX =ENAB	MCE B: +5 Volt Conv Inh Relay Monitor	
4MP5BV = 5.0 ± 0.5	MCE B: +5 Volt Monitor	
4M28IRAX = DISA	MCE A: +28 Volt Conv Inh Relay Mon	
4MP28AV = 6.5 ± 0.5	MCE A: +28 Volt Monitor	
4M28IRBX = ENAB	MCE B: +28 Volt Conv Inh Relay Mon	
4MP28BV = 28.0 ± 0.5	MCE B: +28 Volt Monitor	
4HEXRAX = DISA	MCE A: HETG Execute Relay Status Monitor	
4HLORAX = ENAB	MCE A: HETG Hardware Lockout Relay Status Monitor	
4HRLSA = NRET	MCE A: HETG Limit Switch 1A Monitor (Retracted)	
4HILSA = NINS	MCE A: HETG Limit Switch 2A Monitor (Inserted)	
4HEXRBX = DISA	MCE B: HETG Execute Relay Status Monitor	
4HLORBX = ENAB	MCE B: HETG Hardware Lockout Relay Status Monitor	
4HRLSB = NRET	MCE B: HETG Limit Switch 1B Monitor (Retracted)	
4HILSB = NINS	MCE B: HETG Limit Switch 2B Monitor (Inserted)	
4LENLAX = DISA	MCE A: LETG Enable Logic Status Monitor	
4LEXRAX = DISA	MCE A: LETG Execute Relay Status Monitor	
4LLORAX = ENAB	MCE A: LETG Hardware Lockout Relay Status Monitor	
4LRLSA = NRET	MCE A: LETG Limit Switch 1A Monitor (Retracted)	
4LILSA = INSR -> NINS	MCE A: LETG Limit Switch 2A Monitor (Inserted)	
4LENLBX = ENAB	MCE B: LETG Enable Logic Status Monitor	
4LEXRBX = ENAB	MCE B: LETG Execute Relay Status Monitor	
4LLORBX = DISA -> ENAB	MCE B: LETG Hardware Lockout Relay Status Monitor	
4LRLSBD = NRET -> RETR	MCE B: LETG Limit Switch 1B Monitor (Retracted)	
4LILSBD = INSR -> NINS	MCE B: LETG Limit Switch 2B Monitor (Inserted)	
4LPOSARO ~ 8 -> ~78	LETG A-Side Potentiometer	
4LPOSBRO ~ 6 -> ~78	LETG B-Side Potentiometer	

When retraction has finished:

MSID	Description	Verified
4M5IRAX = ENAB	MCE A: +5 Volt Conv Inh Relay Monitor	
4MP5AV = 5.0 ± 0.5	MCE A: +5 Volt Monitor	
4M5IRBX =DISA	MCE B: +5 Volt Conv Inh Relay Monitor	
4MP5BV = 0.0 ± 0.5	MCE B: +5 Volt Monitor	
4M28IRAX = DISA	MCE A: +28 Volt Conv Inh Relay Mon	
4MP28AV = 0.0 ± 0.5	MCE A: +28 Volt Monitor	
4M28IRBX = DISA	MCE B: +28 Volt Conv Inh Relay Mon	
4MP28BV = 0.0 ± 0.5	MCE B: +28 Volt Monitor	
4HEXRAX = DISA	MCE A: HETG Execute Relay Status Monitor	
4HLORAX = ENAB	MCE A: HETG Hardware Lockout Relay Status Monitor	
4HRLSA = NRET	MCE A: HETG Limit Switch 1A Monitor (Retracted)	
4HILSA = NINS	MCE A: HETG Limit Switch 2A Monitor (Inserted)	
4LENLAX = DISA	MCE A: LETG Enable Logic Status Monitor	
4LEXRAX = DISA	MCE A: LETG Execute Relay Status Monitor	
4LLORAX = ENAB	MCE A: LETG Hardware Lockout Relay Status Monitor	
4LRLSA = NRET	MCE A: LETG Limit Switch 1A Monitor (Retracted)	
4LILSA = NINS	MCE A: LETG Limit Switch 2A Monitor (Inserted)	

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4LPOSARO ~78	LETG A-Side Potentiometer	
4LPOSBRO ~78	LETG B-Side Potentiometer	

Wait until the move has completed successfully before continuing. The large move should take 153 seconds, and the number of small pulses should be less than 16.

RECORD NUMBER OF SMALL PULSES _____

OC **Resume script.**

3.g Script will uplink command 4OOTGDS

Verify Telemetry:

MSID	Description	Verified
4OOTGMEF = DISA	OTG MOTION ENABLE FLAG	

OC **Resume script.**

3.h Script will uplink command 4MC5BEN

Verify Telemetry:

MSID	Description	Verified
4M5IRAX = ENAB	MCE A: +5 Volt Conv Inh Relay Monitor	
4MP5AV = 5.0 ± 0.5	MCE A: +5 Volt Monitor	
4M5IRBX =ENAB	MCE B: +5 Volt Conv Inh Relay Monitor	
4MP5BV = 5.0 ± 0.5	MCE B: +5 Volt Monitor	
4M28IRAX = DISA	MCE A: +28 Volt Conv Inh Relay Mon	
4MP28AV = 0.0 ± 0.5	MCE A: +28 Volt Monitor	
4M28IRBX = DISA	MCE B: +28 Volt Conv Inh Relay Mon	
4MP28BV = 0.0 ± 0.5	MCE B: +28 Volt Monitor	
4HEXRBX = DISA	MCE B: HETG Execute Relay Status Monitor	
4HLORBX = ENAB	MCE B: HETG Hardware Lockout Relay Status Monitor	
4HRLSB = NRET	MCE B: HETG Limit Switch 1B Monitor (Retracted)	
4HILSB = NINS	MCE B: HETG Limit Switch 2B Monitor (Inserted)	
4LENLBX = DISA	MCE B: LETG Enable Logic Status Monitor	
4LEXRBX = DISA	MCE B: LETG Execute Relay Status Monitor	
4LLORBX = ENAB	MCE B: LETG Hardware Lockout Relay Status Monitor	
4LRLSBD = RETR	MCE B: LETG Limit Switch 1B Monitor (Retracted)	
4LILSBD = NINS	MCE B: LETG Limit Switch 2B Monitor (Inserted)	

OC **Resume script.**

3.i Script will uplink commands 4MC5BDS and 4MC5ADS

Verify Telemetry:

MSID	Description	Verified
4M5IRAX = DISA	MCE A: +5 Volt Conv Inh Relay Monitor	

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4MP5AV = 0.0 ± 0.5	MCE A: +5 Volt Monitor	
4M5IRBX =DISA	MCE B: +5 Volt Conv Inh Relay Monitor	
4MP5BV = 0.0 ± 0.5	MCE B: +5 Volt Monitor	

OC Resume script.

3.j Script will buffer and send commands CODISASX COCLRS1=241 and COCLRSXCOACTS1=241, COACTS2=0

OC Resume to end of script.

3.k Return to flowchart to identify which step should be proceeded to next.

****---------- WARNING ----------
****
You must reference the proper Flowchart to determine which step should be performed next.
****----------****

4.0 HETG INSERTION BY SW COMMAND

****---------- NOTE ----------****
This step will insert the HETG using software commands.

Only perform this step after verifying the proper sequence of steps from the appropriate Flowchart.
****----------****

OC Uplink command load MA_4OHETGIN_242.CLD

OC Begin the following script: M_SW_ HETG_INSR_B.

4.a Script will pause at initial WAIT.

Verify Telemetry:

MSID	Description	Verified
4HPOSARO > 79	HETG A-Side Potentiometer	
4HPOSBRO > 79	HETG B-Side Potentiometer	
4LPOSARO > 78	LETG A-Side Potentiometer	
4LPOSBRO > 78	LETG B-Side Potentiometer	

OC Resume script.

4.b Script will uplink command 4MC5AEN and 4MC5BEN.

Verify Telemetry:

MSID	Description	Verified
4M5IRAX = ENAB	MCE A: +5 Volt Conv Inh Relay Monitor	

4MP5AV = 5.0 ± 0.5	MCE A: +5 Volt Monitor	
4M5IRBX =ENAB	MCE B: +5 Volt Conv Inh Relay Monitor	
4MP5BV = 5.0 ± 0.5	MCE B: +5 Volt Monitor	
4M28IRAX = DISA	MCE A: +28 Volt Conv Inh Relay Mon	
4MP28AV = 0.0 ± 0.5	MCE A: +28 Volt Monitor	
4M28IRBX = DISA	MCE B: +28 Volt Conv Inh Relay Mon	
4MP28BV = 0.0 ± 0.5	MCE B: +28 Volt Monitor	
4HEXRAX = DISA	MCE A: HETG Execute Relay Status Monitor	
4HLORAX = ENAB	MCE A: HETG Hardware Lockout Relay Status Monitor	
4HRLSA = NRET	MCE A: HETG Limit Switch 1A Monitor (Retracted)	
4HILSA = NINS	MCE A: HETG Limit Switch 2A Monitor (Inserted)	
4HEXRBX = DISA	MCE B: HETG Execute Relay Status Monitor	
4HLORBX = ENAB	MCE B: HETG Hardware Lockout Relay Status Monitor	
4HRLSB = NRET	MCE B: HETG Limit Switch 1B Monitor (Retracted)	
4HILSB = NINS	MCE B: HETG Limit Switch 2B Monitor (Inserted)	
4LENLAX = DISA	MCE A: LETG Enable Logic Status Monitor	
4LEXRAX = DISA	MCE A: LETG Execute Relay Status Monitor	
4LLORAX = ENAB	MCE A: LETG Hardware Lockout Relay Status Monitor	
4LRLSA = NRET	MCE A: LETG Limit Switch 1A Monitor (Retracted)	
4LILSA = NINS	MCE A: LETG Limit Switch 2A Monitor (Inserted)	
4LENLBX = DISA	MCE B: LETG Enable Logic Status Monitor	
4LEXRBX = DISA	MCE B: LETG Execute Relay Status Monitor	
4LLORBX = ENAB	MCE B: LETG Hardware Lockout Relay Status Monitor	
4LRLSBD = RETR	MCE B: LETG Limit Switch 1B Monitor (Retracted)	
4LILSBD = NINS	MCE B: LETG Limit Switch 2B Monitor (Inserted)	

OC **Resume script.**

4.c Script will uplink command 4MC5BDS

Verify Telemetry:

MSID	Description	Verified
4M5IRBX = DISA	MCE B: +5 Volt Conv Inh Relay Monitor	
4MP5BV = 0.0 ± 0.5	MCE B: +5 Volt Monitor	

OC **Resume script.**

4.d Script will uplink command 400TGPRT

Verify Telemetry:

MSID	Description	Verified
4OOTGDAS = SEC	OTG DATA SOURCE	

OC **Resume script.**

4.e Script will uplink command 4OOTGEN

Verify Telemetry:

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MSID	Description	Verified
4OOTGMEF = ENAB	OTG MOTION ENABLE FLAG	

OC **Resume script.**

4.f Script will buffer and send commands COENASX COENAS1=242 and COACTSXCOACTS1=242, COACTS2=0

Verify Telemetry:

MSID	Description	Verified
4OOTGMTN = INSR	ACTION (INSERT/RETRACT SELECTED GRATING)	
4OOTGSEL = HETG	SELECTED GRATING	
4M5IRAX = ENAB	MCE A: +5 Volt Conv Inh Relay Monitor	
4MP5AV = 5.0 ± 0.5	MCE A: +5 Volt Monitor	
4M5IRBX =ENAB	MCE B: +5 Volt Conv Inh Relay Monitor	
4MP5BV = 5.0 ± 0.5	MCE B: +5 Volt Monitor	
4M28IRAX = DISA	MCE A: +28 Volt Conv Inh Relay Mon	
4MP28AV = 6.0 ± 0.5	MCE A: +28 Volt Monitor	
4M28IRBX = ENAB	MCE B: +28 Volt Conv Inh Relay Mon	
4MP28BV = 28.0 ± 0.5	MCE B: +28 Volt Monitor	
4HEXRAX = DISA	MCE A: HETG Execute Relay Status Monitor	
4HLORAX = ENAB	MCE A: HETG Hardware Lockout Relay Status Monitor	
4HRLSA = NRET	MCE A: HETG Limit Switch 1A Monitor (Retracted)	
4HILSA = NINS -> INSR	MCE A: HETG Limit Switch 2A Monitor (Inserted)	
4HEXRBX = ENAB	MCE B: HETG Execute Relay Status Monitor	
4HLORBX = ENAB	MCE B: HETG Hardware Lockout Relay Status Monitor	
4HRLSB = NRET	MCE B: HETG Limit Switch 1B Monitor (Retracted)	
4HILSB = NINS -> INSR	MCE B: HETG Limit Switch 2B Monitor (Inserted)	
4LENLAX = DISA	MCE A: LETG Enable Logic Status Monitor	
4LEXRAX = DISA	MCE A: LETG Execute Relay Status Monitor	
4LLORAX = ENAB	MCE A: LETG Hardware Lockout Relay Status Monitor	
4LRLSA = NRET	MCE A: LETG Limit Switch 1A Monitor (Retracted)	
4LILSA = NINS	MCE A: LETG Limit Switch 2A Monitor (Inserted)	
4LENLBX = DISA	MCE B: LETG Enable Logic Status Monitor	
4LEXRBX = DISA	MCE B: LETG Execute Relay Status Monitor	
4LLORBX = ENAB	MCE B: LETG Hardware Lockout Relay Status Monitor	
4LRLSBD = RETR	MCE B: LETG Limit Switch 1B Monitor (Retracted)	
4LILSBD = NINS	MCE B: LETG Limit Switch 2B Monitor (Inserted)	
4HPOSARO ~ 78 -> ~7	HETG A-Side Potentiometer	
4HPOSBRO ~ 79 -> ~7	HETG B-Side Potentiometer	

When insertion has finished:

MSID	Description	Verified
4M5IRAX = ENAB	MCE A: +5 Volt Conv Inh Relay Monitor	
4MP5AV = 5.0 ± 0.5	MCE A: +5 Volt Monitor	
4M5IRBX =DISA	MCE B: +5 Volt Conv Inh Relay Monitor	

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4MP5BV = 0.0 ± 0.5	MCE B: +5 Volt Monitor	
4M28IRAX = DISA	MCE A: +28 Volt Conv Inh Relay Mon	
4MP28AV = 0.0 ± 0.5	MCE A: +28 Volt Monitor	
4M28IRBX = DISA	MCE B: +28 Volt Conv Inh Relay Mon	
4MP28BV = 0.0 ± 0.5	MCE B: +28 Volt Monitor	
4HEXRAX = DISA	MCE A: HETG Execute Relay Status Monitor	
4HLORAX = ENAB	MCE A: HETG Hardware Lockout Relay Status Monitor	
4HRLSA = NRET	MCE A: HETG Limit Switch 1A Monitor (Retracted)	
4HILSA = INSR	MCE A: HETG Limit Switch 2A Monitor (Inserted)	
4LENLAX = DISA	MCE A: LETG Enable Logic Status Monitor	
4LEXRAX = DISA	MCE A: LETG Execute Relay Status Monitor	
4LLORAX = ENAB	MCE A: LETG Hardware Lockout Relay Status Monitor	
4LRLSA = NRET	MCE A: LETG Limit Switch 1A Monitor (Retracted)	
4LILSA = NINS	MCE A: LETG Limit Switch 2A Monitor (Inserted)	
4HPOSARO ~7	HETG A-Side Potentiometer	
4HPOSBRO ~7	HETG B-Side Potentiometer	

Wait until the move has completed successfully (~ 155 seconds) before continuing.

OC **Resume script.**

4.g Script will uplink command 4OOTGDS

Verify Telemetry:

MSID	Description	Verified
4OOTGMEF = DISA	OTG MOTION ENABLE FLAG	

OC **Resume script.**

4.h Script will uplink command 4MC5BEN

Verify Telemetry:

MSID	Description	Verified
4M5IRAX = ENAB	MCE A: +5 Volt Conv Inh Relay Monitor	
4MP5AV = 5.0 ± 0.5	MCE A: +5 Volt Monitor	
4M5IRBX =ENAB	MCE B: +5 Volt Conv Inh Relay Monitor	
4MP5BV = 5.0 ± 0.5	MCE B: +5 Volt Monitor	
4M28IRAX = DISA	MCE A: +28 Volt Conv Inh Relay Mon	
4MP28AV = 0.0 ± 0.5	MCE A: +28 Volt Monitor	
4M28IRBX = DISA	MCE B: +28 Volt Conv Inh Relay Mon	
4MP28BV = 0.0 ± 0.5	MCE B: +28 Volt Monitor	
4HEXRBX = DISA	MCE B: HETG Execute Relay Status Monitor	
4HLORBX = ENAB	MCE B: HETG Hardware Lockout Relay Status Monitor	
4HRLSB = NRET	MCE B: HETG Limit Switch 1B Monitor (Retracted)	
4HILSB = INSR	MCE B: HETG Limit Switch 2B Monitor (Inserted)	
4LENLBX = DISA	MCE B: LETG Enable Logic Status Monitor	
4LEXRBX = DISA	MCE B: LETG Execute Relay Status Monitor	
4LLORBX = ENAB	MCE B: LETG Hardware Lockout Relay Status Monitor	

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4LRLSBD = RETR	MCE B: LETG Limit Switch 1B Monitor (Retracted)	
4LILSBD = NINS	MCE B: LETG Limit Switch 2B Monitor (Inserted)	

OC Resume script.

4.i Script will uplink commands 4MC5BDS and 4MC5ADS

Verify Telemetry:

MSID	Description	Verified
4M5IRAX = DISA	MCE A: +5 Volt Conv Inh Relay Monitor	
4MP5AV = 0.0 ± 0.5	MCE A: +5 Volt Monitor	
4M5IRBX =DISA	MCE B: +5 Volt Conv Inh Relay Monitor	
4MP5BV = 0.0 ± 0.5	MCE B: +5 Volt Monitor	

OC Resume script.

4.j Script will buffer and send commands CODISASX COCLRS1=242 and COCLRSXCOACTS1=242, COACTS2=0

OC Resume to end of script.

4.k Return to flowchart to identify which step should be proceeded to next.

****---------- WARNING ----------****

You must reference the proper Flowchart to determine which step should be performed next.

****----------****

5.0 POST-OTG MOVE RECONFIGURATION

****---------- NOTE ----------****

This step will reconfigure the spacecraft after the completion of OTG motions. It will enable momentum unloading and the momentum monitor, as well as put the spacecraft in NPM.

Only perform this step after verifying the proper sequence of steps from the appropriate Flowchart.

****----------****

5.a Re-enable PCAD Monitors and return to NPM

OC Begin the following script: A_MECH_RECONFIG.

5.a.1 Script will pause at initial WAIT.

OC Resume script.

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5.a.2 Script will uplink command AOFUNCEN AOPCADSE=32

OC **Uplink buffer.**

Verify telemetry:

MSID	Value	
AOPSSCMM	INIT -> ACT	

OC **Resume script.**

5.a.3 Script will uplink command AOMUNLEN.

Verify telemetry:

MSID	Value	
AOAUTUNL	ENAB	

OC **Resume script.**

5.a.4 Script will buffer command COACTSX COACTS1=38, COACTS2=0.

OC **Uplink buffer.**

Verify that all ACA image slots are blank.

OC **Resume script.**

5.a.5 Script will uplink command AONPMODE.

****---------- NOTE ----------****

If Chandra is in Normal Sun Mode, PCAD must write a CAP to disable the Dead Man Load and to reenable momentum unloading and the momentum monitor without returning to Normal Point Mode.

****----------****

Verify telemetry:

MSID	Value	
AOPCADMD	NPNT	
AOACASEQ	AQXN --> GUID --> KALM	
AOFSTAR	GUID	
AOACQSUC	SUC	
AOGDESUC	SUC	

OC **Resume to end of script.**

5.b Disable and clear command load

OC **Use script O_SCS_CTRL to CLEAR SCS 193.**

5.c Return to flowchart to identify which step should be proceeded to next

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****---------- WARNING ----------
****
You must reference the proper Flowchart to determine which step should be performed next.
****----------****

6.0 SWAP SEA/SI-RCTU

****---------- NOTE ----------****
Only perform this step after verifying the proper sequence of steps from the appropriate Flowchart.
SOP_CCDM_SWAP_SI_RCTU_ATOB references procedure SOP_MECH_SWAP_SEA to swap to SEA-B.
****----------****

6.a Perform all the steps in SOP_CCDM_SWAP_SI_RCTU_ATOB to switch the SEA and SI-RCTU to the B-side units.

OC Execute SOP_CCDM_SWAP_SI_RCTU_ATOB

6.b Return to flowchart to identify which step should be proceeded to next.

****---------- WARNING ----------
****
You must reference the proper Flowchart to determine which step should be performed next.
****----------****

7.0 RUN SCS 107

****---------- NOTE ----------****
Only perform this step after verifying the proper sequence of steps from the appropriate Flowchart.
****----------****

7.a Run SCS 107

OC - Using script O_PROT_SCSCTRL, ENABLE AND ACTIVATE SCS 107.

7.b Return to flowchart to identify which step should be proceeded to next.

****---------- WARNING ----------
****
You must reference the proper Flowchart to determine which step should be performed next.
****----------****

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8.0 RETRACT LETG USING HW COMMANDS

****---------- NOTE ----------****
This step will retract the LETG using hardware commands.

Only perform this step after verifying the proper sequence of steps from the appropriate Flowchart.
****----------****

8.a Request GOT to enable disabled command 4LOLGBDS.

8.b Uplink the following command loads:

Load Name	Checksum
MA_LMV153_200.CLD	**501D656**
MA_LMV2MC_222.CLD	**501E304**

OC Uplink the above 2 loads and verify good memload.

8.c LETG Retraction by Hardware Commands

OC Begin the following script: M_LETG_RETR_B_SCS.

8.c.1 Script will pause at initial WAIT.

Verify Telemetry:

MSID	Description	Verified
4HPOSARO > 79	HETG A-Side Potentiometer	
4HPOSBRO > 79	HETG B-Side Potentiometer	
4LPOSARO < 10	LETG A-Side Potentiometer	
4LPOSBRO < 8	LETG B-Side Potentiometer	

OC Resume script.

8.c.2 Script will uplink commands 4MC5AEN, 4MC5BEN, 4SLLGBEN, 4SLLGAEN, 4RTLGBEN, 4MC28BEN, and 4LOLGBDS.

Verify Telemetry:

MSID	Description	Verified
4M5IRAX = ENAB	MCE A: +5 Volt Conv Inh Relay Monitor	
4MP5AV = 5.0 ± 0.5	MCE A: +5 Volt Monitor	
4M5IRBX =ENAB	MCE B: +5 Volt Conv Inh Relay Monitor	
4MP5BV = 5.0 ± 0.5	MCE B: +5 Volt Monitor	
4M28IRAX = DISA	MCE A: +28 Volt Conv Inh Relay Mon	
4MP28AV = 0.0 ± 0.5	MCE A: +28 Volt Monitor	
4M28IRBX = DISA	MCE B: +28 Volt Conv Inh Relay Mon	
4MP28BV = 28.0 ± 0.5	MCE B: +28 Volt Monitor	
4HENLAX = DISA	MCE A: HETG Enable Logic Status Monitor	
4HEXRAX = DISA	MCE A: HETG Execute Relay Status Monitor	

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4HLORAX = ENAB	MCE A: HETG Hardware Lockout Relay Status Monitor	
4HRLSA = NRET	MCE A: HETG Limit Switch 1A Monitor (Retracted)	
4HILSA = NINS	MCE A: HETG Limit Switch 2A Monitor (Inserted)	
4HENLBX = DISA	MCE B: HETG Enable Logic Status Monitor	
4HEXRBX = DISA	MCE B: HETG Execute Relay Status Monitor	
4HLORBX = ENAB	MCE B: HETG Hardware Lockout Relay Status Monitor	
4HRLSB = NRET	MCE B: HETG Limit Switch 1B Monitor (Retracted)	
4HILSB = NINS	MCE B: HETG Limit Switch 2B Monitor (Inserted)	
4LENLAX = DISA	MCE A: LETG Enable Logic Status Monitor	
4LEXRAX = DISA	MCE A: LETG Execute Relay Status Monitor	
4LLORAX = ENAB	MCE A: LETG Hardware Lockout Relay Status Monitor	
4LRLSA = NRET	MCE A: LETG Limit Switch 1A Monitor (Retracted)	
4LILSA = INSR	MCE A: LETG Limit Switch 2A Monitor (Inserted)	
4LENLBX = ENAB	MCE B: LETG Enable Logic Status Monitor	
4LEXRBX = DISA	MCE B: LETG Execute Relay Status Monitor	
4LLORBX = DISA	MCE B: LETG Hardware Lockout Relay Status Monitor	
4LRLSBD = NRET	MCE B: LETG Limit Switch 1B Monitor (Retracted)	
4LILSBD = INSR	MCE B: LETG Limit Switch 2B Monitor (Inserted)	
4LRSMA = SELE	MCE A: OTG Select Relay Status Monitor – LETG	
4LRSMB = SELE	MCE B: OTG Select Relay Status Monitor – LETG	
4LDIRB = RETR	MCE B: LETG Direction Relay Status Monitor	

OC **Resume script, and send buffer.**

8.c.3 Script will buffer and send commands COENASX COENAS1=200 and COACTSXCOACTS1=200, COACTS2=0

Verify Telemetry:

MSID	Description	Verified
4M5IRAX = ENAB	MCE A: +5 Volt Conv Inh Relay Monitor	
4MP5AV = 5.0 ± 0.5	MCE A: +5 Volt Monitor	
4M5IRBX =ENAB	MCE B: +5 Volt Conv Inh Relay Monitor	
4MP5BV = 5.0 ± 0.5	MCE B: +5 Volt Monitor	
4M28IRAX = DISA	MCE A: +28 Volt Conv Inh Relay Mon	
4MP28AV = 7.0 ± 0.5	MCE A: +28 Volt Monitor	
4M28IRBX = ENAB	MCE B: +28 Volt Conv Inh Relay Mon	
4MP28BV = 28.0 ± 0.5	MCE B: +28 Volt Monitor	
4HENLAX = DISA	MCE A: HETG Enable Logic Status Monitor	
4HEXRAX = DISA	MCE A: HETG Execute Relay Status Monitor	
4HLORAX = ENAB	MCE A: HETG Hardware Lockout Relay Status Monitor	
4HRLSA = NRET	MCE A: HETG Limit Switch 1A Monitor (Retracted)	
4HILSA = NINS	MCE A: HETG Limit Switch 2A Monitor (Inserted)	
4HENLBX = DISA	MCE B: HETG Enable Logic Status Monitor	
4HEXRBX = DISA	MCE B: HETG Execute Relay Status Monitor	
4HLORBX = ENAB	MCE B: HETG Hardware Lockout Relay Status Monitor	
4HRLSB = NRET	MCE B: HETG Limit Switch 1B Monitor (Retracted)	
4HILSB = NINS	MCE B: HETG Limit Switch 2B Monitor (Inserted)	
4LENLAX = DISA	MCE A: LETG Enable Logic Status Monitor	

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4LEXRAX = DISA	MCE A: LETG Execute Relay Status Monitor	
4LLORAX = ENAB	MCE A: LETG Hardware Lockout Relay Status Monitor	
4LRLSA = NRET	MCE A: LETG Limit Switch 1A Monitor (Retracted)	
4LILSA = INSR -> NINS	MCE A: LETG Limit Switch 2A Monitor (Inserted)	
4LENLBX = ENAB	MCE B: LETG Enable Logic Status Monitor	
4LEXRBX = ENAB/DISA	MCE B: LETG Execute Relay Status Monitor	
4LLORBX = DISA	MCE B: LETG Hardware Lockout Relay Status Monitor	
4LRLSBD = NRET -> RETR	MCE B: LETG Limit Switch 1B Monitor (Retracted)	
4LILSBD = INSR -> NINS	MCE B: LETG Limit Switch 2B Monitor (Inserted)	
4LPOSARO ~ 8 -> ~78	LETG A-Side Potentiometer	
4LPOSBRO ~ 6 -> ~78	LETG B-Side Potentiometer	

OC Resume script by entering "2MC" at the prompt, and sending the buffer. Repeat this step until the LETG is retracted. Then enter "NONE" at the prompt.

8.c.4 Script will buffer and send commands COENASX COENAS1=222 and COACTSXCOACTS1=222, COACTS2=0

Verify Telemetry:

MSID	Description	Verified
4M5IRAX = ENAB	MCE A: +5 Volt Conv Inh Relay Monitor	
4MP5AV = 5.0 ± 0.5	MCE A: +5 Volt Monitor	
4M5IRBX =ENAB	MCE B: +5 Volt Conv Inh Relay Monitor	
4MP5BV = 5.0 ± 0.5	MCE B: +5 Volt Monitor	
4M28IRAX = DISA	MCE A: +28 Volt Conv Inh Relay Mon	
4MP28AV = 0.0 ± 0.5	MCE A: +28 Volt Monitor	
4M28IRBX = ENAB	MCE B: +28 Volt Conv Inh Relay Mon	
4MP28BV = 28.0 ± 0.5	MCE B: +28 Volt Monitor	
4HENLAX = DISA	MCE A: HETG Enable Logic Status Monitor	
4HEXRAX = DISA	MCE A: HETG Execute Relay Status Monitor	
4HLORAX = ENAB	MCE A: HETG Hardware Lockout Relay Status Monitor	
4HRLSA = NRET	MCE A: HETG Limit Switch 1A Monitor (Retracted)	
4HILSA = NINS	MCE A: HETG Limit Switch 2A Monitor (Inserted)	
4HENLBX = DISA	MCE B: HETG Enable Logic Status Monitor	
4HEXRBX = DISA	MCE B: HETG Execute Relay Status Monitor	
4HLORBX = ENAB	MCE B: HETG Hardware Lockout Relay Status Monitor	
4HRLSB = NRET	MCE B: HETG Limit Switch 1B Monitor (Retracted)	
4HILSB = NINS	MCE B: HETG Limit Switch 2B Monitor (Inserted)	
4LENLAX = DISA	MCE A: LETG Enable Logic Status Monitor	
4LEXRAX = DISA	MCE A: LETG Execute Relay Status Monitor	
4LLORAX = ENAB	MCE A: LETG Hardware Lockout Relay Status Monitor	
4LRLSA = NRET	MCE A: LETG Limit Switch 1A Monitor (Retracted)	
4LILSA = NINS	MCE A: LETG Limit Switch 2A Monitor (Inserted)	
4LENLBX = ENAB	MCE B: LETG Enable Logic Status Monitor	
4LEXRBX = ENAB	MCE B: LETG Execute Relay Status Monitor	
4LLORBX = DISA	MCE B: LETG Hardware Lockout Relay Status Monitor	
4LRLSBD = RETR	MCE B: LETG Limit Switch 1B Monitor (Retracted)	
4LILSBD = NINS	MCE B: LETG Limit Switch 2B Monitor (Inserted)	
4LPOSARO ~78	LETG A-Side Potentiometer	

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4LPOSBRO ~78	LETG B-Side Potentiometer	

Each activation after the first should cause an invalid SCS transition OBC error.

RECORD NUMBER OF SMALL PULSES _____

OC **Resume script.**

8.c.5 Script will uplink command 4LOLGBEN

Verify Telemetry:

MSID	Description	Verified
4LLORBX = ENAB	MCE B: LETG Hardware Lockout Relay Status Monitor	

OC **Resume script.**

8.c.6 Script will uplink commands 4MC28BDS, 4MC5BDS, and 4MC5ADS.

Verify Telemetry:

MSID	Description	Verified
4M5IRAX = DISA	MCE A: +5 Volt Conv Inh Relay Monitor	
4MP5AV = 0.0 ± 0.5	MCE A: +5 Volt Monitor	
4M5IRBX =DISA	MCE B: +5 Volt Conv Inh Relay Monitor	
4MP5BV = 0.0 ± 0.5	MCE B: +5 Volt Monitor	
4M28IRAX = DISA	MCE A: +28 Volt Conv Inh Relay Mon	
4MP28AV = 0.0 ± 0.5	MCE A: +28 Volt Monitor	
4M28IRBX = DISA	MCE B: +28 Volt Conv Inh Relay Mon	
4MP28BV = 0.0 ± 0.5	MCE B: +28 Volt Monitor	

Script will buffer commands to disable and clear SCS 200, 201-203, 211-213, and 221-223.

OC **Send buffer and resume to end of script.**

This should cause 16 additional invalid SCS transition errors.

8.d Return to flowchart to identify which step should be proceeded to next.

****---------- WARNING ----------
****
You must reference the proper Flowchart to determine which step should be performed next.
****----------****

9.0 INSERT HETG BY HW COMMANDS

****---------- NOTE ----------****
This step will insert the LETG using hardware commands.

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SOP_SYSTEM_UNSAFE_ACIS_PHASE2

Only perform this step after verifying the proper sequence of steps from the appropriate Flowchart.
****----------****

9.a Uplink the following command loads:

Load Name	Checksum
MA_HINS160_200.CLD	**701D65A**

OC **Uplink the above load and verify good memload.**

9.b HETG Insertion by Hardware Commands

OC **Begin the following script: M_HETG_INSR_B_SCS.**

9.b.1Script will pause at initial WAIT.

Verify Telemetry:

MSID	Description	Verified
4HPOSARO > 78	HETG A-Side Potentiometer	
4HPOSBRO > 78	HETG B-Side Potentiometer	
4LPOSARO > 78	LETG A-Side Potentiometer	
4LPOSBRO > 78	LETG B-Side Potentiometer	

OC **Resume script.**

9.b.2Script will uplink commands 4MC5AEN, 4MC5BEN, 4SLHGBEN, 4SLHGAEN, 4INHGBEN, and 4MC28BEN.

Verify Telemetry:

MSID	Description	Verified
4M5IRAX = ENAB	MCE A: +5 Volt Conv Inh Relay Monitor	
4MP5AV = 5.0 ± 0.5	MCE A: +5 Volt Monitor	
4M5IRBX =ENAB	MCE B: +5 Volt Conv Inh Relay Monitor	
4MP5BV = 5.0 ± 0.5	MCE B: +5 Volt Monitor	
4M28IRAX = DISA	MCE A: +28 Volt Conv Inh Relay Mon	
4MP28AV = 0.0 ± 0.5	MCE A: +28 Volt Monitor	
4M28IRBX = ENAB	MCE B: +28 Volt Conv Inh Relay Mon	
4MP28BV = 28.0 ± 0.5	MCE B: +28 Volt Monitor	
4HEXRAX = DISA	MCE A: HETG Execute Relay Status Monitor	
4HLORAX = ENAB	MCE A: HETG Hardware Lockout Relay Status Monitor	
4HRLSA = NRET	MCE A: HETG Limit Switch 1A Monitor (Retracted)	
4HILSA = NINS	MCE A: HETG Limit Switch 2A Monitor (Inserted)	
4HENLBX = ENAB	MCE B: HETG Enable Logic Status Monitor	
4HEXRBX = DISA	MCE B: HETG Execute Relay Status Monitor	
4HLORBX = ENAB	MCE B: HETG Hardware Lockout Relay Status Monitor	
4HRLSB = NRET	MCE B: HETG Limit Switch 1B Monitor (Retracted)	
4HILSB = NINS	MCE B: HETG Limit Switch 2B Monitor (Inserted)	
4LENLAX = DISA	MCE A: LETG Enable Logic Status Monitor	

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4LEXRAX = DISA	MCE A: LETG Execute Relay Status Monitor	
4LLORAX = ENAB	MCE A: LETG Hardware Lockout Relay Status Monitor	
4LRLSA = NRET	MCE A: LETG Limit Switch 1A Monitor (Retracted)	
4LILSA = NINS	MCE A: LETG Limit Switch 2A Monitor (Inserted)	
4LENLBX = DISA	MCE B: LETG Enable Logic Status Monitor	
4LEXRBX = DISA	MCE B: LETG Execute Relay Status Monitor	
4LLORBX = ENAB	MCE B: LETG Hardware Lockout Relay Status Monitor	
4LRLSBD = RETR	MCE B: LETG Limit Switch 1B Monitor (Retracted)	
4LILSBD = NINS	MCE B: LETG Limit Switch 2B Monitor (Inserted)	
4HRSMA = SELE	MCE A: OTG Select Relay Status Monitor – HETG	
4HRSMB = SELE	MCE B: OTG Select Relay Status Monitor – HETG	
4HDIRB = INSR	MCE B: HETG Direction Relay Status Monitor	

OC **Resume script, and send buffer.**

9.b.3Script will buffer and send commands COENASX COENAS1=200 and COACTSX COACTS1=200, COACTS2=0

Verify Telemetry:

MSID	Description	Verified
4M5IRAX = ENAB	MCE A: +5 Volt Conv Inh Relay Monitor	
4MP5AV = 5.0 ± 0.5	MCE A: +5 Volt Monitor	
4M5IRBX =ENAB	MCE B: +5 Volt Conv Inh Relay Monitor	
4MP5BV = 5.0 ± 0.5	MCE B: +5 Volt Monitor	
4M28IRAX = DISA	MCE A: +28 Volt Conv Inh Relay Mon	
4MP28AV = 6.0 ± 0.5	MCE A: +28 Volt Monitor	
4M28IRBX = ENAB	MCE B: +28 Volt Conv Inh Relay Mon	
4MP28BV = 28.0 ± 0.5	MCE B: +28 Volt Monitor	
4HENLAX = DISA	MCE A: HETG Enable Logic Status Monitor	
4HEXRAX = DISA	MCE A: HETG Execute Relay Status Monitor	
4HLORAX = ENAB	MCE A: HETG Hardware Lockout Relay Status Monitor	
4HRLSA = NRET	MCE A: HETG Limit Switch 1A Monitor (Retracted)	
4HILSA = NINS -> INSR	MCE A: HETG Limit Switch 2A Monitor (Inserted)	
4HENLBX = ENAB -> DISA	MCE B: HETG Enable Logic Status Monitor	
4HEXRBX = ENAB -> DISA	MCE B: HETG Execute Relay Status Monitor	
4HLORBX = ENAB	MCE B: HETG Hardware Lockout Relay Status Monitor	
4HRLSB = NRET	MCE B: HETG Limit Switch 1B Monitor (Retracted)	
4HILSB = NINS -> INSR	MCE B: HETG Limit Switch 2B Monitor (Inserted)	
4LENLAX = DISA	MCE A: LETG Enable Logic Status Monitor	
4LEXRAX = DISA	MCE A: LETG Execute Relay Status Monitor	
4LLORAX = ENAB	MCE A: LETG Hardware Lockout Relay Status Monitor	
4LRLSA = NRET	MCE A: LETG Limit Switch 1A Monitor (Retracted)	
4LILSA = NINS	MCE A: LETG Limit Switch 2A Monitor (Inserted)	
4LENLBX = DISA	MCE B: LETG Enable Logic Status Monitor	
4LEXRBX = DISA	MCE B: LETG Execute Relay Status Monitor	
4LLORBX = ENAB	MCE B: LETG Hardware Lockout Relay Status Monitor	
4LRLSBD = RETR	MCE B: LETG Limit Switch 1B Monitor (Retracted)	
4LILSBD = NINS	MCE B: LETG Limit Switch 2B Monitor (Inserted)	
4HPOSARO ~79 -> ~7	HETG A-Side Potentiometer	

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4HPOSBRO ~79 -> ~7	HETG B-Side Potentiometer	

OC Resume script by entering "NONE" at the prompt.

OC Resume script.

9.b.4Script will uplink commands 4MC28BDS, 4MC5BDS, and 4MC5ADS.

Verify Telemetry:

MSID	Description	Verified
4M5IRAX = DISA	MCE A: +5 Volt Conv Inh Relay Monitor	
4MP5AV = 0.0 ± 0.5	MCE A: +5 Volt Monitor	
4M5IRBX =DISA	MCE B: +5 Volt Conv Inh Relay Monitor	
4MP5BV = 0.0 ± 0.5	MCE B: +5 Volt Monitor	
4M28IRAX = DISA	MCE A: +28 Volt Conv Inh Relay Mon	
4MP28AV = 0.0 ± 0.5	MCE A: +28 Volt Monitor	
4M28IRBX = DISA	MCE B: +28 Volt Conv Inh Relay Mon	
4MP28BV = 0.0 ± 0.5	MCE B: +28 Volt Monitor	

OC Resume to end of script.

OC Using script O_SCSCTRL, disable and clear SCS 200.

9.c Return to flowchart to identify which step should be proceeded to next.

****---------- WARNING ----------
****
You must reference the proper Flowchart to determine which step should be performed next.
****----------****

10.0 RUN SCRIPT I_SAFEINST

****---------- NOTE ----------****
Only perform this step after verifying the proper sequence of steps from the appropriate Flowchart.
****----------****

10.a Run Script I_SAFEINST

OC - Start Script I_SAFEINST

****---------- NOTE ----------****
The I_SAFEINST script is designed to perform the same function as SCS 107 if, for whatever reason, SCS 107 cannot do the job. If this step is being performed, it is likely that there is some OBC/SEA/RCTU malfunction preventing the successful completion of SI safing actions. While this script will only serve as a work-around for OBC-related problems, it is recommended that this action be taken before the SI-RCTU/SEA swap (Step 6) when following Flowchart C, as this script does not require any (possibly unnecessary) HW swapping. Of course, if Engineering believes that the problem clearly lies in the SI-RCTU/SEA, this step may be bypassed.

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I_SAFEINST is considerably more complex than other scripts. In order to keep the running time of this script reasonable, all telemetry verification is done automatically by the ONLS. Before any commands are issued, the script assesses Chandra's state and outputs a list recommended actions to be taken or not taken. At this point, the OC can override any of the script's assessments before continuing, at which point the script will proceed to completion (which will take ~15-25 minutes, depending on which options are selected. Below is a chart listing recommended actions to be taken by the script. This table is meant as a guide only - the OC should receive a confirmation from the listed subsystem before proceeding. Expected States in **bold text** should always be applied.

****----------****

Action	Expected Response	Subsystem Responsibility
DISABLE RADMON	YES	SYSTEM
TERM DAILY LOAD	YES	SYSTEM
CMD NORM MAN MODE	YES	PCAD
DISA MOM MANGEMENT	YES	PCAD
XLATE SIM TO SAFE	NO	MECH
RETRACT GRATING	**NO**	MECH
SAFE ACIS	YES	ACIS
SAFE HRC	YES	HRC
RAMP DOWN HRC-I HV	YES	HRC
RAMP DOWN HRC-S HV	YES	HRC
CLOSE HRC DOOR	NO	HRC
HOME +Y SHUTTER	NO	HRC
HOME -Y SHUTTER	NO	HRC
XLATE SIM TO HRCS	**YES**	MECH
ENABLE MOM MANAGE	YES	PCAD
RETURN TO NPNT	YES	PCAD

10.b Return to flowchart to identify which step should be proceeded to next.

****---------- WARNING ----------****

You must reference the proper Flowchart to determine which step should be performed next.

****----------****

11.0 TRANSLATE SIM TO HRC-S BY SCRIPT

****---------- NOTE ----------****

Only perform this step after verifying the proper sequence of steps from the appropriate Flowchart.

****----------****

11.a Perform all the steps in SOP_MECH_SIM_XLATE to translate the SIM to the HRC-S position (-99,616 steps).

OC **Execute SOP_MECH_SIM_XLATE**

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11.b Return to flowchart to identify which step should be proceeded to next.

****---------- WARNING ----------
****
You must reference the proper Flowchart to determine which step should be performed next.
****----------****

12.0 RECOVER FROM A SIM STALL

****---------- NOTE ----------****
Only perform this step after verifying the proper sequence of steps from the appropriate Flowchart.
****----------****

12.a Perform all the steps in SEP_MECH_SIM_TSC_STALL_RECOVERY to produce a CAP to attempt recovery from a SIM stall. (NOTE: This could be a very lengthy process, perhaps on the order of days. There are possible SIM HW failures which cannot be recovered from.)

12.b Return to flowchart to identify which step should be proceeded to next.

****---------- WARNING ----------
****
You must reference the proper Flowchart to determine which step should be performed next.
****----------****

-----END OF PROCEDURE-----

SOP_SYSTEM_UNSAFE_ACIS_PHASE2

APPENDIX 1 - PHASE 3 - DETERMINING CAUSE

Completion of the Phase 2 SOP should leave ACIS in a safe position for all failure scenarios, except certain problems with non-redundant SIM hardware. Phase 3 assumes that ACIS is currently safe, but that the cause of the failure is still unknown.

This appendix is intended as a guide for how to proceed with the investigation. In all cases, the investigation should involve careful review of back-orbit telemetry and command history leading up to the failure, and review of the results of actions taken in the first two phases of the response. With these data, the following chart serves to identify which failures could have caused the unsafe ACIS condition. The Index column refers to the index numbers of failures in the fault tree, attached as appendix 2 of this procedure.

Index	Description	Identifiers
1.1.1	Hung Load and RADMON disabled	CORADMEN = DISA; Load not proceeding
(1.A)	SIM not commanded	Review of daily load or RT command history
(1.B)	SIM at Hard Stops	See SEP_MECH_SIM_TSC_STALL_RECOVERY, SIM Stall and O/C counters
(1.C)	Incomplete SIM Move (commanding)	Review of daily load or RT command history, SIM stall counter
1.2.3	EPHIN Thresholds set incorrectly	Review recent Patch of K-constants
A.1	SCS 107 Does Not Run Correctly	No OBC Control OR telemetry indicates incomplete or absent safing actions
A.2	IU SEU Results in bad SIM commanding	Review of back-orbit data from time of attempted SIM move, dump of SEA memory, SIM stall counter
A.3.1	SEA SEU results in bad SIM commanding	Review of back-orbit data from time of attempted SIM move, dump of SEA memory, SIM stall counter
A.3.2.1	RCTU PS/Data Bus Failure	Bad SIM SD telemetry, SI-RCTU B active
A.3.2.2	Failure of command logic module/command bus	Bad SIM SD telemetry, SI-RCTU B active
A.3.2.3	Failure of TLM logic module, TLM request or reply bus	Bad SIM SD telemetry, SI-RCTU B active
A.3.2.4	Failure in converter control logic	Safe Mode - Bad SIM SD telemetry, SI-RCTU B active
B.1.1.1	SEA Hard Reset (SEA/RCTU SEU)	Back-orbit data - sudden 0 value for 3TSCPOS, 3-update value of 3SEARSET=RSET
B.1.1.2	SEA Soft Reset (SEA/RCTU SEU)	Back-orbit data - 3-update value of 3SEARSET=RSET during SIM TT move
C.1	EPHIN cannot detect high radiation	5OHWFAIL = TRUE and/or 5ONOMOP = FALSE
C.2	EPHIN cannot report to OBC	5OHWFAIL = TRUE and/or 5ONOMOP = FALSE
D.1	SEA Power Switch Failure	SEA voltages = 0, SIM TLM garbage
D.2	SEA Input Surge Limiting/Filtering Failure	SEA voltages = 0, SIM TLM garbage
D.3	SEA Power Undervoltage	SEA voltages below low red limits
E.1,4-8, 10, 12-19	Assorted SEA Data Processor & data Acquisition Failures (telemetry)	SEA TLM partially or completely unreliable (may also have some commanding problems)
E.2-3, 9, 11	Assorted SEA Data Processor & data Acquisition Failures (commanding)	SEA not responsive to some or all SIM commands (may also have some TLM corruption)
F.1-2, 4-5	SEA-RCTU Interface Failures	SEA TLM partially or completely unreliable, possibly spurious RESET commands
F.3	CMD ENABLE, DATA, or CLOCK	SEA not responsive to some or all SIM commands

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	failure	
G.1,4	Motor Brake Failure	Difficulty achieving correct translation position
G.2-3, 5-6, 8	Mechanical HW Failure	SIM Stall and O/C counters, See SEP_MECH_SIM_TSC_STALL_RECOVERY
G.7	Flexible Lead Wire Breaks (multiple)	Permanent loss of SIM TT commanding

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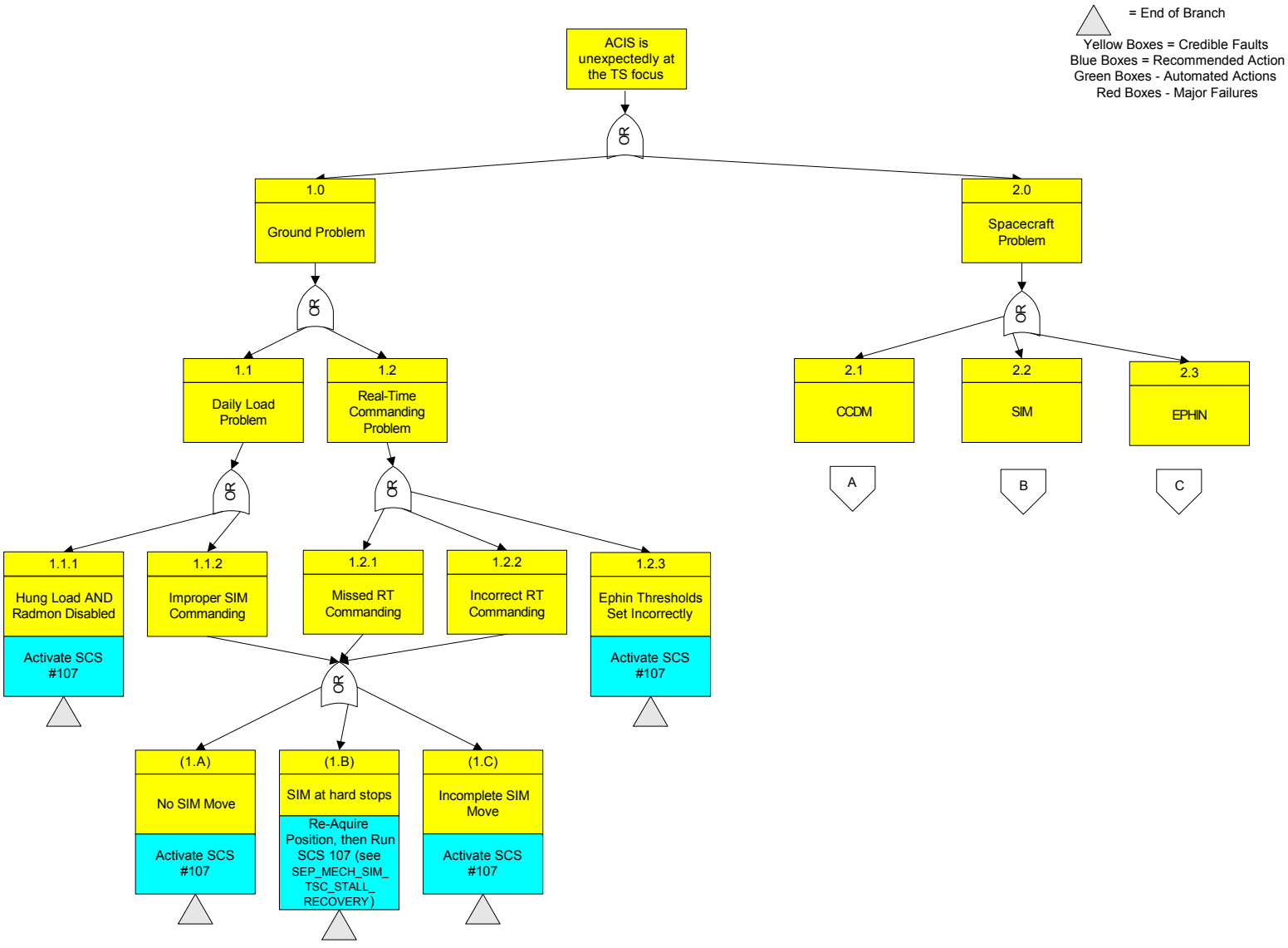
Appendix 2 - Unsafe ACIS Fault Tree



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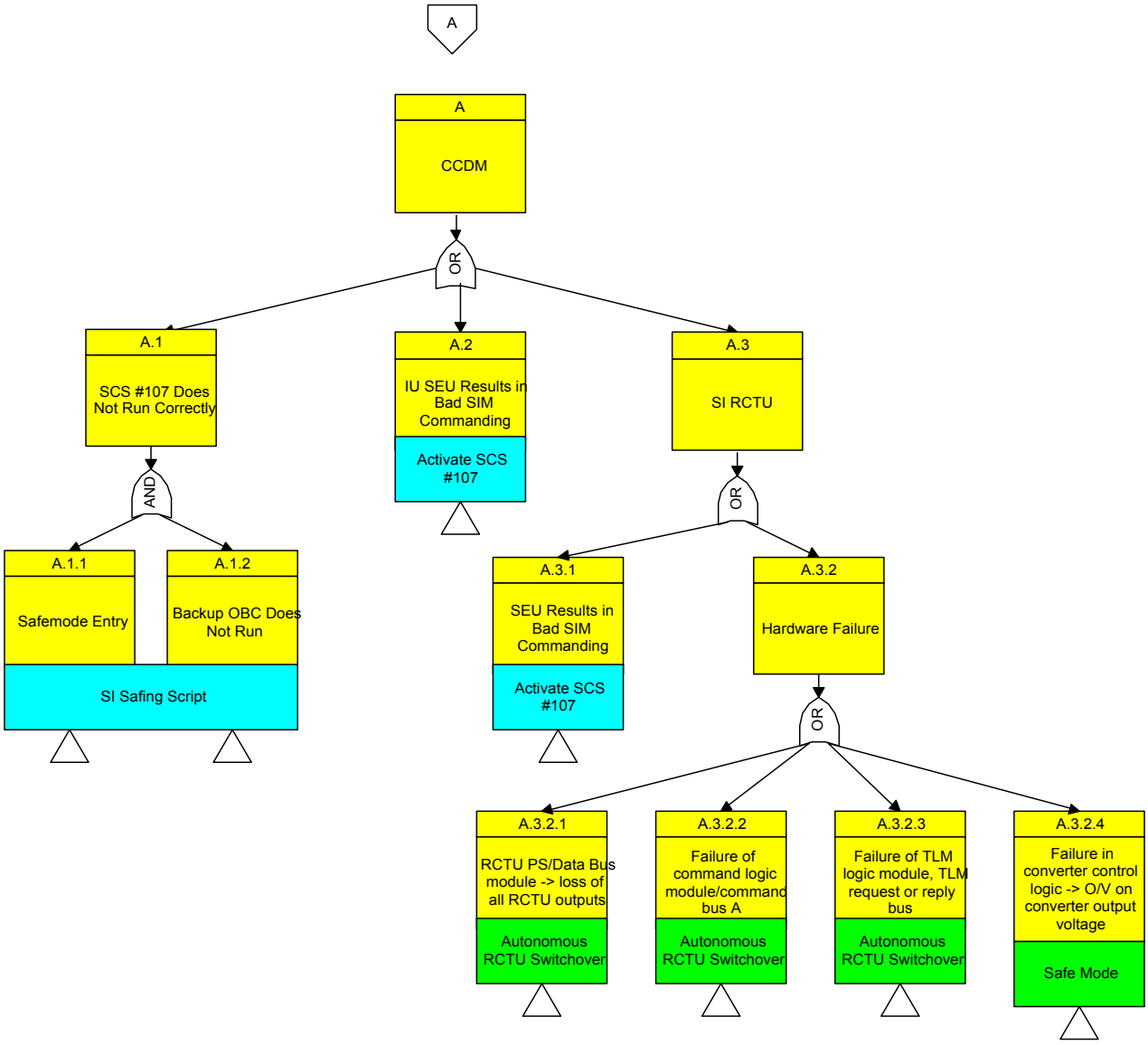

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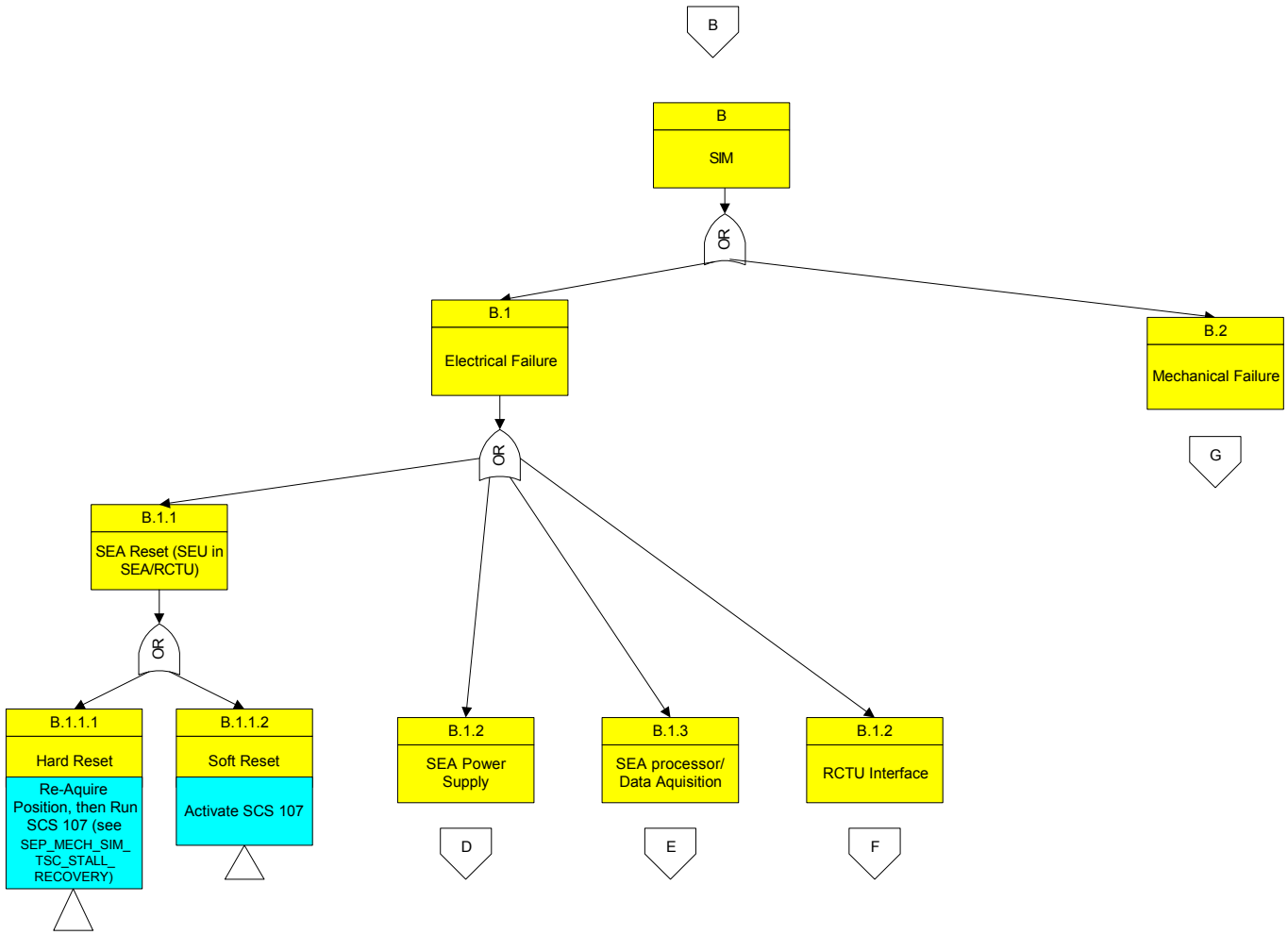

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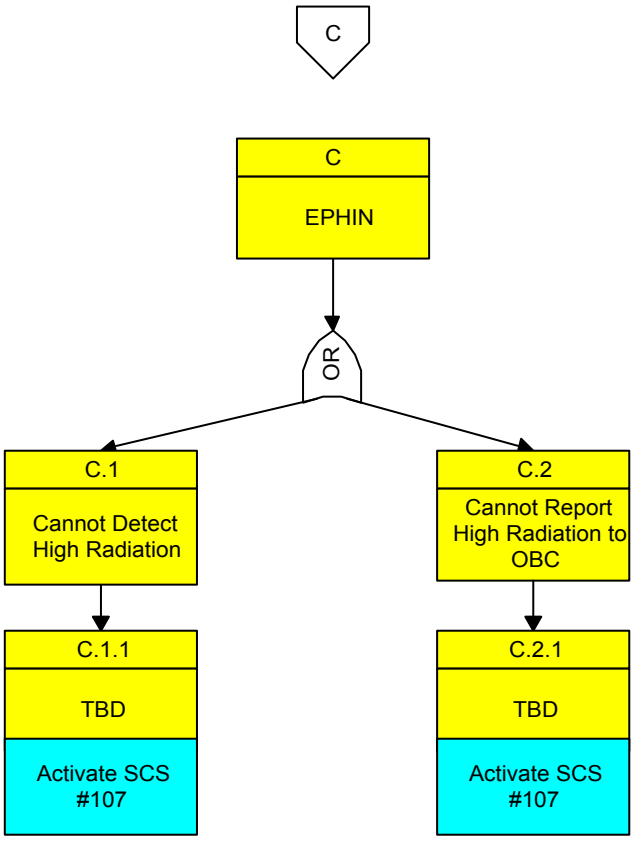

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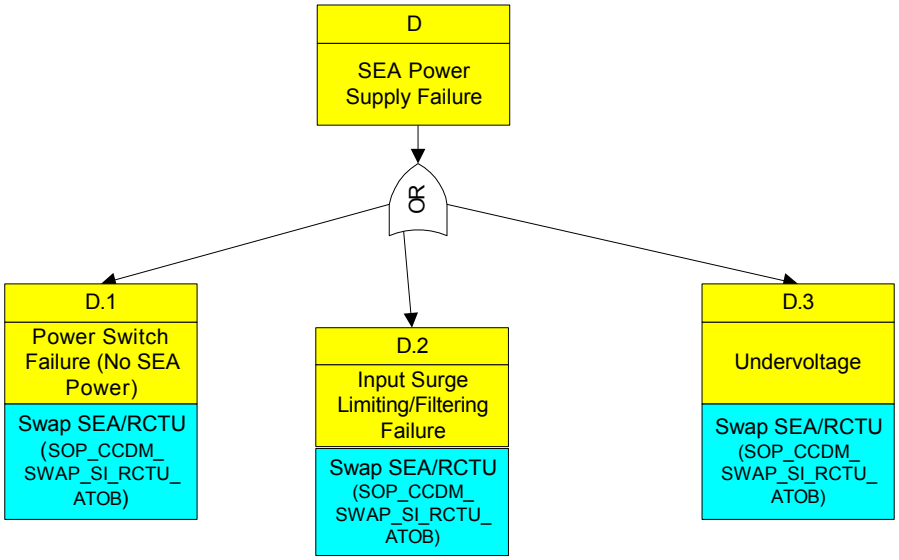

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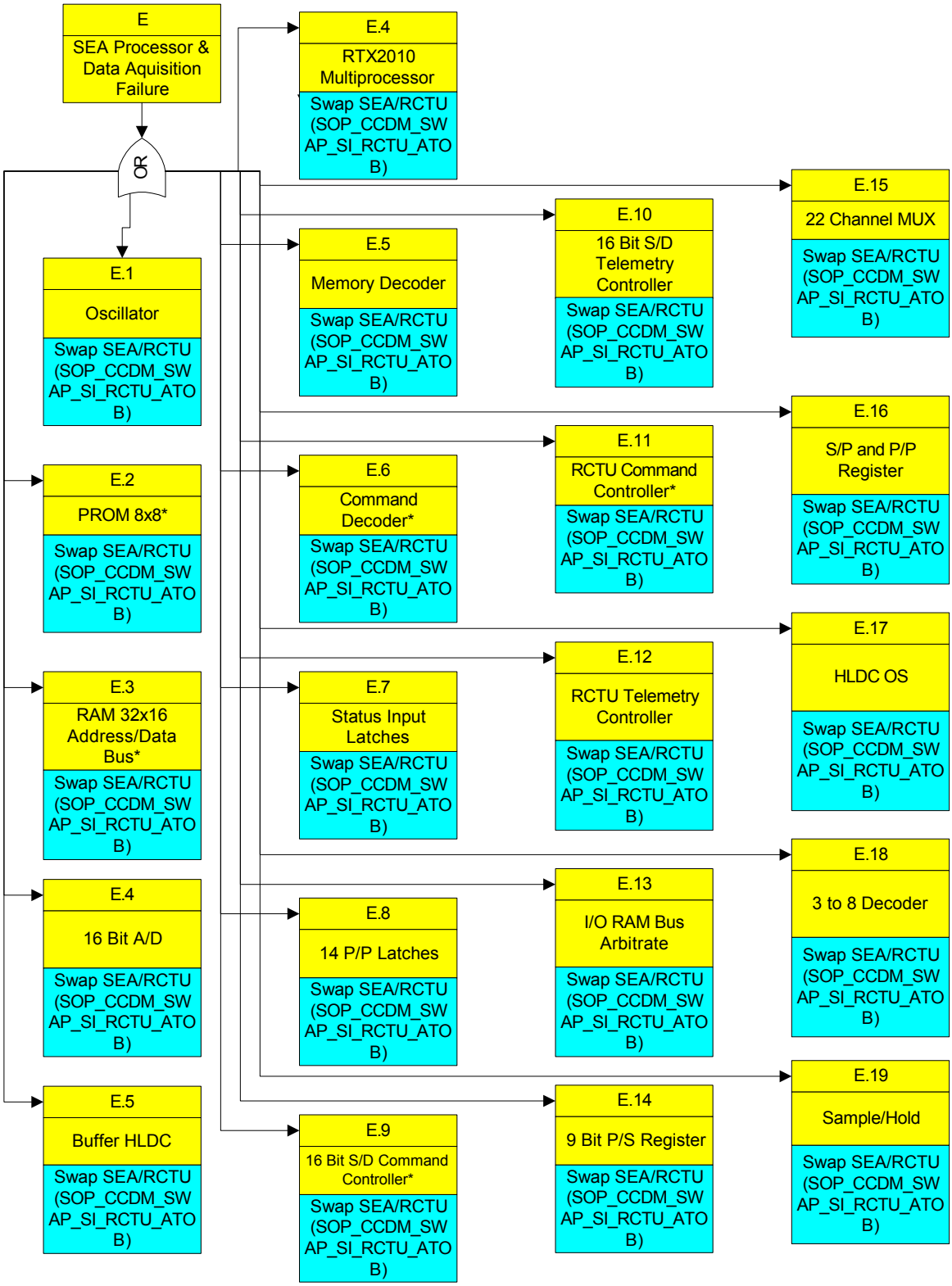

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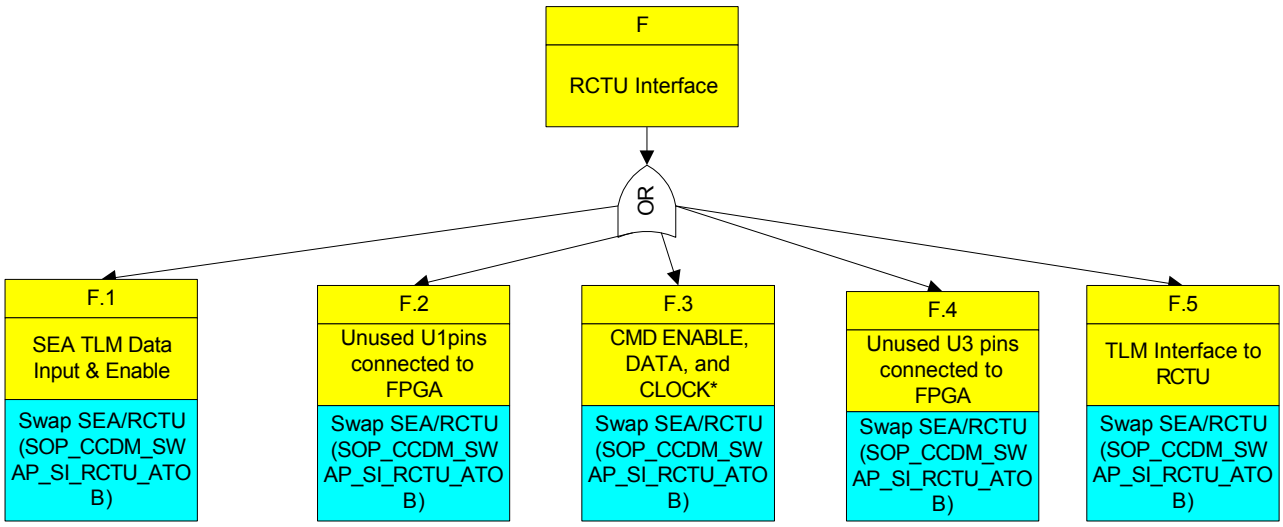

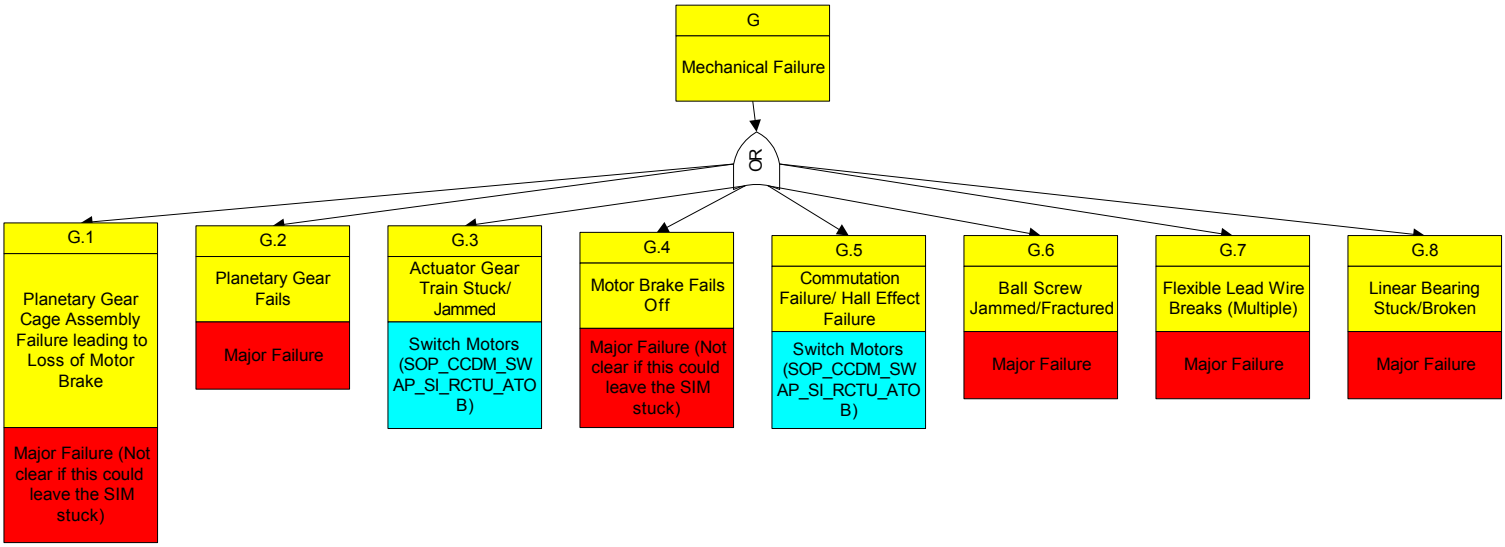

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Appendix 3 - History

KEYWORDS: ACIS, UNSAFE, SIM, PHASE2

HISTORY:

NAME	AUTHOR	REVISION	DATE
SOP_SYSTEM_UNSAFE_ACIS_ PHASE2	F. Richard Myers	3.0	03/08/02

EXTERNAL REFERENCES: SOP_OPS_UNSAFE_ACIS_PHASE1

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