Chandra On-Orbit Protected SCS Handbook

Introduction

This volume is the successor to the very popular, best-selling, SCS Handbook Rev. J that was approved in March of 2012. Since that time, several tasks involving making SCS modifications have been performed. This Revision brings the SCS Handbook up to date with PR-319 as the latest patch loaded onboard. Recall that protected SCSs refer to the 127 slots that lie within the checksummed region of OBC memory, hence are protected from bit level corruption. These protected SCSs require a software patch to change their contents. If you are using the electronic copy of this document, hyperlinks are indicated in BLUE.

NOTES - quick links to useful tables:

Table 1 is the table of contents for the protected SCS listed in this handbook.

Table 2 is a listing of the protected stored command sequences indicating their slot size (the number of commands that can be placed into each slot), plus each SCS starting and ending address in OBC memory

Table 3 is a listing of the sizes of the mission stored command sequence, included in this document for reference.

Table 4 is the latest Safe Modes Summary chart, included in this document for reference.

Table 5 shows the allowed and invalid SCS transitions

Table 6 contains all the SCS control commands

Table 7 is a listing of the Safe Mode related Modifications required due to H/W Reconfiguration

Table 8 is a listing of the Non-Safe Mode related Modifications required due to H/W Reconfiguration

Following these tables, and prior to the SCS listings themselves, is a brief overview of Stored Command Sequences.

This document is to remain current with the SCS image on the Chandra Spacecraft. Change pages are to be used, and a revision record is to be maintained. Electronic copies are also to be maintained.

Revision Record

Rev #	Date	Description of Change	Change Author
Original	Pre-Launch	Original Issue	TRW Operations Team
Rev. A	March 7, 2000	Post-OAC Comprehensive Cleanup	D. Muleady, TRW Chandra Operations
Rev. B	May 14, 2001	Addition of OTG Nudge Move SCSs 55, 56, 57 and 58	D. Muleady
		Change to SCS 82, OTG Safing SCS	
		Corrections to:	
		SCS 73 step 8, Relative Time Delay is 1mc, not 2 mc	
		SCS 73 step 8, Relative Time Delay is 1mc, not 2 mc	
Rev. C	July 27, 2004	Updated to reflect on-orbit SCS configurations: • SCS 31: Corrected text to for TX-A and PA-A are turned on • SCS 82: Updated to reflect code to halt OTG motion upon SCS 107 run • Various references to SCS 82 changed to reflect new name (OTG Emergency Halt) and function • Old SCS 29 updated and moved to SCS 30 • Brand new SCS 29 created for Eclipse Load Control • SCS 32 and 33 updated for use for Eclipse Entrance and Exit • SCSs 14, 78 and 82 updated to call appropriate SCSs • SCS 83 designated a No-op SCS • SCS 118 (Post-IUS Separation Tasks) and all references to it renamed to OBC Reset Reconfiguration Tasks – References in SCSs 7, 8,	F. Richard Myers

		9, 11, 12, 13, 14, 23, 25, 26, 27, 37, and 80. Description updated to reflect what it's currently used for. • Updates to SCS 31 and 34 for IRU Swap • SCS 36 updated to reflect on-orbit values • Add SCS 55, 56, 57, and 58 – OTG nudge SCSs • Spare SCS descriptions updated. • SCS 104 HRC mechanism commanding removed, call to SCS 105 removed, time delay added • SCS 106 step count updated. Starts from 1 instead of 0. • SCS 101 added to include checksummed CPE patches • SCS 31 modified to enable and activate SCS 101	
Rev. D	April 18, 2005	Changes made in order to avoid long time periods at poor thermal attitudes for the propulsion lines as part of PR-196 • Update to SCS 107 to activate SCS 84 • SCS 84 modified to issue command to enter Normal Sun Mode – SCS 84 will no longer be a spare SCS	Christine Harbison, F. Richard Myers
Rev. E	October 31, 2005	Modifications to SCS 107 to only move the SIM once, replacing the call to SCS 81 with a call to SCS 108	F. Richard Myers
Rev. F	July 17, 2006	New SCS 15 for Propulsion Line Temperature Monitor (PR-209).	F. Richard Myers
Rev. G	October 17, 2006	Update to Table 4 Safe Modes Summary Flow Chart	Paul Viens

Rev. H	May 24, 2011	• Corrected Comment in SCS 32 about disabling the Angular Momentum Unloading Logic • Added SCS 120 Update (PR-217) plus entry in Tables 1 and 2 • Table 8, added note that failure of VDE-A requires changes to SCS 120 to command VDE-B • Table 8, added note for required patching of primary database if staying on IP-B • SCS 14: updated value of Momentum AutoUnload Threshold • Corrected SCS 23 SADA monitor threshold to 172F • Corrected SCS 27 flow diagram title • Updated SCS 29 F_Eclipse flag current threshold • Deleted extraneous SCS 31 command mnemonic AIB2CAYS in step 63 of the SCS table • Corrected SCS 31 misspelled command mnemonic in step 65 of the SCS table • Corrections were made to the constraints section of SCS 16, 26, 27, 28, 31, 60 • Added SCS step reference column to SCS tables • Added SCS step description in Stored Command Sequence Description • Corrected a variety of field name typos for multi-part and modifiable commands in several SCSs	F. Richard Myers Daniel Wong

Rev. I	October 13, 2011	• Science Only Safing Action (SOSA) changes to SCSs 15, 27, 123 (new SCS entry) and 107 • Table 3 (Mission Stored Command Sequence Slot Sizes and Addresses) –new SCS sizes and addresses • Table 4 Safe Mode Summary Flow Chart – updated chart • Added new section describing SOSA changes • Removed command AORWMBDS in SCSs 17 – 22, and replaced with equivalent AORWMOMD command that is used in SCS 107	Daniel Wong
Rev. J	March 22, 2012	• Removed mentioning of SA Position Monitoring being re-enabled in SCS 23. • Updated SCS 90 for new HRC-S MCP ramp up step values via PR-307	Daniel Wong
Rev. K	August 23, 2012	• Updated SCS 101 for CPE patch PR-319 (Momentum Auto-unload Threshold Limit)	Daniel Wong

Table 1 Protected Stored Command Sequences Handbook Contents

Table 2 Protected SCS Slot Sizes and Addresses

SCS #	Size, Cmds	Start Address	End Address	Name
1	5	1B000	1B009	Initialize Online
2	5	1B00A	1B013	Safe Transition
3	5	1B014	1B01D	Deploy Transition
4	5	1B01E	1B027	Offline Transition
5	5	1B028	1B031	CCDM RCTU Command Wrap Fault
6	5	1B032	1B03B	Attitude Rate Monitor Fault
7	5	1B03C	1B045	IRU Monitor Fault
8	10	1B046	1B059	Sun Position Monitor Fault
9	10	1B05A	1B06D	Spacecraft Mom Monitor Fault
10	5	1B06E	1B077	Attitude Ref Eclipse Monitor
11	5	1B078	1B081	EPS Sun Overload Fault
12	5	1B082	1B08B	EPS Eclipse Overload Fault
13	5	1B08C	1B095	PCAD Sensor Processor Fault
14	5	1B096	1B09F	RW Unload Monitor Fault
15	5	1B0A0	1B0A9	Propulsion Line Temp Monitor Fault
16	20	1B0AA	1B0D1	Attitude Ref Sun Monitor Fault
17	15	1B0D2	1B0EF	RW1 Momentum Monitor Fault
18	15	1B0F0	1B10D	RW2 Momentum Monitor Fault
19	15	1B10E	1B12B	RW3 Momentum Monitor Fault
20	15	1B12C	1B149	RW4 Momentum Monitor Fault
21	15	1B14A	1B167	RW5 Momentum Monitor Fault
22	15	1B168	1B185	RW6 Momentum Monitor Fault
23	40	1B186	1B1D5	SADA Position or Temp Monitor Fault
24	10	1B1D6	1B1E9	Unexpected Battery Connect Fault
25	40	1B1EA	1B239	EP RCTU Monitor Fault
26	60	1B23A	1B2B1	TS RCTU Monitor Fault
27	45	1B2B2	1B30B	SIM RCTU Monitor Fault
28	5	1B30C	1B315	Bright Star Acquisition Monitor Fault
29	20	1B316	1B33D	Eclipse Load Control
30	60	1B33E	1B3B5	Battery Connection to Bus Safing Action
31	225	1B3B6	1B577	Safe Mode Reconfiguration
32	50	1B578	1B5DB	Eclipse Entrance
33	50	1B5DC	1B63F	Eclipse Exit
34	10	1B640	1B653	Configure PCAD
35	15	1B654	1B671	Activate Sensor Processing
36	110	1B672	1B74D	Enter Standby Mode
37	90	1B74E	1B801	First Normal Sun Mode
38	50	1B802	1B865	ACA Fid Light Reset
39	20	1B866	1B88D	OBA Heater Zone Shutoff
40	130	1B88E	1B991	ACIS Shutdown
41	75	1B992	1BA27	HRC Shutdown
42	70	1BA28	1BAB3	Trim Heater Prime Disable
43	60	1BAB4	1BB2B	Trim Heater Redundant Disable
44	20	1BB2C	1BB53	ESA Prime Disable
45	20	1BB54	1BB7B	ESA Redundant Disable
46	20	1BB7C	1BBA3	Tank Heater Disable
47	20	1BBA4	1BBCB	Transmitter Prime Disable
48	20	1BBCC	1BBF3	Transmitter Redundant Disable
49	20	1BBF4	1BC1B	FLCA Prime Disable
50	20	1BC1C	1BC43	FLCA Redundant Disable
51	10	1BC44	1BC57	RCS Heater Prime Disable
52	10	1BC58	1BC6B	RCS Heater Redundant Disable
53	20	1BC6C	1BC93	LAE Heater Prime Disable
54	20	1BC94	1BCBB	LAE Heater Redundant Disable
55	10	1BCBC	1BCCF	MCE-B LETG Insert Nudge
56	10	1BCD0	1BCE3	MCE-B HETG Insert Nudge
57	10	1BCE4	1BCF7	MCE-B LETG Retract Nudge
58	10	1BCF8	1BD0B	MCE-B HETG Retract Nudge

SCS #	Size, Cmds	Start Address	End Address	Name
59	10	1BD0C	1BD1F	Spare
60	25	1BD20	1BD51	PC RCTU Monitor Fault
61	20	1BD52	1BD79	ESA Prime Enable
62	20	1BD7A	1BDA1	ESA Redundant Enable
63	20	1BDA2	1BDC9	Transmitter Prime Enable
64	20	1BDCA	1BDF1	Transmitter Redundant Enable
65	20	1BDF2	1BE19	Tank Heater Enable
66	20	1BE1A	1BE41	FLCA Prime Enable
67	20	1BE42	1BE69	FLCA Redundant Enable
68	10	1BE6A	1BE7D	OBA Thermal Control Enable
69	100	1BE7E	1BF45	HRC Turn On
70	50	1BF46	1BFA9	ACIS Turn On
71	10	1BFAA	1BFBD	RCS Heater Prime Enable
72	10	1BFBE	1BFD1	RCS Heater Redundant Enable
73	20	1BFD2	1BFF9	LAE Heater Prime Enable
74	20	1BFFA	1C021	LAE Heater Redundant Enable
75	75	1C022	1C0B7	Trim Heater Prime Enable
76	60	1C0B8	1C12F	Trim Heater Redundant Enable
77	5	1C130	1C139	Halt OBC
78	10	1C13A	1C14D	VDE Off Halt
79	35	1C14E	1C193	NSM Transition
80	70	1C194	1C21F	Standby State Timeout
81	15	1C220	1C23D	SIM Move to Safe Position
82	75	1C23E	1C2D3	OTG Emergency Halt
83	10	1C2D4	1C2E7	No-op SCS
84	10	1C2E8	1C2FB	Command Normal Sun Mode
85	50	1C2FC	1C35F	Spare
86	10	1C360	1C373	Spare
87	25	1C374	1C3A5	Ramp Down HRC-I HV
88	25	1C3A6	1C3D7	Ramp Down HRC-S HV
89	120	1C3D8	1C4C7	Ramp Up HRC-I HV
90	120	1C4C8	1C5B7	Ramp Up HRC-S HV
91	20	1C5B8	1C5DF	Dither Control
92	25	1C5E0	1C611	HRC-I MCP HV On
93	25	1C612	1C643	HRC-S MCP HV On
94	10	1C644	1C657	OBA Heater Enable
95	10	1C658	1C66B	EPHIN Failure
96	10	1C66C	1C67F	PEA Reset
97	10	1C680	1C693	Spare
98	10	1C694	1C6A7	Bright Star Normal Sun Mode
99	10	1C6A8	1C6BB	Bright Star SI Safing
100	10	1C6BC	1C6CF	Spare
101	200	1C6D0	1C85F	Checksum CPE Patches
102	200	1C860	1C9EF	Spare
103	200	1C9F0	1CB7F	Spare
104	200	1CB80	1CD0F	HRC Safing Part 1
105	200	1CD10	1CE9F	HRC Safing Part 2
106	100	1CEA0	1CF67	ACIS Safing
107	100	1CF68	1D02F	Main SI Safing SCS
108	100	1D030	1D0F7	SIM Move to HRC-S Position
109	100	1D0F8	1D1BF	Spare
110	100	1D1C0	1D287	Spare
111	100	1D288	1D34F	Spare
112	100	1D350	1D417	Spare
113	100	1D418	1D4DF	Spare
114	100	1D4E0	1D5A7	Spare
115	100	1D5A8	1D66F	Spare
116	100	1D670	1D737	Spare
117	100	1D738	1D7FF	Spare
118	110	1D800	1D8DB	OBC Reset Reconfiguration Tasks
119	100	1D8DC	1D9A3	Spare
120	100	1D9A4	1DA6B	Momentum Unload Cutoff Monitor
121	100	1DA6C	1DB33	Spare
122	100	1DB34	1DBFB	Spare

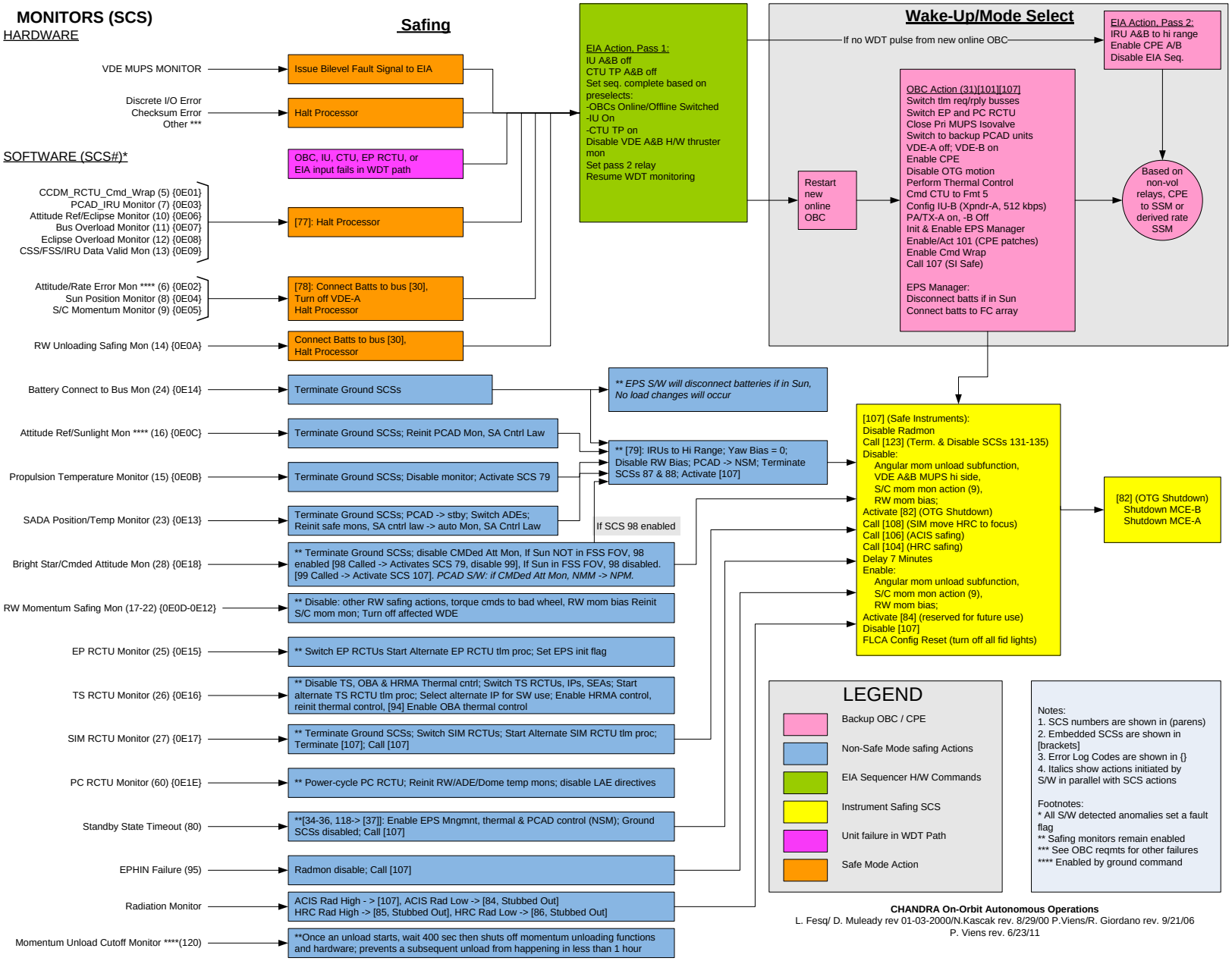
SCS #	Size, Cmds	Start Address	End Address	Name
123	100	1DBFC	1DCC3	Terminate and Disable Observing SCSs 131 - 135
124	100	1DCC4	1DD8B	Spare
125	100	1DD8C	1DE53	Spare
126	100	1DE54	1DF1B	Spare
127	60	1DF1C	1DF93	Spare

Table 3 Mission Stored Command Sequence Slot Sizes and Addresses

SCS #	Size, Cmds	Start Address	End Address
128	1830	32545	33390
129	1830	33391	341DC
130	1830	341DD	35028
131	2040	35029	36018
132	2040	36019	37008
133	2040	37009	37FF8
134	3	37FF9	38044
135	512	38045	38444
136	512	38445	38844
137	256	38845	38A44
138	256	38A45	38C44
139	256	38C45	38E44
140	256	38E45	39044
141	128	39045	39144
142	128	39145	39244
143	128	39245	39344
144	128	39345	39444
145	128	39445	39544
146	64	39545	395C4
147	64	395C5	39644
148	64	39645	396C4
149	64	396C5	39744
150	64	39745	397C4
151	64	397C5	39844
152	64	39845	398C4
153	64	398C5	39944
154	64	39945	399C4
155	64	399C5	39A44
156	64	39A45	39AC4
157	64	39AC5	39B44
158	64	39B45	39BC4
159	64	39BC5	39C44
160	64	39C45	39CC4
161	64	39CC5	39D44
162	64	39D45	39DC4
163	64	39DC5	39E44
164	64	39E45	39EC4
165	64	39EC5	39F44
166	64	39F45	39FC4
167	64	39FC5	3A044
168	64	3A045	3A0C4
169	64	3A0C5	3A144
170	64	3A145	3A1C4
171	64	3A1C5	3A244
172	32	3A245	3A284
173	32	3A285	3A2C4
174	32	3A2C5	3A304
175	32	3A305	3A344
176	32	3A345	3A384
177	32	3A385	3A3C4
178	32	3A3C5	3A404
179	32	3A405	3A444
180	32	3A445	3A484
181	32	3A485	3A4C4
182	32	3A4C5	3A504
183	32	3A505	3A544
184	32	3A545	3A584
185	32	3A585	3A5C4
186	32	3A5C5	3A604
187	32	3A605	3A644
188	32	3A645	3A684
189	32	3A685	3A6C4
190	32	3A6C5	3A704
191	32	3A705	3A744
192	32	3A745	3A784
193	32	3A785	3A7C4
194	32	3A7C5	3A804
195	32	3A805	3A844
196	32	3A845	3A884
197	16	3A885	3A8A4
198	16	3A8A5	3A8C4
199	16	3A8C5	3A8E4
200	16	3A8E5	3A904
201	16	3A905	3A924
202	16	3A925	3A944
203	16	3A945	3A964
204	16	3A965	3A984
205	16	3A985	3A9A4
206	16	3A9A5	3A9C4
207	16	3A9C5	3A9E4
208	16	3A9E5	3AA04
209	16	3AA05	3AA24
210	16	3AA25	3AA44
211	16	3AA45	3AA64
212	16	3AA65	3AA84
213	16	3AA85	3AAA4
214	16	3AAA5	3AAC4
215	16	3AAC5	3AAE4
216	16	3AAE5	3AB04
217	16	3AB05	3AB24

SCS #	Size, Cmds	Start Address	End Address
218	16	3AB25	3AB44
219	16	3AB45	3AB64
220	16	3AB65	3AB84
221	16	3AB85	3ABA4
222	16	3ABA5	3ABC4
223	16	3ABC5	3ABE4
224	16	3ABE5	3AC04
225	16	3AC05	3AC24
226	16	3AC25	3AC44
227	16	3AC45	3AC64
228	16	3AC65	3AC84
229	16	3AC85	3ACA4
230	16	3ACA5	3ACC4
231	16	3ACC5	3ACE4
232	16	3ACE5	3AD04
233	16	3AD05	3AD24
234	16	3AD25	3AD44
235	16	3AD45	3AD64
236	16	3AD65	3AD84
237	16	3AD85	3ADA4
238	16	3ADA5	3ADC4
239	16	3ADC5	3ADE4
240	16	3ADE5	3AE04
241	16	3AE05	3AE24
242	16	3AE25	3AE44
243	16	3AE45	3AE64
244	16	3AE65	3AE84
245	16	3AE85	3AEA4
246	16	3AEA5	3AEC4
247	16	3AEC5	3AEE4
248	16	3AEE5	3AF04
249	16	3AF05	3AF24
250	16	3AF25	3AF44
251	16	3AF45	3AF64
252	16	3AF65	3AF84
253	16	3AF85	3AFA4
254	16	3AFA5	3AFC4
255	16	3AFC5	3AFE4

Table 4 Safe Modes Summary Flow Chart


MONITORS (SCS)
HARDWARE
VDE MUPS MONITOR
Discrete I/O Error
Checksum Error
Other ***
SOFTWARE (SCS#)*
CCDM_RCTU_Cmd_Wrap (5) {0E01}
PCAD_IRU Monitor (7) {0E03}
Attitude Ref/Eclipse Monitor (10) {0E06}
Bus Overload Monitor (11) {0E07}
Eclipse Overload Monitor (12) {0E08}
CSS/FSS/IRU Data Valid Mon (13) {0E09}
Attitude/Rate Error Mon **** (6) {0E02}
Sun Position Monitor (8) {0E04}
S/C Momentum Monitor (9) {0E05}
RW Unloading Safing Mon (14) {0E0A}
Battery Connect to Bus Mon (24) {0E14}
Attitude Ref/Sunlight Mon **** (16) {0E0C}
Propulsion Temperature Monitor (15) {0E0B}
SADA Position/Temp Monitor (23) {0E13}
Bright Star/Cmded Attitude Mon (28) {0E18}
RW Momentum Safing Mon (17-22) {0E0D-0E12}
EP RCTU Monitor (25) {0E15}
TS RCTU Monitor (26) {0E16}
SIM RCTU Monitor (27) {0E17}
PC RCTU Monitor (60) {0E1E}
Standby State Timeout (80)
EPHIN Failure (95)
Radiation Monitor
Momentum Unload Cutoff Monitor ****(120)
Safing
Issue Bilevel Fault Signal to EIA
Halt Processor
OBC, IU, CTU, EP RCTU, or EIA input fails in WDT path
[77]: Halt Processor
[78]: Connect Batts to bus [30], Turn off VDE-A Halt Processor
Connect Batts to bus [30], Halt Processor
Terminate Ground SCSs
Terminate Ground SCSs; Reinit PCAD Mon, SA Cntrl Law
Terminate Ground SCSs; Disable monitor; Activate SCS 79
Terminate Ground SCSs; PCAD -> stby; Switch ADEs; Reinit safe mons, SA cntrl law -> auto Mon, SA Cntrl Law
** Terminate Ground SCSs; disable CMDed Att Mon, If Sun NOT in FSS FOV, 98 enabled [98 Called -> Activates SCS 79, disable 99], If Sun in FSS FOV, 98 disabled. [99 Called -> Activate SCS 107]. PCAD S/W: if CMDed Att Mon, NMM -> NPM.
** Disable: other RW safing actions, torque cmds to bad wheel, RW mom bias Reinit S/C mom mon; Turn off affected WDE
** Switch EP RCTUs Start Alternate EP RCTU tlm proc; Set EPS init flag
** Disable TS, OBA & HRMA Thermal cntrl; Switch TS RCTUs, IPs, SEAs; Start alternate TS RCTU tlm proc; Select alternate IP for SW use; Enable HRMA control, reinit thermal control, [94] Enable OBA thermal control
** Terminate Ground SCSs; Switch SIM RCTUs; Start Alternate SIM RCTU tlm proc; Terminate [107]; Call [107]
** Power-cycle PC RCTU; Reinit RW/ADE/Dome temp mons; disable LAE directives
**[34-36, 118-> [37]]: Enable EPS Mngmnt, thermal & PCAD control (NSM); Ground SCSs disabled; Call [107]
Radmon disable; Call [107]
ACIS Rad High - > [107], ACIS Rad Low -> [84, Stubbed Out]
HRC Rad High -> [85, Stubbed Out], HRC Rad Low -> [86, Stubbed Out]
**Once an unload starts, wait 400 sec then shuts off momentum unloading functions and hardware; prevents a subsequent unload from happening in less than 1 hour
EIA Action, Pass 1:
IU A&B off
CTU TP A&B off
Set seq. complete based on preselects:
-OBCs Online/Offline Switched
-IU On
-CTU TP on
Disable VDE A&B H/W thruster mon
Set pass 2 relay
Resume WDT monitoring
Wake-Up/Mode Select
If no WDT pulse from new online OBC
EIA Action, Pass 2:
IRU A&B to hi range
Enable CPE A/B
Disable EIA Seq.
Restart new online OBC
OBC Action (31)[101][107]
Switch tlm req/rply busses
Switch EP and PC RCTU
Close Pri MUPS Isovalve
Switch to backup PCAD units
VDE-A off; VDE-B on
Enable CPE
Disable OTG motion
Perform Thermal Control
Cmd CTU to Fmt 5
Config IU-B (Xpndr-A, 512 kbps)
PA/TX-A on, -B Off
Init & Enable EPS Manager
Enable/Act 101 (CPE patches)
Enable Cmd Wrap
Call 107 (SI Safe)
EPS Manager:
Disconnect batts if in Sun
Connect batts to FC array
Based on non-vol relays, CPE to SSM or derived rate SSM
** EPS S/W will disconnect batteries if in Sun, No load changes will occur
** [79]: IRUs to Hi Range; Yaw Bias = 0; Disable RW Bias; PCAD -> NSM; Terminate SCSs 87 & 88; Activate [107]
If SCS 98 enabled
[107] (Safe Instruments):
Disable Radmon
Call [123] (Term. & Disable SCSs 131-135)
Disable:
Angular mom unload subfunction,
VDE A&B MUPS hi side,
S/C mom mon action (9),
RW mom bias;
Activate [82] (OTG Shutdown)
Call [108] (SIM move HRC to focus)
Call [106] (ACIS safing)
Call [104] (HRC safing)
Delay 7 Minutes
Enable:
Angular mom unload subfunction,
S/C mom mon action (9),
RW mom bias;
Activate [84] (reserved for future use)
Disable [107]
FLCA Config Reset (turn off all fid lights)
[82] (OTG Shutdown)
Shutdown MCE-B
Shutdown MCE-A
LEGEND
Backup OBC / CPE
Non-Safe Mode safing Actions
EIA Sequencer H/W Commands
Instrument Safing SCS
Unit failure in WDT Path
Safe Mode Action
Notes:
1. SCS numbers are shown in (parens)
2. Embedded SCSs are shown in [brackets]
3. Error Log Codes are shown in {}
4. Italics show actions initiated by S/W in parallel with SCS actions
Footnotes:
* All S/W detected anomalies set a fault flag
** Safing monitors remain enabled
*** See OBC reqmts for other failures
**** Enabled by ground command
CHANDRA On-Orbit Autonomous Operations
L. Fesq/ D. Muleady rev 01-03-2000/N.Kascak rev. 8/29/00 P.Viens/R. Giordano rev. 9/21/06
P. Viens rev. 6/23/11

Stored Command Sequence Description

Some of the following material has been excerpted from DM05, Software Requirements Specification. Refer to DM05 for more detail on the FSW SCS processing subfunction.

Stored Command Sequences (SCSs) are blocks of one or more commands stored in OBC memory. These SCSs can contain Absolute Time Sequences (ATSs) or Relative Time Sequences (RTSs). An ATS is a stored command sequence to be issued at a specific time (based on the OBC VCDU count converted to Major Frame/Minor Cycle). Examples of ATSs used at the OCC are the three daily load sequence pairs, SCS slots 128 through 133. An RTS is a stored command sequence to be issued after a particular time increment has elapsed since the issuance of a previous command or after an event wait occurrence set in an SCS. An RTS can also be activated by ground command. SCS control commands can be interleaved with ATSs or RTSs in an SCS. SCSs, not containing ATSs, can be repeatable.

The commands stored in SCSs can be satellite hardware commands (e.g., to be sent to the CTU to control the spacecraft or command the payload), commands for the flight software (e.g., enable/disable software functions, enter certain states, direct the software to perform a specific action like turning on or off a particular software feature or function, or to set a bit in memory), and commands to control the SCS. Satellite hardware commands are 28-bit commands containing an RCTU address, the command type, and the 21-bit command. All stored commands (except stored SCS control commands) are routed to the Command Processing Subfunction. In the next minor cycle, these commands are interpreted as if they were ground commands, but the command accept or reject counter is not incremented.

Table 5 shows the SCS state transitions and the possible errors from invalid SCS transitions. Figure 1 shows the SCS State Transition Diagram. There are four operational states for SCSs. An SCS can be active, inactive, suspended or disabled. A specific SCS can be terminated if it is active and all active ground SCSs can be terminated with the “terminate all ground SCSs” command. An active SCS can be processed by the OFP every minor cycle. An inactive SCS is not processed. An SCS can be temporarily suspended and then resumed or terminated as long as it is active and timing conflicts do not exist.

Table 5 SCS State Transitions

State	Command: Activate	Terminate	Suspend	Resume	Enable	Disable	Call
Active	E	Inactive	Suspended	E	E	Disabled	*SCS Runs
Inactive	Active	E	E	E	E	Disabled	SCS Runs
Suspended	E	Inactive	E	Active	E	Disabled	*SCS Runs
Disabled	E	E	E	E	Inactive	E	X

E = Log an OBC Error, Request Ignored (Invalid SCS Transition, Error Code 0408 + Data)
X = No Error, Request Ignored
* A separate instance of the SCS runs in parallel with Active or Suspended SCS

SCS Error Code Deciphering:

FFFF	FFFF	CCCC	PP	EE	DDDD	DDDD

F – Major Frame
C – Minor Cycle
P – On-Board Flight Program (OFP) Process = 04 hex ≡ CCDM Partition 2
E – Error Code = 08 hex ≡ Invalid SCS Transition
D – Error Log Data Field = Hex of 32-bit OBC command that generated error

SCS State Transition Command	Error Log Entry Hex*
Activate	FFFF FFFF CCCC 0408 X840 SSRR
Terminate	FFFF FFFF CCCC 0408 X841 SS00
Suspend	FFFF FFFF CCCC 0408 X842 SS00
Resume	FFFF FFFF CCCC 0408 X843 SS00
Enable	FFFF FFFF CCCC 0408 X844 SS00
Disable	FFFF FFFF CCCC 0408 X845 SS00

* F-Major Frame, C-Minor Cycle, X - Don't Care, S – SCS ID, R – Repeat Count

SCSs are activated, terminated, suspended, resumed, enabled, or disabled by OBC software commands from the ground, another SCS or another flight software function. An SCS can suspend or terminate itself via internal SCS control commands. When an SCS is activated, it can be executed once (repeat count = 0), be repeated a specified number of times (repeat count = 1-254) or be repeated forever (repeat count = 255).

In addition to the triggering of SCSs by invocation, the control of issuing the stored commands, embedded in active SCSs, can be modified through SCS internal commands (i.e. commands that cannot be sent from the ground. See Table 6). These deal primarily with the timely issuance of the stored hardware commands or the OBC software commands. Delay commands can be interleaved in such a way as to provide an absolute delay or a relative delay between the commands, otherwise up to 20 commands per minor cycle are sent to Command Processing for distribution.

An SCS Call command can be used to invoke an SCS, from another SCS, thereby suspending the calling SCS until the invoked SCS has completed. A called SCS runs under the calling SCS priority, whereas an activated SCS runs under its own priority. So that means the activated SCS could run before, after or in parallel (interleaved) with the SCS that executed the activation. The only way that SCSs can run in parallel (if more than one is activated) is if the SCS contains time delays. When a time delay is reached in an SCS, SCS processing is allowed to executed other activated SCSs of lower priority until the delay is complete. To invoke an SCS, from another SCS, without the invoking SCS suspending, an Activate SCS can be used. Up to 5 SCSs can be “nested” in this way. Note that the Disable SCS command only disables the top most SCS of a nested group of SCSs, whereas the Terminate SCS command to the top most SCS of a nested group also terminates the occurrence of each lower level SCS in the nest. Note: Other occurrences of the lower level SCSs in other nests are not terminated.

Table 6 itemizes the SCS control commands that affect an entire SCS and those that affect the processing within an SCS plus those that have the capability for both. All SCS commands that can act externally on an entire SCS and have the capability to be embedded in an SCS, have the same 16-bit OBC software command format whether external or embedded.

Each SCS command has an associated step number which is set and updated as the SCS is processed. The OFP keeps track of which commands in the SCS have been processed. The OFP can also report the status of each SCS (current state and step number) in OBC generated telemetry for up to 5 SCSs. Once commands are in the command queue, they will be issued even if an SCS state transition occurs.

For the purposes of this handbook, the accounting for the elements of a Stored Command Sequence can be done using either “steps” or “counts”. Both values are listed in the command list tables presented for each SCS in this document. As suggested above, the “steps” value represents the basic block of command bits that will be processed by the OBC at one time. The “step” being processed by the OBC is represented in telemetry using the MSIDs COSCIC01 thru COSCIC14 (Current Execution Index of Active SCS (Slot xx)). Alternatively, the “count” value is used to identify the specific command that is defined in the ground system command databases, and is the unit of measure used to drive the command accept and reject counters reported in telemetry. All commands, whether they be a single pre-defined command, a single command with modifiable fields, or a multi-part command, are assigned an individual/unique “count” number in the tables below. In the cases of modifiable or multi-part commands, all of the elements of those commands will share the same “count” value. However, the assignment of “step” values is done differently. In the case of single pre-defined commands, the “step” value will be the same as the “count” value, since the command fits entirely within the 32-bit blocks of command bits being processed by the OBC at one time. The same is true for single commands with modifiable fields, where in this case all of the fields for the command will have the same step number. However, in the case of multi-part commands it is possible to have a series of step numbers assigned to the command elements, depending on the number of bits that are needed to implement the command. Since the multi-part commands may take up several 28-bit blocks, the “step” number values roughly correspond to the number of 28-bit blocks needed to employ each of the multipart commands. In some cases, individual elements of the multi-part command may span two different step numbers as there is no attempt to force the individual multi-part command elements to start on the 28-bit boundaries.

Figure 1 - SCS State Transition Diagram

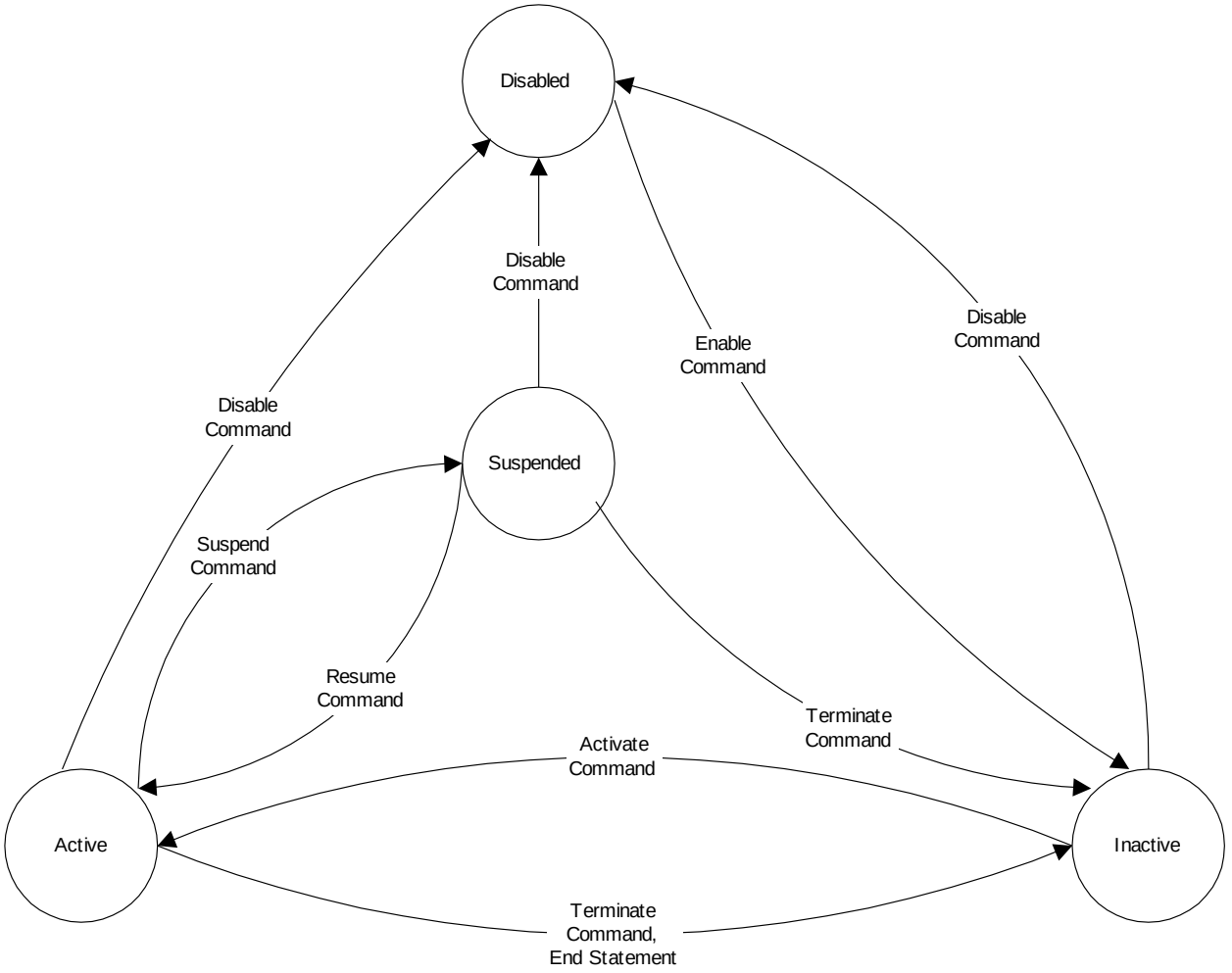


Table 6 SCS Control Commands

SCS Commands		**Required State of SCS**
The following SCS Control Commands can be sent from the ground as a real-time command or can be embedded in an SCS		
Activate SCS#	N/A	Inactive
*Terminate SCS#	N/A	Active/Suspended
Suspend SCS#	N/A	Active
Resume SCS#	N/A	Suspended
Clear SCS#	N/A	Inactive
Terminate All Ground SCSs	N/A	Active/Suspended
Enable SCS#	N/A	Disabled
Disable SCS#	N/A	Active/Inactive/Suspended
*CAUTION: It is NOT possible to directly TERMINATE a CALLED SCS. You must TERMINATE the top ACTIVATED SCS that CALLED the SCS.		
The following SCS Control Commands can only be embedded in SCSs, they cannot be sent from the ground as real-time commands.		
Command	**Required State of Source SCS**	**Required State of Target SCS**
Absolute Time Delay	Active	N/A
Relative Time Delay	Active	N/A
SCS Call	Active	Active, Inactive, Suspended**
Event Wait	Active	N/A
Set SCS Step # - Unconditional Branch	Active	N/A
Set Loop Counter#	Active	N/A
Decrement Loop Counter, Branch not=0	Active	N/A
End SCS	Active	N/A
Halt OBC (for “protected” SCSs only)	Active	N/A
Branch on Event Condition	Active	N/A
**CAUTION: A CALLED SCS is NOT shown as ACTIVE, which is the check performed by SCS processing. Therefore note the following cases: It is possible to CALL an ACTIVE SCS, and have two instances running. It is possible to ACTIVATE a CALLED SCS, and have two instances running. It is possible to CALL a SUSPENDED SCS, and have one instance running, and one suspended.		

Chandra Safing SCS Modifications due to H/W Reconfiguration

The following tables describe the changes required to the protected SCSs should equipment failures occur. This table is based on no failures having occurred since launch, and that the A-side boxes form the nominal equipment complement. Note that a failed box is indicated for each case, with most of the cases involving a B-side box. If the A-side box is failed, generally no change is required to the default SCS because they are already configured to fail over to the B-side.

Table 7 Safe Mode related Modifications due to H/W Reconfiguration

Safe Mode related:

Unit	Failure	Change Required to SCS and/or Preselects - On-Orbit
CTU	CTU-B has failed	31 - Select CTU A & data bus A Command bus B off, A on Select A telemetry request & reply busses CTU A to format 5 Change EIA preselects to use CTU-A
	CTU-A has failed	80 Select CTU B and data bus B (new command)
IU	IU-B has failed	31 - IU A select transponder A & B IU mode select mode bits to select transponder Change EIA preselects to use IU-A
OBC	OBC-B has failed	Change EIA preselects to use OBC-A
EP RCTU	EP-RCTU B has failed	31 - B off, A on 25 - B off, A on Remove check for A ON prior to switchover
PC RCTU	PC-RCTU B has failed	31 - B off, A on
IRU	IRU-2 has failed	31 - IRU 2 off, 1 on IRU 1 to high range Set corresponding CPE PLR relays IRU-1 Temp controls ON IRU-2 Temp controls OFF 79 - (OK, sets both IRUs to high range) 37 - (OK, sets both IRUs to high range)

Unit	Failure	Change Required to SCS and/or Preselects - On-Orbit
VDE	VDE-B has failed	31 - VDE B off, A on Close iso #5 (vs #3) 78 - VDE B off 80 - VDE B off at beginning, on at end 34 – Select VDE side B
ADE	ADE-B has failed	31 - B off, A on 23 - B off, A on 80 - Reinit ADE B EPIC counters 34 – Select ADE side B
SPE	SPE-B has failed	31 - B off, A on 34 – Select SPE side B
IOE	IOE-B has failed	31 - B off, A on Enable CPE via IOE-B
FSSA	FSSA-B has failed	31 - B off, A on Set corresponding CPE PLR relays
EIA	EIA Channel 0 Failed	SCS 31 contains only channel 0 commands for the following. The SCS would have to be changed to use channel 1 commands if channel 0 fails: PCL131EN ENAB CLOSE 1-3 (CHAN 0) PF131CL FORWARD CLOSE 1-3 (CHAN 0) PIV3F1CL CLOSE ISOVALVE 3 (WITH FORWARD CURRENT) (CHAN 0) PCL131DS DISA CLOSE 1-3 (CHAN 0) AIR2HRP1 IRU-2 HIGH RANGE PRI (CHAN 0) ACPEB1EN Enable CPE, IOE-B (Slice A4, Ch.0)

Table 8 Non-Safe Mode related Modifications due to H/W Reconfiguration

Non-Safe Mode related:

Unit	Failure	SCS - On-Orbit
CPE	CPE-A has failed	31 - Set all CPE PLR relays for CPE B
TS RCTU	TS-RCTU B has failed	26 - B off, A on Remove check for A on prior to failover
SI RCTU	SI-RCTU B has failed	27 - B off, A on Remove check for A on prior to failover
TS SEA	TS SEA B has failed	26 - B off, A on
IP	IP-B has failed IP-A has failed	26 - B off, A on Select IP-A Select Primary Database 31 – Select Secondary Database 80 – Select Secondary Database NOTE: The proper database selection was left out of these safing actions. If we stay on IP-B, the primary database should be patched to reflect the appropriate B-side calibrations.
TS MCE	TS MCE-A has failed	31 – Select Secondary OTG source 80 – Select Secondary OTG source 82 – Use All MCE-B commands for OTG emergency halt
SI SEA	SI SEA-A has failed	75 – Redundant Flexure Heaters
Load-shed and power recovery units		for most, Power ON and Power OFF are in separate SCSs for Prime and Redundant Units 32 – Configured by Power SSE for the next eclipse event 33 – Configured by Power SSE for the next eclipse event 75 & 76 – restrictions on some heaters being powered simultaneously. Change a heater in 75, may have to change one in 76. Consult Thermal SSE.
VDE	VDE-A has failed	120 – Modify for appropriate commanding for VDE - B

Chandra SCS Modifications due to Science Only Safing Action Load Splitting

Safing prior to the implementation of PR-271 for high radiation stopped the onboard mission command loads, which could have fairly quickly created undesirable conditions or constraint violations. Maneuver-only command loads were often needed to keep Chandra "safe after safing" by maneuvering to a better attitude until recovery to nominal science operations was possible. The increasing number of constraints as the mission has progressed has led to a greater need for these "maneuver-only" loads following safing for high radiation.

Flight Software Patch PR-271 modified the CCDM subsystem part of the flight software to be compatible with a load where the "observing" commanding and "vehicle" commanding are contained in different mission SCSs. With this “split” load, the safing subsystem response to high radiation is such that only "observing" commanding ceases when the science instruments are safed. The "vehicle" commanding (e.g. maneuvers, eclipse handling, momentum unloads) continues after a high radiation safing event.

The basic mechanism for accomplishing the split between "vehicle" commands and "observing" commands is to put each type of command in its own SCS for execution by the OBC. Vehicle commands go into SCSs 128, 129 and 130; observing commands go into SCSs 131, 132 and 133. There is a fixed correspondence between vehicle and observing SCSs: 128 ↔ 131, 129 ↔ 132, 130 ↔ 133. This SCS utilization scheme requires modifications to the sizes and starting addresses for a number of mission SCS slots. The sizes for SCSs 128-133 are based on estimates derived from current usage and reasonable assignment of commands into vehicle/observing categories. Note that a significant portion of "SCS space", currently unusable in SCS 130 because of a page boundary issue, can be "reclaimed" with the new size/address allocations.

To properly implement the modified safing actions, PR-271 patched several protected SCSs:

- SCS 15 (Propulsion Line Temperature Monitor Fault Safing Action) - Added "Terminate All Ground SCSs" command.
- SCS 27 (SIM RCTU Monitor Fault Safing) - Added "Terminate All Ground SCSs" command.
- SCS 123 (Terminate and Disable Observing SCSs 131 - 135) - modified to contain the following sequence of commands:
  - Terminate SCS 131.
  - Terminate SCS 132.
  - Terminate SCS 133.
  - Terminate SCS 134.
  - Terminate SCS 135.

  - Disable SCS 131.
  - Disable SCS 132.
  - Disable SCS 133.
  - Disable SCS 134.
  - Disable SCS 135.

- SCS 107 (Main SI Safing) - replaced "Terminate All Ground SCSs" command with call to SCS 123.

- SCS 107 - added command to turn off all fiducial lights at the end.

SCS #: 1 -- Initialize Online State

Description:

This SCS is activated called by the OBC FSW upon initialization to the online state

Main Steps in SCS:

End SCS command

What Phase is this SCS used in? What Patches are Required for Normal Operations?

This SCS is a placeholder, left over when the FSW folks anticipated they would need a few commands to initialize the on-line state.

Constraints:

None

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 2 -- Safe State Transition

Description:

This SCS is activated by the OBC upon transition to safe mode.
The contents of the SCS are calls to SCS 111 for the transfer orbit phase, or to SCS 31 for the science orbit phase.

Main Steps in SCS:

Call to SCS #: 31 -- Safe Mode Reconfiguration
End SCS command

What Phase is this SCS used in? What Patches are Required for Normal Operations?

SCS 2 is hard-coded into the flight software to be called in case of safe mode entry. The safe mode response is dictated by the contents of SCS 2, which is either a call to SCS 111 during the transfer orbit, or to SCS 31 for the science orbit. As part of the LL2OO patch during OAC, a call to SCS 31 replaced the call to SCS 111.

Constraints:

None

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	COSCALL	SCS CALL SCS								NA	NA				
1	1	COSCALL1	COSCALL - SCS NUMBER -- SCS Number	31												
2	2	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 3 -- Deployment State Transition

Description:

This SCS gets activated by the OBC FSW upon entry to the Deployment State (activation of SCS 3 is hard-coded into the FSW).

Main Steps in SCS:

End SCS command

What Phase is this SCS used in? What Patches are Required for Normal Operations?

This was used by the FSW to activate SCS 111 when commanded to the deployment state at the beginning of the mission up until the IUS and Chandra separate. Patch Request PR-93 resulted in SCS 3 being stubbed out so that no SCS is called if the Observatory was ever inadvertently commanded to the deployment state.

Constraints:

None

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 4 -- Off-Line State Transition

Description:

This SCS was called by the OBC FSW, but was commented out long ago. It is no longer used by anyone.

Main Steps in SCS:

End SCS command

What Phase is this SCS used in? What Patches are Required for Normal Operations?

Constraints:

None

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 5 -- OO - CCDM RCTU Command Wrap Test

Description:

This SCS is activated when the CCDM RCTU Command Wrap Safing Monitor trips. This monitor looks for no response from the EP RCTU and the PC RCTU. Lack of response from either RCTU is an indication that the OBC is having communication problems, and this SCS halts the OBC to induce a failover into Safe Mode.

Main Steps in SCS:

Calls SCS #: 77 -- OO - Halt OBC Safing Action, which is a "common" SCS called by a number of Safing Actions to accomplish halting the processor.

What Phase is this SCS used in? What Patches are Required for Normal Operations?

The SCS, as described herein, is used in the On-Orbit Phase.

Constraints:

If this SCS is edited, be sure that the final action is to Halt the Processor. This SCS is called because there is a communications problem between the OBC and the RCTUs which could be caused by the OBC or the cmd/data busses. By halting the processor, a Safe Mode Transition will accomplish switching OBCs as well as the cmd/data busses (in addition to the EP and PC RCTUs).

If the CCDM RCTU Cmd Wrap Monitor trips, it is likely that any or all of the following errors will appear in the OBC Error Log:

1) Invalid RCTU Response (0227) will probably appear for the EP and/or the PC RCTU
2) Command Wrap Errors (0221) may appear for the EP or the PC RCTU
3) EP RCTU Monitor error (0e15) may appear, which activates SCS #: 25 -- EP RCTU Monitor Fault
4) PC RCTU Monitor error (0e1e) may appear, which activates SCS #: 60 -- PC RCTU Monitor Fault
5) CCDM RCTU Command Wrap Fault (0e01) will appear, which activates SCS #: 5 -- OO - CCDM RCTU Command Wrap Test.

This SCS defaults to disabled upon OBC reset, and is automatically enabled by SCS #: 80 -- OO - Standby State Timeout.

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	COSCALL	SCS CALL SCS								NA	NA				
1	1	COSCALL1	COSCALL - SCS NUMBER -- SCS Number	77												
2	2	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 6 -- OO - Attitude/Rate Error Monitor Fault

Description:

This SCS is activated when the Attitude/Rate Error Safing Monitor trips. This monitor looks for attitude errors and rate errors.

Main Steps in SCS:

Calls SCS #: 78 -- OO - Battery Connection / Halt OBC Safing Action, which is a "common" SCS called by a number of Safing Actions to accomplish the following:

Call SCS #: 30 -- Battery Connection to Bus Safing Action to connect the batteries to the bus

Turn off VDE A

Halt the processor.

What Phase is this SCS used in? What Patches are Required for Normal Operations?

The SCS, as described herein, is used in the On-Orbit Phase.

Constraints:

If this SCS is edited, be sure that no commands are deleted. All are required to ensure proper safing following an attitude error or a rate error.

When the Attitude/Rate Error Safing Monitor trips, an error code of 0E02 will appear in the OBC Error Log, and OBC Health and Status will activate SCS 6.

This SCS defaults to disabled upon OBC reset, and is automatically enabled by SCS #: 118 -- OBC Reset Reconfiguration Tasks.

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	COSCALL	SCS CALL SCS								NA	NA				
1	1	COSCALL1	COSCALL – SCS NUMBER -- SCS Number	78												
2	2	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 7 -- OO - IRU Monitor Fault Safing Action

Description:

This SCS is activated when the IRU Fault Safing Monitor trips. This monitor protects against gyro failures by performing two tests:

1. Miscompare: Compares 4 gyro outputs to see if they are consistent
2. Zero output: Watches for lack of output pulses from the gyro.

Main Steps in SCS:

Call SCS #: 77 -- OO - Halt OBC Safing Action, which is a "common" SCS called by a number of Safing Actions to accomplish the following:

Halt the processor.

What Phase is this SCS used in? What Patches are Required for Normal Operations?

The SCS, as described herein, is used in the On-Orbit Phase.

Constraints:

If this SCS is edited, be sure that no commands are deleted. All are required to ensure proper safing following an IRU failure.

When the IRU Monitor trips, an error code of 0E03 will appear in the OBC Error Log, and OBC Health and Status will activate SCS 7.

This SCS defaults to disabled upon OBC reset, and is automatically enabled by SCS #: 118 -- OBC Reset Reconfiguration Tasks.

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	COSCALL	SCS CALL SCS								NA	NA				
1	1	COSCALL1	COSCALL - SCS NUMBER -- SCS Number	77												
2	2	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 8 -- OO - Sun Position Monitor Fault Safing Action

Description:

This SCS is activated when the Sun Position Safing Monitor trips. This monitor protects against sun in the HRMA sun exclusion region and on the ACIS radiator. It uses CSS data and, if available, FSS data to compute the projection of the sun in the spacecraft XY plane and check this against pre-defined limits. It also compares the CSS data against the FSS data for consistency.

Main Steps in SCS:

Call SCS #: 78 -- OO - Battery Connection / Halt OBC Safing Action, which is a "common" SCS called by a number of Safing Actions to accomplish the following:

Call SCS #: 30 -- Battery Connection to Bus Safing Action to connect the batteries to the bus

Turn off VDE A

Halt the processor.

What Phase is this SCS used in? What Patches are Required for Normal Operations?

The SCS, as described herein, is used in the On-Orbit Phase.

Constraints:

If this SCS is edited, be sure that no commands are deleted. All are required to ensure proper safing following an attitude error or a rate error.

When the Sun Position Monitor trips, an error code of 0e04 will appear in the OBC Error Log, and OBC Health and Status will activate SCS 8.

This SCS defaults to disabled upon OBC reset, and is automatically enabled by SCS #: 118 -- OBC Reset Reconfiguration Tasks.

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	COSCALL	SCS CALL SCS								NA	NA				
1	1	COSCALL1	COSCALL - SCS NUMBER -- SCS Number	78												
2	2	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 9 -- OO - Spacecraft Momentum Monitor Fault Safing Action

Description:

This SCS is activated when the Spacecraft Momentum Safing Monitor trips. This monitor protects against stuck thruster faults. It compares integrated thruster torques against actual momentum changes as measured by reaction wheel tachs and gyro rates.

Main Steps in SCS:

Call SCS #: 78 -- OO - Battery Connection / Halt OBC Safing Action, which is a "common" SCS called by a number of Safing Actions to accomplish the following:

Call SCS #: 30 -- Battery Connection to Bus Safing Action to connect the batteries to the bus

Turn off VDE A

Halt the processor.

What Phase is this SCS used in? What Patches are Required for Normal Operations?

The SCS, as described herein, is used in the On-Orbit Phase.

Constraints:

If this SCS is edited, be sure that no commands are deleted. All are required to ensure proper safing following an attitude error or a rate error.

When the Spacecraft Momentum Monitor trips, an error code of 0e05 will appear in the OBC Error Log, and OBC Health and Status will activate SCS 9.

This SCS defaults to disabled upon OBC reset, and is automatically enabled by SCS #: 118 -- OBC Reset Reconfiguration Tasks.

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	COSCALL	SCS CALL SCS								NA	NA				
1	1	COSCALL1	COSCALL - SCS NUMBER -- SCS Number	78												
2	2	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 10 -- OO - Attitude Reference in Eclipse Monitor

Description:

This SCS is activated when the Attitude Reference in Eclipse Safing Monitor trips. This monitor detects loss of stars in the Aspect Camera Assembly.

Main Steps in SCS:

Call SCS #: 77 -- OO - Halt OBC Safing Action, which is a "common" SCS called by a number of Safing Actions to accomplish halting the processor.

What Phase is this SCS used in? What Patches are Required for Normal Operations?

This SCS is used in the On-Orbit Phase only. SCS 10 does not apply to the Transfer Orbit phase since the Aspect Camera Assembly is not yet operational.

Constraints:

If this SCS is edited, be sure that the final action is to Halt the Processor.

When the Attitude Reference in Eclipse Monitor trips, an error code of 0e06 will appear in the OBC Error Log, and OBC Health and Status will activate SCS 10.

This SCS defaults to disabled upon OBC reset, and is enabled by ground command in preparation for the On-Orbit Phase.

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	COSCALL	SCS CALL SCS								NA	NA				
1	1	COSCALL1	COSCALL - SCS NUMBER -- SCS Number	77												
2	2	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 11 -- OO - EPS Sunlight Overload Fault

Description:

This SCS is activated when the Bus Overload Safing Monitor (aka SOL Monitor) trips. This monitor is tripped after the EPS software has detected an unexpected connection of the batteries in sunlight and was unsuccessful at disconnecting the batteries following a load shed.

Main Steps in SCS:

Call SCS #: 77 -- OO - Halt OBC Safing Action, which is a "common" SCS called by a number of Safing Actions to accomplish halting the processor.

What Phase is this SCS used in? What Patches are Required for Normal Operations?

The SCS, as described herein, is used in the On-Orbit Phase.

Constraints:

If this SCS is edited, be sure that the final action is to Halt the Processor.

When the Bus Overload Monitor trips, the following errors will be observed in the OBC Error Log:

Unexpected Connection of the Batteries (0e14) (aka Safing EPS Battery Disconnect) will appear, which activates SCS #: 24 -- Unexpected Connection of the Batteries

Invalid SCS Transition (0408) may appear showing that SCS #: 87 -- HRC Scheduled/No Dither HRC-I HV Ramp Down Commands was terminated when it wasn't running

Invalid SCS Transition (0408) may appear showing that SCS #: 88 -- HRC Scheduled/No Dither HRC-S HV Ramp Down Commands was terminated when it wasn't running

Invalid SCS Transition (0408) may appear showing that SCS #: 33 -- was terminated when it wasn't running

Invalid SCS Transition (0408) may appear showing that SCS 33 was enabled even though it was already enabled

Sunlight Overload Fault (0e07) (aka Safing EPS Unexpected Connection) will appear, and OBC Health and Status will activate SCS 11.

This SCS defaults to disabled upon OBC reset, and is automatically enabled by SCS #: 118 -- OBC Reset Reconfiguration Tasks.

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	COSCALL	SCS CALL SCS								NA	NA				
1	1	COSCALL1	COSCALL - SCS NUMBER -- SCS Number	77												
2	2	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 12 -- OO - EPS Eclipse Overload Fault

Description:

This SCS is activated when the Eclipse Overload Safing Monitor (aka EOL Monitor) trips. This monitor checks the battery State of Charge against a trend line. If two of three batteries fall below the trend line, the Eclipse Overload (EOL) fault flag is set.

Main Steps in SCS:

Call SCS #: 77 -- OO - Halt OBC Safing Action, which is a "common" SCS called by a number of Safing Actions to accomplish halting the processor.

What Phase is this SCS used in? What Patches are Required for Normal Operations?

The SCS, as described herein, is used in the On-Orbit Phase.

Constraints:

If this SCS is edited, be sure that the final action is to Halt the Processor.

When Eclipse Overload Monitor trips, the Eclipse overload error (0e08) (aka Safing EPS Battery Polarity) will be observed in the OBC Error Log, and OBC Health and Status will activate SCS 12.

This SCS defaults to disabled upon OBC reset, and is automatically enabled by SCS #: 118 -- OBC Reset Reconfiguration Tasks.

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	COSCALL	SCS CALL SCS								NA	NA				
1	1	COSCALL1	COSCALL - SCS NUMBER -- SCS Number	77												
2	2	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 13 -- OO - PCAD Sensor Processing Fault

Description:

This SCS is activated when the CSS/FSS/IRU Data Validity Monitor trips. This monitor checks data validity status from the IOE and the CCDM equipment. If these units indicate that the data are invalid, the Data Validity Monitor sets a fault flag which triggers this SCS.

Main Steps in SCS:

Call SCS #: 77 -- OO - Halt OBC Safing Action, which is a "common" SCS called by a number of Safing Actions to halt the processor.

What Phase is this SCS used in? What Patches are Required for Normal Operations?

The SCS, as described herein, is used in the On-Orbit Phase.

Constraints:

If this SCS is edited, be sure that the final action is to Halt the Processor.

When the PCAD Data Validity Monitor trips, the PCAD Sensor Processing error (0e09) will be observed in the OBC Error Log, and OBC Health and Status will activate SCS 13.

This SCS defaults to disabled upon OBC reset, and is automatically enabled by SCS #: 118 -- OBC Reset Reconfiguration Tasks.

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	COSCALL	SCS CALL SCS								NA	NA				
1	1	COSCALL1	COSCALL - SCS NUMBER -- SCS Number	77												
2	2	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 14 -- OO - RW Unloading Monitor Fault

Description:

This SCS is activated when the Reaction Wheel Unloading Monitor trips. This monitor helps protect against a failed VDE or loss of an IRU in NSM by checking the magnitude of the total spacecraft momentum. Normally, the OBC RW unloading logic will automatically attempt to unload the reaction wheels to zero momentum if the magnitude exceeds 40.0 ft-lb-sec (if the autounloading feature is enabled). However, if the momentum exceeds a limit of 60 ft-lb-sec, the monitor will set a fault flag that will ultimately lead to a safe mode transition.

Main Steps in SCS:

Call SCS #: 30 -- Battery Connection to Bus Safing Action to connect the batteries to the bus

Halt the processor.

What Phase is this SCS used in? What Patches are Required for Normal Operations?

The SCS, as described herein, is used in the On-Orbit Phase.

Constraints:

If this SCS is edited, be sure that the batteries get connected and that the final action is to Halt the Processor.

When the RW Unloading Monitor trips, the Safing PCAD RW Unloading error (0e0a) will be observed in the OBC Error Log, and OBC Health and Status will activate SCS 14.

This SCS defaults to disabled upon OBC reset, and is automatically enabled by SCS #: 118 -- OBC Reset Reconfiguration Tasks.

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	COSCALL	SCS CALL SCS								NA	NA				
1	1	COSCALL1	COSCALL - SCS NUMBER --	30												
2	2	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
2	2	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	5												
3	3	COSOHALT	SCS HALT OBC								LR	OBC				
4	4	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 15 -- Propulsion Line Temperature Monitor Fault Safing Action

Description:

This SCS is activated by the Propulsion Line Temperature Monitor when a fault condition is present in order to trigger Normal Sun Mode

Main Steps in SCS:

1. Terminate all Ground SCSs
2. Disable PCAD Subfunction 37 – Propulsion Line Temperature Monitor
3. Activate SCS #: 79 -- OO - NSM Transition.

What Phase is this SCS used in? What Patches are Required for Normal Operations?

Constraints:

None

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	COTRMALL	TERMINATE ALL GROUND SCSs								NA	NA				
2	2	AOFUNCDS	PCAD SUBFUNCTION DISABLE								NA	NA				
2	2	AOPCADSD	PCAD_Subfunction	37												
3	3	COACTSX	ACTIVATE SCS#								NA	NA				
3	3	COACTS1	COACTSX - SCS NUMBER -- SCS Number	79												
3	3	COACTS2	COACTSX - REPEAT COUNT -- Repeat Count. If this is 0, then SCS is executed once.	0												
4	4	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 16 -- Attitude Reference in Sunlight Monitor

Description:

This SCS is activated when the attitude reference is lost in while in sunlight. This monitor detects loss of stars in the Aspect Camera Assembly field of view. The logic for this function is part of the OBC Health and Status Safing Actions. If the ACA_Sequence flag is set to FALSE due to the inability of the ACA sequence routine to find sufficient guide-, acquisition- or bright-stars and the EPS management has set the F_Eclipse flag to SUN, then this SCS will be activated.

Main Steps in SCS:

Step 1: Terminate all ground SCS's. This doesn't disable them. The desire is to stop absolute time tagged command sequences which change the mission configuration such as maneuvers, SIM movement, etc.

Steps 2-10: Enable/reinitialize the IRU, sun position, attitude/rate error, s/c momentum, RW momentum, RW unloading, and solar array position monitors and the solar array control law. Normally, these functions are already enabled, so the purpose is to reinitialize these functions.

Step 11: Activate SCS #: 79 -- OO - NSM Transition which contains commands for entry to Normal Sun Mode.

What Phase is this SCS used in? What Patches are Required for Normal Operations?

This SCS is used in the On-Orbit Phase only. SCS 16 does not apply to the Transfer Orbit phase since the Aspect Camera Assembly is not yet operational. The Transfer Orbit version contains only an End SCS command.

Constraints/Considerations:

If this SCS is modified, be sure that the final action is to call SCS 79. Failure to terminate mission SCS's may result in maneuvers from unknown starting points or exposing an SI to a potentially harmful X-ray source.

When the Attitude Reference in Sunlight Monitor trips, an error code of 0e0c will appear in the OBC Error Log, and OBC Health and Status will activateSCS#: 16.

This SCS defaults to disabled upon OBC reset, and is enabled by ground command in preparation for the On-Orbit Phase prior to Normal Point Mode operation.

There is no monitor to disable. The only way to disable this function is to disable this SCS. If this safing action is disabled, PCAD will be left in Normal Point Mode holding on gyro's.

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	COTRMALL	TERMINATE ALL GROUND SCSS								NA	NA				
2	2	AOFUNCEN	PCAD SUBFUNCTION ENABLE / REINIT								NA	NA				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
2	2	AOPCADSE	PCAD Subfunction for EN -- PCAD Subfunction Number. See DMO5	29												
3	3	AOFUNCEN	PCAD SUBFUNCTION ENABLE / REINIT								NA	NA				
3	3	AOPCADSE	PCAD Subfunction for EN -- PCAD Subfunction Number. See DMO5	30												
4	4	AOFUNCEN	PCAD SUBFUNCTION ENABLE / REINIT								NA	NA				
4	4	AOPCADSE	PCAD Subfunction for EN -- PCAD Subfunction Number. See DMO5	31												
5	5	AOFUNCEN	PCAD SUBFUNCTION ENABLE / REINIT								NA	NA				
5	5	AOPCADSE	PCAD Subfunction for EN -- PCAD Subfunction Number. See DMO5	32												
6	6	AOFUNCEN	PCAD SUBFUNCTION ENABLE / REINIT								NA	NA				
6	6	AOPCADSE	PCAD Subfunction for EN -- PCAD Subfunction Number. See DMO5	33												
7	7	AOFUNCEN	PCAD SUBFUNCTION ENABLE / REINIT								NA	NA				
7	7	AOPCADSE	PCAD Subfunction for EN -- PCAD Subfunction Number. See DMO5	34												
8	8	AOFUNCEN	PCAD SUBFUNCTION ENABLE / REINIT								NA	NA				
8	8	AOPCADSE	PCAD Subfunction for EN -- PCAD Subfunction Number. See DMO5	35												
9	9	AOFUNCEN	PCAD SUBFUNCTION ENABLE / REINIT								NA	NA				
9	9	AOPCADSE	PCAD Subfunction for EN -- PCAD Subfunction Number. See DMO5	38												
10	10	AOFUNCEN	PCAD SUBFUNCTION ENABLE / REINIT								NA	NA				
10	10	AOPCADSE	PCAD Subfunction for EN -- PCAD Subfunction Number. See DMO5	23												
11	11	COACTSX	ACTIVATE SCS#								NA	NA				
11	11	COACTS1	COACTSX - SCS NUMBER -- SCS Number	79												
11	11	COACTS2	COACTSX - REPEAT COUNT -- Repeat Count. If this is 0, then SCS is executed once.	0												
12	12	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 17 -- RW #1 Fault Handling

Description:

This SCS is activated when a problem is detected with RW #1 or its associated Wheel Drive Electronics (WDE).

PCAD operation can tolerate the failure of up to 2 reaction wheels and respective WDEs. It is a design goal to avoid safe mode for a RW failure. Therefore when a problem is detected, the problem wheel is deactivated and Chandra controls with the remaining 5 wheels.

Main Steps in SCS:

1. Disable all the other 5 reaction wheel fault SCSs to prevent inadvertent shutdown of any other wheels. The risk is that all wheels could be shut down inadvertently when only one wheel is at fault.
2. Disable reaction wheel torque commands to the affected wheel.
3. Disable the reaction wheel bias. This is required in order to increase the momentum storage envelope under 5 wheel control, which is what Chandra will be controlling with if one of these RW SCSs is activated.
4. Re-initialize the Spacecraft Momentum Monitor (PCAD sub-function 32)
5. Turn of the affected wheel drive electronics

What Phase is this SCS used in? What Patches are Required for Normal Operations?

This SCS is used during the On-Orbit phase

Constraints:

None

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	CODISASX	DISABLE SCS#								NA	NA				
1	1	CODISAS1	CODISASX - SCS NUMBER --	18												
2	2	CODISASX	DISABLE SCS#								NA	NA				
2	2	CODISAS1	CODISASX - SCS NUMBER --	19												
3	3	CODISASX	DISABLE SCS#								NA	NA				
3	3	CODISAS1	CODISASX - SCS NUMBER --	20												
4	4	CODISASX	DISABLE SCS#								NA	NA				
4	4	CODISAS1	CODISASX - SCS NUMBER --	21												
5	5	CODISASX	DISABLE SCS#								NA	NA				
5	5	CODISAS1	CODISASX - SCS NUMBER --	22												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
6	6	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
6	6	COSRTDL1	Relative Time Delay (SCS Only) – Relative Time Delay (minor cycles)	1							NA	NA				
7	7	AORWTQED	ENABLE/DISABLE RW TORQUE CMD								NA	NA				
7	7	AORWTQED	RW WHEEL NUMBER -- WHEEL NUMBER BETWEEN 0 AND 5	0							NA	NA				
7	7	AORWFIL1	FILLER --													
7	7	AORENA	ENABLE DISABLE FLAG -- 1=ENABLE 0=DISABLE	0												
8	8	AORWMOMD	DISABLE RW MOMENTUM BIAS		AORWBIAS	DISA					NA	NA				
9	9	AOFUNCEN	PCAD SUBFUNCTION ENABLE / REINIT								NA	NA				
9	9	AOPCADSE	PCAD Subfunction for EN -- PCAD Subfunction Number. See DMO5	32												
10	10	AWDE1OF	WDE-1 PWR CONV OFF		AWDE1X	OFF					PC	LCC				
11	11	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 18 -- RW #2 Fault Handling

Description:

This SCS is activated when a problem is detected with RW #2 or its associated Wheel Drive Electronics (WDE).

PCAD operation can tolerate the failure of up to 2 reaction wheels and respective WDEs. It is a design goal to avoid safe mode for a RW failure. Therefore when a problem is detected, the problem wheel is deactivated and Chandra controls with the remaining 5 wheels.

Main Steps in SCS:

1. Disable all the other 5 reaction wheel fault SCSs to prevent inadvertent shutdown of any other wheels. The risk is that all wheels could be shut down inadvertently when only one wheel is at fault.
2. Disable reaction wheel torque commands to the affected wheel.
3. Disable the reaction wheel bias. This is required in order to increase the momentum storage envelope under 5 wheel control, which is what Chandra will be controlling with if one of these RW SCSs is activated.
4. Re-initialize the Spacecraft Momentum Monitor (PCAD sub-function 32)
5. Turn of the affected wheel drive electronics

What Phase is this SCS used in? What Patches are Required for Normal Operations?

This SCS is used during the On-Orbit phase

Constraints:

None

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	CODISASX	DISABLE SCS#								NA	NA				
1	1	CODISAS1	CODISASX - SCS NUMBER --	17												
2	2	CODISASX	DISABLE SCS#								NA	NA				
2	2	CODISAS1	CODISASX - SCS NUMBER --	19												
3	3	CODISASX	DISABLE SCS#								NA	NA				
3	3	CODISAS1	CODISASX - SCS NUMBER --	20												
4	4	CODISASX	DISABLE SCS#								NA	NA				
4	4	CODISAS1	CODISASX - SCS NUMBER --	21												
5	5	CODISASX	DISABLE SCS#								NA	NA				
5	5	CODISAS1	CODISASX - SCS NUMBER --	22												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
6	6	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
6	6	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
7	7	AORWTQED	ENABLE/DISABLE RW TORQUE CMD								NA	NA				
7	7	AORWTQED	RW WHEEL NUMBER -- WHEEL NUMBER BETWEEN 0 AND 5	1							NA	NA				
7	7	AORWFIL1	FILLER --													
7	7	AORENA	ENABLE DISABLE FLAG -- 1=ENABLE 0=DISABLE	0												
8	8	AORWMOMD	DISABLE RW MOMENTUM BIAS		AORWBIAS	DISA					NA	NA				
9	9	AOFUNCEN	PCAD SUBFUNCTION ENABLE / REINIT								NA	NA				
9	9	AOPCADSE	PCAD Subfunction for EN -- PCAD Subfunction Number. See DMO5	32												
10	10	AWDE2OF	WDE-2 PWR CONV OFF		AWDE2X	OFF					PC	LCC				
11	11	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 19 -- RW #3 Fault Handling

Description:

This SCS is activated when a problem is detected with RW #3 or its associated Wheel Drive Electronics (WDE).

PCAD operation can tolerate the failure of up to 2 reaction wheels and respective WDEs. It is a design goal to avoid safe mode for a RW failure. Therefore when a problem is detected, the problem wheel is deactivated and Chandra controls with the remaining 5 wheels.

Main Steps in SCS:

1. Disable all the other 5 reaction wheel fault SCSs to prevent inadvertent shutdown of any other wheels. The risk is that all wheels could be shut down inadvertently when only one wheel is at fault.
2. Disable reaction wheel torque commands to the affected wheel.
3. Disable the reaction wheel bias. This is required in order to increase the momentum storage envelope under 5 wheel control, which is what Chandra will be controlling with if one of these RW SCSs is activated.
4. Re-initialize the Spacecraft Momentum Monitor (PCAD sub-function 32)
5. Turn of the affected wheel drive electronics

What Phase is this SCS used in? What Patches are Required for Normal Operations?

This SCS is used during the On-Orbit phase

Constraints:

None

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	CODISASX	DISABLE SCS#								NA	NA				
1	1	CODISAS1	CODISASX - SCS NUMBER --	17												
2	2	CODISASX	DISABLE SCS#								NA	NA				
2	2	CODISAS1	CODISASX - SCS NUMBER --	18												
3	3	CODISASX	DISABLE SCS#								NA	NA				
3	3	CODISAS1	CODISASX - SCS NUMBER --	20												
4	4	CODISASX	DISABLE SCS#								NA	NA				
4	4	CODISAS1	CODISASX - SCS NUMBER --	21												
5	5	CODISASX	DISABLE SCS#								NA	NA				
5	5	CODISAS1	CODISASX - SCS NUMBER --	22												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
6	6	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
6	6	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
7	7	AORWTQED	ENABLE/DISABLE RW TORQUE CMD								NA	NA				
7	7	AORWTQED	RW WHEEL NUMBER -- WHEEL NUMBER BETWEEN 0 AND 5	2							NA	NA				
7	7	AORWFIL1	FILLER --													
7	7	AORENA	ENABLE DISABLE FLAG -- 1=ENABLE 0=DISABLE	0												
8	8	AORWMOMD	DISABLE RW MOMENTUM BIAS		AORWBIAS	DISA					NA	NA				
9	9	AOFUNCEN	PCAD SUBFUNCTION ENABLE / REINIT								NA	NA				
9	9	AOPCADSE	PCAD Subfunction for EN -- PCAD Subfunction Number. See DMO5	32												
10	10	AWDE3OF	WDE-3 PWR CONV OFF		AWDE3X	OFF					PC	LCC				
11	11	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 20 -- RW #4 Fault Handling

Description:

This SCS is activated when a problem is detected with RW #4 or its associated Wheel Drive Electronics (WDE).

PCAD operation can tolerate the failure of up to 2 reaction wheels and respective WDEs. It is a design goal to avoid safe mode for a RW failure. Therefore when a problem is detected, the problem wheel is deactivated and Chandra controls with the remaining 5 wheels.

Main Steps in SCS:

1. Disable all the other 5 reaction wheel fault SCSs to prevent inadvertent shutdown of any other wheels. The risk is that all wheels could be shut down inadvertently when only one wheel is at fault.
2. Disable reaction wheel torque commands to the affected wheel.
3. Disable the reaction wheel bias. This is required in order to increase the momentum storage envelope under 5 wheel control, which is what Chandra will be controlling with if one of these RW SCSs is activated.
4. Re-initialize the Spacecraft Momentum Monitor (PCAD sub-function 32)
5. Turn of the affected wheel drive electronics

What Phase is this SCS used in? What Patches are Required for Normal Operations?

This SCS is used during the On-Orbit phase

Constraints:

None

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	CODISASX	DISABLE SCS#								NA	NA				
1	1	CODISAS1	CODISASX - SCS NUMBER --	17												
2	2	CODISASX	DISABLE SCS#								NA	NA				
2	2	CODISAS1	CODISASX - SCS NUMBER --	18												
3	3	CODISASX	DISABLE SCS#								NA	NA				
3	3	CODISAS1	CODISASX - SCS NUMBER --	19												
4	4	CODISASX	DISABLE SCS#								NA	NA				
4	4	CODISAS1	CODISASX - SCS NUMBER --	21												
5	5	CODISASX	DISABLE SCS#								NA	NA				
5	5	CODISAS1	CODISASX - SCS NUMBER --	22												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
6	6	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
6	6	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
7	7	AORWTQED	ENABLE/DISABLE RW TORQUE CMD								NA	NA				
7	7	AORWTQED	RW WHEEL NUMBER -- WHEEL NUMBER BETWEEN 0 AND 5	3							NA	NA				
7	7	AORWFIL1	FILLER --													
7	7	AORENA	ENABLE DISABLE FLAG -- 1=ENABLE 0=DISABLE	0												
8	8	AORWMOMD	DISABLE RW MOMENTUM BIAS		AORWBIAS	DISA					NA	NA				
9	9	AOFUNCEN	PCAD SUBFUNCTION ENABLE / REINIT								NA	NA				
9	9	AOPCADSE	PCAD Subfunction for EN -- PCAD Subfunction Number. See DMO5	32												
10	10	AWDE4OF	WDE-4 PWR CONV OFF		AWDE4X	OFF					PC	LCC				
11	11	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 21 -- RW #5 Fault Handling

Description:

This SCS is activated when a problem is detected with RW #5 or its associated Wheel Drive Electronics (WDE).

PCAD operation can tolerate the failure of up to 2 reaction wheels and respective WDEs. It is a design goal to avoid safe mode for a RW failure. Therefore when a problem is detected, the problem wheel is deactivated and Chandra controls with the remaining 5 wheels.

Main Steps in SCS:

1. Disable all the other 5 reaction wheel fault SCSs to prevent inadvertent shutdown of any other wheels. The risk is that all wheels could be shut down inadvertently when only one wheel is at fault.
2. Disable reaction wheel torque commands to the affected wheel.
3. Disable the reaction wheel bias. This is required in order to increase the momentum storage envelope under 5 wheel control, which is what Chandra will be controlling with if one of these RW SCSs is activated.
4. Re-initialize the Spacecraft Momentum Monitor (PCAD sub-function 32)
5. Turn of the affected wheel drive electronics

What Phase is this SCS used in? What Patches are Required for Normal Operations?

This SCS is used during the On-Orbit phase

Constraints:

None

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	CODISASX	DISABLE SCS#								NA	NA				
1	1	CODISAS1	CODISASX - SCS NUMBER --	17												
2	2	CODISASX	DISABLE SCS#								NA	NA				
2	2	CODISAS1	CODISASX - SCS NUMBER --	18												
3	3	CODISASX	DISABLE SCS#								NA	NA				
3	3	CODISAS1	CODISASX - SCS NUMBER --	19												
4	4	CODISASX	DISABLE SCS#								NA	NA				
4	4	CODISAS1	CODISASX - SCS NUMBER --	20												
5	5	CODISASX	DISABLE SCS#								NA	NA				
5	5	CODISAS1	CODISASX - SCS NUMBER --	22												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
6	6	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
6	6	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
7	7	AORWTQED	ENABLE/DISABLE RW TORQUE CMD								NA	NA				
7	7	AORWTQED	RW WHEEL NUMBER -- WHEEL NUMBER BETWEEN 0 AND 5	4							NA	NA				
7	7	AORWFIL1	FILLER --													
7	7	AORENA	ENABLE DISABLE FLAG -- 1=ENABLE 0=DISABLE	0												
8	8	AORWMOMD	DISABLE RW MOMENTUM BIAS		AORWBIAS	DISA					NA	NA				
9	9	AOFUNCEN	PCAD SUBFUNCTION ENABLE / REINIT								NA	NA				
9	9	AOPCADSE	PCAD Subfunction for EN -- PCAD Subfunction Number. See DMO5	32												
10	10	AWDE5OF	WDE-5 PWR CONV OFF		AWDE5X	OFF					PC	LCC				
11	11	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 22 -- RW #6 Fault Handling

Description:

This SCS is activated when a problem is detected with RW #6 or its associated Wheel Drive Electronics (WDE).

PCAD operation can tolerate the failure of up to 2 reaction wheels and respective WDEs. It is a design goal to avoid safe mode for a RW failure. Therefore when a problem is detected, the problem wheel is deactivated and Chandra controls with the remaining 5 wheels.

Main Steps in SCS:

1. Disable all the other 5 reaction wheel fault SCSs to prevent inadvertent shutdown of any other wheels. The risk is that all wheels could be shut down inadvertently when only one wheel is at fault.
2. Disable reaction wheel torque commands to the affected wheel.
3. Disable the reaction wheel bias. This is required in order to increase the momentum storage envelope under 5 wheel control, which is what Chandra will be controlling with if one of these RW SCSs is activated.
4. Re-initialize the Spacecraft Momentum Monitor (PCAD sub-function 32)
5. Turn of the affected wheel drive electronics

What Phase is this SCS used in? What Patches are Required for Normal Operations?

This SCS is used during the On-Orbit phase

Constraints:

None

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	CODISASX	DISABLE SCS#								NA	NA				
1	1	CODISAS1	CODISASX - SCS NUMBER --	17												
2	2	CODISASX	DISABLE SCS#								NA	NA				
2	2	CODISAS1	CODISASX - SCS NUMBER --	18												
3	3	CODISASX	DISABLE SCS#								NA	NA				
3	3	CODISAS1	CODISASX - SCS NUMBER --	19												
4	4	CODISASX	DISABLE SCS#								NA	NA				
4	4	CODISAS1	CODISASX - SCS NUMBER --	20												
5	5	CODISASX	DISABLE SCS#								NA	NA				
5	5	CODISAS1	CODISASX - SCS NUMBER --	21												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
6	6	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
6	6	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
7	7	AORWTQED	ENABLE/DISABLE RW TORQUE CMD								NA	NA				
7	7	AORWTQED	RW WHEEL NUMBER -- WHEEL NUMBER BETWEEN 0 AND 5	5							NA	NA				
7	7	AORWFIL1	FILLER --													
7	7	AORENA	ENABLE DISABLE FLAG -- 1=ENABLE 0=DISABLE	0												
8	8	AORWMOMD	DISABLE RW MOMENTUM BIAS		AORWBIAS	DISA					NA	NA				
9	9	AOFUNCEN	PCAD SUBFUNCTION ENABLE / REINIT								NA	NA				
9	9	AOPCADSE	PCAD Subfunction for EN -- PCAD Subfunction Number. See DMO5	32												
10	10	AWDE6OF	WDE-6 PWR CONV OFF		AWDE6X	OFF					PC	LCC				
11	11	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 23 -- OO - SADA Position or Temperature Monitor Fault

Description:

This SCS is activated when the SADA Position or Temperature Monitor trips. The position monitor protects against a failed ADE by comparing the SADA resolvers to the open loop SADA control position estimate and triggering the safing action if the difference is greater than 5 deg. for either SADA. The temperature monitor is triggered if either SADA temperature exceeds 172 deg. F. The glitch filter is 8.2 sec for both monitors. These thresholds represent the current settings and may be adjusted.

Main Steps in SCS:

Step 1: Terminate all ground SCS's. This doesn't disable them. The desire is to stop absolute time tagged command sequences which change the mission configuration such as maneuvers, SIM movement, etc.

Step 2: Set the PCAD mode to standby. This suspends attitude control.

Step 3: Enable/reinitialize the solar array control law. This causes the solar array control to set the estimated SADA position to the resolver reading when the PCAD mode goes to Normal Sun Mode.

Steps 4 & 5: Disable the SADA Position and Temperature monitors.

Steps 6-19: Set software ADE selection to B. Turn off ADE A, turn on ADE B, and configure the ADE EPIC excitation and step clocks.

Steps 20-24: Enable/reinitialize the IRU, sun position, s/c momentum, RW momentum and RW unloading. Normally, these functions are already enabled, so the purpose is to reinitialize these functions.

Activate SCS #: 79 -- OO - NSM Transition which:

Sets the IRU's to high range.

Sets the yaw bias to zero, the solar array control and sun mode to auto, disables RW momentum bias, and commands PCAD to NSM.

Terminates the SI safing SCS and then run the SI safing SCS (SCS #: 107 -- Main SI Safing).

What Phase is this SCS used in? What Patches are Required for Normal Operations?

On-orbit phase.

Constraints:

If this SCS is modified, be sure that the final action is to activate SCS 79. Also, failure to terminate mission SCS's may result in maneuvers from unknown starting points or exposing an SI to a potentially harmful X-ray source.

When the SADA position or temperature monitors trip, error code 0E13 will be observed in the OBC Error Log, and OBC Health and Status will activate SCS #: 23 -- OO - SADA Position or Temperature Monitor Fault. The specific monitor that tripped the safing action may be determined from the fault status word in the error log.

This SCS defaults to disabled upon OBC reset and is automatically enabled by SCS #: 118 -- OBC Reset Reconfiguration Tasks which is called by SCS #: 80 -- OO - Standby State Timeout when the OBC is reset and not in safe mode.

This safing action may be disabled by either disabling the monitor or the safing action. It is preferable to disable the monitor to avoid filling the error log. If this safing action is disabled, the spacecraft is vulnerable to power problems such as bus overvoltage.

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	COTRMALL	TERMINATE ALL GROUND SCSS								NA	NA				
2	2	AOSBMODE	OBC SET PCAD MODE STANDBY		AOPCADMD	STBY					NA	NA				
3	3	AOFUNCEN	PCAD SUBFUNCTION ENABLE / REINIT								NA	NA				
3	3	AOPCADSE	PCAD Subfunction for EN	23												
4	4	AOFUNCDS	PCAD SUBFUNCTION DISABLE								NA	NA				
4	4	AOPCADSD	PCAD_Subfunction	35							NA	NA				
5	5	AOFUNCDS	PCAD SUBFUNCTION DISABLE								NA	NA				
5	5	AOPCADSD	PCAD_Subfunction	36							NA	NA				
6	6	AOADEB	SELECT ADE SIDE B		AOADESEL	B					NA	NA				
7	7	ADEAOF	ADE-A PWR OFF		ADEAPWR	OFF					PC	LCC				
8	8	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
8	8	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1												
9	9	ADEAOF	ADE-A PWR OFF		ADEAPWR	OFF					PC	LCC				
10	10	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
10	10	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1												
11	11	ADEBON	ADE-B PWR ON		ADEBPWR	ON					PC	LCC				
12	12	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
12	12	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1												
13	13	ADEBON	ADE-B PWR ON		ADEBPWR	ON					PC	LCC				
14	14	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
14	14	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	32												
15-16	15	ADEBO3IN	ADE-B INIT, CT3, SELECT 4.096 MHZ (OBC)--CONTROL COMMAND SERIAL INTERFACE		AOADBC3A		AOADBC3C		AOADBC3E		PC	SD				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			(OBC)													
15-16	15	ADEBO3_1	ADEBO3IN Data Bits D13 to D0 of Data Field --													
15-16	15	ADEBO3_2	Q Odd Parity -- CPE parity bit over ground bits 19-34 of the command.	0												
15-16	15	ADEBO3_3	ADEBO3IN Least Significant Word and First Command Word --													
15-16	15	ADEBO3_4	ADEBO3IN Filler bit --													
15-16	15	ADEBO3_5	ADEBO3IN Address Part of Data Field -- Address part of the data field													
15-16	15	ADEBO3_6	ADEBO3IN Channel Part of Data Field -- Channel part of the data field													
15-16	15	ADEBO3_7	ADEBO3IN Data Bits D15 and D14 -- Data Bits 15 and 14 of second command word													
15-16	15	ADEBO3_8	ADEBO3IN Most Significant Word and Second Word of two word command -- Most Significant word of two word command													
17-18	16	ADEBO4IN	ADE-B INIT, CT3, DIVIDE BY 166 (24.67 KHZ) (OBC)--CONTROL COMMAND SERIAL INTERFACE (OBC)		AOADBC3A		AOADBC3C		AOADBC3E		PC	SD				
17-18	16	ADEBO4_1	ADEBO4IN Data Bits D13 to D0 of Data Field --													
17-18	16	ADEBO4_2	Q Odd Parity -- CPE parity bit over ground bits 19-34 of the command.	0												
17-18	16	ADEBO4_3	ADEBO4IN Least Significant Word and First Command Word --													
17-18	16	ADEBO4_4	ADEBO4IN Filler bit --													
17-18	16	ADEBO4_5	ADEBO4IN Address Part of Data Field -- Address part of the data field													
17-18	16	ADEBO4_6	ADEBO4IN Channel Part of Data Field -- Channel part of the data field													
17-18	16	ADEBO4_7	ADEBO4IN Data Bits D15 and D14 -- Data Bits 15 and 14 of second command word													
17-18	16	ADEBO4_8	ADEBO4IN Most Significant Word and Second Word of two word command -- Most Significant word of two word command													

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
19	17	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
19	17	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1												
20-21	18	ADEBO3IN	ADE-B INIT, CT3, SELECT 4.096 MHZ (OBC)--CONTROL COMMAND SERIAL INTERFACE (OBC)		AOADBC3A		AOADBC3C		AOADBC3E		PC	SD				
20-21	18	ADEBO3_1	ADEBO3IN Data Bits D13 to D0 of Data Field --													
20-21	18	ADEBO3_2	Q Odd Parity -- CPE parity bit over ground bits 19-34 of the command.	0												
20-21	18	ADEBO3_3	ADEBO3IN Least Significant Word and First Command Word --													
20-21	18	ADEBO3_4	ADEBO3IN Filler bit --													
20-21	18	ADEBO3_5	ADEBO3IN Address Part of Data Field -- Address part of the data field													
20-21	18	ADEBO3_6	ADEBO3IN Channel Part of Data Field -- Channel part of the data field													
20-21	18	ADEBO3_7	ADEBO3IN Data Bits D15 and D14 -- Data Bits 15 and 14 of second command word													
20-21	18	ADEBO3_8	ADEBO3IN Most Significant Word and Second Word of two word command -- Most Significant word of two word command													
22-23	19	ADEBO4IN	ADE-B INIT, CT3, DIVIDE BY 166 (24.67 KHZ) (OBC)--CONTROL COMMAND SERIAL INTERFACE (OBC)		AOADBC3A		AOADBC3C		AOADBC3E		PC	SD				
22-23	19	ADEBO4_1	ADEBO4IN Data Bits D13 to D0 of Data Field --													
22-23	19	ADEBO4_2	Q Odd Parity -- CPE parity bit over ground bits 19-34 of the command.	0												
22-23	19	ADEBO4_3	ADEBO4IN Least Significant Word and First Command Word --													
22-23	19	ADEBO4_4	ADEBO4IN Filler bit --													
22-23	19	ADEBO4_5	ADEBO4IN Address Part of Data Field -- Address part of the data field													
22-23	19	ADEBO4_6	ADEBO4IN Channel Part of Data Field -- Channel part of the data field													

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
22-23	19	ADEBO4_7	ADEBO4IN Data Bits D15 and D14 -- Data Bits 15 and 14 of second command word													
22-23	19	ADEBO4_8	ADEBO4IN Most Significant Word and Second Word of two word command -- Most Significant word of two word command													
24	20	AOFUNCEN	PCAD SUBFUNCTION ENABLE / REINIT								NA	NA				
24	20	AOPCADSE	PCAD Subfunction for EN -- PCAD Subfunction Number. See DMO5	29												
25	21	AOFUNCEN	PCAD SUBFUNCTION ENABLE / REINIT								NA	NA				
25	21	AOPCADSE	PCAD Subfunction for EN -- PCAD Subfunction Number. See DMO5	30												
26	22	AOFUNCEN	PCAD SUBFUNCTION ENABLE / REINIT								NA	NA				
26	22	AOPCADSE	PCAD Subfunction for EN -- PCAD Subfunction Number. See DMO5	32												
27	23	AOFUNCEN	PCAD SUBFUNCTION ENABLE / REINIT								NA	NA				
27	23	AOPCADSE	PCAD Subfunction for EN -- PCAD Subfunction Number. See DMO5	33												
28	24	AOFUNCEN	PCAD SUBFUNCTION ENABLE / REINIT								NA	NA				
28	24	AOPCADSE	PCAD Subfunction for EN -- PCAD Subfunction Number. See DMO5	34												
29	25	COACTSX	ACTIVATE SCS#								NA	NA				
29	25	COACTS1	COACTSX - SCS NUMBER -- SCS Number	79												
29	25	COACTS2	COACTSX - REPEAT COUNT -- Repeat Count. If this is 0, then SCS is executed once.	0												
30	26	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 24 -- Unexpected Connection of the Batteries

Description:

This SCS is used when the OBC detects an unexpected charge or discharge relay connect problem. The EPS fault handling software detects the problem and sets the Batt_Disconnect fault flag. The action is to let EPS FSW try and fix the problem, while Chandra is commanded to terminate the mission SCSs and transition PCAD to Normal Sun Mode.

Main Steps in SCS:

1. Terminate all ground SCSs
2. Activate SCS #: 79 -- OO - NSM Transition which:
   Sets the IRU's to high range.
   Sets the yaw bias to zero, the solar array control and sun mode to auto, disables RW momentum bias, and commands PCAD to NSM.
   Terminates the SI safing SCS and then run SCS #: 107 -- Main SI Safing.

What Phase is this SCS used in? What Patches are Required for Normal Operations?

This SCS is used in the On-Orbit phase.

Constraints:

None

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	COTRMALL	TERMINATE ALL GROUND SCSS								NA	NA				
2	2	COACTSX	ACTIVATE SCS#								NA	NA				
2	2	COACTS1	COACTSX - SCS NUMBER – SCS Number	79												
2	2	COACTS2	COACTSX - REPEAT COUNT -- Repeat Count. If this is 0, then SCS is executed once.	0												
3	3	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 25 -- EP RCTU Monitor Fault

Description:

This SCS is activated when the EP RCTU Monitor trips. This monitor protects against a failed EP RCTU, or if the RCTU has been shut down by an SEU.

Main Steps in SCS:

(See attached flow chart) Check to see if the SCS was triggered due to a wrap fault, or an EPS fault. If it was an EPS fault, fail over the converter and telemetry processor, and initialize EPS.

If a wrap fault occurred, check to see which RCTU is on. If Prime is on, cycle Prime RCTU converter power, else cycle the redundant power

Initialize EPS and wait two seconds

Check to see if the wrap fault has cleared. If yes, exit. If no, and Prime converter is on, fail over the converter and telemetry processor, and initialize EPS. Else, exit.

What Phase is this SCS used in? What Patches are Required for Normal Operations?

This SCS is used during all Mission Phases.

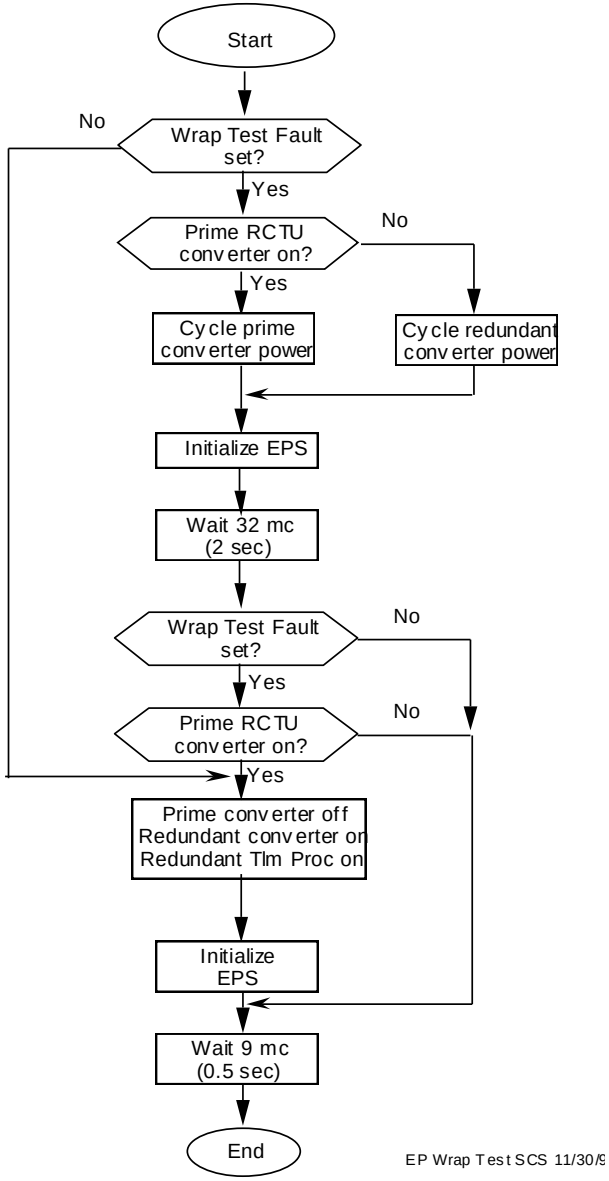
Constraints:

If this SCS is edited, be sure that the RCTU is brought back on line within one second of the failure. Many other protected SCSs are designed with this one second value in mind. Commands that go through this RCTU are doubled up with one second delays between them in the event that the RCTU is shut down by an SEU.

When the EP RCTU Monitor trips, the EPS TLM Error Or Cmd Wrap error (0e15) will be observed in the OBC Error Log, and OBC Health and Status will activate SCS 25.

This SCS defaults to disabled upon OBC reset, and is automatically enabled by SCS #: 80 -- OO - Standby State Timeout and SCS #: 118 -- OBC Reset Reconfiguration Tasks.

Flow SCS 25-1 EP RCTU Monitor Fault



Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	OCNDEVBR	CONDITIONAL EVENT BRANCH								NA	NA				
1	1	OCNDEVB1	OCCURRENCE FLAG -- 0 - EVENT FAILED TO OCCUR 1 - EVENT OCCURED	0												
1	1	OCNDEVB2	OCNDEVB1 EV NUMBER -- CONDITIONAL EVENT NUMBER BEING INTERROGATED.	23												
1	1	OCNDEVB3	OCNDEVBR SCS STEP -- SCS STEP NUMBER AT WHICH THE PROCESSING WILL CONTINUE	22												
2	2	OCNDEVBR	CONDITIONAL EVENT BRANCH								NA	NA				
2	2	OCNDEVB1	OCCURRENCE FLAG -- 0 - EVENT FAILED TO OCCUR 1 - EVENT OCCURED	0												
2	2	OCNDEVB2	OCNDEVB1 EV NUMBER -- CONDITIONAL EVENT NUMBER BEING INTERROGATED.	19												
2	2	OCNDEVB3	OCNDEVBR SCS STEP -- SCS STEP NUMBER AT WHICH THE PROCESSING WILL CONTINUE	11												
3	3	CEPPCPOF	RCTU-EP PRI CONV PWR OFF		CTUEPA	OFF					LR	HLP				
4	4	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
4	4	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
5	5	CEPPCPOF	RCTU-EP PRI CONV PWR OFF		CTUEPA	OFF					LR	HLP				
6	6	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
6	6	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
7	7	CEPPCPON	RCTU-EP PRI CONV PWR ON		CTUEPA	ON					LR	HLP				
8	8	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
8	8	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
9	9	CEPPCPON	RCTU-EP PRI CONV PWR ON		CTUEPA	ON					LR	HLP				
10	10	COSBRCH	SCS SET STEP# (I.E.UNCONDITIONAL BRANCH)								NA	NA				
10	10	COSBRCH1	COSBRCH - SCS STEP -- SCS Step Number	18												
11	11	CEPRCPOF	RCTU-EP RED CONV PWR OFF		CTUEPB	OFF					LR	HLP				
12	12	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
12	12	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
13	13	CEPRCPOF	RCTU-EP RED CONV PWR OFF		CTUEPB	OFF					LR	HLP				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
14	14	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
14	14	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
15	15	CEPRCPON	RCTU-EP RED CONV PWR ON		CTUEPB	ON					LR	HLP				
16	16	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
16	16	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1												
17	17	CEPRCPON	RCTU-EP RED CONV PWR ON		CTUEPB	ON					LR	HLP				
18	18	EOINISET	Set initialization flag to true		EGCTTEL3	OVRT					NA	NA				
19	19	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
19	19	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	32												
20	20	OCNDEVBR	CONDITIONAL EVENT BRANCH								NA	NA				
20	20	OCNDEVB1	OCCURRENCE FLAG -- 0 - EVENT FAILED TO OCCUR 1 - EVENT OCCURED	0							NA	NA				
20	20	OCNDEVB2	OCNDEVB1 EV NUMBER -- CONDITIONAL EVENT NUMBER BEING INTERROGATED.	23							NA	NA				
20	20	OCNDEVB3	OCNDEVBR SCS STEP -- SCS STEP NUMBER AT WHICH THE PROCESSING WILL CONTINUE	35							NA	NA				
21	21	OCNDEVBR	CONDITIONAL EVENT BRANCH								NA	NA				
21	21	OCNDEVB1	OCCURRENCE FLAG -- 0 - EVENT FAILED TO OCCUR 1 - EVENT OCCURED	0							NA	NA				
21	21	OCNDEVB2	OCNDEVB1 EV NUMBER -- CONDITIONAL EVENT NUMBER BEING INTERROGATED.	19							NA	NA				
21	21	OCNDEVB3	OCNDEVBR SCS STEP -- SCS STEP NUMBER AT WHICH THE PROCESSING WILL CONTINUE	35							NA	NA				
22	22	CEPPCPOF	RCTU-EP PRI CONV PWR OFF		CTUEPA	OFF					LR	HLP				
23	23	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
23	23	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
24	24	CEPPCPOF	RCTU-EP PRI CONV PWR OFF		CTUEPA	OFF					LR	HLP				
25	25	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
25	25	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
26	26	CEPRCPON	RCTU-EP RED CONV PWR ON		CTUEPB	ON					LR	HLP				
27	27	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
27	27	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
28	28	CEPRCPON	RCTU-EP RED CONV PWR ON		CTUEPB	ON					LR	HLP				
29	29	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
29	29	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	8							NA	NA				
30	30	CEPTBON	RCTU-EP TLM PROC B ON (OH)		CEPTLMB	ON					EP	HLP				
31	31	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
31	31	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1												
32	32	CEPTBON	RCTU-EP TLM PROC B ON (OH)		CEPTLMB	ON					EP	HLP				
33	33	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
33	33	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1												
34	34	EOINISET	SET EPS INIT FLAG		EGCTTEL3	OVRT					NA	NA				
35	35	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
35	35	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	9												
36	36	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 26 -- TS RCTU Monitor or Telescope Thermal Control Fault

Description:

This SCS is activated when the TS RCTU Monitor trips. This monitor protects against a failed TS RCTU, or if the RCTU has been shut down by an SEU.

Main Steps in SCS:

(See attached flow chart) Disable Thermal Control.

Check to see if the SCS was triggered due to a wrap fault, or Thermal fault. If it was a Thermal fault, fail over the converter, the telemetry processor, the IP, and the SEA, and re-enable/reinitialize Thermal Control.

If a wrap fault occurred, check to see which RCTU is on. If Prime is on, cycle Prime RCTU converter power, else cycle the redundant power

Wait two seconds

Check to see if the wrap fault has cleared. If yes, Re-enable/reinitialize Thermal Control and exit. If no, fail over the converter the telemetry processor, the IP, and the SEA, and re-enable/reinitialize Thermal Control, and exit.

What Phase is this SCS used in? What Patches are Required for Normal Operations?

This SCS is used during all Mission Phases.

Constraints:

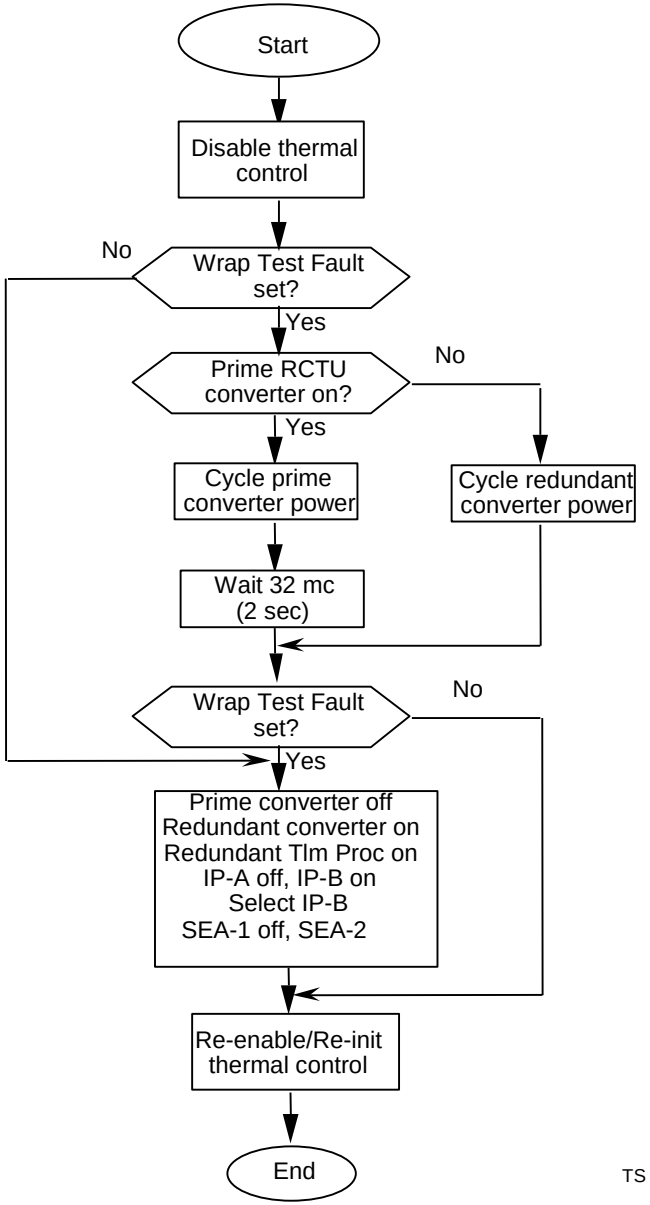
If this SCS is edited, be sure that the RCTU is brought back on line within one second of the failure. Many other protected SCSs are designed with this one second value in mind. Commands that go through this RCTU are doubled up with one second delays between them in the event that the RCTU is shut down by an SEU.

When the TS RCTU Monitor trips, the telescope thermal alarm or TS Cmd Wrap error (0e16) will be observed in the OBC Error Log, and OBC Health and Status will activate SCS 26.

When this SCS was originally generated, the command to select the secondary database for use with the redundant IP and SEU swap was left out. The secondary equipment will work with the prime database selected, but this configuration should be corrected if it is decided that the secondary equipment will be used for operations. There is no danger to the OBA or HRMA for any length of time using the prime database with the secondary equipment, however the system is not optimized in this configuration.

This SCS defaults to disabled upon OBC reset, and is automatically enabled by SCS #: 80 -- OO - Standby State Timeout and SCS #: 118 -- OBC Reset Reconfiguration Tasks.

Flow SCS 26-1 TS RCTU Monitor Fault



TS Wrap Test SCS 9/15/9

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	4OTTCPDS	TEL THERMAL CONTROL PROCESS DISABLE		4OTCPEN	DISA					NA	NA				
2	2	4OHMTCDS	DISABLE HRMA THERMAL CONTROL		4OACHRMH	DISA					NA	NA				
3	3	4OOBTCDS	DISABLE OBA THERMAL CONTROL		4OACOBAH	DISA					NA	NA				
4	4	OCNDEVBR	CONDITIONAL EVENT BRANCH								NA	NA				
4	4	OCNDEVB1	OCCURRENCE FLAG -- 0 - EVENT FAILED TO OCCUR 1 - EVENT OCCURED	0							NA	NA				
4	4	OCNDEVB2	OCNDEVB1 EV NUMBER -- CONDITIONAL EVENT NUMBER BEING INTERROGATED.	25							NA	NA				
4	4	OCNDEVB3	OCNDEVBR SCS STEP -- SCS STEP NUMBER AT WHICH THE PROCESSING WILL CONTINUE	23							NA	NA				
5	5	OCNDEVBR	CONDITIONAL EVENT BRANCH								NA	NA				
5	5	OCNDEVB1	OCCURRENCE FLAG -- 0 - EVENT FAILED TO OCCUR 1 - EVENT OCCURED	0							NA	NA				
5	5	OCNDEVB2	OCNDEVB1 EV NUMBER -- CONDITIONAL EVENT NUMBER BEING INTERROGATED.	21							NA	NA				
5	5	OCNDEVB3	OCNDEVBR SCS STEP -- SCS STEP NUMBER AT WHICH THE PROCESSING WILL CONTINUE	14							NA	NA				
6	6	CTSPCPOF	RCTU-TS PRI CONV PWR OFF		CTUTSA	OFF					LR	HLP				
7	7	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
7	7	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1												
8	8	CTSPCPOF	RCTU-TS PRI CONV PWR OFF		CTUTSA	OFF					LR	HLP				
9	9	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
9	9	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1												
10	10	CTSPCPON	RCTU-TS PRI CONV PWR ON		CTUTSA	ON					LR	HLP				
11	11	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
11	11	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1												
12	12	CTSPCPON	RCTU-TS PRI CONV PWR ON		CTUTSA	ON					LR	HLP				
13	13	COSBRCH	SCS SET STEP# (I.E.UNCONDITIONAL BRANCH)								NA	NA				
13	13	COSBRCH1	COSBRCH - SCS STEP -- SCS Step Number	21												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
14	14	CTSPCROF	RCTU-TS RED CONV PWR OFF		CTUTSB	OFF					LR	HLP				
15	15	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
15	15	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
16	16	CTSPCROF	RCTU-TS RED CONV PWR OFF		CTUTSB	OFF					LR	HLP				
17	17	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
17	17	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
18	18	CTSPCRON	RCTU-TS RED CONV PWR ON		CTUTSB	ON					LR	HLP				
19	19	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
19	19	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
20	20	CTSPCRON	RCTU-TS RED CONV PWR ON		CTUTSB	ON					LR	HLP				
21	21	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
21	21	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	32							NA	NA				
22	22	OCNDEVBR	CONDITIONAL EVENT BRANCH								NA	NA				
22	22	OCNDEVB1	OCCURRENCE FLAG -- 0 - EVENT FAILED TO OCCUR 1 - EVENT OCCURED	0							NA	NA				
22	22	OCNDEVB2	OCNDEVB1 EV NUMBER -- CONDITIONAL EVENT NUMBER BEING INTERROGATED.	25							NA	NA				
22	22	OCNDEVB3	OCNDEVBR SCS STEP -- SCS STEP NUMBER AT WHICH THE PROCESSING WILL CONTINUE	52							NA	NA				
23	23	CTSPCPOF	RCTU-TS PRI CONV PWR OFF		CTUTSA	OFF					LR	HLP				
24	24	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
24	24	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
25	25	CTSPCPOF	RCTU-TS PRI CONV PWR OFF		CTUTSA	OFF					LR	HLP				
26	26	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
26	26	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
27	27	CTSPCRON	RCTU-TS RED CONV PWR ON		CTUTSB	ON					LR	HLP				
28	28	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
28	28	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
29	29	CTSPCRON	RCTU-TS RED CONV PWR ON		CTUTSB	ON					LR	HLP				
30	30	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
30	30	COSRTDL1	Relative Time Delay (SCS Only) --	8							NA	NA				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			Relative Time Delay (minor cycles)													
31	31	CTSTPBON	RCTU-TS TLM PROC B ON (OH)		CTSTLMB	ON					TS	HLP				
32	32	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
32	32	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
33	33	CTSTPBON	RCTU-TS TLM PROC B ON (OH)		CTSTLMB	ON					TS	HLP				
34	34	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
34	34	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1												
35	35	4IPSPADS	IP A: DISABLE SECONDARY PWR CONV		4IPIRAX	DISA	4IP5AV	0/.5			TS	HLP				
36	36	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
36	36	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1												
37	37	4IPSPADS	IP A: DISABLE SECONDARY PWR CONV		4IPIRAX	DISA	4IP5AV	0/.5			TS	HLP				
38	38	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
38	38	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1												
39	39	4IPSPBEN	IP B: TURN ON -- ENAB SECONDARY PWR CONV		4IPIRBX	ENAB	4IP5BV				TS	HLP				
40	40	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
40	40	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1												
41	41	4IPSPBEN	IP B: TURN ON -- ENAB SECONDARY PWR CONV		4IPIRBX	ENAB	4IP5BV				TS	HLP				
42	42	4OIPSELB	SELECT INSTRUMENTATION PROCESSOR B		4OCDIPSL	IP_2					NA	NA				
43	43	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
43	43	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1												
44	44	4SESP1DS	SEA 1: DISA SECONDARY POWER CONV		4S1IRX	DISA	4SP51V				TS	HLP				
45	45	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
45	45	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1												
46	46	4SESP1DS	SEA 1: DISA SECONDARY POWER CONV		4S1IRX	DISA	4SP51V				TS	HLP				
47	47	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
47	47	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1												
48	48	4SESP2EN	SEA 2: TURN BOX ON -- ENAB		4S2IRX	ENAB	4SP52V				TS	HLP				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			DC/DC CONV													
49	49	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
49	49	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1												
50	50	4SESP2EN	SEA 2: TURN BOX ON -- ENAB DC/DC CONV		4S2IRX	ENAB	4SP52V				TS	HLP				
51	51	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
51	51	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1												
52	52	4OTTCPEN	TEL THERMAL CONTROL PROCESS ENABLE		4OTCPEN	ENAB					NA	NA				
53	53	4OHMTCEN	ENABLE HRMA THERMAL CONTROL		4OACHRMH	ENAB					NA	NA				
54	54	4OTELTCR	REINITIALIZE TELESCOPE THERMAL CONTROL		4ORINITC	TRUE					NA	NA				
55	55	COSCALL	SCS CALL SCS								NA	NA				
55	55	COSCALL1	COSCALL - SCS NUMBER -- SCS Number	94												
56	56	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
56	56	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	9							NA	NA				
57	57	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 27 -- SIM RCTU Monitor Fault Safing

Description:

This SCS is activated when the SIM RCTU Monitor trips. This monitor protects against a failed SI RCTU, or if the RCTU has been shut down by an SEU.

Main Steps in SCS:

See attached flow chart:

1. Terminate all Ground SCSs
2. Check to see which RCTU is on. If Prime is on, cycle Prime RCTU converter power, else cycle the redundant power
3. Wait two seconds
4. Check to see if the wrap fault has cleared. If it has not cleared, and the prime converter is indicated on, then there is a possible failure of the prime converter. Turn off the prime converter, and turn on the redundant converter and telemetry processor. If the wrap test has cleared, then the prime converter is back on.
5. Either branch leads to the Terminate SCS #: 107 -- Main SI Safing, delay 3 MF, and call SCS 107, then exit.

What Phase is this SCS used in? What Patches are Required for Normal Operations?

This SCS is used during all Mission Phases.

This SCS was patched to replace the call SCS 81 statement with the call SCS 107 statement as part of the SI safing enhancement.

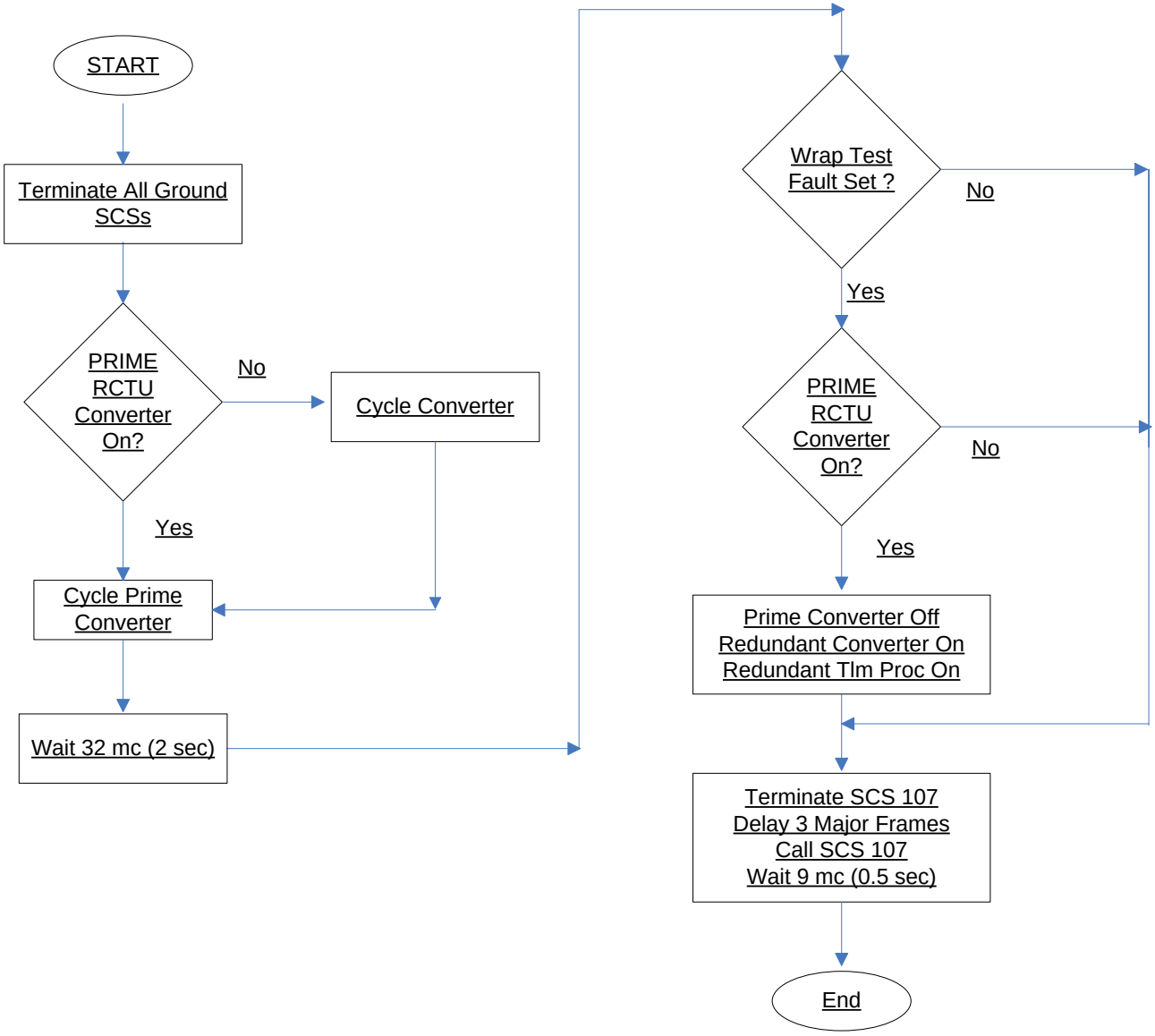
Constraints:

If this SCS is edited, be sure that the RCTU is brought back on line within one second of the failure. Many other protected SCSs are designed with this one second value in mind. Commands that go through this RCTU are doubled up with one second delays between them in the event that the RCTU is shut down by an SEU.

When the SI RCTU Monitor trips, the SI Cmd Wrap error (0e17) will be observed in the OBC Error Log, and OBC Health and Status will activate SCS 27.

This SCS defaults to disabled upon OBC reset, and is automatically enabled by SCS #: 80 -- OO - Standby State Timeout and SCS #: 118 -- OBC Reset Reconfiguration Tasks.

Flow SCS 27-1 SIM RCTU Monitor Fault



Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	COTRMALL	TERMINATE ALL GROUND SCSs								NA	NA				
2	2	OCNDEVBR	CONDITIONAL EVENT BRANCH								NA	NA				
2	2	OCNDEVB1	OCCURRENCE FLAG -- 0 - EVENT FAILED TO OCCUR 1 - EVENT OCCURED	0												
2	2	OCNDEVB2	OCNDEVB1 EV NUMBER -- CONDITIONAL EVENT NUMBER BEING INTERROGATED.	22												
2	2	OCNDEVB3	OCNDEVBR SCS STEP -- SCS STEP NUMBER AT WHICH THE PROCESSING WILL CONTINUE	11												
3	3	CSIPOF	RCTU-SI PRI CONV PWR OFF		CTUSIA	OFF					LR	HLP				
4	4	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
4	4	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1												
5	5	CSIPOF	RCTU-SI PRI CONV PWR OFF		CTUSIA	OFF					LR	HLP				
6	6	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
6	6	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1												
7	7	CSIPON	RCTU-SI PRI CONV PWR ON		CTUSIA	ON					LR	HLP				
8	8	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
8	8	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1												
9	9	CSIPON	RCTU-SI PRI CONV PWR ON		CTUSIA	ON					LR	HLP				
10	10	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
10	10	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1												
11	11	COSBRCH	SCS SET STEP# (I.E.UNCONDITIONAL BRANCH)								NA	NA				
11	11	COSBRCH1	COSBRCH - SCS STEP -- SCS Step Number	18												
12	12	CSIROF	RCTU-SI RED CONV PWR OFF		CTUSIB	OFF					LR	HLP				
13	13	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
13	13	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1												
14	14	CSIROF	RCTU-SI RED CONV PWR OFF		CTUSIB	OFF					LR	HLP				
15	15	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
15	15	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1												
16	16	CSIRON	RCTU-SI RED CONV PWR ON		CTUSIB	ON					LR	HLP				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
17	17	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
17	17	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1												
18	18	CSIRON	RCTU-SI RED CONV PWR ON		CTUSIB	ON					LR	HLP				
19	19	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
19	19	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	32												
20	20	OCNDEVBR	CONDITIONAL EVENT BRANCH								NA	NA				
20	20	OCNDEVB1	OCCURRENCE FLAG -- 0 - EVENT FAILED TO OCCUR 1 - EVENT OCCURED	0							NA	NA				
20	20	OCNDEVB2	OCNDEVB1 EV NUMBER -- CONDITIONAL EVENT NUMBER BEING INTERROGATED.	26							NA	NA				
20	20	OCNDEVB3	OCNDEVBR SCS STEP -- SCS STEP NUMBER AT WHICH THE PROCESSING WILL CONTINUE	33							NA	NA				
21	21	OCNDEVBR	CONDITIONAL EVENT BRANCH								NA	NA				
21	21	OCNDEVB1	OCCURRENCE FLAG -- 0 - EVENT FAILED TO OCCUR 1 - EVENT OCCURED	0							NA	NA				
21	21	OCNDEVB2	OCNDEVB1 EV NUMBER -- CONDITIONAL EVENT NUMBER BEING INTERROGATED.	22							NA	NA				
21	21	OCNDEVB3	OCNDEVBR SCS STEP -- SCS STEP NUMBER AT WHICH THE PROCESSING WILL CONTINUE	33							NA	NA				
22	22	CSIPOF	RCTU-SI PRI CONV PWR OFF		CTUSIA	OFF					LR	HLP				
23	23	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
23	23	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
24	24	CSIPOF	RCTU-SI PRI CONV PWR OFF		CTUSIA	OFF					LR	HLP				
25	25	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
25	25	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
26	26	CSIRON	RCTU-SI RED CONV PWR ON		CTUSIB	ON					LR	HLP				
27	27	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
27	27	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
28	28	CSIRON	RCTU-SI RED CONV PWR ON		CTUSIB	ON					LR	HLP				
29	29	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
29	29	COSRTDL1	Relative Time Delay (SCS Only) --	8							NA	NA				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			Relative Time Delay (minor cycles)													
30	30	CSITBON	RCTU-SI TLM PROC B ON (OH)		CSITLMB	ON					SI	HLP				
31	31	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
31	31	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1												
32	32	CSITBON	RCTU-SI TLM PROC B ON (OH)		CSITLMB	ON					SI	HLP				
33	33	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
33	33	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1												
34	34	COTERMSX	TERMINATE SCS#								NA	NA				
34	34	COTERMS1	COTERMSX - SCS NUMBER -- SCS Number	107							NA	NA				
35	35	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
35	35	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1536							NA	NA				
36	36	COSCALL	SCS CALL SCS								NA	NA				
36	36	COSCALL1	COSCALL - SCS NUMBER -- SCS Number	107												
37	37	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
37	37	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	9												
38	38	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 28 -- Bright Star or Commanded Attitude Monitor

Description:

This SCS is used in one of two events: 1) the PCAD mode has transitioned to Bright Star Hold, meaning that the spacecraft has lost the ability to identify a known attitude reference from the stars it sees, but still has the ability to hold attitude on bright stars 2) The commanded attitude monitor has tripped, meaning that the spacecraft determined that the next command quaternion would put the spacecraft into a known exclusion zone if allowed to execute. The response by this SCS is also governed on whether an additional SCS is enabled or not.

For observations where the sun is in the fine sun sensor FOV, SCS 98 is disabled, and after the call to SCS 98 is ignored, SCS 99 is activated. SCS 99 has only the Activate SCS 107 in it, so in essence Chandra would hold on bright stars but safe all the instruments.

For observations where the sun is NOT in the fine sun sensor FOV, then SCS 98 is enabled. If the monitor trips, SCS 98 gets called, and performs tasks that include transitioning Chandra to Normal Sun Mode. SCS 98 also contains the commands to disable SCS 99, so SCS 99 never gets a chance to run. SCS 98 via SCS 79 has the commands to safe the instrument.

Refer to flow chart FLOW SCS 28-1 for a quick overview.

Main Steps in SCS:

1. Terminate all ground mission SCSs.
2. Disable PCAD subfunction 38, which is the command attitude monitor (cmd_att_mon)
3. Call SCS #: 98 -- Bright Star Normal Sun Mode. This SCS is normally disabled for observations that have the sun in the fine sun sensor field of view. SCS 98 Calls SCS #: 79 -- OO - NSM Transition then disables SCS 99 to keep it from running when the SCS processing returns to SCS 28 after this call. Therefore if the sun is in the field of view, on the next command, SCS 99, gets activated
4. Activate SCS #: 99 -- Bright Star SI Safing. This SCS only contains an activate SCS #: 107 -- Main SI Safing command.
5. End SCS.

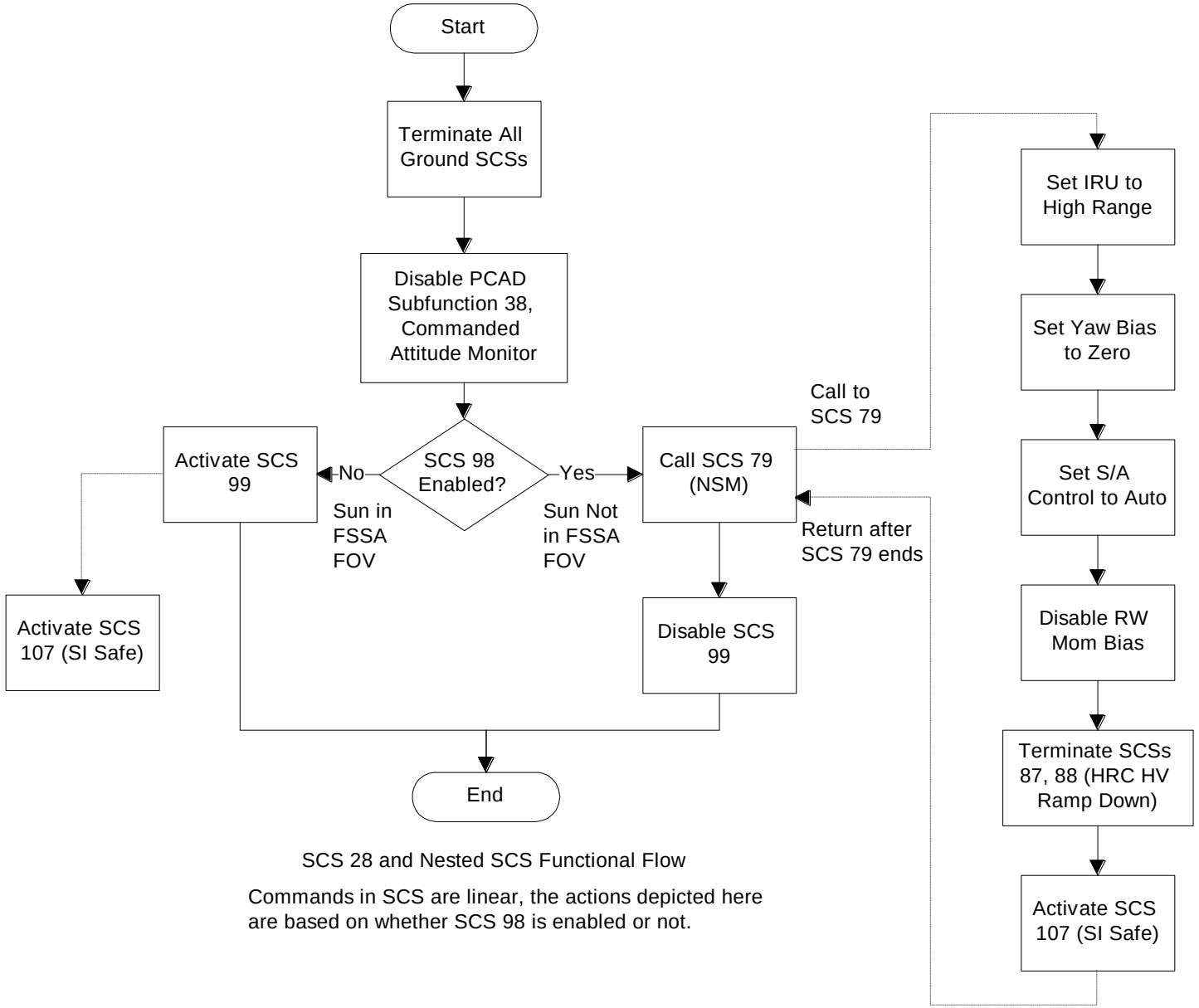
What Phase is this SCS used in? What Patches are Required for Normal Operations?

This is used in the on-orbit phase.

Constraints:

SAFE MODE or OBC RESET note: This SCS must be remain disabled during safe mode recovery until the proper ephemeris time offset has been uplinked via patch.

Flow SCS 28-1 Function Flow



SCS 28 and Nested SCS Functional Flow

Commands in SCS are linear, the actions depicted here are based on whether SCS 98 is enabled or not.

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	COTRMALL	TERMINATE ALL GROUND SCSS								NA	NA				
2	2	AOFUNCDS	PCAD SUBFUNCTION DISABLE								NA	NA				
2	2	AOPCADSD	PCAD_Subfunction	38												
3	3	COSCALL	SCS CALL SCS								NA	NA				
3	3	COSCALL1	COSCALL - SCS NUMBER -- SCS Number	98												
4	4	COACTSX	ACTIVATE SCS#								NA	NA				
4	4	COACTS1	COACTSX - SCS NUMBER -- SCS Number	99												
4	4	COACTS2	COACTSX - REPEAT COUNT -- Repeat Count. If this is 0, then SCS is executed once.	0												
5	5	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 29 – Eclipse Load Control SCS

Description:

This SCS is used during eclipse season. During normal configuration, this SCS monitors the EPS eclipse flag "F-Eclipse" and when TRUE, will run SCS #: 32 -- Eclipse Entry. There is also a penumbra only configuration which is used during a Penumbra eclipse.

Main Steps in SCS:

a) Nominal Configuration

1. Wait on flag F-Eclipse.
2. When F-Eclipse Flag True, call SCS #: 32 -- Eclipse Entry.

b) Penumbra Configuration

1. Set Eclipse entrance timeout.
2. Set eclipse timeout (Lower Bound)
3. Set eclipse timeout2 (Upper Bound).
4. Branch on flag F_Eclipse_1st flag
5. Relative Time Delay
6. Branch on EPS_INTERFACE.FAULT_Indicator = EPS_INTERFACE_TYPES.Batt_Disconnect (TRUE when 2 or more batteries connected)
7. Activate SCS #: 32 -- Eclipse Entry

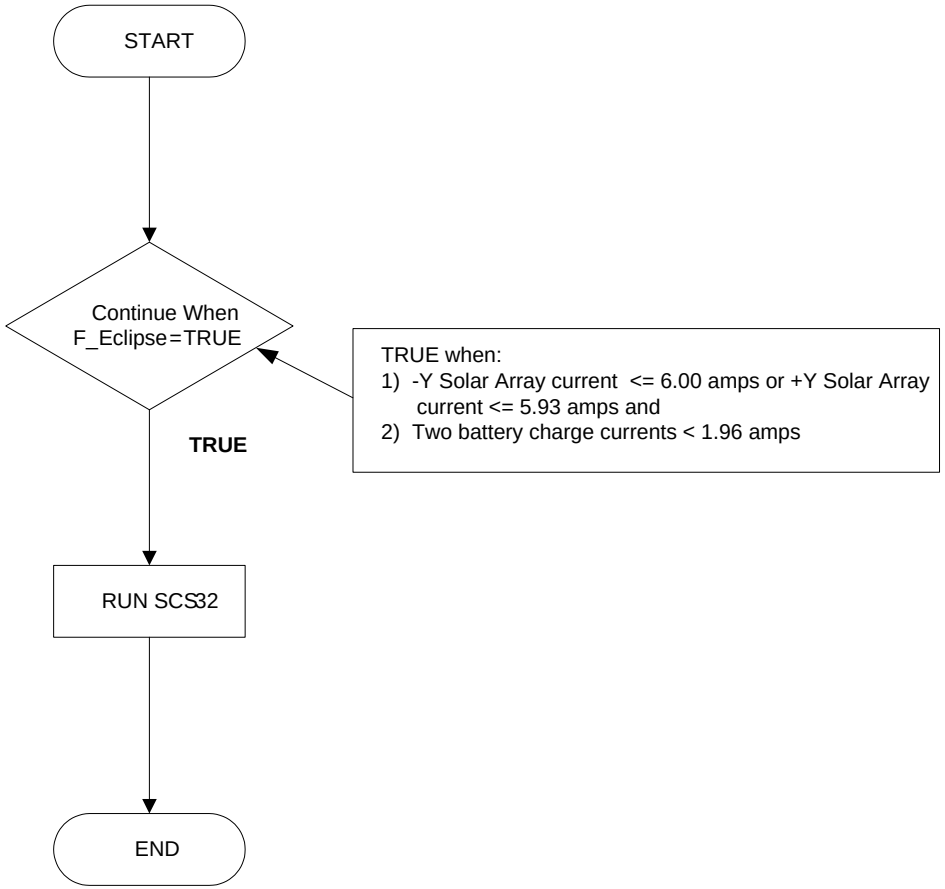
What Phase is this SCS used in? What Patches are Required for Normal Operations?

This SCS is used in the On-Orbit phase.

Constraints:

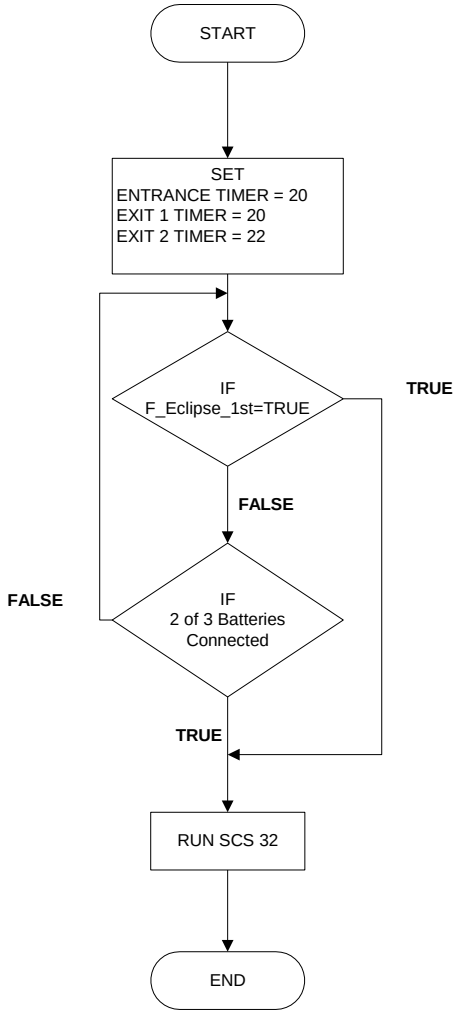
None

Normal Configuration



Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	COSEVTWT	EVENT WAIT (SCS ONLY)													
1	1	COSEVTW1	Event Number in K Constant Table	31												
2	2	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
2	2	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1												
3	3	COACTSX	ACTIVATE SCS#								NA	NA				
3	3	COACTS1	COACTSX - SCS NUMBER – SCS Number	32												
3	3	COACTS2	COACTSX - REPEAT COUNT -- Repeat Count. If this is 0, then SCS is executed once.	0												
4	4	COSCSEND	END SCS (SCS ONLY)								NA	NA				

Penumbra Only Configuration



Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1-3	1	EOECLETO	Eclipse Entrance Timeout (ST)													
1-3	1	EOECLET1	EOECLETO Header													
1-3	1	EOECLET2	EOECLETO Commands Following													
1-3	1	EOECLET3	EOECLETO Filler													
1-3	1	EOECLET4	EOECLETO Timeout Period	7024												
4-6	2	EOECLSTO	Eclipse Timeout (ST) Lower Bound													
4-6	2	EORCLTO1	EOECLSTO - Header													
4-6	2	EORCLTO2	EOECLSTO - Number of words													
4-6	2	EOECTS3	EOECLSTO - Fixed													
4-6	2	EOECTS24	EOECLSTO - Lower Bound	4683												
7-9	3	EOECLST2	Eclipse Timeout2 (Upper Bound)													
7-9	3	EORCLT21	EOECLST2 - Header													
7-9	3	EORCLT22	EOECLST2 – Number of Words													
7-9	3	EORCLT23	EOECLST2 – Filler													
7-9	3	EORCLT24	EOECLST2 - Timeout	5151												
10	4	OCNDEVBR	CONDITIONAL EVENT BRANCH													
10	4	OCNDEVB1	OCCURRENCE FLAG -- 0 - EVENT FAILED TO OCCUR 1 - EVENT OCCURRED.	1												
10	4	OCNDEVB2	OCNDEVB1 EV NUMBER -- CONDITIONAL EVENT NUMBER BEING INTERROGATED.	29												
10	4	OCNDEVB3	OCNDEVBR SCS STEP -- SCS STEP NUMBER AT WHICH THE COMMAND PROCESSOR WILL CONTINUE	13												
11	5	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
11	5	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1												
12	6	OCNDEVBR	CONDITIONAL EVENT BRANCH													
12	6	OCNDEVB1	OCCURRENCE FLAG -- 0 - EVENT FAILED TO OCCUR 1 - EVENT OCCURRED.	0												
12	6	OCNDEVB2	OCNDEVB1 EV NUMBER -- CONDITIONAL EVENT NUMBER BEING INTERROGATED.	30												
12	6	OCNDEVB3	OCNDEVBR SCS STEP -- SCS STEP NUMBER AT WHICH THE COMMAND PROCESSOR WILL	10												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			CONTINUE													
13	7	COACTSX	ACTIVATE SCS#								NA	NA				
13	7	COACTS1	COACTSX - SCS NUMBER – SCS Number	32												
13	7	COACTS2	COACTSX - REPEAT COUNT -- Repeat Count. If this is 0, then SCS is executed once.	0												
14	8	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 30 -- Battery Connection to Bus Safing Action

Description:

This safing SCS is used as an intermediate step by several monitors. This SCS contains conditional event branches that check to see if a battery is disabled or not by the flight software. It performs this check to make sure that a battery already disabled is not connected to the bus. A disabled battery has failed in some way, and should not be used.

A check is made for each battery. If the check is passed, then the K1, K2 and K5 relays for each battery are set to the closed position, connecting the battery to the bus and placing full charge on the batteries. If the check is not passed, then the K-relay commands are bypassed.

Main Steps in SCS:

Conditional event checks for each battery.

What Phase is this SCS used in? What Patches are Required for Normal Operations?

This is used in the on-orbit phase.

This SCS is used by the following SCSs:

SCS #: 6 -- OO - Attitude/Rate Error Monitor Fault

SCS #: 8 -- OO - Sun Position Monitor Fault Safing Action

SCS #: 9 -- OO - Spacecraft Momentum Monitor Fault Safing Action

SCS #: 14 -- OO - RW Unloading Monitor Fault

Constraints:

Unlike most safing SCSs, this one did not get built with doubled up commands. However, that is not a problem as long as we have 3 good batteries. If a single command did not get through to connect a battery, Chandra can operate on 2 batteries. If however sometime in the mission we have to disable a battery to prevent it from being used, then this SCS should be patched to double up the commands to connect the batteries. This would preclude a situation where only ONE good battery gets connected because of a single dropped command.

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	OCNDEVBR	CONDITIONAL EVENT BRANCH								NA	NA				
1	1	OCNDEVB1	OCCURRENCE FLAG -- 0 - EVENT FAILED TO OCCUR 1 - EVENT OCCURRED.	0												
1	1	OCNDEVB2	OCNDEVB1 EV NUMBER -- CONDITIONAL EVENT NUMBER	13												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			BEING INTERROGATED.													
1	1	OCNDEVB3	OCNDEVBR SCS STEP -- SCS STEP NUMBER AT WHICH THE COMMAND PROCESSOR WILL CONTINUE	8												
2	2	EB1K1CL	BATT 1 K1 CLOSE		EB1K1	CLOS					EP	HLP				
3	3	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
3	3	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1												
4	4	EB1K2CL	BATT 1 K2 CLOSE		EB1K2	CLOS					EP	HLP				
5	5	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
5	5	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1												
6	6	EB1K5ON	BATT 1 K5 ON		EB1K5	ON					EP	HLP				
7	7	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
7	7	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1												
8	8	OCNDEVBR	CONDITIONAL EVENT BRANCH								NA	NA				
8	8	OCNDEVB1	OCCURRENCE FLAG -- 0 - EVENT FAILED TO OCCUR 1 - EVENT OCCURRED.	0												
8	8	OCNDEVB2	OCNDEVB1 EV NUMBER -- CONDITIONAL EVENT NUMBER BEING INTERROGATED.	14												
8	8	OCNDEVB3	OCNDEVBR SCS STEP -- SCS STEP NUMBER AT WHICH THE COMMAND PROCESSOR WILL CONTINUE	15												
9	9	EB2K1CL	BATT 2 K1 CLOSE		EB2K1	CLOS					EP	HLP				
10	10	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
10	10	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1												
11	11	EB2K2CL	BATT 2 K2 CLOSE		EB2K2	CLOS					EP	HLP				
12	12	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
12	12	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1												
13	13	EB2K5ON	BATT 2 K5 ON		EB2K5	ON					EP	HLP				
14	14	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
14	14	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1												
15	15	OCNDEVBR	CONDITIONAL EVENT BRANCH								NA	NA				
15	15	OCNDEVB1	OCCURRENCE FLAG -- 0 -	0												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			EVENT FAILED TO OCCUR 1 - EVENT OCCURRED.													
15	15	OCNDEVB2	OCNDEVB1 EV NUMBER -- CONDITIONAL EVENT NUMBER BEING INTERROGATED.	15												
15	15	OCNDEVB3	OCNDEVBR SCS STEP -- SCS STEP NUMBER AT WHICH THE COMMAND PROCESSOR WILL CONTINUE	22												
16	16	EB3K1CL	BATT 3 K1 CLOSE		EB3K1	CLOS					EP	HLP				
17	17	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
17	17	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1												
18	18	EB3K2CL	BATT 3 K2 CLOSE		EB3K2	CLOS					EP	HLP				
19	19	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
19	19	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	3												
20	20	EB3K5ON	BATT 3 K5 ON		EB3K5	ON					EP	HLP				
21	21	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
21	21	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1												
22	22	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 31 -- Safe Mode Reconfiguration

Description:

This is the main SCS that is used to reconfigure Chandra into Safe Mode during On-Orbit Operations. It is activated when the OBC enters State 4, the Safe Mode State (see Figure 1). This SCS is executed by the new On-Line OBC, as determined by the EIA preselects.

This SCS was modified to call the SI safing SCS 107 as part of the SI safe mode enhancement.

Refer to Table 4 Safe Modes Summary Flow Chart for more information on safe mode actions.

Main Steps in SCS:

1. Select the CTU B, data bus B, and telemetry request and reply bus B. Switch to redundant equipment to remove the potential cause of the Safe Mode transition.
2. Turn off command bus A to avoid potential for collisions caused by ground operators sending commands over the A bus. Turn on command bus B.
3. Turn off prime EP and PC RCTU converters. Turn on redundant EP and PC RCTU converters and telemetry processors.
4. Enable EP and PC RCTU wrap monitors and corresponding safing actions SCS #: 25 -- EP RCTU Monitor Fault & SCS #: 60 -- PC RCTU Monitor Fault. SEUs can occur even while in Safe Mode. Safing SCSs will cycle converter power to return the RCTU to operation within one second.
5. Turn off VDE A.
6. Enable and close isovalve 3 (with forward current).
7. Turn off:
   a. Gyros 1 and 2 in IRU 2,
   b. IRU 2 temperature controls, and
   c. IRU 2.
8. Reset the corresponding CPE power loss recovery relays: GYRO SEL B1 = NO, GYRO SEL B2 = NO.
9. Turn on IRU 1 and set IRU 1 to High Range in preparation for CPE-controlled Safe Sun Mode or RCS SSM. Turn on Gyros 1 and 2 in IRU 1, and corresponding IRU temperature controls.
10. Reset the corresponding CPE power loss recovery relays: GYRO SEL A1 = YES, GYRO SEL A2 = YES.
11. Turn on VDE B.
12. Turn off A side of the following units, and turn on the B side: ADE, SPE, IOE, FSSA.
13. Reset CPE power loss recovery relay to reflect FSSA B.

14. Select CTU format 5.
15. Select EPS OBC subformat to allow uninterrupted CPE commanding.
16. Enable the CPE via IOE B to allow the CPE to control.
17. Resync the CPE to external sync. During the transition to Safe Mode, CPE lost external sync and transitioned to internal sync (ALT). A non-checksummed memory load to the CPE is performed to command the CPE back to external sync (NORM).
18. Enable Telescope Support Process, which defaults to Inactive in the OBC Safe Mode State.
19. Disable Battery Thermal control, Battery Peak Power control, and OTG motion. Enable and Initialize Telescope Thermal control, HRMA and OBA Thermal control.
20. Return to Normal OBC subformat now that CPE memory loads are complete.
21. Configure IU for IU B to Transponder A, 512 Kbps bit rate.
22. Turn off PA-B and TX-B, and turn on PA-A and TX-A.
23. IU B select Transponder A and select Transponder B.
24. Initialize and Enable EPS manager.
25. Enable and activate SCS #: 101 – Checksum CPE Patches to install all checksummed CPE patches.
26. Enable all RCTU command wrap monitors and remaining corresponding safing SCSs SCS #: 26 -- TS RCTU Monitor or Telescope Thermal Control Fault and SCS #: 27 -- SIM RCTU Monitor Fault Safing.
27. Safe Instruments by calling SCS #: 107 -- Main SI Safing.

What Phase is this SCS used in? What Patches are Required for Normal Operations?

This SCS is used in the On-Orbit Phase only.

Constraints:

If this SCS is edited, be sure that no commands are deleted. These commands are necessary to ensure that the Observatory is safed in the event of a Safe Mode transition, that operations continue on “B-side” hardware, and that the CPE is enabled so as to perform attitude control.

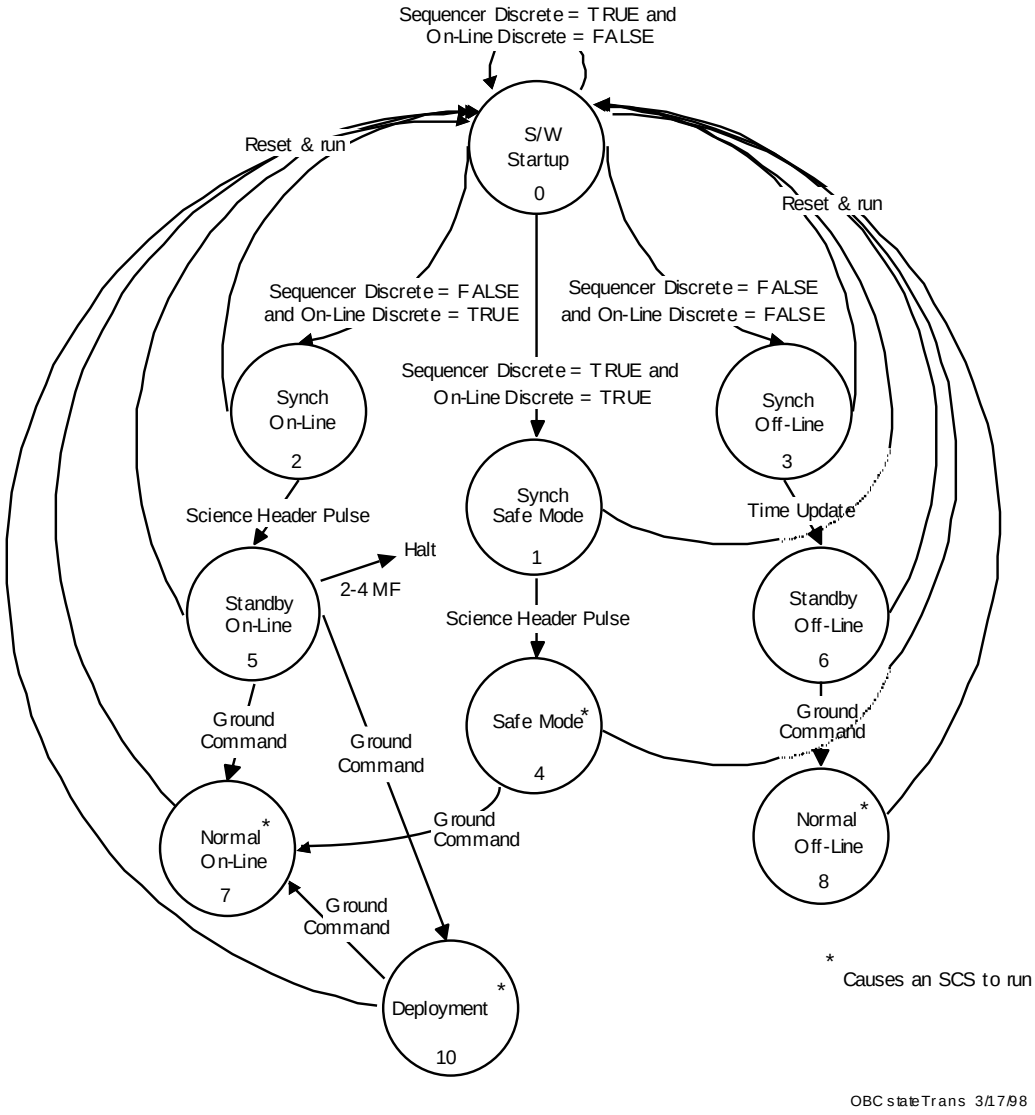
This SCS defaults to enabled upon OBC reset. Disabling this SCS has no effect since the only time it is used is after an OBC reset, and at that time, it will be re-enabled.

All hardware commands are repeated in order to protect against an SEU. Repeated blocks of commands to hardware through RCTU’s must be separated by a one second delay.

All EIA commands must be separated by a minimum time delay equal to the command pulse width (CARD CCDM-C-008).

All RCTU commands must be separated by at least one minor cycle (CARD CCDM-L-001).

Figure SCS 31-1. OBC State Transition Diagram



Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	COCTUBB	SELECT CTU B AND DATA BUS B--Selects CTU B and Data Bus B								NA	NA				
2	2	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
2	2	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
3	3	CBUSADS	CMD BUS PWR A OFF / CTX DIS		CCTXA	DISA					LR	HLP				
4	4	CBUSBEN	CMD BUS PWR B ON / CTX EN		CCTXB	ENAB					LR	HLP				
5	5	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
5	5	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	3							NA	NA				
6	6	CBUSADS	CMD BUS PWR A OFF / CTX DIS		CCTXA	DISA					LR	HLP				
7	7	CBUSBEN	CMD BUS PWR B ON / CTX EN		CCTXB	ENAB					LR	HLP				
8	8	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
8	8	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	2							NA	NA				
9	9	CEPPCPOF	RCTU-EP PRI CONV PWR OFF		CTUEPA	OFF					LR	HLP				
10	10	CEPRCPON	RCTU-EP RED CONV PWR ON		CTUEPB	ON					LR	HLP				
11	11	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
11	11	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	2							NA	NA				
12	12	CTUBTQBB	CTU-B TLM REQUEST BUS SELECT B		CTUTMRQB	B					LR	HLP				
13	13	CTUBTRBB	CTU-B TLM REPLY BUS SELECT B		CTUTMRYB	B					LR	HLP				
14	14	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
14	14	COSRTDL1	Relative Time Delay (SCS Only) – Relative Time Delay (minor cycles)	8												
15	15	CEPTBON	RCTU-EP TLM PROC B ON (OH)		CEPTLMB	ON					EP	HLP				
16	16	CTUBTQBB	CTU-B TLM REQUEST BUS SELECT B		CTUTMRQB	B					LR	HLP				
17	17	CTUBTRBB	CTU-B TLM REPLY BUS SELECT B		CTUTMRYB	B					LR	HLP				
18	18	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
18	18	COSRTDL1	Relative Time Delay (SCS Only) – Relative Time Delay (minor cycles)	2							NA	NA				
19	19	CPCPOF	RCTU-PC PRI CONV PWR OFF		CTUPCA	OFF					LR	HLP				
20	20	CPCRON	RCTU-PC RED CONV PWR ON		CTUPCB	ON					LR	HLP				
21	21	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
21	21	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	8							NA	NA				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
22	22	CPCTBON	RCTU-PC TLM PROC B ON (OH)		CPCTLMB	ON					PC	HLP				
23	23	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
23	23	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	8							NA	NA				
24	24	COWRAPED	Set RCTU Command Wrap Enable/Disable								LR	SD				
24	24	EP_RCTU	EP RCTU -- 0 = Disable Wrap Test 1=Enable Wrap Test	1							LR	SD				
24	24	PC_RCTU	PC RCTU -- 0 = Disable Wrap Test 1=Enable Wrap Test	1							LR	SD				
24	24	TS_RCTU	TE RCTU -- 0 = Disable Wrap Test 1=Enable Wrap Test	0							LR	SD				
24	24	SI_RCTU	SI RCTU -- 0 = Disable Wrap Test 1=Enable Wrap Test	0							LR	SD				
25	25	COENASX	ENABLE SCS#								NA	NA				
25	25	COENAS1	COENASX - SCS NUMBER -- SCS Number	25												
26	26	COENASX	ENABLE SCS#								NA	NA				
26	26	COENAS1	COENASX - SCS NUMBER -- SCS Number	60												
27	27	COSLPCT	SCS SET LOOP CNTR								NA	NA				
27	27	COSLPCT1	COSLPCT - LOOP COUNTER -- Loop Counter	2												
28	28	AVDEAOF	VDE-A PWR OFF		AVDEAX	OFF					PC	LCC				
29	29	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
29	29	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	2							NA	NA				
30	30	PCL131EN	ENAB CLOSE 1-3 (CHAN 0)		PIV13C1X	ENAB	PIV13C2X	ENAB			EP	SD	2	2	32	K4
31	31	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
31	31	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	2							NA	NA				
32	32	PF131CL	FORWARD CLOSE 1-3 (CHAN 0)		PIV13RC1	NORM	PIV13RC2	NORM			EP	SD	4	3	32	K5
33	33	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
33	33	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	2							NA	NA				
34	34	PIV3F1CL	CLOSE ISOVALVE 3 (WITH FORWARD CURRENT) (CHAN 0)		PF1MV1C1	CLOS	PF1MV1C2	CLOS			EP	SD	2	6	128	K12
35	35	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
35	35	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	4							NA	NA				
36	36	PCL131DS	DISA CLOSE 1-3 (CHAN 0)		PIV13C1X	DISA	PIV13C2X	DISA			EP	SD	3	4	32	K4
37	37	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
37	37	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	6							NA	NA				
38	38	COSDBRNZ	SCS DECREMENT AND BRANCH NON ZERO								NA	NA				
39	39	COSLPCT	SCS SET LOOP CNTR								NA	NA				
39	39	COSLPCT1	COSLPCT - LOOP COUNTER -- Loop Counter	2												
40	40	AI2G1OF	IRU-2 GYRO 1 OFF		AIRU2G1I						PC	HLP				
41	41	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
41	41	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	2							NA	NA				
42	42	AIB1CANO	IRU GYRO SEL B1 NO (PWR LOSS RECOV SETUP) , CPE-A		AG3SELA	NO					PC	LCC				
43	43	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
43	43	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	2												
44	44	AI2G2OF	IRU-2 GYRO 2 OFF		AIRU2G2I						PC	HLP				
45	45	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
45	45	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	2												
46	46	AIB2CANO	IRU GYRO SEL B2 NO (PWR LOSS RECOV SETUP) , CPE-A		AG4SELA	NO					PC	LCC				
47	47	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
47	47	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	2												
48	48	AI2TCOF	IRU-2 TEMPERATURE CONTROLS (ALL) OFF								PC	HLP				
49	49	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
49	49	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	2												
50	50	AIRU2OF	IRU-2 PWR OFF		AIRU2	OFF					PC	LCC				
51	51	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
51	51	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	2												
52	52	AIRU1ON	IRU-1PWR ON		AIRU1	ON					PC	LCC				
53	53	AIR1HRP1	IRU-1 HIGH RANGE PRI (CHAN 0)		AIRU1R1X	HIGH	AIRU1R1Y	HIGH	AIRU1R2X	HIGH	EP	SD	5	5	64	K24
54	54	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
54	54	COSRTDL1	Relative Time Delay (SCS Only) --	4												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			Relative Time Delay (minor cycles)													
55	55	COSDBRNZ	SCS DECREMENT AND BRANCH NON ZERO								NA	NA				
56	56	COSLPCT	SCS SET LOOP CNTR								NA	NA				
56	56	COSLPCT1	COSLPCT - LOOP COUNTER -- Loop Counter	2												
57	57	AI1G1ON	IRU-1 GYRO 1 ON		AIRU1G1I						PC	HLP				
58	58	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
58	58	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1												
59	59	AIA1CAYS	IRU GYRO SEL A1 YES (PWR LOSS RECOV SETUP) , CPE-A		AG1SELA	YES					PC	LCC				
60	60	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
60	60	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
61	61	AI1G2ON	IRU-1 GYRO 2 ON		AIRU1G2I						PC	HLP				
62	62	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
62	62	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1												
63	63	AIA2CAYS	IRU GYRO SEL A2 YES (PWR LOSS RECOV SETUP) , CPE-A		AG2SELA	YES					PC	LCC				
64	64	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
64	64	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1												
65	65	AI1G1TON	IRU-1 GYRO 1 TEMPERATURE CONTROL ON		AIRU1G1T						PC	HLP				
66	66	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
66	66	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1												
67	67	AI1G2TON	IRU-1 GYRO 2 TEMPERATURE CONTROL ON		AIRU1G2T						PC	HLP				
68	68	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
68	68	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
69	69	AI1VTCON	IRU-1 VFC TEMPERATURE CONTROL ON								PC	HLP				
70	70	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
70	70	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
71	71	AVDEBON	VDE-B PWR ON		AVDEBX	ON					PC	LCC				
72	72	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
72	72	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1												
73	73	ADEAOF	ADE-A PWR OFF		ADEAPWR	OFF					PC	LCC				
74	74	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
74	74	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1												
75	75	ADEBON	ADE-B PWR ON		ADEBPWR	ON					PC	LCC				
76	76	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
76	76	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1												
77	77	ASPEAOF	SPE-A PWR OFF		ASPEAX	OFF					PC	LCC				
78	78	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
78	78	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1												
79	79	ASPEBON	SPE-B PWR ON		ASPEBX	ON					PC	LCC				
80	80	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
80	80	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1												
81	81	AIOEAOF	IOE-A OFF		AIOEA	OFF					PC	LCC				
82	82	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
82	82	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	8												
83	83	AIOEBON	IOE-B ON		AIOEB	ON					PC	LCC				
84	84	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
84	84	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1												
85	85	AFSSAAOF	FSSA-A PWR OFF		AFSSAA	OFF					PC	LCC				
86	86	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
86	86	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1												
87	87	AFSSABON	FSSA-B PWR ON		AFSSAB	ON					PC	LCC				
88	88	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
88	88	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1												
89	89	AFBCAREC	FSSA B ON/A OFF (PWR LOSS RECOVERY SETUP) , CPE-A		AFSSAFLG	BON					PC	LCC				
90	90	CSELFMT5	CTU TLM MODE CTRL SELECT FORMAT 5		CTUFMTSL	FMT5					LR	SD				
91	91	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
91	91	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1												
92	92	COSDBRNZ	SCS DECREMENT AND BRANCH NON ZERO								NA	NA				
93	93	OFMTSEPS	OBC TLM SMODE SLCT EPS DATA--OBC Telemetry Sub-Mode Format Select - EPS calculated or processed data		COTLRDSF	EPS					NA	NA				
94	94	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
94	94	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
95	95	COSLPCT	SCS SET LOOP CNTR								NA	NA				
95	95	COSLPCT1	COSLPCT - LOOP COUNTER -- Loop Counter	2												
96	96	ACPEB1EN	Enable CPE, IOE-B (Slice A4, Ch.0)		ACPEB1X	ENAB	ACPEB2X	ENAB			EP	SD	5	5	32	K27B
97	97	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
97	97	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	7							NA	NA				
98	98	ACMEMLCL	CPE CLEAR MEMORY LOAD BUFFER								PC	SD				
99	99	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
99	99	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
100	100	ACPMMLD0	CPE Ram Load Command Header--This command specifies the first serial digital h/w command in a CPE RAM Load sequence. Additional information may be found in the CPE DM05 section 3.2.2.3.2 CPE RAM Memory Load.								NA					
100	100	ACPECN02	CPE Memory Load Header Constant -- This field is defined with a constant, a value of binary (0000 0000) - essentially a space filler since the CPE requires word pairs.													
101	101	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
101	101	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
102	102	ACPMMLD1	CPE Ram Load Command Word Count--This command specifies the second serial digital h/w command in a CPE RAM Load sequence. Additional information may be found in the CPE DM05 section 3.2.2.3.2								NA					

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			CPE RAM Memory Load.													
102	102	ACPECB12	CPE Memory Load Checksum Bypass Flag -- This flag, when set, alerts the CPE firmware that the contents of the buffer are modifying a defined checksummed region of CPE RAM memory. A new expected checksum must be loaded in the sequence if load is performed within a checksummed region of CPE RAM memory.	0												
102	102	ACPESQ13	CPE Memory Load Sequence Flag -- This flag, when set, indicates that the current load buffer is the last in a sequence of load buffers or the only load buffer in a sequence.	1												
102	102	ACPEWL14	CPE Memory Load Word Count -- This field is used to specifiy the number of data (byte pairs) or word that follow in the load sequence. 0 represents 64 data byte pairs follow. Each data byte pair is a sequence of two commands carring the 8 MSBs and the 8 LSBs of a single CPE data word.	1												
103	103	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
103	103	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
104	104	ACPMMLD2	CPE Ram Load Command MSB Start Address--This command specifies the third serial digital h/w command in a CPE RAM Load sequence. Additional information may be found in the CPE DM05 section 3.2.2.3.2 CPE RAM Memory Load.								NA					
104	104	ACPEAD22	CPE Memory Load MSByte Start Address -- This field is used to specify the most significant byte of a 16-bit start address at which the data load begins.	161												
105	105	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
105	105	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
106	106	ACPMMLD3	CPE Ram Load Command LSB Start Address--This command specifies the fourth serial digital h/w								NA					

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			command in a CPE RAM Load sequence. Additional information may be found in the CPE DM05 section 3.2.2.3.2 CPE RAM Memory Load.													
106	106	ACPEAD32	CPE Memory Load LSByte Start Address -- This field is used to specify the least significant byte of a 16-bit start address at which the data load begins.	13												
107	107	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
107	107	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
108	108	ACPMMLD4	CPE Ram Load Command MSB Data--This command specifies the fifth serial digital h/w command in a CPE RAM Load sequence and may repeat up to 64 times in a load sequence. Additional information may be found in the CPE DM05 section 3.2.2.3.2 CPE RAM Memory Load.								NA					
108	108	ACPEDT42	CPE Memory Load MSByte Of Data -- This field is used to specify the most significant byte of a 16-bit data word. A single CPE Load Command sequence may consist of 64 data byte pairs.	0												
109	109	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
109	109	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
110	110	ACPMMLD5	CPE Ram Load Command LSB Data--This command specifies the sixth serial digital h/w command in a CPE RAM Load sequence and may repeat up to 64 times in a load sequence. Additional information may be found in the CPE DM05 section 3.2.2.3.2 CPE RAM Memory Load.								NA					
110	110	ACPEDT52	CPE Memory Load LSByte Of Data -- This field is used to specify the least significant byte of a 16-bit data word. A single CPE Load Command sequence may consist of 64 data byte pairs.	0												
111	111	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
111	111	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
112	112	ACPMMLD8	Ram Load Command MSB Buffer Checksum--This command specifies the second to the last serial digital h/w command in a CPE RAM Load sequence. Additional information may be found in the CPE DM05 section 3.2.2.3.2 CPE RAM Memory Load.								NA					
112	112	ACPECS82	CPE Memory Load MSByte of Memory Buffer Checksum -- This field is used to specify the most significant byte of a 16-bit memory load buffer checksum.	0												
113	113	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
113	113	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
114	114	ACPMMLD9	Ram Load Command LSB Buffer Checksum--This command specifies the last serial digital h/w command in a CPE RAM Load sequence. Additional information may be found in the CPE DM05 section 3.2.2.3.2 CPE RAM Memory Load.								NA					
114	114	ACPECS92	CPE Memory Load LSByte of Memory Buffer Checksum -- This field is used to specify the least significant byte of a 16-bit memory load buffer checksum.	239												
115	115	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
115	115	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
116	116	ACMEMLD	CPE COMPLETE MEMORY LOAD								PC	SD				
117	117	COSDBRNZ	SCS DECREMENT AND BRANCH NON ZERO								NA	NA				
118	118	OOTSPEN	Telescope Support Process Enable		COTHEMEN	ENAB					NA	NA				
119	119	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
119	119	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
120	120	4OBATCDS	DISABLE BATTERY THERMAL CONTROL		4OACBATH	DISA					NA	NA				
121	121	4OBAPKDS	DISABLE BATTERY PEAK POWER CONTROL		4OPPMEN	DISA					NA	NA				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
122	122	4OOTGDS	DISABLE OTG MOTION		4OOTGMEF	DISA					NA	NA				
123	123	4OTTCPEN	TEL THERMAL CONTROL PROCESS ENABLE		4OTCPEN	ENAB					NA	NA				
124	124	4OTELTCI	INITIALIZE TELESCOPE THERMAL CONTROL		4OINITC	TRUE					NA	NA				
125	125	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
125	125	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	5							NA	NA				
126	126	4OTTHCDB	TELE THERM CONTROL DATA BASE SELECT								NA	NA				
126	126	4OTTHCD1	4OTTHCDB- Filler --								NA	NA				
126	126	4OTTHCD2	4OTTHCDB - Data Base to select -- 0-Primary Database 1-Secondary Database 2-Tertiary Database	00							NA	NA				
127	127	4OHMTCEN	ENABLE HRMA THERMAL CONTROL		4OACHRMH	ENAB					NA	NA				
128	128	4OOBTCEN	ENABLE OBA THERMAL CONTROL		4OACOBAH	ENAB					NA	NA				
129	129	4OOTGPT	SELECT OTG PRIMARY DATA SOURCE		4OOTGDAS	PRI					NA	NA				
130	130	OFMTSNRM	OBC TLM FMT SELECT - DEFAULT--OBC Telemetry Sub-Mode Format Select - Normal PCAD default telemetry		COTLRDSF	NORM					NA	NA				
131	131	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
131	131	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	930							NA	NA				
132	132	CIMODESL	IU MODE SELECT - BIT RATE /ENCODING--VARIABLE FIELD COMMAND THAT SELECTS ENCODING TYPE, ACA CALIBRATION, TRANSPONDER SELECTION, MODULATION SELECTION, AND BIT RATE SELECTION. UPON POWER-UP, CCSDS ENCODING IS ON, CONVOLUTION EONCODING IS ON, ACA CALIBRATION IS OFF, ACA SIDE A IS SELECTED, TRANSMITTER A DRIVER IS ENABLED, A TRANSMITTER IS SELECTED, B TRANSMITTER DRIVER IS ENABLED, B TRANSMITTER IS SELECTED,								LR	SD				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			DIRECT MODULATION NRZ-L IS SELECTED, AND 512KB/S DATA RATE IS SELECTED.													
132	132	CIUENRTS	IU Mode Select Encode And Rate Command Select -- These bits select the IU Mode Select Command variable field section which is used to set CCSDS or Convolution Encoding on or off, set ACA Calibration on or off and select ACA side A or B, set transponder mode, set modulation mode, and select bit rate for transmission. Set to binary (000000).								LR	SD				
132	132	CIUCCSDS	IU Mode Select CCSDS Encoding On Or Off -- This bit is used to set CCSDS encoding on or off. 0 = Off, 1 = On.	1							LR	SD				
132	132	CIUCONVE	IU Mode Select Convolution Encoding On Or Off -- This bit is used to set Convolution encoding on or off. 0 = Off, 1 = On.	1							LR	SD				
132	132	CIUACASD	IU Mode Select ACA Side -- This bit is used to select ACA side A or B. 0 = Select ACA Side A, 1 = Select ACA Side B.	0							LR	SD				
132	132	CIUACALB	IU Mode Select ACA Calibration -- This bit is used to set the IU to ACA Calibration Mode. 0 = ACA Calibration Off, 1 = ACA Calibration On.	0							LR	SD				
132	132	CIUXPNDR	IU Mode Select Transponder -- This bit is used to select Transponder A or B side. 0 = select xmttr (A) if IU side (A) is active, select xmttr (B) if IU Side (B) is active. 1 = select xmttr (B) if IU side (A) is active, select xmttr (A) if IU side (B) is active.	1							LR	SD				
132	132	CIUMODUL	IU Mode Select Modulation -- These bits are used to select Modulation Mode. Binary (00) = STS Mode, 2 Kb/s. Binary (10) = DSN Subcarrier Mode, 32 Kb/s. Binary (11) = DSN Direct Modulation, rates >= 64 Kb/s.	11							LR	SD				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
132	132	CIUBRSEL	IU Mode Select Bit Rate -- This bits are used to select the bit rate for transmission. Binary (000) = 2 Kb/s Binary (001) = 32 Kb/s Binary (010) = 64 Kb/s Binary (011) = 128 Kb/s Binary (100) = 256 Kb/s Binary (101) = 512 Kb/s, Automatically selected when ACA Calibration mode is On. Binary (110) = 1024 Kb/s Binary (111) = Not Used	101							LR	SD				
133	133	CPABOF	PA-B OFF		CPA2	OFF					LR	HLP				
134	134	CPAAON	PA-A ON		CPA1	ON					LR	HLP				
135	135	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
135	135	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	3							NA	NA				
136	136	CPABOF	PA-B OFF		CPA2	OFF					LR	HLP				
137	137	CPAAON	PA-A ON		CPA1	ON					LR	HLP				
138	138	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
138	138	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	2							NA	NA				
139	139	CTXBOF	TX-B OFF		CTXBX	OFF					LR	HLP				
140	140	CTXAON	TX-A ON		CTXAX	ON					LR	HLP				
141	141	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
141	141	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	3							NA	NA				
142	142	CTXBOF	TX-B OFF		CTXBX	OFF					LR	HLP				
143	143	CTXAON	TX-A ON		CTXAX	ON					LR	HLP				
144	144	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
144	144	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	3							NA	NA				
145	145	CIUBXPA	IU-B SELECT TRANSPONDER A (SEL 0)		CIUAXPNS	BA					LR	HLP				
146	146	CIUBXPB	IU-B SELECT TRANSPONDER B (SEL 1)		CIUBXPNS	BB					LR	HLP				
147	147	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
147	147	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	3							NA	NA				
148	148	CIUBXPA	IU-B SELECT TRANSPONDER A (SEL 0)		CIUAXPNS	BA					LR	HLP				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
149	149	CIUBXPB	IU-B SELECT TRANSPONDER B (SEL 1)		CIUBXPNS	BB					LR	HLP				
150	150	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
150	150	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
151	151	EOINISET	Set initialization flag to true		EGCTTEL3	OVRT					NA	NA				
152	152	EOEMGSTN	EPS Manager State (B4) Normal-- Build 4		EGCTTEL1	NORM					NA	NA				
153	153	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
153	153	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
154	154	COENASX	ENABLE SCS#								NA	NA				
154	154	COENAS1	COENASX - SCS NUMBER -- SCS Number	101												
155	155	COACTSX	Activate SCS#								NA	NA				
155	155	COACTS1	COACTSX - SCS NUMBER -- SCS Number	101												
155	155	COACTS2	COACTSX – REPEAT COUNT – Repeat Count. If this is 0, then SCS is executed once.	0												
156	156	COWRAPED	Set RCTU Command Wrap Enable/Disable								LR	SD				
156	156	EP_RCTU	EP RCTU -- 0 = Disable Wrap Test 1=Enable Wrap Test	1							LR	SD				
156	156	PC_RCTU	PC RCTU -- 0 = Disable Wrap Test 1=Enable Wrap Test	1							LR	SD				
156	156	TS_RCTU	TE RCTU -- 0 = Disable Wrap Test 1=Enable Wrap Test	1							LR	SD				
156	156	SI_RCTU	SI RCTU -- 0 = Disable Wrap Test 1=Enable Wrap Test	1							LR	SD				
157	157	COENASX	ENABLE SCS#								NA	NA				
157	157	COENAS1	COENASX - SCS NUMBER -- SCS Number	26												
158	158	COENASX	ENABLE SCS#								NA	NA				
158	158	COENAS1	COENASX - SCS NUMBER -- SCS Number	27												
159	159	COSCALL	SCS CALL SCS								NA	NA				
159	159	COSCALL1	COSCALL - SCS NUMBER -- SCS Number	107												
160	160	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 32 -- Eclipse Entry

Description:

This SCS was originally designed to perform a load shed function, reducing loads for all fault conditions. This SCS is now edited and patched by the FOT to provide the desired load levels (either turning off equipment, or turning on equipment) required for pending eclipses. In addition, this SCS implements several CARD items applicable to eclipse conditions as indicated below:

SCS 32 is now called during eclipse entry.

Main Steps in SCS:

1. Disable PCAD subfunction #21, Angular Momentum Unloading Logic. This function is disabled to prevent commands from an auto-unloading event from colliding with the hardware commands following in SCS 32. This also satisfies the requirement for no auto-unloading during the eclipse event. SCS 33 contains the command to re-enable this function at eclipse exit.
2. Branch on F_Short_Eclipse = TRUE (Event 32)
3. IF_Short_Eclipse is TRUE, Select Telescope Tertiary Database, Re-initialize Telescope Thermal Control, Run SCS #: 71 -- RCS Catbed Heaters Prime Enable, SCS #: 72 -- RCS Catbed Heaters Redundant Enable, and SCS #: 73 -- LAE Injector Heaters Prime Enable (all 4 engines).
4. End SCS Command

What Phase is this SCS used in? What Patches are Required for Normal Operations?

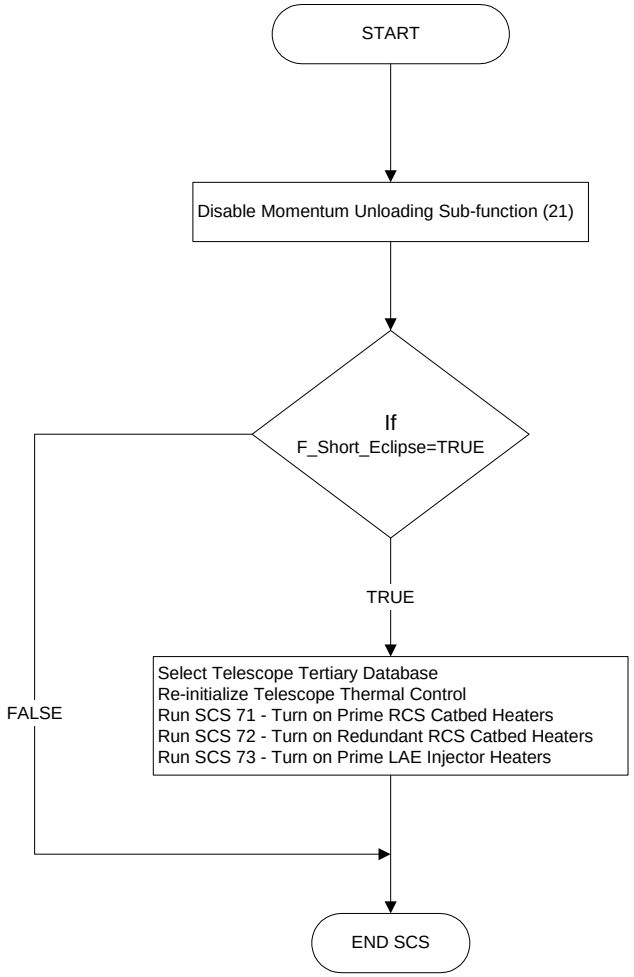
This SCS is used in the On-Orbit Phase only.

Constraints:

The first command in this SCS, or ahead of any calls to equipment SCSs, must be disable PCAD monitor function #21, Angular Momentum Logic.

Calls to SCSs should be separated by at least 1 minor-cycle relative time delay.

Figure SCS 32-1 Eclipse Entry



Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	AOFUNCDS	PCAD Subfunction Disable								NA	NA				
1	1	AOFUNCDS	PCAD subfunction Angular Momentum Unloading Logic	21												
2	2	OCNDEVBR	CONDITIONAL EVENT BRANCH													
2	2	OCNDEVB1	OCCURRENCE FLAG -- 0 - EVENT FAILED TO OCCUR 1 - EVENT OCCURRED.	0												
2	2	OCNDEVB2	OCNDEVB1 EV NUMBER -- CONDITIONAL EVENT NUMBER BEING INTERROGATED.	32												
2	2	OCNDEVB3	OCNDEVBR SCS STEP -- SCS STEP NUMBER AT WHICH THE COMMAND PROCESSOR WILL CONTINUE	11												
3	3	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
3	3	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
4	4	4OTTCDBT	Select tertiary telescope thermal db		4OTCDBSL	TRI					NA	NA				
5	5	4OTELTCR	REINITIALIZE TELESCOPE THERMAL CONTROL		4ORINITC	TRUE					NA	NA				
6	6	COSCALL	SCS CALL SCS								NA	NA				
6	6	COSCALL1	COSCALL - SCS NUMBER -- SCS Number	71												
7	7	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
7	7	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1												
8	8	COSCALL	SCS CALL SCS								NA	NA				
8	8	COSCALL1	COSCALL - SCS NUMBER -- SCS Number	72												
9	9	COSRTDLY	SCS RELATIVE TIME DELAY													
9	9	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1												
10	10	COSCALL	SCS CALL SCS													
10	10	COSCALL1	COSCALL - SCS NUMBER -- SCS Number	73												
11	11	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 33 -- Eclipse Exit

Description:

This SCS was originally designed to perform a power recovery function, restoring loads for all fault conditions that SCS #: 32 -- Eclipse Entry had turned off. This SCS is now edited and patched by the FOT to provide the desired load levels (either turning off equipment, or turning on equipment) required after exiting eclipses or recovering from a fault condition. This SCS is a complement to SCS #: 32 -- Eclipse Entry, in that whatever loads SCS #: 32 -- Eclipse Entry adds or subtracts, this SCS nominally performs the opposite functions. The EPS software always calls SCS 33 after disconnecting the batteries from the bus in sunlight, either due to exiting from eclipse or after a fault that had connected the batteries to the bus. For this reason, SCS 33 is also used to implement several PCAD CARD items.

There are four main eclipse profiles that use SCS 32: Short, Medium, Long and Lunar.

Main Steps in SCS:

1. Re-enable PCAD subfunction #30, Sun Position Monitor. This function is disabled prior to eclipse entry.
2. Re-enable PCAD subfunction #31, Attitude Error and Rate Error Monitor. This function is disabled prior to eclipse entry.
3. Jump to re-enabling Angular Momentum Unloading logic if Short eclipse flag is false (event 32).
4. Calls to SCS #: 51 -- RCS Catbed Heaters Prime Disable, SCS #: 52 -- RCS Catbed Heaters Redundant Disable, and SCS #: 53 -- LAE Heaters Prime Disable or equipment required to add or diminish load power. Note that for short eclipses the OBA heaters use the Tertiary Database to increase the load power for a short period of time. SCS 33 would contain the commands to use the primary or secondary database after eclipse exit.
5. 12-hour relative time delay. This delay is required between re-activation of the prime and redundant ISIM trim heaters. This command is not required if the ISIM prime and redundant trim heaters are not part of the loadshed (i.e. short eclipse, medium eclipse). This time delay is only used for long eclipses and is added via patching.
6. Re-enable PCAD subfunction #21, Angular Momentum Unloading Logic. This is the prime method for re-enabling this function after the eclipse event.
7. Enable and Activate SCS #: 29 – Eclipse Load Control SCS.
8. End SCS command

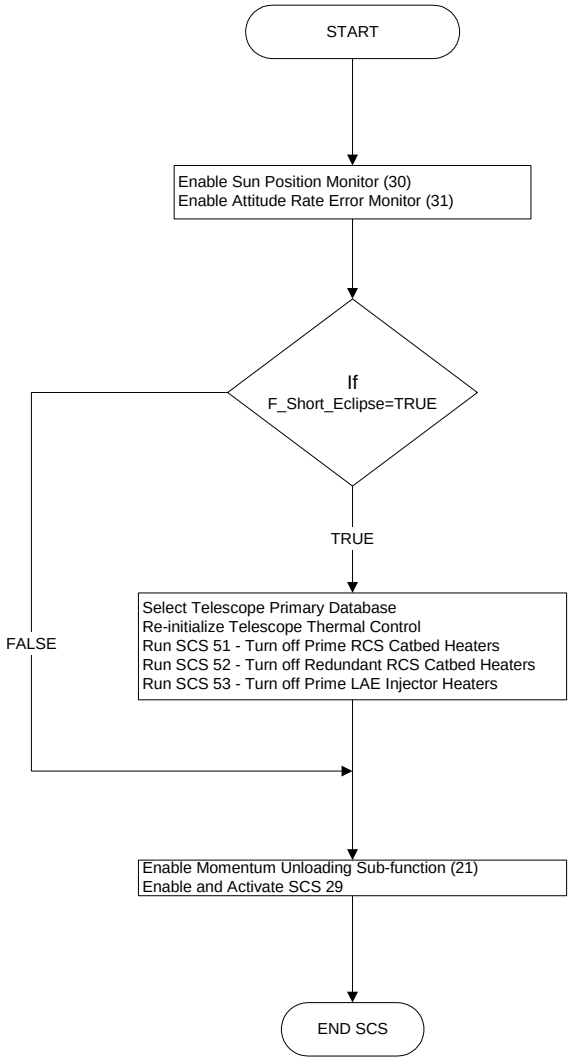
What Phase is this SCS used in? What Patches are Required for Normal Operations?

This SCS is used in the On-Orbit Phase only.

Constraints:

The first two commands must always be to re-enable PCAD subfunctions #30 and #31.
The near last command in this SCS must be enable PCAD monitor function #21, Angular Momentum Logic.
Calls to SCSs should be separated by at least 1 minor-cycle relative time delay.

Figure SCS 33-1 Eclipse Exit



SCS 33 Eclipse Exit

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	AOFUNCEN	PCAD SUBFUNCTION ENABLE / REINIT								NA	NA				
1	1	AOPCADSE	PCAD Subfunction for EN	30												
2	2	AOFUNCEN	PCAD SUBFUNCTION ENABLE / REINIT								NA	NA				
2	2	AOPCADSE	PCAD Subfunction for EN	31												
3	3	OCNDEVBR	CONDITIONAL EVENT BRANCH													
3	3	OCNDEVB1	OCCURRENCE FLAG -- 0 - EVENT FAILED TO OCCUR 1 - EVENT OCCURRED.	0												
3	3	OCNDEVB2	OCNDEVB1 EV NUMBER -- CONDITIONAL EVENT NUMBER BEING INTERROGATED.	32												
3	3	OCNDEVB3	OCNDEVBR SCS STEP -- SCS STEP NUMBER AT WHICH THE COMMAND PROCESSOR WILL CONTINUE	11												
4	4	4OTTCDBP	Select Primary telescope thermal db		4OTCDBSL	PRI					NA	NA				
5	5	4OTELTCR	REINITIALIZE TELESCOPE THERMAL CONTROL		4ORINITC	TRUE					NA	NA				
6	6	COSCALL	SCS CALL SCS								NA	NA				
6	6	COSCALL1	COSCALL - SCS NUMBER -- SCS Number	51												
7	7	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
7	7	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1												
8	8	COSCALL	SCS CALL SCS								NA	NA				
8	8	COSCALL1	COSCALL - SCS NUMBER -- SCS Number	52												
9	9	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
9	9	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1												
10	10	COSCALL	SCS CALL SCS								NA	NA				
10	10	COSCALL1	COSCALL - SCS NUMBER -- SCS Number	53												
11	11	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
11	11	COSRTDL1	Relative Time Delay (SCS Only) --	1												

			Relative Time Delay (minor cycles)														
12	12	AOFUNCEN	PCAD SUBFUNCTION ENABLE / REINIT								NA	NA					
12	12	AOPCADSE	PCAD Subfunction for EN	21							NA	NA					
13	13	COENASX	ENABLE SCS														
13	13	COENAS1	SCS #	29													
14	14	COACTSX	ACTIVATE SCS														
14	14	COACTS1	SCS #	29													
14	14	COACTS2	Repeat Count	0													
15	15	COSCSEND	END SCS (SCS ONLY)								NA	NA					

SCS #: 34 -- Configure PCAD

Description:

This SCS is used to set up the OBC PCAD S/W settings with relationship to the current hardware configuration. It is currently set up for A side equipment and using accumulated tachometer counts from the WDE's. These settings are used to control which sensor data is used in the OBC processing and to which actuators commands are sent. ACA processing and commanding is not configured by this SCS.

This SCS was originally configured to be called by SCS 116 during the deployment phase. Now it is used for Safe Mode Recovery operations.

Main Steps in SCS:

1. Command the OBC to select SPE-A for data retrieval (CSS and FSS).
2. Command the OBC to use FSS-A misalignments for data processing.
3. Command the OBC to use gyro configuration 2 k-constants in data processing. At launch configuration 1 is set up for IRU-A and configuration 2 is set up for IRU-B.
4. Command the OBC to use accumulated tachometer counts from the WDE's rather than pulse interval counts. This command should not be changed. The AXAF system is designed for use of Tachometer rather than pulse interval data. The pulse interval selection command exists primarily for diagnostics if it is ever needed.
5. Command the OBC to send thruster commands to VDE-A.
6. Command the OBC to send SADA commands to and to read SA resolver data from ADE-A.
7. Command a one second delay to allow processing time before execution of SCS #: 35 -- Activate Sensor Processing which normally follows right on the heels of this SCS.

What Phase is this SCS used in? What Patches are Required for Normal Operations?

No patches are required for nominal operation, however, this SCS should be patched whenever the equipment configuration for the SPE, ADE, VDE, IRU changes or FSS changes. Changing the setup performed in this SCS is just one step required to use other than A side equipment. Use the OP03b Vol. 4 PCAD equipment reconfiguration procedures to ensure all necessary steps are taken.

Constraints:

Do not remove 1 second delay at the end, it is needed for OBC processing to complete prior to calling SCS 35.

Do not command OBC to use RW Pulse Interval Data, performance will be degraded.

Order of commands does not matter, except the delay must come last.

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	AOSPEA	SELECT SPE SIDE A		AOSPESEL	A					NA	NA				
2	2	AOFSSA	SELECT FINE SUN SENSOR HEAD A		AOFSSSEL	A					NA	NA				
3	3	AOGYRO2	SELECT GYRO CONFIGURATION 2		AOGYRSEL	CFG2					NA	NA				
4	4	AORWPULS	SET REACTION WHEEL TACH DATA TYPE PULSE		AORWTYPE	PULS					NA	NA				
5	5	AOVDEA	SELECT VDE SIDE A		AOVDESEL	A					NA	NA				
6	6	AOADEA	SELECT ADE SIDE A		AOADESEL	A					NA	NA				
7	7	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
7	7	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
8	8	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 35 -- Activate Sensor Processing

Description:

This SCS is designed to initialize all the sensor processing functions which run in Standby Mode (not ACA data processing which is initialized just after the ACA is turned on). It also sets the PCAD manager state to initialize.

Main Steps in SCS:

1. Enable/initialize CSSA data processing, FSSA data processing, IRU data processing, RWA data processing, and SADA data processing.
2. Initialize PCAD manager.
3. Delay approximately 8 seconds to allow initializations to complete prior to running any other SCS.

What Phase is this SCS used in? What Patches are Required for Normal Operations?

This SCS was originally called by SCS 116 PCAD/MUPs activation during the transfer orbit. It is called just after SCS #: 34 -- Configure PCAD. It is normally followed by SCS 36 Enter Standby Mode. No patches are required for normal operations.

This SCS is now used as part of a recovery to OBC operations from Safe Mode. It is not equipment dependent, so no changes are required in the event of equipment configurations.

Constraints:

Sensor Processing subfunction initialization is not order dependent, but must come before the command to set the PCAD manager state to Initialize.

The 8 second delay at the end is required to allow sensor processing to complete prior to running SCS 36.

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	AORWTQED	ENABLE/DISABLE RW TORQUE CMD								NA	NA				
1	1	AORWTQED	RW WHEEL NUMBER -- WHEEL NUMBER BETWEEN 1 AND 6 (Wheel number -1 from 0-5)	0							NA	NA				
1	1	AORWFIL1	FILLER --													
1	1	AORENA	ENABLE DISABLE FLAG -- 0=DISABLE 1=ENABLE	1												
2	2	AORWTQED	ENABLE/DISABLE RW TORQUE CMD								NA	NA				
2	2	AORWTQED	RW WHEEL NUMBER -- WHEEL NUMBER BETWEEN 1 AND 6 (Wheel number -1 from 0-5)	1							NA	NA				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
2	2	AORWFIL1	FILLER --													
2	2	AORENA	ENABLE DISABLE FLAG -- 0=DISABLE 1=ENABLE	1												
3	3	AORWTQED	ENABLE/DISABLE RW TORQUE CMD								NA	NA				
3	3	AORWTQED	RW WHEEL NUMBER -- WHEEL NUMBER BETWEEN 1 AND 6 (Wheel number -1 from 0-5)	2							NA	NA				
3	3	AORWFIL1	FILLER --													
3	3	AORENA	ENABLE DISABLE FLAG -- 0=DISABLE 1=ENABLE	1												
4	4	AORWTQED	ENABLE/DISABLE RW TORQUE CMD								NA	NA				
4	4	AORWTQED	RW WHEEL NUMBER -- WHEEL NUMBER BETWEEN 1 AND 6 (Wheel number -1 from 0-5)	3							NA	NA				
4	4	AORWFIL1	FILLER --													
4	4	AORENA	ENABLE DISABLE FLAG -- 0=DISABLE 1=ENABLE	1												
5	5	AORWTQED	ENABLE/DISABLE RW TORQUE CMD								NA	NA				
5	5	AORWTQED	RW WHEEL NUMBER -- WHEEL NUMBER BETWEEN 1 AND 6 (Wheel number -1 from 0-5)	4							NA	NA				
5	5	AORWFIL1	FILLER --													
5	5	AORENA	ENABLE DISABLE FLAG -- 0=DISABLE 1=ENABLE	1												
6	6	AORWTQED	ENABLE/DISABLE RW TORQUE CMD								NA	NA				
6	6	AORWTQED	RW WHEEL NUMBER -- WHEEL NUMBER BETWEEN 1 AND 6 (Wheel number -1 from 0-5)	5							NA	NA				
6	6	AORWFIL1	FILLER --													
6	6	AORENA	ENABLE DISABLE FLAG -- 0=DISABLE 1=ENABLE	1												
7	7	AOFUNCEN	PCAD SUBFUNCTION ENABLE / REINIT								NA	NA				
7	7	AOPCADSE	PCAD Subfunction for EN	0												
8	8	AOFUNCEN	PCAD SUBFUNCTION ENABLE / REINIT								NA	NA				
8	8	AOPCADSE	PCAD Subfunction for EN -- PCAD Subfunction Number. See DMO5	1												
9	9	AOFUNCEN	PCAD SUBFUNCTION ENABLE /								NA	NA				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			REINIT													
9	9	AOPCADSE	PCAD Subfunction for EN -- PCAD Subfunction Number. See DMO5	2												
10	10	AOFUNCEN	PCAD SUBFUNCTION ENABLE / REINIT								NA	NA				
10	10	AOPCADSE	PCAD Subfunction for EN -- PCAD Subfunction Number. See DMO5	4												
11	11	AOFUNCEN	PCAD SUBFUNCTION ENABLE / REINIT								NA	NA				
11	11	AOPCADSE	PCAD Subfunction for EN -- PCAD Subfunction Number. See DMO5	5												
12	12	AOSWINIT	OBC INIT PCAD		AOMGRSTA	INIT					NA	NA				
13	13	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
13	13	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	125												
14	14	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 36 -- Enter Standby Mode

Description:

This SCS enables all the sub-functions necessary for standby mode, initializes all commanded parameters necessary for standby mode, and commands standby mode entry. It also initializes quite a few commanded parameters which are not strictly necessary for standby mode operation such as: ACA Processing commanded parameters, S/C ephemeris parameters, maneuver parameters, dither parameters, momentum unloading parameters, delta-v burn parameters, solar array control mode and thruster selection. An attempt was made to initialize all commanded parameters in the PCAD OBC S/W in either SCS 36 or SCS #: 37 -- OO - Normal Sun Mode First Entry even if they will be updated by the ground prior to their first use. This is to prevent any accidental use of un-initialized parameters.

Main Steps in SCS:

1. Initialize sub-functions necessary for SBM operation: Target Reference, CSS Sun Vector, FSS Sun Vector, S/C Angular Rate, Kinematic Integration, S/C Ephemeris Computation, Sun Ephemeris Computation, and Reaction Wheel Momentum Monitor.
2. Command Acquisition Star, Guide Star, Bright Star and Fid Light Parameters to default values.
3. Initialize all ACA images windows to active.
4. Set ACA integration time to the default value, approximately .7 seconds.
5. Enable Stellar Aberration Correction.
6. Command OBC to send commands to PEA-A.
7. Initialize the S/C ephemeris
8. Set maneuver parameters for transfer orbit maneuvers on wheels.
9. Set dither parameters to default values.
10. Set the autonomous momentum unloading limit to 27.9 ft-lb-sec and the desired system momentum vector to (0.0,0.0,0.0) ft-lb-sec.
11. Set the solar array mode to autonomous control (as opposed to ground control).
12. Set the Thruster selection for momentum unloading to MUPs thrusters.
13. Initialize the DV burn duration to 0.0 seconds.
14. Command Standby Mode.
15. Delay 2.05 seconds to allow the transition to Standby Mode to Complete.

What Phase is this SCS used in? What Patches are Required for Normal Operations?

This SCS was originally called by SCS 116 MUPs/PCAD activation prior to IUS separation and just following SCS 35. It is used to enter SBM for the first time. All commands are to the OBC software and are not hardware dependent. If this SCS is called after the IPS activation and prior to the IPS shutdown, the ground will want to command the thruster selection to RCS to take advantage of RCS unloading. No patches are expected for Normal operations or contingencies.

This SCS is now used as part of a recovery to OBC operations from Safe Mode.

Constraints:

Many commands are included just to initialize the commanded software parameters. Steps 1, 7, 14, and 15 are the only ones required for standby mode operation.

Although the commanded attitude monitor is nominally scheduled for SBM, it is not enabled for the standby mode 1st entry because the on-board attitude estimate and solar ephemeris have not yet been initialized. Do not include initialization of the commanded attitude monitor in this SCS.

The two-second delay at the end is to allow time for the sub-functions to initialize and the transition to SBM to take place, do not remove it.

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	AOFUNCEN	PCAD SUBFUNCTION ENABLE / REINIT								NA	NA				
1	1	AOPCADSE	PCAD Subfunction for EN -- PCAD Subfunction Number. See DMO5	7												
2	2	AOFUNCEN	PCAD SUBFUNCTION ENABLE / REINIT								NA	NA				
2	2	AOPCADSE	PCAD Subfunction for EN -- PCAD Subfunction Number. See DMO5	8												
3	3	AOFUNCEN	PCAD SUBFUNCTION ENABLE / REINIT								NA	NA				
3	3	AOPCADSE	PCAD Subfunction for EN -- PCAD Subfunction Number. See DMO5	9												
4	4	AOFUNCEN	PCAD SUBFUNCTION ENABLE / REINIT								NA	NA				
4	4	AOPCADSE	PCAD Subfunction for EN -- PCAD Subfunction Number. See DMO5	10												
5	5	AOFUNCEN	PCAD SUBFUNCTION ENABLE / REINIT								NA	NA				
5	5	AOPCADSE	PCAD Subfunction for EN -- PCAD Subfunction Number. See DMO5	11												
6	6	AOFUNCEN	PCAD SUBFUNCTION ENABLE / REINIT								NA	NA				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
6	6	AOPCADSE	PCAD Subfunction for EN -- PCAD Subfunction Number. See DMO5	13												
7	7	AOFUNCEN	PCAD SUBFUNCTION ENABLE / REINIT								NA	NA				
7	7	AOPCADSE	PCAD Subfunction for EN -- PCAD Subfunction Number. See DMO5	14												
8	8	AOFUNCEN	PCAD SUBFUNCTION ENABLE / REINIT								NA	NA				
8	8	AOPCADSE	PCAD Subfunction for EN -- PCAD Subfunction Number. See DMO5	33												
9-14	9	AOACQPAR	UPDATE ACQUISITION STAR REFERENCE PARAMETERS (MULTI-PART)								NA	NA				
9-14	9	AOACQPR1	Update Acquisition Star Reference Parameters Command 1 -- 1st command of a multi-part command													
9-14	9	AOACQPR2	Update Acquisition Star Reference Parameters Command 2 -- 2nd command of multi-part command													
9-14	9	AOAFLR5	AOAFLR5 spare – filler													
9-14	9	AOACQADJ	Acq_F_Adjust -- Type of adjustment to make to acquisition star search Parmeters (brightness or position or none)	00												
9-14	9	AOACSZSF	Acq_Size_SF -- Acquisition Size Threshold	665												
9-14	9	AOACTHSF	Acq_Thresh_SF -- Acquisition Threshold Scale Factor	2200												
9-14	9	AOAFLR6	AOAFLR6 spare – filler													
9-14	9	AOACQSEL	Acq_Select -- Acquisition Select	1												
9-14	9	AOACDELY	Acq_Delta_Y_Thresh -- Threshold used for identifying pairs of acquisition stars see DM05 to identify acquisition stars	9.7e-05												
9-14	9	AOACDELZ	Acq_Delta_Z_Thresh -- Threshold used for identifying pairs of acquisition stars see DM05 to identify acquisition stars	9.7e-05												
15-20	10	AOGUIPAR	UPDATE GUIDE STAR REFERENCE PARAMETERS (MULTI-PART)								NA	NA				
15-20	10	AOGUIPR1	AOGUIPR1 Update Guide Star Reference Parameters Command 1 -- 1st command word of a multi-part command													

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
15-20	10	AOGUIPR2	AOGUIPR2 Update Guide Star Reference Parameters Command 1 -- 2nd command word of a multi-part command													
15-20	10	AOGUSZTH	Guide_Size_SF -- Guide Star Search Box Size Scale Factor	665												
15-20	10	AOGUTHSF	Guide_Thresh_SF -- Guide Star Minimum Magnitude Threshold Scale Factor	2200												
15-20	10	AOGFLR7	AOGFLR7 spare -- filler													
15-20	10	AOGUIDIM	Guide_Dimension -- Guide Star Search Box Dimension	0												
15-20	10	AOGFLR8	AOGFLR8 spare -- filler													
15-20	10	AOGUIRES	Guide_High_Res -- High Resolution Flag	0												
15-20	10	AOGFLR9	AOGFLR9 spare -- filler													
15-20	10	AOGUISEL	Guide_Sel -- Guide Star Brightness/Position Indicator	0												
15-20	10	AOGUDELY	Guide_Delta_Y_Thresh -- Threshold used for identifying guide stars	9.7e-05												
15-20	10	AOGUDELZ	Guide_Delta_Z_Thresh -- Threshold used for identifying guide stars	9.7e-05												
21-26	11	AOFIDPAR	UPDATE FIDUCIAL LIGHT REFERENCE PARAMETERS (MULTI-PART)								NA	NA				
21-26	11	AOFIDPR1	AOFIDPR1 Update Fid Light Reference Parameters Command 1 -- 1st command word of a multi-part command													
21-26	11	AOFIDPR2	AOFIDPR2 Update Fid Light Reference Parameters Command 1 -- 2nd command word of a multi-part command													
21-26	11	AOFISZSF	Fid_Size_SF -- Fid Light Search Box Size Scale Factor	665												
21-26	11	AOFITHSF	Fid_Thresh_SF -- Fid Light Minimum Magnitude Scale Factor	2200												
21-26	11	AOFLR10	AOFLR10 spare -- filler													
21-26	11	AOFIDDIM	Fid_Dimension -- Fid Light Search Box Dimension	0												
21-26	11	AOFLR11	AOFLR11 spare -- filler													
21-26	11	AOFIDRES	Fid_High_Res -- Fid Light High	1												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			Resolution Flag													
21-26	11	AOFLR12	AOFLR12 spare -- filler													
21-26	11	AOFIDSEL	Fid_Sel -- Fid Light Brightness/Position Indicator	0												
21-26	11	AOFIDELY	Fid_Delta_Y_Thresh -- Fid Light Y Position Threshold	9.7e-05												
21-26	11	AOFIDELZ	Fid_Delta_Z_Thresh -- Fid Light Z Position Threshold	9.7e-05												
27-30	12	AOBRIPAR	UPDATE BRIGHT STAR REFERENCE PARAMETERS (MULT-PART)								NA	NA				
27-30	12	AOBRIPR1	Update Bright Star Parameters Command 1 -- 1st Command of a Multi-part command													
27-30	12	AOBRIPR2	Update Bright Star Parameters Command 2 -- 2nd command of a Multi-part Command													
27-30	12	AOFLR13	AOFLR13 spare -- filler													
27-30	12	AOBRIMAX	Bright_Max_Mag -- Bright Star Maximum Magnitude	3123												
27-30	12	AOFLR14	AOFLR14 spare -- filler													
27-30	12	AOBRIMIN	Bright_Min_Mag -- Bright Star Minimum Magnitude	1536												
31	13	AOIMSTAT	ACTIVATE/DEACTIVATE IMAGE WINDOW								NA	NA				
31	13	AOWINDOW	Image Window Number -- Number for the image window being enabled or disabled	0												
31	13	AOFLR15	AOFLR15 spare --													
31	13	AOACTIVE	Image Window Status -- Status for each image window	1												
32	14	AOIMSTAT	ACTIVATE/DEACTIVATE IMAGE WINDOW								NA	NA				
32	14	AOWINDOW	Image Window Number -- Number for the image window being enabled or disabled	1												
32	14	AOFLR15	AOFLR15 spare --													
32	14	AOACTIVE	Image Window Status -- Status for each image window	1												
33	15	AOIMSTAT	ACTIVATE/DEACTIVATE IMAGE WINDOW								NA	NA				
33	15	AOWINDOW	Image Window Number -- Number for the image window being	2												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			enabled or disabled													
33	15	AOFLR15	AOFLR15 spare --													
33	15	AOACTIVE	Image Window Status -- Status for each image window	1												
34	16	AOIMSTAT	ACTIVATE/DEACTIVATE IMAGE WINDOW								NA	NA				
34	16	AOWINDOW	Image Window Number -- Number for the image window being enabled or disabled	3												
34	16	AOFLR15	AOFLR15 spare --													
34	16	AOACTIVE	Image Window Status -- Status for each image window	1												
35	17	AOIMSTAT	ACTIVATE/DEACTIVATE IMAGE WINDOW								NA	NA				
35	17	AOWINDOW	Image Window Number -- Number for the image window being enabled or disabled	4												
35	17	AOFLR15	AOFLR15 spare --													
35	17	AOACTIVE	Image Window Status -- Status for each image window	1												
36	18	AOIMSTAT	ACTIVATE/DEACTIVATE IMAGE WINDOW								NA	NA				
36	18	AOWINDOW	Image Window Number -- Number for the image window being enabled or disabled	5												
36	18	AOFLR15	AOFLR15 spare --													
36	18	AOACTIVE	Image Window Status -- Status for each image window	1												
37	19	AOIMSTAT	ACTIVATE/DEACTIVATE IMAGE WINDOW								NA	NA				
37	19	AOWINDOW	Image Window Number -- Number for the image window being enabled or disabled	6												
37	19	AOFLR15	AOFLR15 spare --													
37	19	AOACTIVE	Image Window Status -- Status for each image window	1												
38	20	AOIMSTAT	ACTIVATE/DEACTIVATE IMAGE WINDOW								NA	NA				
38	20	AOWINDOW	Image Window Number -- Number for the image window being enabled or disabled	7												
38	20	AOFLR15	AOFLR15 spare --													
38	20	AOACTIVE	Image Window Status -- Status for	1												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			each image window													
39-41	21	AOSETINT	SET ACA INTEGRATION TIME		AOACINTT						NA	NA				
39-41	21	AOSTINT1	Set Integration Time Cmd 1 -- 1st command of a multipart command													
39-41	21	AOSTINT2	Set integration Time Cmd 2 -- 2nd command of a multipart command													
39-41	21	AOACACMD	ACA Command Code --													
39-41	21	AOACTIME	ACA Integration Time -- Integration Time : lsb = 1/4 minor cycle	0000000 101100												
39-41	21	AOFLR16	AOFLR16 spare -- filler													
42	22	AOSTABFT	SET STELLAR ABERRATION CORRECTION FLAG/TRUE		AOABERRN	ENAB					NA	NA				
43	23	AOPEAA	OBC SELECT PEA SIDE A		AOPEASEL	A					NA	NA				
44-60	24	AOEPHUPS	UPDATE S/C EPHEMERIS (STORED)								NA	NA				
44-60	24	AOEPHEM1	Update Ephemeris Command 1 -- 1st command of a mult-part command								NA	NA				
44-60	24	AOEPHEM2	Update Ephemeris Command 2 -- 2nd command of a multipart command								NA	NA				
44-60	24	AORATIO	A2P_Ratio -- A2P Ratio - Square Root of Ratio of Apogee to Perigee Distance	2.98427 45							NA	NA				
44-60	24	AOARGPER	Arg_Perigee -- Arg_Perigee - Argument of perigee	4.714							NA	NA				
44-60	24	AOECCENT	Eccentricity -- Orbital eccentricity	7.981e-01							NA	NA				
44-60	24	AO1MINUS	Half_1mCosI -- Half ImCosI = (1-cos(i))/2 (i=orbital inclination)	6.10085 018e-02							NA	NA				
44-60	24	AO1PLUS	Half_1pCosI -- Half IpCosI = (1+cos(i))/2 (i=Orbital Inclination)	9.38991 487e-01							NA	NA				
44-60	24	AOMOTION	Mean_Motion -- Mean Orbital Motion	2.7196e -05							NA	NA				
44-60	24	AOITERAT	Num_Iterations -- Number of iterations for the solution of Kepler's equation	9							NA	NA				
44-60	24	AOORBANG	Orb_Ang_Mom -- Specific Orbital Angular Momentum	1.08517 1e+05							NA	NA				
44-60	24	AOPERIGE	Perigee_Time -- Time of Perigee	0.0							NA	NA				
44-60	24	AOASCEND	RA_Ascend_Node -- Right ascension of the ascending mode	3.4882							NA	NA				
44-60	24	AOSINI	SinI -- Sin(i) - i= orbital inclination	4.78691							NA	NA				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
				8e-01												
44-60	24	AOSLR	SLR -- Semi Latus Rectum	2.954326e+04							NA	NA				
44-60	24	AOSQRTMU	Sqrt_Mu_A_Esq -- (Mu * a * e **2) ** 0.5	1.437409e+05							NA	NA				
61	25	AOSTEADY	SET ATTITUDE CMD MODE STEADY		AOFATTMD	STDY					NA	NA				
62-67	26	AOMANPAR	SET MANEUVER PROFILE PARAMETERS (MULTI-PART)								NA	NA				
62-67	26	AOMANPR1	Set Maneuver profile parameters command 1 -- 1st command of a multipart command													
62-67	26	AOMANPR2	Set Maneuver profile parameters command 2 -- 2nd command of a multipart command													
62-67	26	AOJERK	Jerk_Time -- Jerk Time	6.0e1												
62-67	26	AOOMEGA	Omega_Max -- Maximum Rate	1.309e-3												
62-67	26	AOALPMAX	Alpha_Max -- Maximum Acceleration	2.18166e-6												
68-76	27	AODITPAR	SET DITHER PARAMETERS (MULTI-PART)								NA	NA				
68-76	27	AODITPR1	Set Dither Parameters command 1 -- 1st command of a multipart command													
68-76	27	AODITPR2	Set Dither Parameters command 2 -- 2nd command of a multipart command													
68-76	27	AOANGP	Dither_Ang_P -- Dither angle Pitch	0.0												
68-76	27	AOANGY	Dither_Ang_Y -- Dither angle Yaw	0.0												
68-76	27	AOPHASEP	Dither_Coeff_P -- Dither phase Angle Pitch	9.69627763e-5												
68-76	27	AOPHASEY	Dither_Coeff_Y -- Dither phase Angle Yaw	9.69627763e-5												
68-76	27	AORATEP	Dither_Rate_P -- Dither rate Pitch	4.7e-3												
68-76	27	AORATEY	Dither_Rate_Y -- Dither rate Yaw	1.0e-2												
77-80	28	AOMOMLIM	SET SYSTEM ANGULAR MOMENTUM LIMIT (MULTI-PART)								NA	NA				
77-80	28	AOMOMLM1	Set system angular momentum limit command 1 -- 1st command of a multipart command													

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
77-80	28	AOMOMLM2	Set system angular momentum limit command 2 -- 2nd command of a multipart command													
77-80	28	AOMOMLIM	Mom_Tot_Lim -- Total system momentum limit for angular momentum unloading	2.79e1							NA	NA				
81	29	AOMUNLMO	OBC SET ANGULAR MOMENTUM UNLOADING STATE MONITOR		AOUNLOAD	MON					NA	NA				
82-87	30	AODESMOS	SET DESIRED SPACECRAFT ANGULAR MOMENTUM (Stored)--There are Real and Stored Versions of this command		AOSYMOM1		AOSYMOM2		AOSYMOM3		NA	NA				
82-87	30	AODESMS1	Set Desired System Angular Momentum Command 1 -- 1st command of a multipart command													
82-87	30	AODESMS2	Set Desired System Angular Momentum Command 2 -- 2nd command of a multipart command													
82-87	30	AODESMS3	Mom_Tot_Cmd(1) -- Desired system Momentum vector	0.0												
82-87	30	AODESMS4	Mom_Tot_Cmd(2) -- Desired system Momentum vector	0.0												
82-87	30	AODESMS5	Mom_Tot_Cmd(3) -- Desired system Momentum vector	0.0												
88	31	AOSAMAUT	OBC SET SOLAR ARRAY MODE AUTONOMOUS		AOSAMDGD	AUTO					NA	NA				
89	32	AOMUPSEL	SELECT THRUSTERS MUPS		AOFTHRST	MUPS					NA	NA				
90-93	33	AODVBURN	SET DELTA V BURN DURATION (MULTI-PART)		AODVTIME						NA	NA				
90-93	33	AODBURN1	Set Delta-V Burn Time Command 1 -- 1st command of a multipart command													
90-93	33	AODBURN2	Set Delta-V Burn Time Command 2 -- 2nd command of a multipart command													
90-93	33	AOBTIME	DV_Duration -- Burn time duration	0.0												
94	34	AOSBMODE	OBC SET PCAD MODE STANDBY		AOPCADMD	STBY					NA	NA				
95	35	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
95	35	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	32												
96	36	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 37 -- OO - Normal Sun Mode First Entry

Description:

This SCS enables all the sub-functions necessary for operation in Normal Sun Mode and Normal Maneuver Mode, initializes all commanded parameters necessary for Normal Sun Mode and Normal Maneuver Mode, and commands Normal Sun Mode entry. It also initializes quite a few commanded parameters which are not strictly necessary for Normal Sun Mode or Normal Maneuver Mode operation. An attempt was made to initialize all commanded parameters in the PCAD OBC S/W in either SCS #: 36 -- Enter Standby Mode or SCS 37 even if they will be updated by the ground prior to their first use. This is to prevent any accidental use of un-initialized parameters.

NOTE: this SCS is not to be used for safe mode recovery to OBC control. There exists an SCS command sequence that is used for this role that is loaded into mission SCS slot 141: OBC-A: AA_SCS37_141.CLD, OBC-B: AB_SCS37_141.CLD. Refer to the safe mode recovery procedures for more information. Refer to the RTS files for the command sequence in human-readable format.

Main Steps in SCS:

1. Enable Attitude Command Generation, Attitude Error Computation, Feed-Forward Torque Computation, Pointing Control Law, Sun Mode Control Law, Transfer Orbit Control Law, Angular Momentum Unloading Logic, Reaction Wheel Control Law, Solar Array Control Law, RCS Thruster Selection Logic, Reaction Wheel Command Processing, Solar Array Command Processing, and Thruster Command Processing Sub-functions.
2. Disable Delta-V Command Processing and LAE Dome Temperature Monitor.
3. Enable IRU Monitor, Sun Position Monitor, Attitude Error and Rate Error Monitor, S/C Momentum Monitor, Reaction Wheel Unloading Monitor, Solar Array Position Monitor, SADA Over-temperature Monitor.
4. Disable Dithering
5. Enable Gravity Gradient Torque Computation (Only used in NPM)
6. Enable RW Momentum Bias
7. Set Yaw Rate Biases used in NSM to zero for both Sun-Point and Attitude Hold sub-modes.
8. Enable Autonomous Angular Momentum Unloading
9. Enable MUPs Directives, Wheel Directives and Solar Array Drive Directives
10. Disable LAE Directives and RCS Directives
11. Disable Autonomous transition from NMM to NPM
12. Set the Sun Mode Control Law Sub-mode to Autonomous Control
13. Command IRUs 1 & 2 to Hi Range Operation (repeat to ensure commands are not dropped)

14. Set the PCAD Mode to NSM
15. Enable Maneuvers
16. Initialize Position integration for all control laws (position integration used in NPM and PFM)
17. Delay 9.8 seconds to allow NSM to finish initializing prior to enabling safing actions (in 118).

What Phase is this SCS used in? What Patches are Required for Normal Operations?

This SCS is called by SCS #: 118 -- OBC Reset Reconfiguration Tasks. It is used on orbit for re-initializing the OBC software in the event of an OBC reset (in which case 118 is called by SCS #: 80 -- OO - Standby State Timeout).

Constraints:

The only commands necessary for starting NSM (assuming that SCS's 34, 35 & 36 have already been called) are those in steps 1, 2, 3, 6, 7, 8, 10, 12, 13, and 14. If a slimmed-down version of SCS 37 is used, however, all necessary parameters for NMM will not be initialized. For use with 118, do not remove the 9.8 second delay at the end of SCS 37.

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	AOFUNCEN	PCAD SUBFUNCTION ENABLE / REINIT								NA	NA				
1	1	AOPCADSE	PCAD Subfunction for EN -- PCAD Subfunction Number. See DMO5	15												
2	2	AOFUNCEN	PCAD SUBFUNCTION ENABLE / REINIT								NA	NA				
2	2	AOPCADSE	PCAD Subfunction for EN -- PCAD Subfunction Number. See DMO5	16												
3	3	AOFUNCEN	PCAD SUBFUNCTION ENABLE / REINIT								NA	NA				
3	3	AOPCADSE	PCAD Subfunction for EN -- PCAD Subfunction Number. See DMO5	17												
4	4	AOFUNCEN	PCAD SUBFUNCTION ENABLE / REINIT								NA	NA				
4	4	AOPCADSE	PCAD Subfunction for EN -- PCAD Subfunction Number. See DMO5	18												
5	5	AOFUNCEN	PCAD SUBFUNCTION ENABLE / REINIT								NA	NA				
5	5	AOPCADSE	PCAD Subfunction for EN -- PCAD Subfunction Number. See DMO5	19												
6	6	AOFUNCDS	PCAD SUBFUNCTION DISABLE								NA	NA				
6	6	AOPCADSD	PCAD_Subfunction	20							NA	NA				
7	7	AOFUNCEN	PCAD SUBFUNCTION ENABLE / REINIT								NA	NA				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
7	7	AOPCADSE	PCAD Subfunction for EN -- PCAD Subfunction Number. See DMO5	21												
8	8	AOFUNCEN	PCAD SUBFUNCTION ENABLE / REINIT								NA	NA				
8	8	AOPCADSE	PCAD Subfunction for EN -- PCAD Subfunction Number. See DMO5	22												
9	9	AOFUNCEN	PCAD SUBFUNCTION ENABLE / REINIT								NA	NA				
9	9	AOPCADSE	PCAD Subfunction for EN -- PCAD Subfunction Number. See DMO5	23												
10	10	AOFUNCDS	PCAD SUBFUNCTION DISABLE								NA	NA				
10	10	AOPCADSD	PCAD_Subfunction	24							NA	NA				
11	11	AOFUNCEN	PCAD SUBFUNCTION ENABLE / REINIT								NA	NA				
11	11	AOPCADSE	PCAD Subfunction for EN -- PCAD Subfunction Number. See DMO5	25												
12	12	AOFUNCEN	PCAD SUBFUNCTION ENABLE / REINIT								NA	NA				
12	12	AOPCADSE	PCAD Subfunction for EN -- PCAD Subfunction Number. See DMO5	26												
13	13	AOFUNCEN	PCAD SUBFUNCTION ENABLE / REINIT								NA	NA				
13	13	AOPCADSE	PCAD Subfunction for EN -- PCAD Subfunction Number. See DMO5	27												
14	14	AOFUNCDS	PCAD SUBFUNCTION DISABLE								NA	NA				
14	14	AOPCADSD	PCAD_Subfunction	28							NA	NA				
15	15	AOFUNCEN	PCAD SUBFUNCTION ENABLE / REINIT								NA	NA				
15	15	AOPCADSE	PCAD Subfunction for EN -- PCAD Subfunction Number. See DMO5	29												
16	16	AOFUNCEN	PCAD SUBFUNCTION ENABLE / REINIT								NA	NA				
16	16	AOPCADSE	PCAD Subfunction for EN -- PCAD Subfunction Number. See DMO5	30												
17	17	AOFUNCEN	PCAD SUBFUNCTION ENABLE / REINIT								NA	NA				
17	17	AOPCADSE	PCAD Subfunction for EN -- PCAD Subfunction Number. See DMO5	31												
18	18	AOFUNCEN	PCAD SUBFUNCTION ENABLE / REINIT								NA	NA				
18	18	AOPCADSE	PCAD Subfunction for EN -- PCAD Subfunction Number. See DMO5	32												
19	19	AOFUNCEN	PCAD SUBFUNCTION ENABLE /								NA	NA				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			REINIT													
19	19	AOPCADSE	PCAD Subfunction for EN -- PCAD Subfunction Number. See DMO5	34												
20	20	AOFUNCEN	PCAD SUBFUNCTION ENABLE / REINIT								NA	NA				
20	20	AOPCADSE	PCAD Subfunction for EN -- PCAD Subfunction Number. See DMO5	35												
21	21	AOFUNCEN	PCAD SUBFUNCTION ENABLE / REINIT								NA	NA				
21	21	AOPCADSE	PCAD Subfunction for EN -- PCAD Subfunction Number. See DMO5	36												
22	22	AOFUNCDS	PCAD SUBFUNCTION DISABLE								NA	NA				
22	22	AOPCADSD	PCAD_Subfunction	37							NA	NA				
23	23	AODSDITH	DITHERING DISABLE		AODITHEN	DISA					NA	NA				
24	24	AOGGTQEN	ENABLE GRAVITY GRADIENT TORQUE COMPUTATION		AOFGRAVG	ENAB					NA	NA				
25	25	AORWMOME	ENABLE RW MOMENTUM BIAS		AORWBIAS	ENAB					NA	NA				
26-30	26	AOSETYAW	SET SUN MODE CONTROL LAW YAW BIASES (MULTI-PART)								NA	NA				
26-30	26	AOSETYW1	Set Yaw Bias Cmd 1 -- 1st command of a multipart command													
26-30	26	AOSETYW2	Set Yaw Bias Cmd 2 -- 2nd command of a multipart command													
26-30	26	AOYAWHLD	Sun_Yaw_Bias_Hold -- Yaw Bias Rate for Hold Submode	0.0												
26-30	26	AOYAWPNT	Sun_Yaw_Bias_Point -- Yaw Bias Rate for Point Submode	0.0												
31	27	AOMUNLEN	OBC AUTONOMOUS ANGULAR MOMENTUM UNLOADING ENABLE		AOAUTUNL	ENAB					NA	NA				
32	28	AODIRCTR	OBC DIRECTIVES ENABLE/DISABLE								NA	NA				
32	28	AODRCTR1	Directive Type (Real) -- 000=MUPS 001=RCS 010=RW 011=SA 100=LAE	0							NA	NA				
32	28	AODRCTR2	AOFLR20 spare -- filler								NA	NA				
32	28	AODRCTR3	AODIRCTR Enable/Disable Flag -- Enable/Disable Directive Flag	1							NA	NA				
33	29	AODIRCTR	OBC DIRECTIVES ENABLE/DISABLE								NA	NA				
33	29	AODRCTR1	Directive Type (Real) -- 000=MUPS 001=RCS 010=RW 011=SA 100=LAE	1							NA	NA				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
33	29	AODRCTR2	AOFLR20 spare -- filler								NA	NA				
33	29	AODRCTR3	AODIRCTR Enable/Disable Flag -- Enable/Disable Directive Flag	0							NA	NA				
34	30	AODIRCTR	OBC DIRECTIVES ENABLE/DISABLE								NA	NA				
34	30	AODRCTR1	Directive Type (Real) -- 000=MUPS 001=RCS 010=RW 011=SA 100=LAE	2							NA	NA				
34	30	AODRCTR2	AOFLR20 spare -- filler								NA	NA				
34	30	AODRCTR3	AODIRCTR Enable/Disable Flag -- Enable/Disable Directive Flag	1							NA	NA				
35	31	AODIRCTR	OBC DIRECTIVES ENABLE/DISABLE								NA	NA				
35	31	AODRCTR1	Directive Type (Real) -- 000=MUPS 001=RCS 010=RW 011=SA 100=LAE	3							NA	NA				
35	31	AODRCTR2	AOFLR20 spare -- filler								NA	NA				
35	31	AODRCTR3	AODIRCTR Enable/Disable Flag -- Enable/Disable Directive Flag	1							NA	NA				
36	32	AODIRCTR	OBC DIRECTIVES ENABLE/DISABLE								NA	NA				
36	32	AODRCTR1	Directive Type (Real) -- 000=MUPS 001=RCS 010=RW 011=SA 100=LAE	4							NA	NA				
36	32	AODRCTR2	AOFLR20 spare -- filler								NA	NA				
36	32	AODRCTR3	AODIRCTR Enable/Disable Flag -- Enable/Disable Directive Flag	0							NA	NA				
37	33	AONM2NPD	AUTONOMOUS TRANSITION FROM NMM TO NPM DISABLE		AOAUTTXN	DISA					NA	NA				
38	34	AOSUNMAU	SET SUN MODE CONTROL LAW SUB MODE TO AUTO								NA	NA				
39	35	AIR1HRP1	IRU-1 HIGH RANGE PRI (CHAN 0)		AIRU1R1X	HIGH	AIRU1R1Y	HIGH	AIRU1R2X	HIGH	EP	SD	4	7	64	K16
40	36	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
40	36	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	2							NA	NA				
41	37	AIR1HRP2	IRU-1 HIGH RANGE PRI (CHAN 1)		AIRU1R1X	HIGH	AIRU1R1Y	HIGH	AIRU1R2X	HIGH	EP	SD	4	7	64	K16
42	38	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
42	38	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	2							NA	NA				
43	39	AIR1HRR1	IRU-1 HIGH RANGE RDNT (CHAN 0)		AIRU1R1X	HIGH	AIRU1R1Y	HIGH	AIRU1R2X	HIGH	EP	SD	4	7	64	K16
44	40	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
44	40	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	2							NA	NA				
45	41	AIR1HRR2	IRU-1 HIGH RANGE RDNT (CHAN 1)		AIRU1R1X	HIGH	AIRU1R1Y	HIGH	AIRU1R2X	HIGH	EP	SD	4	7	64	K16
46	42	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
46	42	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	2							NA	NA				
47	43	AIR2HRP1	IRU-2 HIGH RANGE PRI (CHAN 0)		AIRU2R1X	HIGH	AIRU2R1Y	HIGH	AIRU2R2X	HIGH	EP	SD	5	5	64	K24
48	44	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
48	44	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	2							NA	NA				
49	45	AIR2HRP2	IRU-2 HIGH RANGE PRI (CHAN 1)		AIRU2R1X	HIGH	AIRU2R1Y	HIGH	AIRU2R2X	HIGH	EP	SD	5	5	64	K24
50	46	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
50	46	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	2							NA	NA				
51	47	AIR2HRR1	IRU-2 HIGH RANGE RDNT (CHAN 0)		AIRU2R1X	HIGH	AIRU2R1Y	HIGH	AIRU2R2X	HIGH	EP	SD	5	5	64	K24
52	48	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
52	48	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	2							NA	NA				
53	49	AIR2HRR2	IRU-2 HIGH RANGE RDNT (CHAN 1)		AIRU2R1X	HIGH	AIRU2R1Y	HIGH	AIRU2R2X	HIGH	EP	SD	5	5	64	K24
54	50	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
54	50	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	10							NA	NA				
55	51	AIR1HRP1	IRU-1 HIGH RANGE PRI (CHAN 0)		AIRU1R1X	HIGH	AIRU1R1Y	HIGH	AIRU1R2X	HIGH	EP	SD	4	7	64	K16
56	52	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
56	52	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	2							NA	NA				
57	53	AIR1HRP2	IRU-1 HIGH RANGE PRI (CHAN 1)		AIRU1R1X	HIGH	AIRU1R1Y	HIGH	AIRU1R2X	HIGH	EP	SD	4	7	64	K16
58	54	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
58	54	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	2							NA	NA				
59	55	AIR1HRR1	IRU-1 HIGH RANGE RDNT (CHAN 0)		AIRU1R1X	HIGH	AIRU1R1Y	HIGH	AIRU1R2X	HIGH	EP	SD	4	7	64	K16
60	56	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
60	56	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	2							NA	NA				
61	57	AIR1HRR2	IRU-1 HIGH RANGE RDNT (CHAN 1)		AIRU1R1X	HIGH	AIRU1R1Y	HIGH	AIRU1R2X	HIGH	EP	SD	4	7	64	K16
62	58	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
62	58	COSRTDL1	Relative Time Delay (SCS Only) --	2							NA	NA				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			Relative Time Delay (minor cycles)													
63	59	AIR2HRP1	IRU-2 HIGH RANGE PRI (CHAN 0)		AIRU2R1X	HIGH	AIRU2R1Y	HIGH	AIRU2R2X	HIGH	EP	SD	5	5	64	K24
64	60	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
64	60	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	2							NA	NA				
65	61	AIR2HRP2	IRU-2 HIGH RANGE PRI (CHAN 1)		AIRU2R1X	HIGH	AIRU2R1Y	HIGH	AIRU2R2X	HIGH	EP	SD	5	5	64	K24
66	62	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
66	62	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	2							NA	NA				
67	63	AIR2HRR1	IRU-2 HIGH RANGE RDNT (CHAN 0)		AIRU2R1X	HIGH	AIRU2R1Y	HIGH	AIRU2R2X	HIGH	EP	SD	5	5	64	K24
68	64	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
68	64	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	2							NA	NA				
69	65	AIR2HRR2	IRU-2 HIGH RANGE RDNT (CHAN 1)		AIRU2R1X	HIGH	AIRU2R1Y	HIGH	AIRU2R2X	HIGH	EP	SD	5	5	64	K24
70	66	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
70	66	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	2							NA	NA				
71	67	AONSMODE	OBC SET PCAD MODE NORMAL SUN		AOPCADMD	NSUN					NA	NA				
72	68	AOMNVREN	ENABLE MANEUVERS		AOMVRINH	NINH					NA	NA				
73	69	AOINTAHD	SCS POSTN INTEG DISABLE ATT_HLD CNTL LAW		AOCINTAH	DISA					NA	NA				
74	70	AOINTNMD	SCS POSTN INTEG DISA NORM_MAN CNTL LAW		AOCINTNM	DISA					NA	NA				
75	71	AOINTNPE	SCS POSTN INTEG ENAB NORM POINT CNTL LAW		AOCINTNP	ENAB					NA	NA				
76	72	AOINTPFE	SCS POSTN INTEG ENABLE POW_FLT CNTL LAW		AOCINTPF	ENAB					NA	NA				
77	73	AOINTRMD	SCS POSTN INTEG DISABLE RCS_MAN CNTL LAW		AOCINTRM	DISA					NA	NA				
78	74	AOINTSAD	SCS POSTN INTEG DISABLE SUN_ACQ CNTL LAW		AOCINTSA	DISA					NA	NA				
79	75	AOINTSPD	SCS POSTN INTEG DISABLE SUN_PT CNTL LAW		AOCINTSP	DISA					NA	NA				
80	76	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
80	76	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	157							NA	NA				
81	77	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 38 – Idle ACA Windows

Description:

As discussed in Flight Note 299, ACA searches may fail or time out due to images or monitor windows being retained by the ACA from a previous observation and not commanded over for a subsequent observation.

SCS 38 contains an event wait check which waits until F_ATT_CMD=Steady (end of the maneuver). Following the event wait check in SCS 38, 8 directed search commands are sent to the ACA to search at the same location with the minimum search box size designated and with the brightest dimness threshold selected (magnitude=-2). The 8 search commands are virtually guaranteed to fail thus resetting the ACA windows.

Main Steps in SCS:

Event Wait for F_ATT_CMD = Steady

ACA Directed Search Commands

What Phase is this SCS used in? What Patches are Required for Normal Operations?

This SCS is used in the on-orbit phase

Constraints:

This SCS is activated by the Daily Load SCS as part of normal observations.

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
1	1	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	32												
2	2	OCNDEVBR	CONDITIONAL EVENT BRANCH								NA	NA				
2	2	OCNDEVB1	OCCURRENCE FLAG -- 0 - EVENT FAILED TO OCCUR 1 - EVENT OCCURED	0												
2	2	OCNDEVB2	OCNDEVB1 EV NUMBER -- CONDITIONAL EVENT NUMBER BEING INTERROGATED.	18												
2	2	OCNDEVB3	OCNDEVBR SCS STEP -- SCS STEP NUMBER AT WHICH THE PROCESSING WILL CONTINUE	1												
3	3	AAC1CCSC	ACA CMD CHECKSUM AND COUNT PEA1--THE ACA COMMAND CHECKSUM AND COUNT IS A 16-BIT WORD THAT IS THE FIRST COMMAND OF A								PC	SD				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			GROUP OF N ACA COMMANDS (N NOT TO EXCEED 63). THIS COMMAND CONTAINS A CHECKSUM AND WORD COUNT USED IN ERROR CHECKING. IF THE CHECKSUM FOR ANY GOUP OF ACA COMMAND WORDS IS INVALID, OR IF A SYNTAX ERROR IS DETECTED IN ANY COMMAND WITHIN THE GROUP, THE ERROR SHALL BE REPORTED AND THE ACA WILL NOT EXECUTE ANY COMMAND IN THE GROUP.														
3	3	AACKSUM	AACKSUM Checksum -- The MSByte of this 16-bit command word contains a checksum; computed such that the least significant eight bits of the sum of all 8-bit bytes in the group of ACA command, including the checksum and count, is zero.	156												
3	3	AACONSTN	AACONSTN Constant -- A constant always set to binary (00).													
3	3	AAWRDCNT	Word Count -- The Word Count contains the number of 16-bit words in an ACA Command Group (packet) that follow the ACA Command Checksum and Count command. The count cannot exceed 63 since this field is 6 bits wide.	24												
4-6	4	AAC1SCH	ACA SEARCH CMD PEA1--THE SEARCH COMMAND IS USED TO COMMAND A SEARCH IN THE FOV OR AT DIRECTED LOCATION FOR IMAGES.THE ACA SEARCH COMMAND CONSISTS OF THREE 16-BIT WORDS.								PC	SD				
4-6	4	AASCHFMT	ACA Search Command Format Word -- Constant (binary 001) that identifies command as a Search Command type.													
4-6	4	AASBRITE	AASBRITE Brightness Threshold -- Brightness threshold is the Star Magnitude, an 8-bit word with the LSB representing a value of 0.0625	0												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			mag and range of [-2.00, +13.94]. Zero represents -2.0 and 255 represents +13.94.													
4-6	4	AASCNVTF	Brightest image flag -- Specifies whether brightness (=1), as opposed to position (=0) is to be used as the best image selection criteria.	1												
4-6	4	AASFIDLF	AASFIDLF Fiducial light flag -- Will be set true (1) only if a fiducial light is expected to be the best available image for the search region defined.	0												
4-6	4	AASIMNUM	AASIMNUM Image number -- Specifies where data (which image data slot) is to be reported in the OBC and aspect telemetry data.	0												
4-6	4	AASIMIZR	Search Region Dimension -- Specifies the size of the search region. Unsigned integer.	0												
4-6	4	AASZANGL	Z angle of center of search region -- Z angle coordinate of center of search region; a 2's compliment number with one LSB representing 6.40 arc seconds.	31												
4-6	4	AASCHCON	ACA Search Constant -- Constant set to binary (00).													
4-6	4	AASENDF	End flag -- Set true (1) only for the last command in a continuous sequence of search commands.	0												
4-6	4	AASHRESF	High resolution flag -- High resolution flag for Search Region Dimension; used with Search Region Dimension (D) to specify search region size. True (1) implies half-width of search region = 20 +5D arcsec; False (0) implies half-width of search region = 20 + 40D arcsec.	1												
4-6	4	AASIMSZC	AASIMSZC Image size code -- Image size code: binary (00) specifies 4 x 4 pixel image for aspect data telemetry, (01) specifies modified 6 x 6 image; (10) specifies 8 x 8 image; (11) is not used.	01												
4-6	4	AASYANGL	Y angle corrdinate -- Y angle	31												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			coordinate of center of search region; a 2's compliment number with one LSB representing 6.40 arc seconds.													
7-9	5	AAC1SCH	ACA SEARCH CMD PEA1--THE SEARCH COMMAND IS USED TO COMMAND A SEARCH IN THE FOV OR AT DIRECTED LOCATION FOR IMAGES.THE ACA SEARCH COMMAND CONSISTS OF THREE 16-BIT WORDS.								PC	SD				
7-9	5	AASCHFMT	ACA Search Command Format Word -- Constant (binary 001) that identifies command as a Search Command type.													
7-9	5	AASBRITE	AASBRITE Brightness Threshold -- Brightness threshold is the Star Magnitude, an 8-bit word with the LSB representing a value of 0.0625 mag and range of [-2.00, +13.94]. Zero represents -2.0 and 255 represents +13.94.	0												
7-9	5	AASCNVTF	Brightest image flag -- Specifies whether brightness (=1), as opposed to position (=0) is to be used as the best image selection criteria.	1												
7-9	5	AASFIDLF	AASFIDLF Fiducial light flag -- Will be set true (1) only if a fiducial light is expected to be the best available image for the search region defined.	0												
7-9	5	AASIMNUM	AASIMNUM Image number -- Specifies where data (which image data slot) is to be reported in the OBC and aspect telemetry data.	1												
7-9	5	AASIMIZR	Search Region Dimension -- Specifies the size of the search region. Unsigned integer.	0												
7-9	5	AASZANGL	Z angle of center of search region -- Z angle coordinate of center of search region; a 2's compliment number with one LSB representing 6.40 arc seconds.	31												
7-9	5	AASCHCON	ACA Search Constant -- Constant set to binary (00).													

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
7-9	5	AASENDF	End flag -- Set true (1) only for the last command in a continuous sequence of search commands.	0												
7-9	5	AASHRESF	High resolution flag -- High resolution flag for Search Region Dimension; used with Search Region Dimension (D) to specify search region size. True (1) implies half-width of search region = 20 +5D arcsec; False (0) implies half-width of search region = 20 + 40D arcsec.	1												
7-9	5	AASIMSZC	AASIMSZC Image size code -- Image size code: binary (00) specifies 4 x 4 pixel image for aspect data telemetry, (01) specifies modified 6 x 6 image; (10) specifies 8 x 8 image; (11) is not used.	01												
7-9	5	AASYANGL	Y angle corrdinate -- Y angle coordinate of center of search region; a 2's compliment number with one LSB representing 6.40 arc seconds.	31												
10-12	6	AAC1SCH	ACA SEARCH CMD PEA1--THE SEARCH COMMAND IS USED TO COMMAND A SEARCH IN THE FOV OR AT DIRECTED LOCATION FOR IMAGES.THE ACA SEARCH COMMAND CONSISTS OF THREE 16-BIT WORDS.								PC	SD				
10-12	6	AASCHFMT	ACA Search Command Format Word -- Constant (binary 001) that identifies command as a Search Command type.													
10-12	6	AASBRITE	AASBRITE Brightness Threshold -- Brightness threshold is the Star Magnitude, an 8-bit word with the LSB representing a value of 0.0625 mag and range of [-2.00, +13.94]. Zero represents -2.0 and 255 represents +13.94.	0												
10-12	6	AASCNVTF	Brightest image flag -- Specifies whether brightness (=1), as opposed to position (=0) is to be used as the best image selection criteria.	1												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
10-12	6	AASFIDLF	AASFIDLF Fiducial light flag -- Will be set true (1) only if a fiducial light is expected to be the best available image for the search region defined.	0												
10-12	6	AASIMNUM	AASIMNUM Image number -- Specifies where data (which image data slot) is to be reported in the OBC and aspect telemetry data.	2												
10-12	6	AASIMIZR	Search Region Dimension -- Specifies the size of the search region. Unsigned integer.	0												
10-12	6	AASZANGL	Z angle of center of search region -- Z angle coordinate of center of search region; a 2's compliment number with one LSB representing 6.40 arc seconds.	31												
10-12	6	AASCHCON	ACA Search Constant -- Constant set to binary (00).													
10-12	6	AASENDF	End flag -- Set true (1) only for the last command in a continuous sequence of search commands.	0												
10-12	6	AASHRESF	High resolution flag -- High resolution flag for Search Region Dimension; used with Search Region Dimension (D) to specify search region size. True (1) implies half-width of search region = 20 +5D arcsec; False (0) implies half-width of search region = 20 + 40D arcsec.	1												
10-12	6	AASIMSZC	AASIMSZC Image size code -- Image size code: binary (00) specifies 4 x 4 pixel image for aspect data telemetry, (01) specifies modified 6 x 6 image; (10) specifies 8 x 8 image; (11) is not used.	01												
10-12	6	AASYANGL	Y angle corrdinate -- Y angle coordinate of center of search region; a 2's compliment number with one LSB representing 6.40 arc seconds.	31												
13-15	7	AAC1SCH	ACA SEARCH CMD PEA1--THE SEARCH COMMAND IS USED TO COMMAND A SEARCH IN THE FOV OR AT DIRECTED								PC	SD				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			LOCATION FOR IMAGES.THE ACA SEARCH COMMAND CONSISTS OF THREE 16-BIT WORDS.													
13-15	7	AASCHFMT	ACA Search Command Format Word -- Constant (binary 001) that identifies command as a Search Command type.													
13-15	7	AASBRITE	AASBRITE Brightness Threshold -- Brightness threshold is the Star Magnitude, an 8-bit word with the LSB representing a value of 0.0625 mag and range of [-2.00, +13.94]. Zero represents -2.0 and 255 represents +13.94.	0												
13-15	7	AASCNVTF	Brightest image flag -- Specifies whether brightness (=1), as opposed to position (=0) is to be used as the best image selection criteria.	1												
13-15	7	AASFIDLF	AASFIDLF Fiducial light flag -- Will be set true (1) only if a fiducial light is expected to be the best available image for the search region defined.	0												
13-15	7	AASIMNUM	AASIMNUM Image number -- Specifies where data (which image data slot) is to be reported in the OBC and aspect telemetry data.	3												
13-15	7	AASIMIZR	Search Region Dimension -- Specifies the size of the search region. Unsigned integer.	0												
13-15	7	AASZANGL	Z angle of center of search region -- Z angle coordinate of center of search region; a 2's compliment number with one LSB representing 6.40 arc seconds.	31												
13-15	7	AASCHCON	ACA Search Constant -- Constant set to binary (00).													
13-15	7	AASENDF	End flag -- Set true (1) only for the last command in a continuous sequence of search commands.	0												
13-15	7	AASHRESF	High resolution flag -- High resolution flag for Search Region Dimension; used with Search Region Dimension (D) to specify search region size. True (1) implies	1												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			half-width of search region = 20 +5D arcsec; False (0) implies half-width of search region = 20 + 40D arcsec.													
13-15	7	AASIMSZC	AASIMSZC Image size code -- Image size code: binary (00) specifies 4 x 4 pixel image for aspect data telemetry, (01) specifies modified 6 x 6 image; (10) specifies 8 x 8 image; (11) is not used.	01												
13-15	7	AASYANGL	Y angle corrdinate -- Y angle coordinate of center of search region; a 2's compliment number with one LSB representing 6.40 arc seconds.	31												
16-18	8	AAC1SCH	ACA SEARCH CMD PEA1--THE SEARCH COMMAND IS USED TO COMMAND A SEARCH IN THE FOV OR AT DIRECTED LOCATION FOR IMAGES.THE ACA SEARCH COMMAND CONSISTS OF THREE 16-BIT WORDS.								PC	SD				
16-18	8	AASCHFMT	ACA Search Command Format Word -- Constant (binary 001) that identifies command as a Search Command type.													
16-18	8	AASBRITE	AASBRITE Brightness Threshold -- Brightness threshold is the Star Magnitude, an 8-bit word with the LSB representing a value of 0.0625 mag and range of [-2.00, +13.94]. Zero represents -2.0 and 255 represents +13.94.	0												
16-18	8	AASCNVTF	Brightest image flag -- Specifies whether brightness (=1), as opposed to position (=0) is to be used as the best image selection criteria.	1												
16-18	8	AASFIDLF	AASFIDLF Fiducial light flag -- Will be set true (1) only if a fiducial light is expected to be the best available image for the search region defined.	0												
16-18	8	AASIMNUM	AASIMNUM Image number -- Specifies where data (which image	4												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			data slot) is to be reported in the OBC and aspect telemetry data.													
16-18	8	AASIMIZR	Search Region Dimension -- Specifies the size of the search region. Unsigned integer.	0												
16-18	8	AASZANGL	Z angle of center of search region -- Z angle coordinate of center of search region; a 2's compliment number with one LSB representing 6.40 arc seconds.	31												
16-18	8	AASCHCON	ACA Search Constant -- Constant set to binary (00).													
16-18	8	AASENDF	End flag -- Set true (1) only for the last command in a continuous sequence of search commands.	0												
16-18	8	AASHRESF	High resolution flag -- High resolution flag for Search Region Dimension; used with Search Region Dimension (D) to specify search region size. True (1) implies half-width of search region = 20 +5D arcsec; False (0) implies half-width of search region = 20 + 40D arcsec.	1												
16-18	8	AASIMSZC	AASIMSZC Image size code -- Image size code: binary (00) specifies 4 x 4 pixel image for aspect data telemetry, (01) specifies modified 6 x 6 image; (10) specifies 8 x 8 image; (11) is not used.	01												
16-18	8	AASYANGL	Y angle corrdinate -- Y angle coordinate of center of search region; a 2's compliment number with one LSB representing 6.40 arc seconds.	31												
19-21	9	AAC1SCH	ACA SEARCH CMD PEA1--THE SEARCH COMMAND IS USED TO COMMAND A SEARCH IN THE FOV OR AT DIRECTED LOCATION FOR IMAGES.THE ACA SEARCH COMMAND CONSISTS OF THREE 16-BIT WORDS.								PC	SD				
19-21	9	AASCHFMT	ACA Search Command Format Word -- Constant (binary 001) that identifies command as a Search													

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			Command type.													
19-21	9	AASBRITE	AASBRITE Brightness Threshold -- Brightness threshold is the Star Magnitude, an 8-bit word with the LSB representing a value of 0.0625 mag and range of [-2.00, +13.94]. Zero represents -2.0 and 255 represents +13.94.	0												
19-21	9	AASCNVTF	Brightest image flag -- Specifies whether brightness (=1), as opposed to position (=0) is to be used as the best image selection criteria.	1												
19-21	9	AASFIDLF	AASFIDLF Fiducial light flag -- Will be set true (1) only if a fiducial light is expected to be the best available image for the search region defined.	0												
19-21	9	AASIMNUM	AASIMNUM Image number -- Specifies where data (which image data slot) is to be reported in the OBC and aspect telemetry data.	5												
19-21	9	AASIMIZR	Search Region Dimension -- Specifies the size of the search region. Unsigned integer.	0												
19-21	9	AASZANGL	Z angle of center of search region -- Z angle coordinate of center of search region; a 2's compliment number with one LSB representing 6.40 arc seconds.	31												
19-21	9	AASCHCON	ACA Search Constant -- Constant set to binary (00).													
19-21	9	AASENDF	End flag -- Set true (1) only for the last command in a continuous sequence of search commands.	0												
19-21	9	AASHRESF	High resolution flag -- High resolution flag for Search Region Dimension; used with Search Region Dimension (D) to specify search region size. True (1) implies half-width of search region = 20 +5D arcsec; False (0) implies half-width of search region = 20 + 40D arcsec.	1												
19-21	9	AASIMSZC	AASIMSZC Image size code -- Image size code: binary (00) specifies 4 x 4 pixel image for	01												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			aspect data telemetry, (01) specifies modified 6 x 6 image; (10) specifies 8 x 8 image; (11) is not used.													
19-21	9	AASYANGL	Y angle corrdinate -- Y angle coordinate of center of search region; a 2's compliment number with one LSB representing 6.40 arc seconds.	31												
22-24	10	AAC1SCH	ACA SEARCH CMD PEA1--THE SEARCH COMMAND IS USED TO COMMAND A SEARCH IN THE FOV OR AT DIRECTED LOCATION FOR IMAGES.THE ACA SEARCH COMMAND CONSISTS OF THREE 16-BIT WORDS.								PC	SD				
22-24	10	AASCHFMT	ACA Search Command Format Word -- Constant (binary 001) that identifies command as a Search Command type.													
22-24	10	AASBRITE	AASBRITE Brightness Threshold -- Brightness threshold is the Star Magnitude, an 8-bit word with the LSB representing a value of 0.0625 mag and range of [-2.00, +13.94]. Zero represents -2.0 and 255 represents +13.94.	0												
22-24	10	AASCNVTF	Brightest image flag -- Specifies whether brightness (=1), as opposed to position (=0) is to be used as the best image selection criteria.	1												
22-24	10	AASFIDLF	AASFIDLF Fiducial light flag -- Will be set true (1) only if a fiducial light is expected to be the best available image for the search region defined.	0												
22-24	10	AASIMNUM	AASIMNUM Image number -- Specifies where data (which image data slot) is to be reported in the OBC and aspect telemetry data.	6												
22-24	10	AASIMIZR	Search Region Dimension -- Specifies the size of the search region. Unsigned integer.	0												
22-24	10	AASZANGL	Z angle of center of search region -- Z angle coordinate of center of	31												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			search region; a 2's compliment number with one LSB representing 6.40 arc seconds.													
22-24	10	AASCHCON	ACA Search Constant -- Constant set to binary (00).													
22-24	10	AASENDF	End flag -- Set true (1) only for the last command in a continuous sequence of search commands.	0												
22-24	10	AASHRESF	High resolution flag -- High resolution flag for Search Region Dimension; used with Search Region Dimension (D) to specify search region size. True (1) implies half-width of search region = 20 +5D arcsec; False (0) implies half-width of search region = 20 + 40D arcsec.	1												
22-24	10	AASIMSZC	AASIMSZC Image size code -- Image size code: binary (00) specifies 4 x 4 pixel image for aspect data telemetry, (01) specifies modified 6 x 6 image; (10) specifies 8 x 8 image; (11) is not used.	01												
22-24	10	AASYANGL	Y angle corrdinate -- Y angle coordinate of center of search region; a 2's compliment number with one LSB representing 6.40 arc seconds.	31												
25-27	11	AAC1SCH	ACA SEARCH CMD PEA1--THE SEARCH COMMAND IS USED TO COMMAND A SEARCH IN THE FOV OR AT DIRECTED LOCATION FOR IMAGES.THE ACA SEARCH COMMAND CONSISTS OF THREE 16-BIT WORDS.								PC	SD				
25-27	11	AASCHFMT	ACA Search Command Format Word -- Constant (binary 001) that identifies command as a Search Command type.													
25-27	11	AASBRITE	AASBRITE Brightness Threshold -- Brightness threshold is the Star Magnitude, an 8-bit word with the LSB representing a value of 0.0625 mag and range of [-2.00, +13.94]. Zero represents -2.0 and 255	0												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			represents +13.94.													
25-27	11	AASCNVTF	Brightest image flag -- Specifies whether brightness (=1), as opposed to position (=0) is to be used as the best image selection criteria.	1												
25-27	11	AASFIDLF	AASFIDLF Fiducial light flag -- Will be set true (1) only if a fiducial light is expected to be the best available image for the search region defined.	0												
25-27	11	AASIMNUM	AASIMNUM Image number -- Specifies where data (which image data slot) is to be reported in the OBC and aspect telemetry data.	7												
25-27	11	AASIMIZR	Search Region Dimension -- Specifies the size of the search region. Unsigned integer.	0												
25-27	11	AASZANGL	Z angle of center of search region -- Z angle coordinate of center of search region; a 2's compliment number with one LSB representing 6.40 arc seconds.	31												
25-27	11	AASCHCON	ACA Search Constant -- Constant set to binary (00).													
25-27	11	AASENDF	End flag -- Set true (1) only for the last command in a continuous sequence of search commands.	1												
25-27	11	AASHRESF	High resolution flag -- High resolution flag for Search Region Dimension; used with Search Region Dimension (D) to specify search region size. True (1) implies half-width of search region = 20 +5D arcsec; False (0) implies half-width of search region = 20 + 40D arcsec.	1												
25-27	11	AASIMSZC	AASIMSZC Image size code -- Image size code: binary (00) specifies 4 x 4 pixel image for aspect data telemetry, (01) specifies modified 6 x 6 image; (10) specifies 8 x 8 image; (11) is not used.	01												
25-27	11	AASYANGL	Y angle corrdinate -- Y angle coordinate of center of search region; a 2's compliment number	31												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			with one LSB representing 6.40 arc seconds.													
28	12	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 39 -- Telescope OBA Heater Zone Shutdown

Description:

This SCS turns off the OBA heater zones control.

This command sequence works by disabling the OBA heater zones software task. This command results in the OBA heaters being left in the last state they were commanded to by the flight software. The next multipart command sets all the heater zones OFF. This shuts down ALL the heaters zones, both HRMA and OBA. On the next computation cycle for this software task, the HRMA heater zones, which have not been disabled, return to normal operation.

Main Steps in SCS:

1. Disable OBA thermal control (command to OBC)
2. Send the multipart command to set all heater zones (both OBA and HRMA) to OFF.
3. End SCS command

What Phase is this SCS used in? What Patches are Required for Normal Operations?

This command sequence is used to shut down the OBA heater zones to reduce load power demand for long eclipse passage. This command sequence does not contain any hardware commands. The commands are only to the software process, therefore they do not need to be doubled. This also means the commands are also hardware independent.

Constraints:

None

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	4OOBTCDS	DISABLE OBA THERMAL CONTROL		4OACOBAH	DISA					NA	NA				
2-6	2	4OSTHTRZ	SET TELESCOPE HEATER ZONE STATES (ST)		4OTSHCM1		4OTSHCM1		4OTSHCM1		NA	NA				
2-6	2	4STHTRZ1	4OSTHTRZ Header --													
2-6	2	4STHTRZ2	4OSTHTRZ Number of Comms Following -- 5 HEATER ZONE PARAMETERS.													
2-6	2	4STHTRZ3[01]	4OSTHTRZ Param -- Heater Zone Parameters	0												
2-6	2	4STHTRZ3[02]	4OSTHTRZ Param -- Heater Zone Parameters	0												
2-6	2	4STHTRZ3[03]	4OSTHTRZ Param -- Heater Zone Parameters	0												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
2-6	2	4STHTRZ3[04]	4OSTHTRZ Param -- Heater Zone Parameters	0												
2-6	2	4STHTRZ3[05]	4OSTHTRZ Param -- Heater Zone Parameters	0												
7	3	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
7	3	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
8	4	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 40 -- ACIS Instrument Shutdown

Description:

This SCS performs a controlled shutdown of the ACIS

Main Steps in SCS:

1. Interrupt the current science run (stop science): ACIS parameter block: AA00000000
2. Turn off and disable Detector Housing Bakeout Heaters, A and B side
3. Turn off and disable Detector Housing Heaters, A and B side
4. Turn off and disable focal plane bakeout heaters: ACIS Parameter block: WSFT-120
5. Dump system configuration: ACIS Parameter block: RS-0000001
6. Turn off video boards ACIS Parameter block: ChangeConfigSetting: WSVIDALLDN
7. Turn off the FEPs: ACIS Parameter block: ChangeConfigSetting: WSFEPALLDN
8. Turn off and disable the DEAs, A and B side
9. Turn off and disable the DPAs, A and B side
10. End SCS command

What Phase is this SCS used in? What Patches are Required for Normal Operations?

This SCS is used in phases where long eclipses are anticipated and ACIS shutdown is required to reduce loads. SCS 32, loadshed SCS, is edited to include a call to this SCS.

The default on-board SCS for both the launch load and the on-orbit load turns off all ACIS processors. If load power is not a constraint for long eclipses, then this SCS can be edited and patched to leave the DPA on, thereby keeping the flight software and all patches intact.

Constraints:

This SCS should only be modified and approved for use by the Chandra X-ray Science Center

Commands are doubled to protect against SEU upset.

At least one second between ACIS hardware commands. Note longer delay commands between command packet commands

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1-3	1	COACISLD	ACIS LOAD								NA	NA				
1-3	1	COACISL1	COACISLD - HEADER --													
1-3	1	COACISL2	Number of 16 bit ACIS data -- Number of Serial Digital Commands	3												
1-3	1	COACISL4[01]	ACIS DATA --	3												
1-3	1	COACISL4[02]	ACIS DATA --	1539												
1-3	1	COACISL4[03]	ACIS DATA --	19												
4	2	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
4	2	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	64							NA	NA				
5-7	3	COACISLD	ACIS LOAD								NA	NA				
5-7	3	COACISL1	COACISLD - HEADER --													
5-7	3	COACISL2	Number of 16 bit ACIS data -- Number of Serial Digital Commands	3												
5-7	3	COACISL4[01]	ACIS DATA --	3												
5-7	3	COACISL4[02]	ACIS DATA --	1539												
5-7	3	COACISL4[03]	ACIS DATA --	19												
8	4	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
8	4	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
9	5	1HBOAOF	HOUSING B.O. OFF A--TURNS THE SIDE A DETECTOR HOUSING BAKE OUT OFF		1DABOAON	OFF					SI	HLP				
10	6	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
10	6	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
11	7	1HBOAOF	HOUSING B.O. OFF A--TURNS THE SIDE A DETECTOR HOUSING BAKE OUT OFF		1DABOAON	OFF					SI	HLP				
12	8	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
12	8	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
13	9	1HBOADS	HOUSING B.O. DISABLE A-- DISABLES THE SIDE A DETECTOR HOUSING BAKE OUT		1DABOAEN	DISA					SI	HLP				
14	10	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
14	10	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
15	11	1HBOADS	HOUSING B.O. DISABLE A-- DISABLES THE SIDE A		1DABOAEN	DISA					SI	HLP				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			DETECTOR HOUSING BAKE OUT													
16	12	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
16	12	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
17	13	1HBOBOF	HOUSING B.O. OFF B--TURNS THE SIDE B DETECTOR HOUSING BAKE OUT OFF		1DABOBON	OFF					SI	HLP				
18	14	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
18	14	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
19	15	1HBOBOF	HOUSING B.O. OFF B--TURNS THE SIDE B DETECTOR HOUSING BAKE OUT OFF		1DABOBON	OFF					SI	HLP				
20	16	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
20	16	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
21	17	1HBOBDS	HOUSING B.O. DISABLE B-- DISABLES THE SIDE B DETECTOR HOUSING BAKE OUT		1DABOBEN	DISA					SI	HLP				
22	18	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
22	18	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
23	19	1HBOBDS	HOUSING B.O. DISABLE B-- DISABLES THE SIDE B DETECTOR HOUSING BAKE OUT		1DABOBEN	DISA					SI	HLP				
24	20	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
24	20	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
25	21	1HHTRAOF	HOUSING HTR OFF A--TURNS THE A SIDE HOUSING HEATER OFF		1DAHTAON	OFF					SI	HLP				
26	22	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
26	22	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
27	23	1HHTRAOF	HOUSING HTR OFF A--TURNS THE A SIDE HOUSING HEATER OFF		1DAHTAON	OFF					SI	HLP				
28	24	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
28	24	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
29	25	1HHTRADS	HOUSING HTR DISABLE A-- DISABLES THE A SIDE HOUSING HEATER		1DAHTAEN	DISA					SI	HLP				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
30	26	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
30	26	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
31	27	1HHTRADS	HOUSING HTR DISABLE A-- DISABLES THE A SIDE HOUSING HEATER		1DAHTAEN	DISA					SI	HLP				
32	28	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
32	28	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
33	29	1HHTRBOF	HOUSING HTR OFF B--TURNS THE B SIDE HOUSING HEATER OFF		1DAHTBON	OFF					SI	HLP				
34	30	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
34	30	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
35	31	1HHTRBOF	HOUSING HTR OFF B--TURNS THE B SIDE HOUSING HEATER OFF		1DAHTBON	OFF					SI	HLP				
36	32	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
36	32	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
37	33	1HHTRBDS	HOUSING HTR DISABLE B-- DISABLES THE B SIDE HOUSING HEATER		1DAHTBEN	DISA					SI	HLP				
38	34	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
38	34	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
39	35	1HHTRBDS	HOUSING HTR DISABLE B-- DISABLES THE B SIDE HOUSING HEATER		1DAHTBEN	DISA					SI	HLP				
40	36	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
40	36	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
41-47	37	COACISLD	ACIS LOAD								NA	NA				
41-47	37	COACISL1	COACISLD - HEADER --													
41-47	37	COACISL2	Number of 16 bit ACIS data -- Number of Serial Digital Commands	9												
41-47	37	COACISL4[01]	ACIS DATA --	9												
41-47	37	COACISL4[02]	ACIS DATA --	105												
41-47	37	COACISL4[03]	ACIS DATA --	32												
41-47	37	COACISL4[04]	ACIS DATA --	3												
41-47	37	COACISL4[05]	ACIS DATA --	128												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
41-47	37	COACISL4[06]	ACIS DATA --	4												
41-47	37	COACISL4[07]	ACIS DATA --	106												
41-47	37	COACISL4[08]	ACIS DATA --	5												
41-47	37	COACISL4[09]	ACIS DATA --	0												
48	38	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
48	38	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
49-55	39	COACISLD	ACIS LOAD								NA	NA				
49-55	39	COACISL1	COACISLD - HEADER --													
49-55	39	COACISL2	Number of 16 bit ACIS data -- Number of Serial Digital Commands	9												
49-55	39	COACISL4[01]	ACIS DATA --	9												
49-55	39	COACISL4[02]	ACIS DATA --	105												
49-55	39	COACISL4[03]	ACIS DATA --	32												
49-55	39	COACISL4[04]	ACIS DATA --	3												
49-55	39	COACISL4[05]	ACIS DATA --	128												
49-55	39	COACISL4[06]	ACIS DATA --	4												
49-55	39	COACISL4[07]	ACIS DATA --	106												
49-55	39	COACISL4[08]	ACIS DATA --	5												
49-55	39	COACISL4[09]	ACIS DATA --	0												
56	40	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
56	40	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
57-59	41	COACISLD	ACIS LOAD								NA	NA				
57-59	41	COACISL1	COACISLD - HEADER --													
57-59	41	COACISL2	Number of 16 bit ACIS data -- Number of Serial Digital Commands	3												
57-59	41	COACISL4[01]	ACIS DATA --	3												
57-59	41	COACISL4[02]	ACIS DATA --	66												
57-59	41	COACISL4[03]	ACIS DATA --	33												
60	42	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
60	42	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	32												
61-63	43	COACISLD	ACIS LOAD								NA	NA				
61-63	43	COACISL1	COACISLD - HEADER --													
61-63	43	COACISL2	Number of 16 bit ACIS data -- Number of Serial Digital Commands	3												
61-63	43	COACISL4[01]	ACIS DATA --	3												
61-63	43	COACISL4[02]	ACIS DATA --	66												
61-63	43	COACISL4[03]	ACIS DATA --	33												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
64	44	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
64	44	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
65-68	45	COACISLD	ACIS LOAD								NA	NA				
65-68	45	COACISL1	COACISLD - HEADER --													
65-68	45	COACISL2	Number of 16 bit ACIS data -- Number of Serial Digital Commands	5												
65-68	45	COACISL4[01]	ACIS DATA --	5												
65-68	45	COACISL4[02]	ACIS DATA --	1541												
65-68	45	COACISL4[03]	ACIS DATA --	32												
65-68	45	COACISL4[04]	ACIS DATA --	0												
65-68	45	COACISL4[05]	ACIS DATA --	0												
69	46	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
69	46	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
70-73	47	COACISLD	ACIS LOAD								NA	NA				
70-73	47	COACISL1	COACISLD - HEADER --													
70-73	47	COACISL2	Number of 16 bit ACIS data -- Number of Serial Digital Commands	5												
70-73	47	COACISL4[01]	ACIS DATA --	5												
70-73	47	COACISL4[02]	ACIS DATA --	1541												
70-73	47	COACISL4[03]	ACIS DATA --	32												
70-73	47	COACISL4[04]	ACIS DATA --	0												
70-73	47	COACISL4[05]	ACIS DATA --	0												
74	48	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
74	48	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	160												
75-78	49	COACISLD	ACIS LOAD								NA	NA				
75-78	49	COACISL1	COACISLD - HEADER --													
75-78	49	COACISL2	Number of 16 bit ACIS data -- Number of Serial Digital Commands	5												
75-78	49	COACISL4[01]	ACIS DATA --	5												
75-78	49	COACISL4[02]	ACIS DATA --	1542												
75-78	49	COACISL4[03]	ACIS DATA --	32												
75-78	49	COACISL4[04]	ACIS DATA --	1												
75-78	49	COACISL4[05]	ACIS DATA --	0												
79	50	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
79	50	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
80-83	51	COACISLD	ACIS LOAD								NA	NA				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
80-83	51	COACISL1	COACISLD - HEADER --													
80-83	51	COACISL2	Number of 16 bit ACIS data -- Number of Serial Digital Commands	5												
80-83	51	COACISL4[01]	ACIS DATA --	5												
80-83	51	COACISL4[02]	ACIS DATA --	1542												
80-83	51	COACISL4[03]	ACIS DATA --	32												
80-83	51	COACISL4[04]	ACIS DATA --	1												
80-83	51	COACISL4[05]	ACIS DATA --	0												
84	52	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
84	52	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	96												
85	53	1DEPSBOF	DEA PWR SUPPLY OFF B-- TURNS THE B SIDE POWER SUPPLY TO THE DEA OFF		1DEPSB	OFF	1DEDBBON	OFF			SI	HLP				
86	54	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
86	54	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
87	55	1DEPSBOF	DEA PWR SUPPLY OFF B-- TURNS THE B SIDE POWER SUPPLY TO THE DEA OFF		1DEPSB	OFF	1DEDBBON	OFF			SI	HLP				
88	56	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
88	56	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
89	57	1DEPSBDS	DEA PWR SUPPLY DISABLE B-- DISABLES THE B SIDE DEA POWER SUPPLY		1DEPSBX	DISA					SI	HLP				
90	58	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
90	58	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
91	59	1DEPSBDS	DEA PWR SUPPLY DISABLE B-- DISABLES THE B SIDE DEA POWER SUPPLY		1DEPSBX	DISA					SI	HLP				
92	60	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
92	60	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
93	61	1DEPSAOF	DEA PWR SUPPLY OFF A-- TURNS THE A SIDE POWER SUPPLY TO THE DEA OFF		1DEPSA	OFF	1DEDBAON	OFF			SI	HLP				
94	62	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
94	62	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
95	63	1DEPSAOF	DEA PWR SUPPLY OFF A-- TURNS THE A SIDE POWER		1DEPSA	OFF	1DEDBAON	OFF			SI	HLP				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			SUPPLY TO THE DEA OFF													
96	64	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
96	64	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
97	65	1DEPSADS	DEA PWR SUPPLY DISABLE A-- DISABLES THE A SIDE DEA POWER SUPPLY		1DEPSAX	DISA					SI	HLP				
98	66	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
98	66	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
99	67	1DEPSADS	DEA PWR SUPPLY DISABLE A-- DISABLES THE A SIDE DEA POWER SUPPLY		1DEPSAX	DISA					SI	HLP				
100	68	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
100	68	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
101	69	1DPPSBOF	DPA PWR SUPPLY OFF B-- TURNS THE B SIDE POWER SUPPLY TO THE DPA OFF		1DPPSB	OFF	1DPDBBON	OFF			SI	HLP				
102	70	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
102	70	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
103	71	1DPPSBOF	DPA PWR SUPPLY OFF B-- TURNS THE B SIDE POWER SUPPLY TO THE DPA OFF		1DPPSB	OFF	1DPDBBON	OFF			SI	HLP				
104	72	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
104	72	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
105	73	1DPPSBDS	DPA PWR SUPPLY DISABLE B-- DISABLES THE B SIDE DPA POWER SUPPLY		1DPPSBX	DISA					SI	HLP				
106	74	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
106	74	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
107	75	1DPPSBDS	DPA PWR SUPPLY DISABLE B-- DISABLES THE B SIDE DPA POWER SUPPLY		1DPPSBX	DISA					SI	HLP				
108	76	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
108	76	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
109	77	1DPPSAOF	DPA PWR SUPPLY OFF A-- TURNS THE A SIDE POWER SUPPLY TO THE DPA OFF		1DPPSA	OFF	1DPDBAON	OFF			SI	HLP				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
110	78	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
110	78	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
111	79	1DPPSAOF	DPA PWR SUPPLY OFF A-- TURNS THE A SIDE POWER SUPPLY TO THE DPA OFF		1DPPSA	OFF	1DPDBAON	OFF			SI	HLP				
112	80	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
112	80	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
113	81	1DPPSADS	DPA PWR SUPPLY DISABLE A-- DISABLES THE A SIDE DPA POWER SUPPLY		1DPPSAX	DISA					SI	HLP				
114	82	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
114	82	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
115	83	1DPPSADS	DPA PWR SUPPLY DISABLE A-- DISABLES THE A SIDE DPA POWER SUPPLY		1DPPSAX	DISA					SI	HLP				
116	84	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 41 -- HRC Instrument Shutdown

Description:

This SCS performs a controlled shutdown of the HRC

Main Steps in SCS:

1. Turn off the HRC-S and HRC-I MCP high voltage power supplies
2. Turn off A and B side Antico Shield high voltage power supplies
3. Set HRC-S MCP high voltage plate levels to zero volts
4. Set HRC-I MCP high voltage plate levels to zero volts
5. Set A and B side Antico shield high voltage levels to zero volts
6. Turn off A and B side +5 volt power supplies
7. End SCS command

What Phase is this SCS used in? What Patches are Required for Normal Operations?

This SCS is used in phases where long eclipses are anticipated and HRC shutdown is required to reduce loads. SCS 32, loadshed SCS, is edited to include a call to this SCS.

Constraints:

This SCS should only be modified and approved for use by the Chandra X-ray Science Center.

A one-second delay is required between HRC commands.

Commands are doubled to protect against SEU upset. Commands are doubled individually to maintain correct command order.

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	2SPHVOF	SPECT DET HV OFF--TURNS OFF SP HVPS. BITS 19-26 ARE THE COMMAND NUMBER (01 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=0 TURNS OFF THE SUPPLY.		2SPONST	OFF					SI	SD				
2	2	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
2	2	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
3	3	2SPHVOF	SPECT DET HV OFF--TURNS OFF SP HVPS. BITS 19-26 ARE THE		2SPONST	OFF					SI	SD				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			COMMAND NUMBER (01 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=0 TURNS OFF THE SUPPLY.													
4	4	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
4	4	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
5	5	2IMHVOF	IMAGING DET HV OFF--TURNS OFF IM HVPS. BITS 19-26 ARE THE COMMAND NUMBER (01 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=0 TURNS OFF THE SUPPLY.		2IMONST	OFF					SI	SD				
6	6	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
6	6	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
7	7	2IMHVOF	IMAGING DET HV OFF--TURNS OFF IM HVPS. BITS 19-26 ARE THE COMMAND NUMBER (01 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=0 TURNS OFF THE SUPPLY.		2IMONST	OFF					SI	SD				
8	8	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
8	8	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
9	9	2S1HVOF	SHIELD HVPS A OFF--TURNS OFF SHIELD HVPS A. BITS 19-26 ARE THE COMMAND NUMBER (05 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=0 TURNS OFF THE SUPPLY.		2S1ONST	OFF					SI	SD				
10	10	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
10	10	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
11	11	2S1HVOF	SHIELD HVPS A OFF--TURNS OFF SHIELD HVPS A. BITS 19-26 ARE THE COMMAND NUMBER (05 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=0 TURNS OFF THE SUPPLY.		2S1ONST	OFF					SI	SD				
12	12	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
12	12	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
13	13	2S2HVOF	SHIELD HVPS B OFF--TURNS OFF SHIELD HVPS B. BITS 19-26		2S2ONST	OFF					SI	SD				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			ARE THE COMMAND NUMBER (05 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=0 TURNS OFF THE SUPPLY.													
14	14	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
14	14	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
15	15	2S2HVOF	SHIELD HVPS B OFF--TURNS OFF SHIELD HVPS B. BITS 19-26 ARE THE COMMAND NUMBER (05 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=0 TURNS OFF THE SUPPLY.		2S2ONST	OFF					SI	SD				
16	16	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
16	16	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
17	17	2SPTTHV	SPECT DET TOP PLATE HV SETTING-- SETS VOLTAGE AT TOP OF SP TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.		2SPTPAST	NONE	2SPHBLV	NONE			SI	SD				
17	17	2SPTTHV1	Filler --													
17	17	2SPTTHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF SP TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.	0												
18	18	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
18	18	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
19	19	2SPTTHV	SPECT DET TOP PLATE HV SETTING-- SETS VOLTAGE AT TOP OF SP TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DONT CARE, AND		2SPTPAST	NONE	2SPHBLV	NONE			SI	SD				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.													
19	19	2SPTTHV1	Filler --													
19	19	2SPTTHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF SP TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.	0												
20	20	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
20	20	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
21	21	2SPTBHV	SPECT DET BOTTOM PLATE HV SETTING-- SETS VOLTAGE AT TOP OF SP BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.		2SPBPAST	NONE	2SPHVLV	NONE			SI	SD				
21	21	2SPTBHV1	Filler --													
21	21	2SPTBHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF SP BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.	0												
22	22	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
22	22	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
23	23	2SPTBHV	SPECT DET BOTTOM PLATE HV SETTING-- SETS VOLTAGE AT TOP OF SP BOTTOM CHANNEL		2SPBPAST	NONE	2SPHVLV	NONE			SI	SD				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.													
23	23	2SPTBHV1	Filler --													
23	23	2SPTBHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF SP BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.	0												
24	24	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
24	24	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
25	25	2IMTTHV	IMAGING DET TOP PLATE HV SETTING-- SETS VOLTAGE AT TOP OF IM TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.		2IMTPAST	NONE	2IMHBLV	NONE			SI	SD				
25	25	2IMTTHV1	Filler --													
25	25	2IMTTHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF IM TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.	0												
26	26	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
26	26	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
27	27	2IMTTHV	IMAGING DET TOP PLATE HV SETTING-- SETS VOLTAGE AT TOP OF IM TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.		2IMTPAST	NONE	2IMHBLV	NONE			SI	SD				
27	27	2IMTTHV1	Filler --													
27	27	2IMTTHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF IM TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.	0												
28	28	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
28	28	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
29	29	2IMTBHV	IMAGING DET BOTTOM PLATE HV SETTING-- SETS VOLTAGE AT TOP OF IM BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.		2IMBPAST	NONE	2IMHVLV	NONE			SI	SD				
29	29	2IMTBHV1	Filler --													
29	29	2IMTBHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF IM BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.	0												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
30	30	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
30	30	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
31	31	2IMTBHV	IMAGING DET BOTTOM PLATE HV SETTING-- SETS VOLTAGE AT TOP OF IM BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.		2IMBPAST	NONE	2IMHVLV	NONE			SI	SD				
31	31	2IMTBHV1	Filler --													
31	31	2IMTBHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF IM BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.	0												
32	32	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
32	32	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
33	33	2S1STHV	SHIELD HVPS A STEP-- SETS VOLTAGE ACROSS PMT A BLEEDER STRING. BITS 19-26 ARE THE COMMAND NUMBER (06 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT 16 VOLTS PER COUNT. EXAMPLES: 0600 HEX = 0 VOLTS, 0620H=48 VOLTS, 067FH=2032 VOLTS.		2S1HVST	NONE					SI	SD				
33	33	2S1STHV1	Filler --													
33	33	2S1STHV2	VOLTAGE STEPS -- SETS VOLTAGE ACROSS PMT A BLEEDER STRING. BITS 19-26 ARE THE COMMAND NUMBER (06 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT 16 VOLTS PER COUNT. EXAMPLES: 0600 HEX	0												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			= 0 VOLTS, 0620H=48 VOLTS, 067FH=2032 VOLTS.													
34	34	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
34	34	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
35	35	2S1STHV	SHIELD HVPS A STEP-- SETS VOLTAGE ACROSS PMT A BLEEDER STRING. BITS 19-26 ARE THE COMMAND NUMBER (06 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT 16 VOLTS PER COUNT. EXAMPLES: 0600 HEX = 0 VOLTS, 0620H=48 VOLTS, 067FH=2032 VOLTS.		2S1HVST	NONE					SI	SD				
35	35	2S1STHV1	Filler --													
35	35	2S1STHV2	VOLTAGE STEPS -- SETS VOLTAGE ACROSS PMT A BLEEDER STRING. BITS 19-26 ARE THE COMMAND NUMBER (06 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT 16 VOLTS PER COUNT. EXAMPLES: 0600 HEX = 0 VOLTS, 0620H=48 VOLTS, 067FH=2032 VOLTS.	0												
36	36	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
36	36	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
37	37	2S2STHV	SHIELD HVPS B STEP-- SETS VOLTAGE ACROSS PMT B BLEEDER STRING. BITS 19-26 ARE THE COMMAND NUMBER (06 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT 16 VOLTS PER COUNT. EXAMPLES: 0600 HEX = 0 VOLTS, 0620H=48 VOLTS, 067FH=2032 VOLTS.		2S2HVST	NONE					SI	SD				
37	37	2S2STHV1	Filler --													
37	37	2S2STHV2	VOLTAGE STEPS -- SETS VOLTAGE ACROSS PMT B BLEEDER STRING. BITS 19-26 ARE THE COMMAND NUMBER (06 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT 16 VOLTS PER	0												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			COUNT. EXAMPLES: 0600 HEX = 0 VOLTS, 0620H=48 VOLTS, 067FH=2032 VOLTS.													
38	38	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
38	38	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
39	39	2S2STHV	SHIELD HVPS B STEP-- SETS VOLTAGE ACROSS PMT B BLEEDER STRING. BITS 19-26 ARE THE COMMAND NUMBER (06 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT 16 VOLTS PER COUNT. EXAMPLES: 0600 HEX = 0 VOLTS, 0620H=48 VOLTS, 067FH=2032 VOLTS.		2S2HVST	NONE					SI	SD				
39	39	2S2STHV1	Filler --													
39	39	2S2STHV2	VOLTAGE STEPS -- SETS VOLTAGE ACROSS PMT B BLEEDER STRING. BITS 19-26 ARE THE COMMAND NUMBER (06 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT 16 VOLTS PER COUNT. EXAMPLES: 0600 HEX = 0 VOLTS, 0620H=48 VOLTS, 067FH=2032 VOLTS.	0												
40	40	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
40	40	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
41	41	205VAOF	+5V LV PWR SUPPLY A OFF		2PS5AON	OFF	2P05VAVL	NONE	2C05PALV		SI	HLP				
42	42	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
42	42	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
43	43	205VAOF	+5V LV PWR SUPPLY A OFF		2PS5AON	OFF	2P05VAVL	NONE	2C05PALV		SI	HLP				
44	44	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
44	44	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
45	45	205VBOF	+5V LV PWR SUPPLY B OFF		2PS5BON	OFF	2P05VBVL	NONE	2C05PALV		SI	HLP				
46	46	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
46	46	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
47	47	205VBOF	+5V LV PWR SUPPLY B OFF		2PS5BON	OFF	2P05VBVL	NONE	2C05PALV		SI	HLP				
48	48	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 42 -- Trim Heater Prime Disable

Description:

This SCS turns off select prime-side ISIM Trim Heaters

Main Steps in SCS:

The following ISIM heaters are turned off:

3SMZPTDS	ACIS SUPPORT STRUCTURE - Z PRIME TRIM HTR DISA
3AC1PTDS	ACIS 1 FITTING +Z PRIME TRIM HTR DISA
3AC2PTDS	ACIS 2 FITTING +Y,-Z PRIME TRIM HTR DISA
3AC3PTDS	ACIS 3 FITTING -Y-Z PRIME TRIM HTR DISA
3SPYPTDS	ACIS SUPPORT STRUCTURE +Y PRIME TRIM HTR DISA
3SMYPTDS	ACIS SUPPORT STRUCTURE -Y PRIME TRIM HTR DISA
3HR1PTDS	HRC 1 FITTING -Y,-Z PRIME TRIM HEATER DISABLE
3HR2PTDS	HRC 2 FITTING +Y,-Z PRIME TRIM HEATER DISABLE
3HR3PTDS	HRC 3 FITTING +Z PRIME TRIM HEATER DISABLE
3RCTPTDS	RCTU PRIME TRIM HEATER DISABLE
3PSMPTDS	PSMC PRIME TRIM HEATER DISABLE
3FLCPTDS	FLCA PRIME TRIM HEATER DISABLE
3FA6PADS	FOCUS ASSEMBLY 6 PRIME ABORT HTR DISA
3FA6RADS	FOCUS ASSEMBLY 6 RDNT ABORT HTR DISA

The ISIM Flexure heaters are turned off (heaters A, B and C)

End SCS command

What Phase is this SCS used in? What Patches are Required for Normal Operations?

This SCS is used in phases where long eclipses are anticipated and the prime ISIM trim heater shutdown is required to reduce loads.

Constraints:

The heater commands are doubled-up as a group to protect against SEU upset. One minor cycle between adjacent commands, and 16 mc between the groups.

The SIM Flexure Heaters are doubled up, however the time delay between these commands should have been set to a minimum of 65 seconds (2 major frames). There is a possibility that one or both SIM flexure commands could be rejected by the SIM SEA. Based on a pre-launch CCB meeting, the decision was made not to correct this SCS (and SCS 75, the ON version), and instead add commands to the Long Eclipse Procedure products. The Long Eclipse Procedure, where this SCS would be used,

specifically contains instructions to command the flexure heaters OFF and ON independent of SCS 42 (OFF) and SCS #: 75 -- Trim Heater Prime Enable (ON). This increases the chance that the commands will get through to the SIM SEA.

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	3SMZPTDS	ACIS SUPPORT STRUCTURE - Z PRIME TRIM HEATER DISABLE		3ASMZTHA	DISA					SI	LCC				
2	2	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
2	2	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
3	3	3AC1PTDS	ACIS 1 FITTING -Y,-Z PRIME TRIM HEATER DISABLE		3A1THTRA	DISA					SI	LCC				
4	4	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
4	4	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
5	5	3AC2PTDS	ACIS 2 FITTING +Y,-Z PRIME TRIM HEATER DISABLE		3A2THTRA	DISA					SI	LCC				
6	6	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
6	6	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
7	7	3AC3PTDS	ACIS 3 FITTING +Z PRIME TRIM HEATER DISABLE		3A3THTRA	DISA					SI	LCC				
8	8	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
8	8	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
9	9	3SPYPTDS	ACIS SUPPORT STRUCTURE +Y PRIME TRIM HEATER DISABLE		3ASPYTHA	DISA					SI	LCC				
10	10	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
10	10	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
11	11	3SMYPTDS	ACIS SUPPORT STRUCTURE -Y PRIME TRIM HEATER DISABLE		3ASMYTHA	DISA					SI	LCC				
12	12	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
12	12	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
13	13	3HR1PTDS	HRC 1 FITTING -Y,-Z PRIME TRIM HEATER DISABLE		3H1THTRA	DISA					SI	LCC				
14	14	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
14	14	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
15	15	3HR2PTDS	HRC 2 FITTING +Y,-Z PRIME TRIM HEATER DISABLE		3H2THTRA	DISA					SI	LCC				
16	16	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
16	16	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
17	17	3HR3PTDS	HRC 3 FITTING +Z PRIME TRIM HEATER DISABLE		3H3PZTHA	DISA					SI	LCC				
18	18	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
18	18	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
19	19	3RCTPTDS	RCTU PRIME TRIM HEATER DISABLE		3SITHTRA	DISA					SI	LCC				
20	20	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
20	20	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
21	21	3PSMPTDS	PSMC PRIME TRIM HEATER DISABLE		3APSMTHA	DISA					SI	LCC				
22	22	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
22	22	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
23	23	3FLCPTDS	FLCA PRIME TRIM HEATER DISABLE		3FLCTHTA	DISA					SI	LCC				
24	24	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
24	24	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
25	25	3FA6PADS	FOCUS ASSEMBLY 6 PRIME ABORT HEATER DISABLE		3AZF6HTA	DISA					SI	LCC				
26	26	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
26	26	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
27	27	3FA6RADS	FOCUS ASSEMBLY 6 REDUNDANT ABORT HEATER DISABLE		3AZF6HTB	DISA					SI	LCC				
28	28	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
28	28	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
29	29	3SIMHD	SIM SEA SERIAL COMMAND HEADER--The SEA will only accept commands in groups or packets preceeded by this SEA Header command. The SEA Header command is the first command in a group or packet sent to the SEA. The SEA Header command contains an 8 bit checksum which is computed such that the low order 8 bits of the sum of all 8 bit bytes in								SI	SD				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			the command group or packet, including the two bytes of the Header command, is zero. The Header command also contains field to specify the number of 16 bit command in the group or packet that follow the Header. The maximum number of commands that may be sent in one group, following the header, is 63. The SEA will not execute any command in a group until the entire group has been received and verified to be correct. An error in the checksum, word count, or an illegal value for any individual command will cause the SEA to reject the entire command group or packet and set the invalid command flag in output telemetry.													
29	29	3SIMHD1	SIM SEA Header Checksum -- This field is used to specify an 8 bit checksum of all command bytes within a command group transmitted to the SIM. The checksum is computed such that the low order 8 bits of the sum of all 8 bit bytes in the command group, including the header word, is zero.	159												
29	29	3SIMHD2	SIM SEA Header Fill -- Fill bits, set to binary (00).													
29	29	3SIMHD3	SIM SEA Header No of Commands -- This field is used to specify the number of 16 bit commands in a command group that follow the header. The maximum number of 16 bit commands in a command group is limited to 63.	1												
30	30	3SEASETH	SIM SEA SET FA HTR ZONE TEMP--The Heater Control command controls the heater power latching relay and the temperature for each FA mounting flexure. Three zones or flexures may be specified and controlled with this command. A set point temperature range of -64 to +63 degrees Celsius may be specified. When the binary value (00) is specified in the Zone		3SFLXAST	NONE	3SFLXBST	NONE	3SFLXCST	NONE	SI	SD				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			field of the command, the SEA will ignore the Temperature field in the command and set the heater power latching relay to its OFF state, which switches off power to heaters on all three flexures. When any oter zone is specifed in the command the SEA will set the heater power relay to its ON state, if it is not already in that state. The SEA software will accept multiple heater control commands within one SEA command group or packet, but it may assume that no more than one command within a single group will cause a change in state of the heater power latching relay. After execution of a command that changes the state of the heater power relay, any subsequent command within the same group that also changes the heater power relay state will be ignored by the SEA software.													
30	30	3SEASTH1	SIM Heater Control Zone -- This field is used to specify the zone or FA mounting flexure which is to be controlled. Binary (01) specifies zone 1 or flexure A, binary (10) specifies zone 2 or flexure B, binary (11) specifies zone 3 or flexure C. Binary (00) set the heater power latching relay to its OFF state which switches off power to heaters in all three zones or flexures.	00	3SFLXAST	NONE	3SFLXBST	NONE	3SFLXCST	NONE	SI	SD				
30	30	3SEASTH2	SIM Heater Control Set Temperature -- This field is a 10 bit signed integer used to specify the temperature set point in degrees C within the specified zone. The allowable range is -64 to +63 degrees C.	0000000000	3SFLXAST	NONE	3SFLXBST	NONE	3SFLXCST	NONE	SI	SD				
31	31	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
31	31	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
32	32	3SMZPTDS	ACIS SUPPORT STRUCTURE - Z PRIME TRIM HEATER DISABLE		3ASMZTHA	DISA					SI	LCC				
33	33	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
33	33	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
34	34	3AC1PTDS	ACIS 1 FITTING -Y,-Z PRIME TRIM HEATER DISABLE		3A1THTRA	DISA					SI	LCC				
35	35	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
35	35	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
36	36	3AC2PTDS	ACIS 2 FITTING +Y,-Z PRIME TRIM HEATER DISABLE		3A2THTRA	DISA					SI	LCC				
37	37	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
37	37	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
38	38	3AC3PTDS	ACIS 3 FITTING +Z PRIME TRIM HEATER DISABLE		3A3THTRA	DISA					SI	LCC				
39	39	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
39	39	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
40	40	3SPYPTDS	ACIS SUPPORT STRUCTURE +Y PRIME TRIM HEATER DISABLE		3ASPYTHA	DISA					SI	LCC				
41	41	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
41	41	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
42	42	3SMYPTDS	ACIS SUPPORT STRUCTURE -Y PRIME TRIM HEATER DISABLE		3ASMYTHA	DISA					SI	LCC				
43	43	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
43	43	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
44	44	3HR1PTDS	HRC 1 FITTING -Y,-Z PRIME TRIM HEATER DISABLE		3H1THTRA	DISA					SI	LCC				
45	45	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
45	45	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
46	46	3HR2PTDS	HRC 2 FITTING +Y,-Z PRIME TRIM HEATER DISABLE		3H2THTRA	DISA					SI	LCC				
47	47	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
47	47	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
48	48	3HR3PTDS	HRC 3 FITTING +Z PRIME TRIM HEATER DISABLE		3H3PZTHA	DISA					SI	LCC				
49	49	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
49	49	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
50	50	3RCTPTDS	RCTU PRIME TRIM HEATER DISABLE		3SITHTRA	DISA					SI	LCC				
51	51	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
51	51	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
52	52	3PSMPTDS	PSMC PRIME TRIM HEATER DISABLE		3APSMTHA	DISA					SI	LCC				
53	53	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
53	53	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
54	54	3FLCPTDS	FLCA PRIME TRIM HEATER DISABLE		3FLCTHTA	DISA					SI	LCC				
55	55	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
55	55	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
56	56	3FA6PADS	FOCUS ASSEMBLY 6 PRIME ABORT HEATER DISABLE		3AZF6HTA	DISA					SI	LCC				
57	57	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
57	57	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
58	58	3FA6RADS	FOCUS ASSEMBLY 6 REDUNDANT ABORT HEATER DISABLE		3AZF6HTB	DISA					SI	LCC				
59	59	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
59	59	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
60	60	3SIMHD	SIM SEA SERIAL COMMAND HEADER--The SEA will only accept commands in groups or packets preceeded by this SEA Header command. The SEA Header command is the first command in a group or packet sent to the SEA. The SEA Header command contains an 8 bit checksum which is computed such that the low order 8 bits of the sum of all 8 bit bytes in the command group or packet, including the two bytes of the Header command, is zero. The Header command also contains field to specify the number of 16 bit command in the group or packet that follow the Header. The maximum number of commands								SI	SD				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			that may be sent in one group, following the header, is 63. The SEA will not execute any command in a group until the entire group has been received and verified to be correct. An error in the checksum, word count, or an illegal value for any individual command will cause the SEA to reject the entire command group or packet and set the invalid command flag in output telemetry.													
60	60	3SIMHD1	SIM SEA Header Checksum -- This field is used to specify an 8 bit checksum of all command bytes within a command group transmitted to the SIM. The checksum is computed such that the low order 8 bits of the sum of all 8 bit bytes in the command group, including the header word, is zero.	159												
60	60	3SIMHD2	SIM SEA Header Fill -- Fill bits, set to binary (00).													
60	60	3SIMHD3	SIM SEA Header No of Commands -- This field is used to specify the number of 16 bit commands in a command group that follow the header. The maximum number of 16 bit commands in a command group is limited to 63.	1												
61	61	3SEASETH	SIM SEA SET FA HTR ZONE TEMP--The Heater Control command controls the heater power latching relay and the temperature for each FA mounting flexure. Three zones or flexures may be specified and controlled with this command. A set point temperature range of -64 to +63 degrees Celsius may be specified. When the binary value (00) is specified in the Zone field of the command, the SEA will ignore the Temperature field in the command and set the heater power latching relay to its OFF state, which switches off power to heaters on all three flexures. When any oter zone is specifed in the command the SEA will set the heater power		3SFLXAST	NONE	3SFLXBST	NONE	3SFLXCST	NONE	SI	SD				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			relay to its ON state, if it is not already in that state. The SEA software will accept multiple heater control commands within one SEA command group or packet, but it may assume that no more than one command within a single group will cause a change in state of the heater power latching relay. After execution of a command that changes the state of the heater power relay, any subsequent command within the same group that also changes the heater power relay state will be ignored by the SEA software.													
61	61	3SEASTH1	SIM Heater Control Zone -- This field is used to specify the zone or FA mounting flexure which is to be controlled. Binary (01) specifies zone 1 or flexure A, binary (10) specifies zone 2 or flexure B, binary (11) specifies zone 3 or flexure C. Binary (00) set the heater power latching relay to its OFF state which switches off power to heaters in all three zones or flexures.	00	3SFLXAST	NONE	3SFLXBST	NONE	3SFLXCST	NONE	SI	SD				
61	61	3SEASTH2	SIM Heater Control Set Temperature -- This field is a 10 bit signed integer used to specify the temperature set point in degrees C within the specified zone. The allowable range is -64 to +63 degrees C.	0000000000	3SFLXAST	NONE	3SFLXBST	NONE	3SFLXCST	NONE	SI	SD				
62	62	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
62	62	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
63	63	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 43 -- Trim Heater Redundant Disable

Description:

This SCS turns off select redundant-side ISIM Trim Heaters

Main Steps in SCS:

The following ISIM heaters are turned off:

Command Mnemonic	Description
3SMZRTDS	ACIS SUPPORT STRUCTURE - Z REDUNDANT TRIM HEATER DISABLE
3AC1RTDS	ACIS 1 FITTING -Y,-Z REDUNDANT TRIM HEATER DISABLE
3AC2RTDS	ACIS 2 FITTING +Y,-Z REDUNDANT TRIM HEATER DISABLE
3AC3RTDS	ACIS 3 FITTING +Z REDUNDANT TRIM HEATER DISABLE
3SPYRTDS	ACIS SUPPORT STRUCTURE +Y REDUNDANT TRIM HEATER DISABLE
3SMYRTDS	ACIS SUPPORT STRUCTURE -Y REDUNDANT TRIM HEATER DISABLE
3HR1RTDS	HRC 1 FITTING -Y,-Z REDUNDANT TRIM HEATER DISABLE
3HR2RTDS	HRC 2 FITTING +Y,-Z REDUNDANT TRIM HEATER DISABLE
3HR3RTDS	HRC 3 FITTING +Z REDUNDANT TRIM HEATER DISABLE
3RCTRTDS	RCTU REDUNDANT TRIM HEATER DISABLE
3PSMRTDS	PSMC REDUNDANT TRIM HEATER DISABLE
3FLCRTDS	FLCA REDUNDANT TRIM HEATER DISABLE

End SCS command

What Phase is this SCS used in? What Patches are Required for Normal Operations?

This SCS is used in phases where long eclipses are anticipated and the redundant ISIM trim heater shutdown is required to reduce loads.

Constraints:

The heater commands are doubled-up as a group to protect against SEU upset. One minor cycle between adjacent commands, and 16 mc between the groups.

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	3SMZRTDS	ACIS SUPPORT STRUCTURE - Z REDUNDANT TRIM HEATER DISABLE		3ASMZTHB	DISA					SI	LCC				
2	2	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
2	2	COSRTDL1	Relative Time Delay (SCS Only) --	1							NA	NA				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			Relative Time Delay (minor cycles)													
3	3	3AC1RTDS	ACIS 1 FITTING -Y,-Z REDUNDANT TRIM HEATER DISABLE		3A1THTRB	DISA					SI	LCC				
4	4	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
4	4	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
5	5	3AC2RTDS	ACIS 2 FITTING +Y,-Z REDUNDANT TRIM HEATER DISABLE		3A2THTRB	DISA					SI	LCC				
6	6	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
6	6	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
7	7	3AC3RTDS	ACIS 3 FITTING +Z REDUNDANT TRIM HEATER DISABLE		3A3THTRB	DISA					SI	LCC				
8	8	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
8	8	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
9	9	3SPYRTDS	ACIS SUPPORT STRUCTURE +Y REDUNDANT TRIM HEATER DISABLE		3ASPYTHB	DISA					SI	LCC				
10	10	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
10	10	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
11	11	3SMYRTDS	ACIS SUPPORT STRUCTURE -Y REDUNDANT TRIM HEATER DISABLE		3ASMYTHB	DISA					SI	LCC				
12	12	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
12	12	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
13	13	3HR1RTDS	HRC 1 FITTING -Y,-Z REDUNDANT TRIM HEATER DISABLE		3H1THTRB	DISA					SI	LCC				
14	14	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
14	14	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
15	15	3HR2RTDS	HRC 2 FITTING +Y,-Z REDUNDANT TRIM HEATER DISABLE		3H2THTRB	DISA					SI	LCC				
16	16	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
16	16	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
17	17	3HR3RTDS	HRC 3 FITTING +Z REDUNDANT		3H3PZTHB	DISA					SI	LCC				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			TRIM HEATER DISABLE													
18	18	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
18	18	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
19	19	3RCTRTDS	RCTU REDUNDANT TRIM HEATER DISABLE		3SITHTRB	DISA					SI	LCC				
20	20	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
20	20	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
21	21	3PSMRTDS	PSMC REDUNDANT TRIM HEATER DISABLE		3APSMTHB	DISA					SI	LCC				
22	22	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
22	22	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
23	23	3FLCRTDS	FLCA REDUNDANT TRIM HEATER DISABLE		3FLCTHTB	DISA					SI	LCC				
24	24	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
24	24	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
25	25	3SMZRTDS	ACIS SUPPORT STRUCTURE - Z REDUNDANT TRIM HEATER DISABLE		3ASMZTHB	DISA					SI	LCC				
26	26	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
26	26	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
27	27	3AC1RTDS	ACIS 1 FITTING -Y,-Z REDUNDANT TRIM HEATER DISABLE		3A1THTRB	DISA					SI	LCC				
28	28	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
28	28	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
29	29	3AC2RTDS	ACIS 2 FITTING +Y,-Z REDUNDANT TRIM HEATER DISABLE		3A2THTRB	DISA					SI	LCC				
30	30	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
30	30	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
31	31	3AC3RTDS	ACIS 3 FITTING +Z REDUNDANT TRIM HEATER DISABLE		3A3THTRB	DISA					SI	LCC				
32	32	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
32	32	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
33	33	3SPYRTDS	ACIS SUPPORT STRUCTURE +Y		3ASPYTHB	DISA					SI	LCC				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			REDUNDANT TRIM HEATER DISABLE													
34	34	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
34	34	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
35	35	3SMYRTDS	ACIS SUPPORT STRUCTURE -Y REDUNDANT TRIM HEATER DISABLE		3ASMYTHB	DISA					SI	LCC				
36	36	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
36	36	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
37	37	3HR1RTDS	HRC 1 FITTING -Y,-Z REDUNDANT TRIM HEATER DISABLE		3H1THTRB	DISA					SI	LCC				
38	38	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
38	38	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
39	39	3HR2RTDS	HRC 2 FITTING +Y,-Z REDUNDANT TRIM HEATER DISABLE		3H2THTRB	DISA					SI	LCC				
40	40	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
40	40	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
41	41	3HR3RTDS	HRC 3 FITTING +Z REDUNDANT TRIM HEATER DISABLE		3H3PZTHB	DISA					SI	LCC				
42	42	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
42	42	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
43	43	3RCTRTDS	RCTU REDUNDANT TRIM HEATER DISABLE		3SITHTRB	DISA					SI	LCC				
44	44	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
44	44	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
45	45	3PSMRTDS	PSMC REDUNDANT TRIM HEATER DISABLE		3APSMTHB	DISA					SI	LCC				
46	46	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
46	46	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
47	47	3FLCRTDS	FLCA REDUNDANT TRIM HEATER DISABLE		3FLCTHTB	DISA					SI	LCC				
48	48	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
48	48	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
49	49	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 44 -- ESA and ESA Heater Prime Disable

Description:

This SCS turns off the prime ESA and prime ESA heaters

Main Steps in SCS:

Turn off the Prime Earth Sensor
Turn off the Prime Earth Sensor Heaters.
End SCS command

What Phase is this SCS used in? What Patches are Required for Normal Operations?

This SCS is used to turn off the ESA and ESA heater circuits. The ESA and ESA heaters are no longer used during the mission following SSD opening and successful operation of the Aspect Determination System. However, these can be used for “power ballast” in short earth eclipse conditions where additional loads are required.

Constraints:

Do not use this SCS prior SSD opening to prevent interruption of PCAD operations.
Commands are doubled-up to protect against SEU upset.
16 minor cycles between doubled commands, at least 1 minor cycles between adjacent non-like commands.

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	AESAAOF	ESA-A PWR OFF		AESAA	OFF					PC	LCC				
2	2	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
2	2	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
3	3	AESAAOF	ESA-A PWR OFF		AESAA	OFF					PC	LCC				
4	4	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
4	4	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
5	5	EESP1HOF	HTR BUS 9: ESA/ESE PRI DISA (CH0)		TESAPHT1	DISA	TESAPHT2	DISA			EP	SD	3	4	32	K12A
6	6	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
6	6	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
7	7	EESP1HOF	HTR BUS 9: ESA/ESE PRI DISA (CH0)		TESAPHT1	DISA	TESAPHT2	DISA			EP	SD	3	4	32	K12A
8	8	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
8	8	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
9	9	EESP2HOF	HTR BUS 9: ESA/ESE PRI DISA (CH1)		TESAPHT1	DISA	TESAPHT2	DISA			EP	SD	3	4	32	K12A
10	10	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
10	10	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
11	11	EESP2HOF	HTR BUS 9: ESA/ESE PRI DISA (CH1)		TESAPHT1	DISA	TESAPHT2	DISA			EP	SD	3	4	32	K12A
12	12	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
12	12	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
13	13	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 45 -- ESA and ESA Heater Redundant Disable

Description:

This SCS turns off the redundant ESA and redundant ESA heaters.

Main Steps in SCS:

Turn off the Redundant Earth Sensor
Turn off the Redundant Earth Sensor Heaters.
End SCS command

What Phase is this SCS used in? What Patches are Required for Normal Operations?

This SCS is used to turn off the ESA and ESA heater circuits. The ESA and ESA heaters are no longer used during the mission following SSD opening and successful operation of the Aspect Determination System. However, these can be used for “power ballast” in short earth eclipse conditions where additional loads are required.

Constraints:

Do not use this SCS prior SSD opening to prevent interruption of PCAD operations.
Commands are doubled-up to protect against SEU upset.
16 minor cycles between doubled commands, at least 1 minor cycles between adjacent non-like commands.

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	AESABOF	ESA-B PWR OFF		AESAB	OFF					PC	LCC				
2	2	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
2	2	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
3	3	AESABOF	ESA-B PWR OFF		AESAB	OFF					PC	LCC				
4	4	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
4	4	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
5	5	EESR1HOF	HTR BUS 18: ESA/ESE RDNT DISA (CH0)		TESARHT1	DISA	TESARHT2	DISA			EP	SD	3	4	32	K12A
6	6	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
6	6	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
7	7	EESR1HOF	HTR BUS 18: ESA/ESE RDNT DISA (CH0)		TESARHT1	DISA	TESARHT2	DISA			EP	SD	3	4	32	K12A
8	8	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
8	8	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
9	9	EESR2HOF	HTR BUS 18: ESA/ESE RDNT DISA (CH1)		TESARHT1	DISA	TESARHT2	DISA			EP	SD	3	4	32	K12A
10	10	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
10	10	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
11	11	EESR2HOF	HTR BUS 18: ESA/ESE RDNT DISA (CH1)		TESARHT1	DISA	TESARHT2	DISA			EP	SD	3	4	32	K12A
12	12	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
12	12	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
13	13	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 46 -- Fuel Tank Heater Prime and Redundant Disable

Description:

This SCS turns off the prime and redundant Fuel Tank Heaters

Main Steps in SCS:

Commands to disable prime Tank Heater
Commands to disable redundant Tank Heater
End SCS command

What Phase is this SCS used in? What Patches are Required for Normal Operations?

This SCS is used to shed Fuel Tank Heater loads during long earth eclipses.

Constraints:

Commands are doubled-up to prevent against SEU.
16 minor cycles between doubled commands, at least 2 minor cycles between adjacent non-like commands.

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	PFTPHDS	FUEL TANK HTR PRI DISA		EFTHTRPR	DISA					LR	HLP				
2	2	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
2	2	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
3	3	PFTPHDS	FUEL TANK HTR PRI DISA		EFTHTRPR	DISA					LR	HLP				
4	4	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
4	4	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	2							NA	NA				
5	5	PFTRHDS	FUEL TANK HTR RDNT DISA		EFTHTRRD	DISA					EP	HLP				
6	6	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
6	6	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
7	7	PFTRHDS	FUEL TANK HTR RDNT DISA		EFTHTRRD	DISA					EP	HLP				
8	8	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
8	8	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	2							NA	NA				
9	9	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 47 -- Transmitter and Power Amp Prime Disable

Description:

This SCS turns off the prime transmitter and power amp

Main Steps in SCS:

Commands to turn off the prime Transmitter
Commands to turn of the prime Power Amplifier
End SCS command

What Phase is this SCS used in? What Patches are Required for Normal Operations?

This SCS is used to shed transmitter and power amp loads during long earth eclipses where ground contact is not planned.

Constraints:

Do not include this SCS in SCS 32 or SCS 33 if ground contact is anticipated during the eclipse. The daily load is used to manipulate the transmitter commands.
Commands are doubled-up to protect against SEU upset.
16 minor cycles between doubled commands, at least 2 minor cycles between adjacent non-like commands.
Transmitter must be turned off prior to Power Amp, so keep doubled-up transmitter disable commands ahead of Power Amp disable commands.

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	CTXAOF	TX-A OFF		CTXAX	OFF					LR	HLP				
2	2	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
2	2	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
3	3	CTXAOF	TX-A OFF		CTXAX	OFF					LR	HLP				
4	4	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
4	4	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	2							NA	NA				
5	5	CPAAOF	PA-A OFF		CPA1	OFF					LR	HLP				
6	6	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
6	6	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
7	7	CPAAOF	PA-A OFF		CPA1	OFF					LR	HLP				
8	8	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
8	8	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	2							NA	NA				
9	9	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 48 -- Transmitter and Power Amp Redundant Disable

Description:

This SCS turns off the redundant transmitter and power amp.

Main Steps in SCS:

Commands to turn off the redundant Transmitter
Commands to turn of the redundant Power Amplifier
End SCS command

What Phase is this SCS used in? What Patches are Required for Normal Operations?

This SCS is used to shed transmitter and power amp loads during long earth eclipses where ground contact is not planned.

Constraints:

Do not include this SCS in SCS 32 or SCS 33 if ground contact is anticipated during the eclipse. The daily load is used to manipulate the transmitter commands.
Commands are doubled-up to protect against SEU upset.
16 minor cycles between doubled commands, at least 2 minor cycles between adjacent non-like commands.
Transmitter must be turned off prior to Power Amp, so keep doubled-up transmitter disable commands ahead of Power Amp disable commands.

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	CTXBOF	TX-B OFF		CTXBX	OFF					LR	HLP				
2	2	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
2	2	COSRTDL1	Relative Time Delay (SCS Only) – Relative Time Delay (minor cycles)	16												
3	3	CTXBOF	TX-B OFF		CTXBX	OFF					LR	HLP				
4	4	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
4	4	COSRTDL1	Relative Time Delay (SCS Only) – Relative Time Delay (minor cycles)	2							NA	NA				
5	5	CPABOF	PA-B OFF		CPA2	OFF					LR	HLP				
6	6	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
6	6	COSRTDL1	Relative Time Delay (SCS Only) – Relative Time Delay (minor cycles)	16												
7	7	CPABOF	PA-B OFF		CPA2	OFF					LR	HLP				
8	8	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
8	8	COSRTDL1	Relative Time Delay (SCS Only) – Relative Time Delay (minor cycles)	2							NA	NA				
9	9	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 49 -- FLCA Prime Disable

Description:

This SCS turns off the Prime Fiducial Light Controller Assembly.

Main Steps in SCS:

FID light control command to turn off all FID lights.
Turn off the FID Light Controller Assembly
End SCS command

What Phase is this SCS used in? What Patches are Required for Normal Operations?

This SCS is used to shed FLCA loads for long earth eclipse passage.

Constraints:

Commands are doubled-up to protect against SEU upset.
16 minor cycles between doubled commands

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	AFIDP	FID LIGHT CONTROL PRIME (FLCA-A)--CONTAINS AN FLCA COMMAND WORD WITH: RESET, DMUX ADDRESS, DMUX CHANNEL, CURRENT LEVEL There is only one command which operates both sides, set the side you want to operate on/off with AFLCAA/BON/OF								SI	SD				
1	1	AFIDP01	AFIDP01 Filler --													
1	1	AFIDP02	Reset -- Zero's all current levels when reset and disables Dmux addressing.	1												
1	1	AFIDP03	Driver Dmux Address -- Chooses the dmux being commanded. DMux driver 1 - 00 DMux driver 2 - 01 DMux driver 3 - 10 DMux driver 4 - 11	00												
1	1	AFIDP04	Dmux channel Enable --	0												
1	1	AFIDP05	Dmux Channel Select -- 0 -	000												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			Channel 1, 1 - Channel 2, 2 - Channel 3, 3 - Channel 4, 4 - Channel 5, 5 - Channel 6, 6 - Channel 7, 7 - Channel 8													
1	1	AFIDP06	Current Level Command -- 0,1 - Off, residual current only 2..255 I(FLA)=((0.1432milliamp)/Count)*Current level Command - 0.221 milliamps	00000000												
2	2	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
2	2	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
3	3	AFLCAAOF	FLCA - A OFF		AFLCAAX	OFF					SI	LCC				
4	4	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
4	4	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
5	5	AFLCAAOF	FLCA - A OFF		AFLCAAX	OFF					SI	LCC				
6	6	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
6	6	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
7	7	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 50 -- FLCA Redundant Disable

Description:

This SCS turns off the Redundant Fiducial Light Controller Assembly.

Main Steps in SCS:

FID light control command to turn off all FID lights.
Turn off the FID Light Controller Assembly
End SCS command

What Phase is this SCS used in? What Patches are Required for Normal Operations?

This SCS is used to shed FLCA loads for long earth eclipse passage.

Constraints:

FLCA Off Commands are doubled-up to protect against SEU upset.
16 minor cycles between doubled commands

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	AFIDP	FID LIGHT CONTROL PRIME (FLCA-A)--CONTAINS AN FLCA COMMAND WORD WITH: RESET, DMUX ADDRESS, DMUX CHANNEL, CURRENT LEVEL There is only one command which operates both sides, set the side you want to operate on/off with AFLCAA/BON/OF								SI	SD				
1	1	AFIDP01	AFIDP01 Filler --													
1	1	AFIDP02	Reset -- Zero's all current levels when reset and disables Dmux addressing.	1												
1	1	AFIDP03	Driver Dmux Address -- Chooses the dmux being commanded. DMux driver 1 - 00 DMux driver 2 - 01 DMux driver 3 - 10 DMux driver 4 - 11	00												
1	1	AFIDP04	Dmux channel Enable --	0												
1	1	AFIDP05	Dmux Channel Select -- 0 -	000												

			Channel 1, 1 - Channel 2, 2 - Channel 3, 3 - Channel 4, 4 - Channel 5, 5 - Channel 6, 6 - Channel 7, 7 - Channel 8													
1	1	AFIDP06	Current Level Command -- 0,1 - Off, residual current only 2..255 I(FLA)=((0.1432milliamp)/Count)*Current level Command - 0.221 milliamps	00000000												
2	2	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
2	2	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
3	3	AFLCABOF	FLCA - B OFF		AFLCABX	OFF					SI	LCC				
4	4	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
4	4	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
5	5	AFLCABOF	FLCA - B OFF		AFLCABX	OFF					SI	LCC				
6	6	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
6	6	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
7	7	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 51 -- RCS Catbed Heaters Prime Disable

Description:

This SCS turns off the Prime RCS Catbed Heaters.

Main Steps in SCS:

Commands to Turn off Prime Catbed Heaters
End SCS command.

What Phase is this SCS used in? What Patches are Required for Normal Operations?

The RCS Catbed heaters are used during transfer orbit operations. Following IPS deactivation, these heaters can be used as "power ballast" in short earth eclipse conditions where additional loads are required.

Constraints:

Command is doubled-up to protect against SEU upset.
16 minor cycles between doubled commands.
Do not use this SCS during transfer orbit to prevent interruption of propulsion operations.

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	PCBPHOF	RCS CATBED HTR PRI OFF		PRCSCHPR	OFF					LR	HLP				
2	2	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
2	2	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
3	3	PCBPHOF	RCS CATBED HTR PRI OFF		PRCSCHPR	OFF					LR	HLP				
4	4	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
4	4	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
5	5	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 52 -- RCS Catbed Heaters Redundant Disable

Description:

This SCS turns off the Redundant RCS Catbed Heaters.

Main Steps in SCS:

Commands to Turn off Redundant Catbed Heaters
End SCS command.

What Phase is this SCS used in? What Patches are Required for Normal Operations?

The RCS Catbed heaters are used during transfer orbit operations. Following IPS deactivation, these heaters can be used as "power ballast" in short earth eclipse conditions where additional loads are required.

Constraints:

Command is doubled-up to protect against SEU upset.
16 minor cycles between doubled commands.
Do not use this SCS during transfer orbit to prevent interruption of propulsion operations.

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	PCBRHOF	RCS CATBED HTR RDNT OFF		PRCSCHRD	OFF					LR	HLP				
2	2	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
2	2	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
3	3	PCBRHOF	RCS CATBED HTR RDNT OFF		PRCSCHRD	OFF					LR	HLP				
4	4	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
4	4	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
5	5	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 53 -- LAE Heaters Prime Disable

Description:

This SCS turns off the prime LAE Injector Heaters for all four engines.

Main Steps in SCS:

Commands for Injector Heater #1 disable
Commands for Injector Heater #2 disable
Commands for Injector Heater #3 disable
Commands for Injector Heater #4 disable
End SCS command

What Phase is this SCS used in? What Patches are Required for Normal Operations?

The LAE Injector heaters are used during transfer orbit operations. Following IPS deactivation, these heaters can be used as "power ballast" in short earth eclipse conditions where additional loads are required.

Constraints:

Commands are doubled-up to protect against SEU upset.
Do not use this SCS during transfer orbit to prevent interruption of propulsion operations.
16 minor cycles between doubled commands, at least 2 minor cycles between adjacent non-like commands.
CAUTION: only one set of injector heaters, prime or redundant, is to be powered at any time.

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	PL1IHPOF	LAE 1 INJ HTR OFF PRI		PL1IHPR	OFF					EP	LCC				
2	2	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
2	2	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
3	3	PL1IHPOF	LAE 1 INJ HTR OFF PRI		PL1IHPR	OFF					EP	LCC				
4	4	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
4	4	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	2							NA	NA				
5	5	PL2IHPOF	LAE 2 INJ HTR OFF PRI		PL2IHPR	OFF					EP	LCC				
6	6	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
6	6	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
7	7	PL2IHPOF	LAE 2 INJ HTR OFF PRI		PL2IHPR	OFF					EP	LCC				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
8	8	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
8	8	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	2							NA	NA				
9	9	PL3IHPOF	LAE 3 INJ HTR OFF PRI		PL3IHPR	OFF					EP	LCC				
10	10	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
10	10	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
11	11	PL3IHPOF	LAE 3 INJ HTR OFF PRI		PL3IHPR	OFF					EP	LCC				
12	12	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
12	12	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	2							NA	NA				
13	13	PL4IHPOF	LAE 4 INJ HTR OFF PRI		PL4IHPR	OFF					EP	LCC				
14	14	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
14	14	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
15	15	PL4IHPOF	LAE 4 INJ HTR OFF PRI		PL4IHPR	OFF					EP	LCC				
16	16	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
16	16	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	2												
17	17	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 54 -- LAE Heaters Redundant Disable

Description:

This SCS turns off the redundant LAE Injector Heaters for all four engines.

Main Steps in SCS:

Commands for Injector Heater #1 disable
Commands for Injector Heater #2 disable
Commands for Injector Heater #3 disable
Commands for Injector Heater #4 disable
End SCS command

What Phase is this SCS used in? What Patches are Required for Normal Operations?

The LAE Injector heaters are used during transfer orbit operations. Following IPS deactivation, these heaters can be used as "power ballast" in short earth eclipse conditions where additional loads are required.

Constraints:

Commands are doubled-up to protect against SEU upset.
Do not use this SCS during transfer orbit to prevent interruption of propulsion operations.
16 minor cycles between doubled commands, at least 2 minor cycles between adjacent non-like commands.
CAUTION: only one set of injector heaters, prime or redundant, is to be powered at any time.

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	PL1IHROF	LAE 1 INJ HTR OFF RDNT		PL1IHRD	OFF					EP	LCC				
2	2	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
2	2	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
3	3	PL1IHROF	LAE 1 INJ HTR OFF RDNT		PL1IHRD	OFF					EP	LCC				
4	4	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
4	4	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	2							NA	NA				
5	5	PL2IHROF	LAE 2 INJ HTR OFF RDNT		PL2IHRD	OFF					EP	LCC				
6	6	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
6	6	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
7	7	PL2IHROF	LAE 2 INJ HTR OFF RDNT		PL2IHRD	OFF					EP	LCC				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
8	8	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
8	8	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	2							NA	NA				
9	9	PL3IHROF	LAE 3 INJ HTR OFF RDNT		PL3IHRD	OFF					EP	LCC				
10	10	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
10	10	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
11	11	PL3IHROF	LAE 3 INJ HTR OFF RDNT		PL3IHRD	OFF					EP	LCC				
12	12	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
12	12	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	2							NA	NA				
13	13	PL4IHROF	LAE 4 INJ HTR OFF RDNT		PL4IHRD	OFF					EP	LCC				
14	14	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
14	14	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
15	15	PL4IHROF	LAE 4 INJ HTR OFF RDNT		PL4IHRD	OFF					EP	LCC				
16	16	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
16	16	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	2												
17	17	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 55 – MCE-B LETG Insert Nudge

Description:

This SCS contains the MCE-B LETG Enable Execute relay command and Disable Execute relay command separated by a time delay. Inserting or retracting the gratings uses a combination of one large move and several small moves. Large moves get the grating close to the bumper, and small nudge moves incrementally close in on the end-of-travel position. Limit switch status is checked after each nudge move to detect the grating reaching the end of travel. Small moves are implemented by the Flight Software activating this SCS. SMALL_MOVE_SEQ is used by OTG_SUPPORT_PROC to perform the OTG small moves. This procedure checks whether the end-of-travel limit switch corresponding 27 March, 2001 77 OTG Flight Software Patch Design Document to the move in progress is actuated. If not, an SCS is activated to briefly enable the execute relay. Time between LS checks/SCS activations can be expanded in 8 m.c. increments by storing a value in Small_Move_Delay. The maximum number of small moves allowed during an OTG move operation is limited by KT.Max_Small_Moves.

Main Steps in SCS:

MCE-B Enable LETG Insertion/Retraction

2 minor cycle time delay

MCE-B Disable LETG Insertion/Retraction

What Phase is this SCS used in? What Patches are Required for Normal Operations?

This SCS is activated by the Flight Software during software controlled LETG Insertions.

Constraints:

None

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	4EXLGBEN	MCE B: EXEC LETG INSERTION/RETRACTION-- Command to Initiate OTG Transistion		4LEXRBX	ENAB					TS	HLP				
2	2	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
2	2	COSRTDLY	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	2							NA	NA				
3	3	4EXLGBDS	MCE B:DISA LETG INSERTION/RETRACTION		4LEXRBX	DISA					TS	HLP				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
4	4	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 56 – MCE-B HETG Insert Nudge

Description:

This SCS contains the MCE-B HETG Enable Execute relay command and Disable Execute relay command separated by a time delay. Inserting or retracting the gratings uses a combination of one large move and several small moves. Large moves get the grating close to the bumper, and small nudge moves incrementally close in on the end-of-travel position. Limit switch status is checked after each nudge move to detect the grating reaching the end of travel. Small moves are implemented by the Flight Software activating this SCS. SMALL_MOVE_SEQ is used by OTG_SUPPORT_PROC to perform the OTG small moves. This procedure checks whether the end-of-travel limit switch corresponding 27 March, 2001 77 OTG Flight Software Patch Design Document to the move in progress is actuated. If not, an SCS is activated to briefly enable the execute relay. Time between LS checks/SCS activations can be expanded in 8 m.c. increments by storing a value in Small_Move_Delay. The maximum number of small moves allowed during an OTG move operation is limited by KT.Max_Small_Moves.

Main Steps in SCS:

MCE-B Enable HETG Insertion/Retraction

1 minor cycle time delay

MCE-B Disable HETG Insertion/Retraction

What Phase is this SCS used in? What Patches are Required for Normal Operations?

This SCS is activated by the Flight Software during software controlled HETG Insertions.

Constraints:

None

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	4EXHGBEN	MCE B: EXEC HETG INSERTION/RETRACTION--COMMAND TO INITIATE OTG TRANSISTION		4HEXRBX	ENAB					TS	HLP				
2	2	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
2	2	COSRTDLY	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
3	3	4EXHGBDS	MCE B: DISA HETG INSERTION/RETRACTION		4HEXRBX	DISA					TS	HLP				
4	4	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 57 -- MCE-B LETG Retract Nudge

Description:

This SCS contains the MCE-B LETG Enable Execute relay command and Disable Execute relay command separated by a time delay. Inserting or retracting the gratings uses a combination of one large move and several small moves. Large moves get the grating close to the bumper, and small nudge moves incrementally close in on the end-of-travel position. Limit switch status is checked after each nudge move to detect the grating reaching the end of travel. Small moves are implemented by the Flight Software activating this SCS. SMALL_MOVE_SEQ is used by OTG_SUPPORT_PROC to perform the OTG small moves. This procedure checks whether the end-of-travel limit switch corresponding 27 March, 2001 77 OTG Flight Software Patch Design Document to the move in progress is actuated. If not, an SCS is activated to briefly enable the execute relay. Time between LS checks/SCS activations can be expanded in 8 m.c. increments by storing a value in Small_Move_Delay. The maximum number of small moves allowed during an OTG move operation is limited by KT.Max_Small_Moves.

Main Steps in SCS:

MCE-B Enable LETG Insertion/Retraction

2 minor cycle time delay

MCE-B Disable LETG Insertion/Retraction

What Phase is this SCS used in? What Patches are Required for Normal Operations?

This SCS is activated by the Flight Software during software controlled LETG Retractions.

Constraints:

None

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	4EXLGBEN	MCE B: EXEC LETG INSERTION/RETRACTION-- Command to Initiate OTG Transistion		4LEXRBX	ENAB					TS	HLP				
2	2	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
2	2	COSRTDLY	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	2							NA	NA				
3	3	4EXLGBDS	MCE B:DISA LETG INSERTION/RETRACTION		4LEXRBX	DISA					TS	HLP				
4	4	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 58 -- MCE-B HETG Retract Nudge

Description:

This SCS contains the MCE-B HETG Enable Execute relay command and Disable Execute relay command separated by a time delay. Inserting or retracting the gratings uses a combination of one large move and several small moves. Large moves get the grating close to the bumper, and small nudge moves incrementally close in on the end-of-travel position. Limit switch status is checked after each nudge move to detect the grating reaching the end of travel. Small moves are implemented by the Flight Software activating this SCS. SMALL_MOVE_SEQ is used by OTG_SUPPORT_PROC to perform the OTG small moves. This procedure checks whether the end-of-travel limit switch corresponding 27 March, 2001 77 OTG Flight Software Patch Design Document to the move in progress is actuated. If not, an SCS is activated to briefly enable the execute relay. Time between LS checks/SCS activations can be expanded in 8 m.c. increments by storing a value in Small_Move_Delay. The maximum number of small moves allowed during an OTG move operation is limited by KT.Max_Small_Moves.

Main Steps in SCS:

MCE-B Enable HETG Insertion/Retraction

1 minor cycle time delay

MCE-B Disable HETG Insertion/Retraction What Phase is this SCS used in? What Patches are Required for Normal Operations?

This SCS is activated by the Flight Software during software controlled HETG Retractions.

Constraints:

None

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	4EXHGBEN	MCE B: EXEC HETG INSERTION/RETRACTION-- COMMAND TO INITIATE OTG TRANSISTION		4HEXRBX	ENAB					TS	HLP				
2	2	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
2	2	COSRTDLY	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
3	3	4EXHGBDS	MCE B: DISA HETG INSERTION/RETRACTION		4HEXRBX	DISA					TS	HLP				
4	4	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 59 -- Spare SCS

Description:

This SCS is not used.

Main Steps in SCS:

End SCS command

What Phase is this SCS used in? What Patches are Required for Normal Operations?

Constraints:

None

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 60 -- PC RCTU Monitor Fault

Description:

This SCS is activated when the PC RCTU Monitor trips. This monitor protects against a failed PC RCTU, or if the RCTU has been shut down by an SEU.

Main Steps in SCS:

1. (See attached flow chart) Check to see which RCTU is on. If Prime is on, cycle Prime RCTU converter power, else cycle the redundant power
2. Reinitialize the following PCAD subfunctions:
   Reaction Wheel Monitors
   SADA position Monitor
   Dome Temperature Monitor
3. Disable LAE Directives in case an SEU shut down the PC RCTU while the LAEs were firing.

What Phase is this SCS used in? What Patches are Required for Normal Operations?

This SCS is used during all Mission Phases.

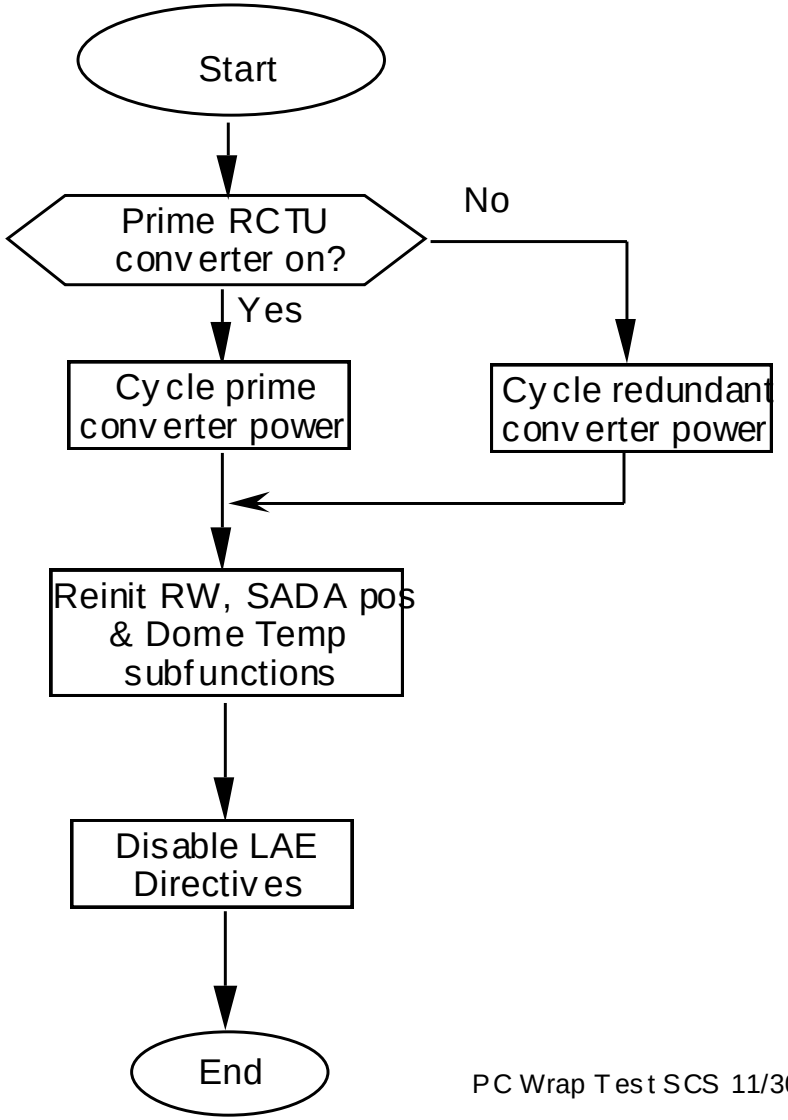
Constraints:

If this SCS is edited, be sure that the RCTU is brought back on line within one second of the failure. Many other protected SCSs are designed with this one second value in mind. Commands that go through this RCTU are doubled up with one second delays between them in the event that the RCTU is shut down by an SEU.

When the PC RCTU Monitor trips, the PC Cmd Wrap error (0e1e) will be observed in the OBC Error Log, and OBC Health and Status will activate SCS 60.

This SCS defaults to disabled upon OBC reset, and is automatically enabled by SCS #: 80 -- OO - Standby State Timeout.

Figure SCS 60-1 PC RCTU Wrap Test



Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	OCNDEVBR	CONDITIONAL EVENT BRANCH								NA	NA				
1	1	OCNDEVB1	OCCURRENCE FLAG -- 0 - EVENT FAILED TO OCCUR 1 - EVENT OCCURED	0												
1	1	OCNDEVB2	OCNDEVB1 EV NUMBER -- CONDITIONAL EVENT NUMBER BEING INTERROGATED.	20												
1	1	OCNDEVB3	OCNDEVBR SCS STEP -- SCS STEP NUMBER AT WHICH THE PROCESSING WILL CONTINUE	10												
2	2	CPCPOF	RCTU-PC PRI CONV PWR OFF		CTUPCA	OFF					LR	HLP				
3	3	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
3	3	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1												
4	4	CPCPOF	RCTU-PC PRI CONV PWR OFF		CTUPCA	OFF					LR	HLP				
5	5	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
5	5	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1												
6	6	CPCPON	RCTU-PC PRI CONV PWR ON		CTUPCA	ON					LR	HLP				
7	7	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
7	7	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1												
8	8	CPCPON	RCTU-PC PRI CONV PWR ON		CTUPCA	ON					LR	HLP				
9	9	COSBRCH	SCS SET STEP# (I.E.UNCONDITIONAL BRANCH)								NA	NA				
9	9	COSBRCH1	COSBRCH - SCS STEP -- SCS Step Number	17												
10	10	CPCROF	RCTU-PC RED CONV PWR OFF		CTUPCB	OFF					LR	HLP				
11	11	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
11	11	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1												
12	12	CPCROF	RCTU-PC RED CONV PWR OFF		CTUPCB	OFF					LR	HLP				
13	13	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
13	13	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1												
14	14	CPCRON	RCTU-PC RED CONV PWR ON		CTUPCB	ON					LR	HLP				
15	15	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
15	15	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1												
16	16	CPCRON	RCTU-PC RED CONV PWR ON		CTUPCB	ON					LR	HLP				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
17	17	AOFUNCEN	PCAD SUBFUNCTION ENABLE / REINIT								NA	NA				
17	17	AOPCADSE	PCAD Subfunction for EN	33												
18	18	AOFUNCEN	PCAD SUBFUNCTION ENABLE / REINIT								NA	NA				
18	18	AOPCADSE	PCAD Subfunction for EN	35												
19	19	AOFUNCEN	PCAD SUBFUNCTION ENABLE / REINIT								NA	NA				
19	19	AOPCADSE	PCAD Subfunction for EN	37												
20	20	AODRLAED	OBC DIRECTIVES LAE DISABLE		AOLAEDEN	DISA					NA	NA				
21	21	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
21	21	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	9												
22	22	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 61 -- ESA and ESA Heater Prime Enable

Description:

This SCS turns ON the prime ESA and prime ESA heaters

Main Steps in SCS:

Turn on the Prime Earth Sensor
Turn on the Prime Earth Sensor Heaters.
End SCS command

What Phase is this SCS used in? What Patches are Required for Normal Operations?

This SCS is used to turn on the ESA and ESA heater circuits. The ESA and ESA heaters are no longer used during the mission following SSD opening and successful operation of the Aspect Determination System. However, these can be used for “power ballast” in short earth eclipse conditions where additional loads are required.

Constraints:

Do not use this SCS prior SSD opening to prevent interruption of PCAD operations.
Commands are doubled-up to protect against SEU upset.
16 minor cycles between doubled commands, at least 1 minor cycles between adjacent non-like commands.

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	AESAAON	ESA-A PWR ON		AESAA	ON					PC	LCC				
2	2	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
2	2	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
3	3	AESAAON	ESA-A PWR ON		AESAA	ON					PC	LCC				
4	4	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
4	4	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
5	5	EESP1HON	HTR BUS 9: ESA/ESE PRI ENAB (CH0)		TESAPHT1	ENAB	TESAPHT2	ENAB			EP	SD	2	5	32	K12B
6	6	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
6	6	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
7	7	EESP1HON	HTR BUS 9: ESA/ESE PRI ENAB (CH0)		TESAPHT1	ENAB	TESAPHT2	ENAB			EP	SD	2	5	32	K12B
8	8	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
8	8	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
9	9	EESP2HON	HTR BUS 9: ESA/ESE PRI ENAB (CH1)		TESAPHT1	ENAB	TESAPHT2	ENAB			EP	SD	2	5	32	K12B
10	10	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
10	10	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
11	11	EESP2HON	HTR BUS 9: ESA/ESE PRI ENAB (CH1)		TESAPHT1	ENAB	TESAPHT2	ENAB			EP	SD	2	5	32	K12B
12	12	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
12	12	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
13	13	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 62 -- ESA and ESA Heater Redundant Enable

Description:

This SCS turns ON the redundant ESA and redundant ESA heaters

Main Steps in SCS:

Turn on the redundant Earth Sensor
Turn on the redundant Earth Sensor Heaters.
End SCS command

What Phase is this SCS used in? What Patches are Required for Normal Operations?

This SCS is used to turn on the ESA and ESA heater circuits. The ESA and ESA heaters are no longer used during the mission following SSD opening and successful operation of the Aspect Determination System. However, these can be used for "power ballast" in short earth eclipse conditions where additional loads are required.

Constraints:

Do not use this SCS prior SSD opening to prevent interruption of PCAD operations.
Commands are doubled-up to protect against SEU upset.
16 minor cycles between doubled commands, at least 1 minor cycles between adjacent non-like commands.

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	AESABON	ESA-B PWR ON		AESAB	ON					PC	LCC				
2	2	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
2	2	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
3	3	AESABON	ESA-B PWR ON		AESAB	ON					PC	LCC				
4	4	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
4	4	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
5	5	EESR1HON	HTR BUS 18: ESA/ESE RDNT ENAB (CH0)		TESARHT1	ENAB	TESARHT2	ENAB			EP	SD	2	5	32	K12B
6	6	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
6	6	COSRTDL1	Relative Time Delay (SCS Only) – Relative Time Delay (minor cycles)	16							NA	NA				
7	7	EESR1HON	HTR BUS 18: ESA/ESE RDNT ENAB (CH0)		TESARHT1	ENAB	TESARHT2	ENAB			EP	SD	2	5	32	K12B
8	8	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
8	8	COSRTDL1	Relative Time Delay (SCS Only) – Relative Time Delay (minor cycles)	1							NA	NA				
9	9	EESR2HON	HTR BUS 18: ESA/ESE RDNT ENAB (CH1)		TESARHT1	ENAB	TESARHT2	ENAB			EP	SD	2	5	32	K12B
10	10	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
10	10	COSRTDL1	Relative Time Delay (SCS Only) – Relative Time Delay (minor cycles)	16							NA	NA				
11	11	EESR2HON	HTR BUS 18: ESA/ESE RDNT ENAB (CH1)		TESARHT1	ENAB	TESARHT2	ENAB			EP	SD	2	5	32	K12B
12	12	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
12	12	COSRTDL1	Relative Time Delay (SCS Only) – Relative Time Delay (minor cycles)	1							NA	NA				
13	13	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 63 -- Transmitter and Power Amp Prime Enable

Description:

This SCS turns ON the prime transmitter and power amp

Main Steps in SCS:

Commands to turn on the prime Power Amplifier
Commands to turn on the prime Transmitter
End SCS command

What Phase is this SCS used in? What Patches are Required for Normal Operations?

This SCS is used to turn on transmitter and power amp loads. This command sequence does not include any link configuration commands.

Constraints:

Do not include this SCS in SCS 32 or SCS 33 if ground contact is anticipated during the eclipse. The daily load is used to manipulate the transmitter commands.

Commands are doubled-up to protect against SEU upset.

16 minor cycles between doubled commands, at least 2 minor cycles between adjacent non-like commands.

Power Amp must be turned on prior to Transmitter, so keep doubled-up Power Amp enable commands ahead of Transmitter enable commands.

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	CPAAON	PA-A ON		CPA1	ON					LR	HLP				
2	2	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
2	2	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
3	3	CPAAON	PA-A ON		CPA1	ON					LR	HLP				
4	4	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
4	4	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	2							NA	NA				
5	5	CTXAON	TX-A ON		CTXAX	ON					LR	HLP				
6	6	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
6	6	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
7	7	CTXAON	TX-A ON		CTXAX	ON					LR	HLP				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
8	8	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
8	8	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	2							NA	NA				
9	9	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 64 -- Transmitter and Power Amp Redundant Enable

Description:

This SCS turns ON the redundant transmitter and power amp

Main Steps in SCS:

Commands to turn on the redundant Power Amplifier

Commands to turn on the redundant Transmitter

End SCS command

What Phase is this SCS used in? What Patches are Required for Normal Operations?

This SCS is used to turn on transmitter and power amp loads. This command sequence does not include any link configuration commands.

Constraints:

Do not include this SCS in SCS 32 or SCS 33 if ground contact is anticipated during the eclipse. The daily load is used to manipulate the transmitter commands.

Commands are doubled-up to protect against SEU upset.

16 minor cycles between doubled commands, at least 2 minor cycles between adjacent non-like commands.

Power Amp must be turned on prior to Transmitter, so keep doubled-up Power Amp enable commands ahead of Transmitter enable commands.

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	CPABON	PA-B ON		CPA2	ON					LR	HLP				
2	2	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
2	2	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
3	3	CPABON	PA-B ON		CPA2	ON					LR	HLP				
4	4	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
4	4	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	2							NA	NA				
5	5	CTXBON	TX-B ON		CTXBX	ON					LR	HLP				
6	6	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
6	6	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
7	7	CTXBON	TX-B ON		CTXBX	ON					LR	HLP				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
8	8	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
8	8	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	2							NA	NA				
9	9	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 65 -- Fuel Tank Heater Prime and Redundant Enable

Description:

This SCS turns on the prime and redundant Fuel Tank Heaters

Main Steps in SCS:

Commands to enable prime Tank Heater
Commands to enable redundant Tank Heater
End SCS command

What Phase is this SCS used in? What Patches are Required for Normal Operations?

This SCS is used to restore Fuel Tank Heater loads following exit from long earth eclipses.

Constraints:

Commands are doubled-up to prevent against SEU.
16 minor cycles between doubled commands, at least 2 minor cycles between adjacent non-like commands.

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	PFTPHEN	FUEL TANK HTR PRI ENAB		EFTHTRPR	ENAB					LR	HLP				
2	2	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
2	2	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
3	3	PFTPHEN	FUEL TANK HTR PRI ENAB		EFTHTRPR	ENAB					LR	HLP				
4	4	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
4	4	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	2							NA	NA				
5	5	PFTRHEN	FUEL TANK HTR RDNT ENAB		EFTHTRRD	ENAB					EP	HLP				
6	6	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
6	6	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
7	7	PFTRHEN	FUEL TANK HTR RDNT ENAB		EFTHTRRD	ENAB					EP	HLP				
8	8	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
8	8	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	2							NA	NA				
9	9	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 66 -- FLCA Prime Enable

Description:

This SCS turns on the Prime Fiducial Light Controller Assembly.

Main Steps in SCS:

Turn on the FID Light Controller Assembly
FID light control command to turn off all FID lights.
End SCS command

What Phase is this SCS used in? What Patches are Required for Normal Operations?

This SCS is used to restore FLCA loads following exit from a long earth eclipse passage.

Constraints:

Commands are doubled-up to protect against SEU upset.
16 minor cycles between doubled commands

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	AFLCAAON	FLCA - A ON		AFLCAAX	ON					SI	LCC				
2	2	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
2	2	COSRTDL1	Relative Time Delay (SCS Only) – Relative Time Delay (minor cycles)	16												
3	3	AFLCAAON	FLCA - A ON		AFLCAAX	ON					SI	LCC				
4	4	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
4	4	COSRTDL1	Relative Time Delay (SCS Only) – Relative Time Delay (minor cycles)	16												
5	5	AFIDP	FID LIGHT CONTROL PRIME (FLCA-A)--CONTAINS AN FLCA COMMAND WORD WITH: RESET, DMUX ADDRESS, DMUX CHANNEL, CURRENT LEVEL There is only one command which operates both sides, set the side you want to operate on/off with AFLCAA/BON/OF								SI	SD				
5	5	AFIDP01	AFIDP01 Filler --													
5	5	AFIDP02	Reset -- Zero's all current levels when reset and disables Dmux addressing.	1												

5	5	AFIDP03	Driver Dmux Address -- Chooses the dmux being commanded. DMux driver 1 - 00 DMux driver 2 - 01 DMux driver 3 - 10 DMux driver 4 - 11	00													
5	5	AFIDP04	Dmux channel Enable --	0													
5	5	AFIDP05	Dmux Channel Select -- 0 - Channel 1, 1 - Channel 2, 2 - Channel 3, 3 - Channel 4, 4 - Channel 5, 5 - Channel 6, 6 - Channel 7, 7 - Channel 8	000													
5	5	AFIDP06	Current Level Command -- 0,1 - Off, residual current only 2..255 I(FLA)=((0.1432milliamp)/Count)*Current level Command - 0.221 milliamps	00000000													
6	6	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA					
6	6	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16													
7	7	AFIDP	FID LIGHT CONTROL PRIME (FLCA-A)--CONTAINS AN FLCA COMMAND WORD WITH: RESET, DMUX ADDRESS, DMUX CHANNEL, CURRENT LEVEL There is only one command which operates both sides, set the side you want to operate on/off with AFLCAA/BON/OF								SI	SD					
7	7	AFIDP01	AFIDP01 Filler --														
7	7	AFIDP02	Reset -- Zero's all current levels when reset and disables Dmux addressing.	1													
7	7	AFIDP03	Driver Dmux Address -- Chooses the dmux being commanded. DMux driver 1 - 00 DMux driver 2 - 01 DMux driver 3 - 10 DMux driver 4 - 11	00													
7	7	AFIDP04	Dmux channel Enable --	0													
7	7	AFIDP05	Dmux Channel Select -- 0 - Channel 1, 1 - Channel 2, 2 - Channel 3, 3 - Channel 4, 4 - Channel 5, 5 - Channel 6, 6 -	000													

			Channel 7, 7 - Channel 8														
7	7	AFIDP06	Current Level Command -- 0,1 - Off, residual current only 2..255 I(FLA)=((0.1432milliamp)/Count)*Current level Command - 0.221 milliamps	00000000													
8	8	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA					
8	8	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA					
9	9	COSCSEND	END SCS (SCS ONLY)								NA	NA					

SCS #: 67 -- FLCA Redundant Enable

Description:

This SCS turns on the Redundant Fiducial Light Controller Assembly.

Main Steps in SCS:

Turn on the FID Light Controller Assembly
FID light control command to turn off all FID lights.
End SCS command

What Phase is this SCS used in? What Patches are Required for Normal Operations?

This SCS is used to restore FLCA loads following exit from a long earth eclipse passage.

Constraints:

Commands are doubled-up to protect against SEU upset.
16 minor cycles between doubled commands

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	AFLCABON	FLCA - B ON		AFLCABX	ON					SI	LCC				
2	2	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
2	2	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
3	3	AFLCABON	FLCA - B ON		AFLCABX	ON					SI	LCC				
4	4	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
4	4	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
5	5	AFIDP	FID LIGHT CONTROL PRIME (FLCA-A)--CONTAINS AN FLCA COMMAND WORD WITH: RESET, DMUX ADDRESS, DMUX CHANNEL, CURRENT LEVEL There is only one command which operates both sides, set the side you want to operate on/off with AFLCAA/BON/OF								SI	SD				
5	5	AFIDP01	AFIDP01 Filler --													
5	5	AFIDP02	Reset -- Zero's all current levels when reset and disables Dmux addressing.	1												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
5	5	AFIDP03	Driver Dmux Address -- Chooses the dmux being commanded. DMux driver 1 - 00 DMux driver 2 - 01 DMux driver 3 - 10 DMux driver 4 - 11	00												
5	5	AFIDP04	Dmux channel Enable --	0												
5	5	AFIDP05	Dmux Channel Select -- 0 - Channel 1, 1 - Channel 2, 2 - Channel 3, 3 - Channel 4, 4 - Channel 5, 5 - Channel 6, 6 - Channel 7, 7 - Channel 8	000												
5	5	AFIDP06	Current Level Command -- 0,1 - Off, residual current only 2..255 I(FLA)=((0.1432milliamp)/Count)*Current level Command - 0.221 milliamps	0000000												
6	6	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
6	6	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
7	7	AFIDP	FID LIGHT CONTROL PRIME (FLCA-A)--CONTAINS AN FLCA COMMAND WORD WITH: RESET, DMUX ADDRESS, DMUX CHANNEL, CURRENT LEVEL There is only one command which operates both sides, set the side you want to operate on/off with AFLCAA/BON/OF								SI	SD				
7	7	AFIDP01	AFIDP01 Filler --													
7	7	AFIDP02	Reset -- Zero's all current levels when reset and disables Dmux addressing.	1												
7	7	AFIDP03	Driver Dmux Address -- Chooses the dmux being commanded. DMux driver 1 - 00 DMux driver 2 - 01 DMux driver 3 - 10 DMux driver 4 - 11	00												
7	7	AFIDP04	Dmux channel Enable --	0												
7	7	AFIDP05	Dmux Channel Select -- 0 - Channel 1, 1 - Channel 2, 2 - Channel 3, 3 - Channel 4, 4 -	000												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			Channel 5, 5 - Channel 6, 6 - Channel 7, 7 - Channel 8													
7	7	AFIDP06	Current Level Command -- 0,1 - Off, residual current only 2..255 I(FLA)=((0.1432milliamp)/Count)*Current level Command - 0.221 milliamps	00000000												
8	8	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
8	8	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
9	9	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 68 -- Telescope OBA Heater Zone Enable

Description:

This SCS turns on the OBA heater zones control.

Main Steps in SCS:

Command Re-initialize Telescope thermal control. This command resets any error flags, and resets the health and safety timers to start counting down. This command does NOT select the IP or database to use.

Command Enable OBA Thermal Control

End SCS command

What Phase is this SCS used in? What Patches are Required for Normal Operations?

This command sequence is used to restore OBA heater zone control after exit from a long eclipse. This command sequence does not contain any hardware commands. The commands are only to the software process, therefore they do not need to be doubled–up. This also means the commands are also hardware independent.

The health and safety counters by default are set to 15 hours for the OBA and 90 hours for the HRMA. These allow time for the thermal control system to stabilize before reporting thermal faults.

Constraints:

None

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	4OTELTCR	REINITIALIZE TELESCOPE THERMAL CONTROL		4ORINITC	TRUE					NA	NA				
2	2	4OOBTCEN	ENABLE OBA THERMAL CONTROL		4OACOBAH	ENAB					NA	NA				
3	3	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
3	3	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
4	4	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 69 -- HRC Turn On (into Standby)

Description:

This SCS performs a controlled turn on the HRC instrument into a standby mode.

Main Steps in SCS:

1. Turn on +5v power supply A.
2. Turn off Spectroscopy Detector HV power supply.
3. Set HRC-S Top Plate to zero volts
4. Set HRC-S Bottom Plate to zero volts
5. Enable HRC-S HV Current Limit
6. Turn off Antico Shield A HV power supply
7. Set Antico Shield A HV to zero volts
8. Turn off Imaging Detector HV power supply
9. Set HRC-I Top Plate to zero volts
10. Set HRC-I Bottom Plate to zero volts
11. Enable HRC-I HV Current Limit
12. Turn off Antico Shield B HV power supply
13. Set Antico Shield B HV to zero volts
14. Disable Motor Drive
15. Reset Motion Control
16. De-select all motors
17. Turn on +15V power supply
18. Turn on +24V power supply
19. Antico Shield PMT 1 select preamp A
20. Antico Shield PMT 2 select preamp B
21. Select Next In Line Mode
22. Reset DATA FIFO
23. End SCS command.

What Phase is this SCS used in? What Patches are Required for Normal Operations?

This SCS is used for powering up the HRC following a long earth eclipse or an unplanned event during a long eclipse season. SCS 33, configured for long eclipse season, would contain the call to this SCS.

Constraints:

This SCS should only be modified and approved for use by the Chandra X-ray Science Center.

A one-second delay is required between HRC commands.

Commands are doubled to protect against SEU upset. Commands are doubled individually to maintain correct command order.

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	205VAON	+5V LV PWR SUPPLY A ON		2PS5AON	ON	2P05VAVL	NONE	2C05PALV		SI	HLP				
2	2	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
2	2	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
3	3	205VAON	+5V LV PWR SUPPLY A ON		2PS5AON	ON	2P05VAVL	NONE	2C05PALV		SI	HLP				
4	4	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
4	4	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
5	5	2SPHVOF	SPECT DET HV OFF--TURNS OFF SP HVPS. BITS 19-26 ARE THE COMMAND NUMBER (01 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=0 TURNS OFF THE SUPPLY.		2SPONST	OFF					SI	SD				
6	6	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
6	6	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
7	7	2SPHVOF	SPECT DET HV OFF--TURNS OFF SP HVPS. BITS 19-26 ARE THE COMMAND NUMBER (01 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=0 TURNS OFF THE SUPPLY.		2SPONST	OFF					SI	SD				
8	8	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
8	8	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
9	9	2SPTTHV	SPECT DET TOP PLATE HV SETTING-- SETS VOLTAGE AT TOP OF SP TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DONT CARE, AND		2SPTPAST	NONE	2SPHBLV	NONE			SI	SD				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.													
9	9	2SPTTHV1	Filler --													
9	9	2SPTTHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF SP TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.	0												
10	10	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
10	10	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
11	11	2SPTTHV	SPECT DET TOP PLATE HV SETTING-- SETS VOLTAGE AT TOP OF SP TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.		2SPTPAST	NONE	2SPHBLV	NONE			SI	SD				
11	11	2SPTTHV1	Filler --													
11	11	2SPTTHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF SP TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.	0												
12	12	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
12	12	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
13	13	2SPTBHV	SPECT DET BOTTOM PLATE HV SETTING-- SETS VOLTAGE AT TOP OF SP BOTTOM CHANNEL		2SPBPAST	NONE	2SPHVLV	NONE			SI	SD				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.													
13	13	2SPTBHV1	Filler --													
13	13	2SPTBHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF SP BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.	0												
14	14	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
14	14	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
15	15	2SPTBHV	SPECT DET BOTTOM PLATE HV SETTING-- SETS VOLTAGE AT TOP OF SP BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.		2SPBPAST	NONE	2SPHVLV	NONE			SI	SD				
15	15	2SPTBHV1	Filler --													
15	15	2SPTBHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF SP BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.	0												
16	16	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
16	16	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
17	17	2SPCLEN	SPECT HV CURRENT LIMIT ENABLE--DISABLES SP HV OUTPUT CURRENT LIMITER. BITS 19-26 ARE THE COMMAND NUMBER (04 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=1 ENABLES THE LIMITER.		2SPCLST	ENAB					SI	SD				
18	18	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
18	18	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
19	19	2SPCLEN	SPECT HV CURRENT LIMIT ENABLE--DISABLES SP HV OUTPUT CURRENT LIMITER. BITS 19-26 ARE THE COMMAND NUMBER (04 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=1 ENABLES THE LIMITER.		2SPCLST	ENAB					SI	SD				
20	20	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
20	20	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
21	21	2S1HVOF	SHIELD HVPS A OFF--TURNS OFF SHIELD HVPS A. BITS 19-26 ARE THE COMMAND NUMBER (05 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=0 TURNS OFF THE SUPPLY.		2S1ONST	OFF					SI	SD				
22	22	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
22	22	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
23	23	2S1HVOF	SHIELD HVPS A OFF--TURNS OFF SHIELD HVPS A. BITS 19-26 ARE THE COMMAND NUMBER (05 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=0 TURNS OFF THE SUPPLY.		2S1ONST	OFF					SI	SD				
24	24	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
24	24	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
25	25	2S1STHV	SHIELD HVPS A STEP-- SETS VOLTAGE ACROSS PMT A BLEEDER STRING. BITS 19-26 ARE THE COMMAND NUMBER (06 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT 16 VOLTS PER COUNT. EXAMPLES: 0600 HEX		2S1HVST	NONE					SI	SD				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			= 0 VOLTS, 0620H=48 VOLTS, 067FH=2032 VOLTS.													
25	25	2S1STHV1	Filler --													
25	25	2S1STHV2	VOLTAGE STEPS -- SETS VOLTAGE ACROSS PMT A BLEEDER STRING. BITS 19-26 ARE THE COMMAND NUMBER (06 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT 16 VOLTS PER COUNT. EXAMPLES: 0600 HEX = 0 VOLTS, 0620H=48 VOLTS, 067FH=2032 VOLTS.	0												
26	26	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
26	26	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
27	27	2S1STHV	SHIELD HVPS A STEP-- SETS VOLTAGE ACROSS PMT A BLEEDER STRING. BITS 19-26 ARE THE COMMAND NUMBER (06 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT 16 VOLTS PER COUNT. EXAMPLES: 0600 HEX = 0 VOLTS, 0620H=48 VOLTS, 067FH=2032 VOLTS.		2S1HVST	NONE					SI	SD				
27	27	2S1STHV1	Filler --													
27	27	2S1STHV2	VOLTAGE STEPS -- SETS VOLTAGE ACROSS PMT A BLEEDER STRING. BITS 19-26 ARE THE COMMAND NUMBER (06 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT 16 VOLTS PER COUNT. EXAMPLES: 0600 HEX = 0 VOLTS, 0620H=48 VOLTS, 067FH=2032 VOLTS.	0												
28	28	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
28	28	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
29	29	2IMHVOF	IMAGING DET HV OFF--TURNS OFF IM HVPS. BITS 19-26 ARE THE COMMAND NUMBER (01 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=0 TURNS OFF THE SUPPLY.		2IMONST	OFF					SI	SD				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
30	30	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
30	30	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
31	31	2IMHVOF	IMAGING DET HV OFF--TURNS OFF IM HVPS. BITS 19-26 ARE THE COMMAND NUMBER (01 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=0 TURNS OFF THE SUPPLY.		2IMONST	OFF					SI	SD				
32	32	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
32	32	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
33	33	2IMTTHV	IMAGING DET TOP PLATE HV SETTING-- SETS VOLTAGE AT TOP OF IM TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.		2IMTPAST	NONE	2IMHBLV	NONE			SI	SD				
33	33	2IMTTHV1	Filler --													
33	33	2IMTTHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF IM TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.	0												
34	34	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
34	34	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
35	35	2IMTTHV	IMAGING DET TOP PLATE HV SETTING-- SETS VOLTAGE AT TOP OF IM TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS,		2IMTPAST	NONE	2IMHBLV	NONE			SI	SD				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			027FH=-5080 VOLTS.													
35	35	2IMTTHV1	Filler --													
35	35	2IMTTHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF IM TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.	0												
36	36	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
36	36	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
37	37	2IMTBHV	IMAGING DET BOTTOM PLATE HV SETTING-- SETS VOLTAGE AT TOP OF IM BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.		2IMBPAST	NONE	2IMHVLV	NONE			SI	SD				
37	37	2IMTBHV1	Filler --													
37	37	2IMTBHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF IM BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.	0												
38	38	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
38	38	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
39	39	2IMTBHV	IMAGING DET BOTTOM PLATE HV SETTING-- SETS VOLTAGE AT TOP OF IM BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE		2IMBPAST	NONE	2IMHVLV	NONE			SI	SD				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.													
39	39	2IMTBHV1	Filler --													
39	39	2IMTBHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF IM BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.	0												
40	40	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
40	40	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
41	41	2IMCLEN	IMAGING HV CURRENT LIMIT ENABLE--DISABLES IM HV OUTPUT CURRENT LIMITER. BITS 19-26 ARE THE COMMAND NUMBER (04 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=1 ENABLES THE LIMITER.		2IMCLST	ENAB					SI	SD				
42	42	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
42	42	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
43	43	2IMCLEN	IMAGING HV CURRENT LIMIT ENABLE--DISABLES IM HV OUTPUT CURRENT LIMITER. BITS 19-26 ARE THE COMMAND NUMBER (04 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=1 ENABLES THE LIMITER.		2IMCLST	ENAB					SI	SD				
44	44	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
44	44	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
45	45	2S2HVOF	SHIELD HVPS B OFF--TURNS OFF SHIELD HVPS B. BITS 19-26 ARE THE COMMAND NUMBER (05 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=0 TURNS OFF THE SUPPLY.		2S2ONST	OFF					SI	SD				
46	46	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
46	46	COSRTDL1	Relative Time Delay (SCS Only) --	16												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			Relative Time Delay (minor cycles)													
47	47	2S2HVOF	SHIELD HVPS B OFF--TURNS OFF SHIELD HVPS B. BITS 19-26 ARE THE COMMAND NUMBER (05 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=0 TURNS OFF THE SUPPLY.		2S2ONST	OFF					SI	SD				
48	48	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
48	48	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
49	49	2S2STHV	SHIELD HVPS B STEP-- SETS VOLTAGE ACROSS PMT B BLEEDER STRING. BITS 19-26 ARE THE COMMAND NUMBER (06 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT 16 VOLTS PER COUNT. EXAMPLES: 0600 HEX = 0 VOLTS, 0620H=48 VOLTS, 067FH=2032 VOLTS.		2S2HVST	NONE					SI	SD				
49	49	2S2STHV1	Filler --													
49	49	2S2STHV2	VOLTAGE STEPS -- SETS VOLTAGE ACROSS PMT B BLEEDER STRING. BITS 19-26 ARE THE COMMAND NUMBER (06 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT 16 VOLTS PER COUNT. EXAMPLES: 0600 HEX = 0 VOLTS, 0620H=48 VOLTS, 067FH=2032 VOLTS.	0												
50	50	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
50	50	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
51	51	2S2STHV	SHIELD HVPS B STEP-- SETS VOLTAGE ACROSS PMT B BLEEDER STRING. BITS 19-26 ARE THE COMMAND NUMBER (06 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT 16 VOLTS PER COUNT. EXAMPLES: 0600 HEX = 0 VOLTS, 0620H=48 VOLTS, 067FH=2032 VOLTS.		2S2HVST	NONE					SI	SD				
51	51	2S2STHV1	Filler --													
51	51	2S2STHV2	VOLTAGE STEPS -- SETS VOLTAGE ACROSS PMT B	0												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			BLEEDER STRING. BITS 19-26 ARE THE COMMAND NUMBER (06 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT 16 VOLTS PER COUNT. EXAMPLES: 0600 HEX = 0 VOLTS, 0620H=48 VOLTS, 067FH=2032 VOLTS.													
52	52	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
52	52	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
53	53	2MDRVADI	MOTOR DRIVE DISABLE--APPLIES POWER TO SELECTED MOTOR CIRCUIT. BITS 19-26 ARE THE COMMAND NUMBER (68 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=0 SETS THIS MODE.		2MDRVAST	DISA					SI	SD				
54	54	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
54	54	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
55	55	2MDRVADI	MOTOR DRIVE DISABLE--APPLIES POWER TO SELECTED MOTOR CIRCUIT. BITS 19-26 ARE THE COMMAND NUMBER (68 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=0 SETS THIS MODE.		2MDRVAST	DISA					SI	SD				
56	56	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
56	56	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
57	57	2MCMRASL	MOTION CONTROL MODE RESET--PREVENTS MOTION CONTROL MODES 2MVPSAEX, 2MVLAAEX, 2MVLBAEX, 2NSTAAEX, AND 2NSTBAEX FROM BEING EXECUTED. BITS 19-26 ARE THE COMMAND NUMBER (6F HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=1 SETS THIS MODE.		2MCMDARS	RSET					SI	SD				
58	58	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
58	58	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
59	59	2MCMRASL	MOTION CONTROL MODE RESET--PREVENTS MOTION		2MCMDARS	RSET					SI	SD				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			CONTROL MODES 2MVPSAEX, 2MVLAAEX, 2MVLBAEX, 2NSTAAEX, AND 2NSTBAEX FROM BEING EXECUTED. BITS 19-26 ARE THE COMMAND NUMBER (6F HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=1 SETS THIS MODE.													
60	60	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
60	60	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
61	61	2ALMTADS	ALL MOTORS DESELECT-- DESELECTS ALL MOTORS. BITS 19-26 ARE THE COMMAND NUMBER (70 HEX), BITS 27-34 ARE DONT CARE.		2ALMTAST	NSEL					SI	SD				
62	62	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
62	62	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
63	63	2ALMTADS	ALL MOTORS DESELECT-- DESELECTS ALL MOTORS. BITS 19-26 ARE THE COMMAND NUMBER (70 HEX), BITS 27-34 ARE DONT CARE.		2ALMTAST	NSEL					SI	SD				
64	64	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
64	64	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
65	65	215PCAON	+15V LV PWR SUPPLY ON-- TURNS ON +15V LVPS. BITS 19-26 ARE THE COMMAND NUMBER (10 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=1 TURNS ON THE SUPPLY.		215PCAST	ON	2P15VAVL	NONE	2C15PALV		SI	SD				
66	66	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
66	66	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
67	67	215PCAON	+15V LV PWR SUPPLY ON-- TURNS ON +15V LVPS. BITS 19-26 ARE THE COMMAND NUMBER (10 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=1 TURNS ON THE SUPPLY.		215PCAST	ON	2P15VAVL	NONE	2C15PALV		SI	SD				
68	68	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
68	68	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	32							NA	NA				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
69	69	224PCAON	+24V LV PWR SUPPLY ON--TURNS ON +24V LVPS. BITS 19-26 ARE THE COMMAND NUMBER (12 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=1 TURNS ON THE SUPPLY.		224PCAST	ON	2P24VAVL	NONE	2C24PALV		SI	SD				
70	70	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
70	70	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
71	71	224PCAON	+24V LV PWR SUPPLY ON--TURNS ON +24V LVPS. BITS 19-26 ARE THE COMMAND NUMBER (12 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=1 TURNS ON THE SUPPLY.		224PCAST	ON	2P24VAVL	NONE	2C24PALV		SI	SD				
72	72	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
72	72	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1405							NA	NA				
73	73	2PRA1SL	SHIELD PMT 1 SEL, PREAMP A		2ELEASS	PMT1					SI	HLP				
74	74	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
74	74	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
75	75	2PRA1SL	SHIELD PMT 1 SEL, PREAMP A		2ELEASS	PMT1					SI	HLP				
76	76	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
76	76	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
77	77	2PRB2SL	SHIELD PMT 2 SEL, PREAMP B		2ELEBSS	PMT2					SI	HLP				
78	78	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
78	78	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
79	79	2PRB2SL	SHIELD PMT 2 SEL, PREAMP B		2ELEBSS	PMT2					SI	HLP				
80	80	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
80	80	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
81	81	2NXILASL	NEXT-IN-LINE MODE SELECT--SETS THE TELEMETRY OUTPUT FOR OBSERVING AS THE NEXT IN LINE SCIENCE INSTRUMENT. BITS 19-26 ARE THE COMMAND NUMBER (1A HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=1 SETS THIS MODE.		2OBNLASL	NEXT					SI	SD				
82	82	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
82	82	COSRTDL1	Relative Time Delay (SCS Only) --	16							NA	NA				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			Relative Time Delay (minor cycles)													
83	83	2NXILASL	NEXT-IN-LINE MODE SELECT-- SETS THE TELEMETRY OUTPUT FOR OBSERVING AS THE NEXT IN LINE SCIENCE INSTRUMENT. BITS 19-26 ARE THE COMMAND NUMBER (1A HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=1 SETS THIS MODE.		2OBNLASL	NEXT					SI	SD				
84	84	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
84	84	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
85	85	2FIFOAOF	DATA FIFO RESET-- HOLDS PRIMARY DATA FIFO IN RESET MODE. BITS 19-26 ARE THE COMMAND NUMBER (45 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=0 SETS THIS MODE.		2FIFOAVR	DISA					SI	SD				
86	86	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
86	86	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
87	87	2FIFOAOF	DATA FIFO RESET-- HOLDS PRIMARY DATA FIFO IN RESET MODE. BITS 19-26 ARE THE COMMAND NUMBER (45 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=0 SETS THIS MODE.		2FIFOAVR	DISA					SI	SD				
88	88	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
88	88	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
89	89	2FIFOAON	DATA FIFO ENABLE-- RELEASES DATA FIFO TO OPERATIONAL MODE. BITS 19-26 ARE THE COMMAND NUMBER (45 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=1 SETS THIS MODE.		2FIFOAVR	ENAB					SI	SD				
90	90	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
90	90	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
91	91	2FIFOAON	DATA FIFO ENABLE-- RELEASES DATA FIFO TO OPERATIONAL MODE. BITS 19-26 ARE THE COMMAND NUMBER (45 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=1 SETS THIS MODE.		2FIFOAVR	ENAB					SI	SD				
92	92	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 70 -- ACIS Turn-on into Standby

Description:

This SCS performs a controlled turn on the ACIS instrument into a standby mode.

Main Steps in SCS:

1. Enable B-side Detector Housing heater
2. Turn On B-side Detector Housing Heater
3. Enable A-side DPA Power Supply
4. Turn On A-side DPA
5. Enable B-side DPA Power Supply
6. Turn On B-side DPA
7. Enable A-side DEA Power Supply
8. Turn on A-side DEA Power Supply
9. Start DEA Housekeeping run, ACIS Parameter block: startDEA: XDZ0000001
10. Set DPA Warm Boot flag
11. Command DPA reset (parameter = 1), Halt BEP
12. Command DPA reset (parameter = 0), Restart BEP
13. Start DEA Housekeeping run, ACIS parameter block: startDEA: XDZ0000001

What Phase is this SCS used in? What Patches are Required for Normal Operations?

This SCS is used in phases where long eclipses are anticipated and ACIS shutdown is required to reduce loads. SCS 32, loadshed SCS, is edited to include a call to this SCS.

The default on-board SCS for both the launch load and the on-orbit load turns off all ACIS processors. If load power is not a constraint for long eclipses, then SCS 40 can be edited and patched to leave the DPA on, thereby keeping the flight software and all patches intact. This SCS may in turn have to be modified to not send the DPA power command, since it will already be on.

Constraints:

This SCS should only be modified and approved for use by the Chandra X-ray Science Center.

Commands are NOT doubled per request by CXC.

At least one second between ACIS hardware commands. Note longer delay commands between command packet commands

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	1HHTRBEN	HOUSING HTR ENABLE B--ENABLES THE B SIDE HOUSING HEATER		1DAHTBEN	ENAB					SI	HLP				
2	2	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
2	2	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
3	3	1HHTRBON	HOUSING HTR ON B--TURNS THE B SIDE HOUSING HEATER ON		1DAHTBON	ON					SI	HLP				
4	4	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
4	4	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
5	5	1DPPSAEN	DPA PWR SUPPLY ENABLE A--ENABLES THE A SIDE DPA POWER SUPPLY		1DPPSAX	ENAB					SI	HLP				
6	6	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
6	6	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
7	7	1DPPSAON	DPA PWR SUPPLY ON A--TURNS THE A SIDE POWER SUPPLY TO THE DPA ON		1DPPSA	ON	1DPDBAON	ON			SI	HLP				
8	8	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
8	8	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
9	9	1DPPSBEN	DPA PWR SUPPLY ENABLE B--ENABLES THE B SIDE DPA POWER SUPPLY		1DPPSBX	ENAB					SI	HLP				
10	10	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
10	10	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
11	11	1DPPSBON	DPA PWR SUPPLY ON B--TURNS THE B SIDE POWER SUPPLY TO THE DPA ON		1DPPSB	ON	1DPDBBON	ON			SI	HLP				
12	12	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
12	12	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
13	13	1DEPSAEN	DEA PWR SUPPLY ENABLE A--ENABLES THE A SIDE DEA POWER SUPPLY		1DEPSAX	ENAB					SI	HLP				
14	14	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
14	14	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
15	15	1DEPSAON	DEA PWR SUPPLY ON A--TURNS THE A SIDE POWER SUPPLY TO THE DEA ON		1DEPSA	ON	1DEDBAON	ON			SI	HLP				
16	16	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
16	16	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
17-20	17	COACISLD	ACIS LOAD								NA	NA				
17-20	17	COACISL1	COACISLD - HEADER --													
17-20	17	COACISL2	Number of 16 bit ACIS data -- Number of Serial Digital Commands	4												
17-20	17	COACISL4[01]	ACIS DATA --	4												
17-20	17	COACISL4[02]	ACIS DATA --	10												
17-20	17	COACISL4[03]	ACIS DATA --	18												
17-20	17	COACISL4[04]	ACIS DATA --	0												
21	18	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
21	18	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1920												
22	19	1WRMBTSB	DPA Warm Boot--Sets BEP Status Register bit WARM_BOOT to value = D(0). This bit defaults to 0 upon power up). D(o)=1 indicates that the S/C requires taht the DPA enter a low current mode.								SI	SD				
22	19	1WRMBTS1	BEP STATUS REGISTER BIT WARM_BOOT -- SETS BEP STATUS REGISTER BIT WARM_BOOT TO VALUE=D(0). THIS BIT DEFAULTS TO 0 UPON POWER-UP. D(0)=1 INDICATES THAT THE S/C REQUIRES THAT THE DPA ENTER A LOW-CURRENT MODE.	1												
23	20	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
23	20	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
24	21	1RSETIRT	DPA CMD RESET								SI	SD				
24	21	1RSETIRT_FLD1	FILLER --													
24	21	1RSETIR1	RESET -- ASSERTS RESET. D(0)=1 HOLDS THE BOARD IN A RESET STATE (EXCEPT FOR THE HW COMMAND DECODER). D(0)=0 DEASSERTS. THIS BIT	1												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			DEFAULTS TO 0 UPON POWER-UP.													
25	22	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
25	22	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
26	23	1RSETIRT	DPA CMD RESET								SI	SD				
26	23	1RSETIRT_FLD1	FILLER --													
26	23	1RSETIR1	RESET -- ASSERTS RESET. D(0)=1 HOLDS THE BOARD IN A RESET STATE (EXCEPT FOR THE HW COMMAND DECODER). D(0)=0 DEASSERTS. THIS BIT DEFAULTS TO 0 UPON POWER-UP.	0												
27	24	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
27	24	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	64							NA	NA				
28-31	25	COACISLD	ACIS LOAD								NA	NA				
28-31	25	COACISL1	COACISLD - HEADER --								NA	NA				
28-31	25	COACISL2	Number of 16 bit ACIS data -- Number of Serial Digital Commands	4							NA	NA				
28-31	25	COACISL4[01]	ACIS DATA --	4							NA	NA				
28-31	25	COACISL4[02]	ACIS DATA --	10							NA	NA				
28-31	25	COACISL4[03]	ACIS DATA --	18							NA	NA				
28-31	25	COACISL4[04]	ACIS DATA --	0							NA	NA				
32	26	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 71 -- RCS Catbed Heaters Prime Enable

Description:

This SCS turns On the Prime RCS Catbed Heaters.

Main Steps in SCS:

Commands to Turn on Prime Catbed Heaters
End SCS command.

What Phase is this SCS used in? What Patches are Required for Normal Operations?

The RCS Catbed heaters are used during transfer orbit operations. Following IPS deactivation, these heaters can be used as "power ballast" in short earth eclipse conditions where additional loads are required.

Constraints:

Command is doubled-up to protect against SEU upset.
16 minor cycles between doubled commands.
Do not use this SCS during transfer orbit to prevent interruption of propulsion operations.

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	PCBPHON	RCS CATBED HTR PRI ON		PRCSCHPR	ON					LR	HLP				
2	2	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
2	2	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
3	3	PCBPHON	RCS CATBED HTR PRI ON		PRCSCHPR	ON					LR	HLP				
4	4	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
4	4	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
5	5	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 72 -- RCS Catbed Heaters Redundant Enable

Description:

This SCS turns On the Redundant RCS Catbed Heaters.

Main Steps in SCS:

Commands to Turn on Redundant Catbed Heaters
End SCS command.

What Phase is this SCS used in? What Patches are Required for Normal Operations?

The RCS Catbed heaters are used during transfer orbit operations. Following IPS deactivation, these heaters can be used as "power ballast" in short earth eclipse conditions where additional loads are required.

Constraints:

Command is doubled-up to protect against SEU upset.
16 minor cycles between doubled commands.
Do not use this SCS during transfer orbit to prevent interruption of propulsion operations.

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	PCBRHON	RCS CATBED HTR RDNT ON		PRCSCHRD	ON					LR	HLP				
2	2	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
2	2	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
3	3	PCBRHON	RCS CATBED HTR RDNT ON		PRCSCHRD	ON					LR	HLP				
4	4	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
4	4	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
5	5	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 73 -- LAE Injector Heaters Prime Enable (all 4 engines)

Description:

This SCS turns On the prime LAE Injector Heaters for all four engines.

Main Steps in SCS:

Commands for Injector Heater #1 enable
Commands for Injector Heater #2 enable
Commands for Injector Heater #3 enable
Commands for Injector Heater #4 enable
End SCS command

What Phase is this SCS used in? What Patches are Required for Normal Operations?

The LAE Injector heaters are used during transfer orbit operations. Following IPS deactivation, these heaters can be used as "power ballast" in short earth eclipse conditions where additional loads are required.

Constraints:

Commands are doubled-up to protect against SEU upset.
Do not use this SCS during transfer orbit to prevent interruption of propulsion operations.
16 minor cycles between doubled commands, at least 2 minor cycles between adjacent non-like commands.
CAUTION: only one set of injector heaters, prime or redundant, is to be powered at any time.

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	PL1IHPON	LAE 1 INJ HTR ON PRI		PL1IHPR	ON					EP	LCC				
2	2	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
2	2	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
3	3	PL1IHPON	LAE 1 INJ HTR ON PRI		PL1IHPR	ON					EP	LCC				
4	4	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
4	4	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	2							NA	NA				
5	5	PL2IHPON	LAE 2 INJ HTR ON PRI		PL2IHPR	ON					EP	LCC				
6	6	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
6	6	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
7	7	PL2IHPON	LAE 2 INJ HTR ON PRI		PL2IHPR	ON					EP	LCC				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
8	8	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
8	8	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
9	9	PL3IHPON	LAE 3 INJ HTR ON PRI		PL3IHPR	ON					EP	LCC				
10	10	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
10	10	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
11	11	PL3IHPON	LAE 3 INJ HTR ON PRI		PL3IHPR	ON					EP	LCC				
12	12	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
12	12	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	2							NA	NA				
13	13	PL4IHPON	LAE 4 INJ HTR ON PRI		PL4IHPR	ON					EP	LCC				
14	14	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
14	14	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
15	15	PL4IHPON	LAE 4 INJ HTR ON PRI		PL4IHPR	ON					EP	LCC				
16	16	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
16	16	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	2							NA	NA				
17	17	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 74 -- LAE Injector Heaters Redundant Enable (all 4 engines)

Description:

This SCS turns On the redundant LAE Injector Heaters for all four engines.

Main Steps in SCS:

Commands for Injector Heater #1 enable
Commands for Injector Heater #2 enable
Commands for Injector Heater #3 enable
Commands for Injector Heater #4 enable
End SCS command

What Phase is this SCS used in? What Patches are Required for Normal Operations?

The LAE Injector heaters are used during transfer orbit operations. Following IPS deactivation, these heaters can be used as "power ballast" in short earth eclipse conditions where additional loads are required.

Constraints:

Commands are doubled-up to protect against SEU upset.
Do not use this SCS during transfer orbit to prevent interruption of propulsion operations.
16 minor cycles between doubled commands, at least 2 minor cycles between adjacent non-like commands.
CAUTION: only one set of injector heaters, prime or redundant, is to be powered at any time.

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	PL1IHRON	LAE 1 INJ HTR ON RDNT		PL1IHRD	ON					EP	LCC				
2	2	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
2	2	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
3	3	PL1IHRON	LAE 1 INJ HTR ON RDNT		PL1IHRD	ON					EP	LCC				
4	4	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
4	4	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	2							NA	NA				
5	5	PL2IHRON	LAE 2 INJ HTR ON RDNT		PL2IHRD	ON					EP	LCC				
6	6	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
6	6	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
7	7	PL2IHRON	LAE 2 INJ HTR ON RDNT		PL2IHRD	ON					EP	LCC				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
8	8	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
8	8	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	2							NA	NA				
9	9	PL3IHRON	LAE 3 INJ HTR ON RDNT		PL3IHRD	ON					EP	LCC				
10	10	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
10	10	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
11	11	PL3IHRON	LAE 3 INJ HTR ON RDNT		PL3IHRD	ON					EP	LCC				
12	12	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
12	12	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	2							NA	NA				
13	13	PL4IHRON	LAE 4 INJ HTR ON RDNT		PL4IHRD	ON					EP	LCC				
14	14	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
14	14	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
15	15	PL4IHRON	LAE 4 INJ HTR ON RDNT		PL4IHRD	ON					EP	LCC				
16	16	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
16	16	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	2							NA	NA				
17	17	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 75 -- Trim Heater Prime Enable

Description:

This SCS turns ON the prime trim heaters and the three flexure heaters.

Main Steps in SCS:

The following heaters are turned ON:

3AC1PTEN	ACIS 1 FITTING -Y,-Z PRIME TRIM HEATER ENABLE
3AC2PTEN	ACIS 2 FITTING +Y,-Z PRIME TRIM HEATER ENABLE
3AC3PTEN	ACIS 3 FITTING +Z PRIME TRIM HEATER ENABLE
3HR1PTEN	HRC 1 FITTING -Y,-Z PRIME TRIM HEATER ENABLE
3HR2PTEN	HRC 2 FITTING +Y,-Z PRIME TRIM HEATER ENABLE
3HR3PTEN	HRC 3 FITTING +Z PRIME TRIM HEATER ENABLE
3PSMPTEN	PSMC PRIME TRIM HEATER ENABLE
3FLCPTEN	FLCA PRIME TRIM HEATER ENABLE
3RCTPTEN	RCTU PRIME TRIM HEATER ENABLE
3SPYPTEN	ACIS SUPPORT STRUCTURE +Y PRIME TRIM HEATER ENABLE
3SMYPTEN	ACIS SUPPORT STRUCTURE -Y PRIME TRIM HEATER ENABLE
3SMZPTEN	ACIS SUPPORT STRUCTURE - Z PRIME TRIM HEATER ENABLE
3FA6PAEN	FOCUS ASSEMBLY 6 PRIME ABORT HEATER ENABLE

The ISIM Flexure heaters are turned ON (heaters A, B and C)

End SCS command

What Phase is this SCS used in? What Patches are Required for Normal Operations?

This SCS re-enables all the prime trim heaters that would be disabled for a long eclipse passage. Along with the latching relay commands are the serial digital commands to enable the three flexure heater zones.

Constraints:

The heater commands are doubled-up as a group to protect against SEU upset. One minor cycle between adjacent commands, and 16 mc between the groups.

The SIM Flexure Heaters are doubled up, however the time delay between these commands should have been set to a minimum of 65 seconds (2 major frames). There is a possibility that one or both SIM flexure commands could be rejected by the SIM SEA. Based on a pre-launch CCB meeting, the decision was made not to correct this SCS (and SCS 42, the OFF version), and instead add commands to the Long Eclipse Procedure products. The Long Eclipse Procedure, where this SCS would be used,

specifically contains instructions to command the flexure heaters OFF and ON independent of SCS 75 (ON) and SCS #: 42 -- Trim Heater Prime Disable (OFF). This increases the chance that the commands will get through to the SIM SEA.

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	3AC1PTEN	ACIS 1 FITTING -Y,-Z PRIME TRIM HEATER ENABLE		3A1THTRA	ENAB					SI	LCC				
2	2	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
2	2	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
3	3	3AC2PTEN	ACIS 2 FITTING +Y,-Z PRIME TRIM HEATER ENABLE		3A2THTRA	ENAB					SI	LCC				
4	4	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
4	4	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
5	5	3AC3PTEN	ACIS 3 FITTING +Z PRIME TRIM HEATER ENABLE		3A3THTRA	ENAB					SI	LCC				
6	6	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
6	6	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
7	7	3HR1PTEN	HRC 1 FITTING -Y,-Z PRIME TRIM HEATER ENABLE		3H1THTRA	ENAB					SI	LCC				
8	8	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
8	8	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
9	9	3HR2PTEN	HRC 2 FITTING +Y,-Z PRIME TRIM HEATER ENABLE		3H2THTRA	ENAB					SI	LCC				
10	10	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
10	10	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
11	11	3HR3PTEN	HRC 3 FITTING +Z PRIME TRIM HEATER ENABLE		3H3PZTHA	ENAB					SI	LCC				
12	12	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
12	12	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
13	13	3PSMPTEN	PSMC PRIME TRIM HEATER ENABLE		3APSMTHA	ENAB					SI	LCC				
14	14	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
14	14	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
15	15	3FLCPTEN	FLCA PRIME TRIM HEATER ENABLE		3FLCTHTA	ENAB					SI	LCC				
16	16	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
16	16	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
17	17	3RCTPTEN	RCTU PRIME TRIM HEATER ENABLE		3SITHTRA	ENAB					SI	LCC				
18	18	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
18	18	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
19	19	3SPYPTEN	ACIS SUPPORT STRUCTURE +Y PRIME TRIM HEATER ENABLE		3ASPYTHA	ENAB					SI	LCC				
20	20	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
20	20	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
21	21	3SMYPTEN	ACIS SUPPORT STRUCTURE -Y PRIME TRIM HEATER ENABLE		3ASMYTHA	ENAB					SI	LCC				
22	22	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
22	22	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
23	23	3SMZPTEN	ACIS SUPPORT STRUCTURE - Z PRIME TRIM HEATER ENABLE		3ASMZTHA	ENAB					SI	LCC				
24	24	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
24	24	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
25	25	3FA6PAEN	FOCUS ASSEMBLY 6 PRIME ABORT HEATER ENABLE		3AZF6HTA	ENAB					SI	LCC				
26	26	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
26	26	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
27	27	3SIMHD	SIM SEA SERIAL COMMAND HEADER--The SEA will only accept commands in groups or packets preceeded by this SEA Header command. The SEA Header command is the first command in a group or packet sent to the SEA. The SEA Header command contains an 8 bit checksum which is computed such that the low order 8 bits of the sum of all 8 bit bytes in the command group or packet, including the two bytes of the Header command, is zero. The Header command also contains field to specify the number of 16 bit command in the group or packet that follow the Header. The										SI	SD				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			maximum number of commands that may be sent in one group, following the header, is 63. The SEA will not execute any command in a group until the entire group has been received and verified to be correct. An error in the checksum, word count, or an illegal value for any individual command will cause the SEA to reject the entire command group or packet and set the invalid command flag in output telemetry.													
27	27	3SIMHD1	SIM SEA Header Checksum -- This field is used to specify an 8 bit checksum of all command bytes within a command group transmitted to the SIM. The checksum is computed such that the low order 8 bits of the sum of all 8 bit bytes in the command group, including the header word, is zero.	213												
27	27	3SIMHD2	SIM SEA Header Fill -- Fill bits, set to binary (00).													
27	27	3SIMHD3	SIM SEA Header No of Commands -- This field is used to specify the number of 16 bit commands in a command group that follow the header. The maximum number of 16 bit commands in a command group is limited to 63.	3												
28	28	3SEASETH	SIM SEA SET FA HTR ZONE TEMP--The Heater Control command controls the heater power latching relay and the temperature for each FA mounting flexure. Three zones or flexures may be specified and controlled with this command. A set point temperature range of -64 to +63 degrees Celsius may be specified. When the binary value (00) is specified in the Zone field of the command, the SEA will ignore the Temperature field in the command and set the heater power latching relay to its OFF state, which switches off power to heaters on all three flexures. When any oter zone is specifed in the command		3SFLXAST	NONE	3SFLXBST	NONE	3SFLXCST	NONE	SI	SD				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			the SEA will set the heater power relay to its ON state, if it is not already in that state. The SEA software will accept multiple heater control commands within one SEA command group or packet, but it may assume that no more than one command within a single group will cause a change in state of the heater power latching relay. After execution of a command that changes the state of the heater power relay, any subsequent command within the same group that also changes the heater power relay state will be ignored by the SEA software.													
28	28	3SEASTH1	SIM Heater Control Zone -- This field is used to specify the zone or FA mounting flexure which is to be controlled. Binary (01) specifies zone 1 or flexure A, binary (10) specifies zone 2 or flexure B, binary (11) specifies zone 3 or flexure C. Binary (00) set the heater power latching relay to its OFF state which switches off power to heaters in all three zones or flexures.	01	3SFLXAST	NONE	3SFLXBST	NONE	3SFLXCST	NONE	SI	SD				
28	28	3SEASTH2	SIM Heater Control Set Temperature -- This field is a 10 bit signed integer used to specify the temperature set point in degrees C within the specified zone. The allowable range is -64 to +63 degrees C.	0001010000	3SFLXAST	NONE	3SFLXBST	NONE	3SFLXCST	NONE	SI	SD				
29	29	3SEASETH	SIM SEA SET FA HTR ZONE TEMP--The Heater Control command controls the heater power latching relay and the temperature for each FA mounting flexure. Three zones or flexures may be specified and controlled with this command. A set point temperature range of -64 to +63 degrees Celsius may be specified. When the binary value (00) is specified in the Zone field of the command, the SEA will ignore the Temperature field in the command and set the heater power		3SFLXAST	NONE	3SFLXBST	NONE	3SFLXCST	NONE	SI	SD				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			latching relay to its OFF state, which switches off power to heaters on all three flexures. When any oter zone is specifed in the command the SEA will set the heater power relay to its ON state, if it is not already in that state. The SEA software will accept multiple heater control commands within one SEA command group or packet, but it may assume that no more than one command within a single group will cause a change in state of the heater power latching relay. After execution of a command that changes the state of the heater power relay, any subsequent command within the same group that also changes the heater power relay state will be ignored by the SEA software.													
29	29	3SEASTH1	SIM Heater Control Zone -- This field is used to specify the zone or FA mounting flexure which is to be controlled. Binary (01) specifies zone 1 or flexure A, binary (10) specifies zone 2 or flexure B, binary (11) specifies zone 3 or flexure C. Binary (00) set the heater power latching relay to its OFF state which switches off power to heaters in all three zones or flexures.	10	3SFLXAST	NONE	3SFLXBST	NONE	3SFLXCST	NONE	SI	SD				
29	29	3SEASTH2	SIM Heater Control Set Temperature -- This field is a 10 bit signed integer used to specify the temperature set point in degrees C within the specified zone. The allowable range is -64 to +63 degrees C.	0001010000	3SFLXAST	NONE	3SFLXBST	NONE	3SFLXCST	NONE	SI	SD				
30	30	3SEASETH	SIM SEA SET FA HTR ZONE TEMP--The Heater Control command controls the heater power latching relay and the temperature for each FA mounting flexure. Three zones or flexures may be specified and controlled with this command. A set point temperature range of -64 to +63 degrees Celsius may be specified. When the binary		3SFLXAST	NONE	3SFLXBST	NONE	3SFLXCST	NONE	SI	SD				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			value (00) is specified in the Zone field of the command, the SEA will ignore the Temperature field in the command and set the heater power latching relay to its OFF state, which switches off power to heaters on all three flexures. When any oter zone is specifed in the command the SEA will set the heater power relay to its ON state, if it is not already in that state. The SEA software will accept multiple heater control commands within one SEA command group or packet, but it may assume that no more than one command within a single group will cause a change in state of the heater power latching relay. After execution of a command that changes the state of the heater power relay, any subsequent command within the same group that also changes the heater power relay state will be ignored by the SEA software.													
30	30	3SEASTH1	SIM Heater Control Zone -- This field is used to specify the zone or FA mounting flexure which is to be controlled. Binary (01) specifies zone 1 or flexure A, binary (10) specifies zone 2 or flexure B, binary (11) specifies zone 3 or flexure C. Binary (00) set the heater power latching relay to its OFF state which switches off power to heaters in all three zones or flexures.	11	3SFLXAST	NONE	3SFLXBST	NONE	3SFLXCST	NONE	SI	SD				
30	30	3SEASTH2	SIM Heater Control Set Temperature -- This field is a 10 bit signed integer used to specify the temperature set point in degrees C within the specified zone. The allowable range is -64 to +63 degrees C.	0001010000	3SFLXAST	NONE	3SFLXBST	NONE	3SFLXCST	NONE	SI	SD				
31	31	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
31	31	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
32	32	3AC1PTEN	ACIS 1 FITTING -Y,-Z PRIME TRIM HEATER ENABLE		3A1THTRA	ENAB					SI	LCC				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
33	33	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
33	33	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
34	34	3AC2PTEN	ACIS 2 FITTING +Y,-Z PRIME TRIM HEATER ENABLE		3A2THTRA	ENAB					SI	LCC				
35	35	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
35	35	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
36	36	3AC3PTEN	ACIS 3 FITTING +Z PRIME TRIM HEATER ENABLE		3A3THTRA	ENAB					SI	LCC				
37	37	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
37	37	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
38	38	3HR1PTEN	HRC 1 FITTING -Y,-Z PRIME TRIM HEATER ENABLE		3H1THTRA	ENAB					SI	LCC				
39	39	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
39	39	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
40	40	3HR2PTEN	HRC 2 FITTING +Y,-Z PRIME TRIM HEATER ENABLE		3H2THTRA	ENAB					SI	LCC				
41	41	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
41	41	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
42	42	3HR3PTEN	HRC 3 FITTING +Z PRIME TRIM HEATER ENABLE		3H3PZTHA	ENAB					SI	LCC				
43	43	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
43	43	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
44	44	3PSMPTEN	PSMC PRIME TRIM HEATER ENABLE		3APSMTHA	ENAB					SI	LCC				
45	45	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
45	45	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
46	46	3FLCPTEN	FLCA PRIME TRIM HEATER ENABLE		3FLCTHTA	ENAB					SI	LCC				
47	47	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
47	47	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
48	48	3RCTPTEN	RCTU PRIME TRIM HEATER ENABLE		3SITHTRA	ENAB					SI	LCC				
49	49	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
49	49	COSRTDL1	Relative Time Delay (SCS Only) --	1							NA	NA				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			Relative Time Delay (minor cycles)													
50	50	3SPYPTEN	ACIS SUPPORT STRUCTURE +Y PRIME TRIM HEATER ENABLE		3ASPYTHA	ENAB					SI	LCC				
51	51	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
51	51	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
52	52	3SMYPTEN	ACIS SUPPORT STRUCTURE -Y PRIME TRIM HEATER ENABLE		3ASMYTHA	ENAB					SI	LCC				
53	53	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
53	53	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
54	54	3SMZPTEN	ACIS SUPPORT STRUCTURE - Z PRIME TRIM HEATER ENABLE		3ASMZTHA	ENAB					SI	LCC				
55	55	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
55	55	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
56	56	3FA6PAEN	FOCUS ASSEMBLY 6 PRIME ABORT HEATER ENABLE		3AZF6HTA	ENAB					SI	LCC				
57	57	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
57	57	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
58	58	3SIMHD	SIM SEA SERIAL COMMAND HEADER--The SEA will only accept commands in groups or packets preceeded by this SEA Header command. The SEA Header command is the first command in a group or packet sent to the SEA. The SEA Header command contains an 8 bit checksum which is computed such that the low order 8 bits of the sum of all 8 bit bytes in the command group or packet, including the two bytes of the Header command, is zero. The Header command also contains field to specify the number of 16 bit command in the group or packet that follow the Header. The maximum number of commands that may be sent in one group, following the header, is 63. The SEA will not execute any command in a group until the entire group has been received and verified to be correct. An error in the checksum,								SI	SD				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			word count, or an illegal value for any individual command will cause the SEA to reject the entire command group or packet and set the invalid command flag in output telemetry.													
58	58	3SIMHD1	SIM SEA Header Checksum -- This field is used to specify an 8 bit checksum of all command bytes within a command group transmitted to the SIM. The checksum is computed such that the low order 8 bits of the sum of all 8 bit bytes in the command group, including the header word, is zero.	213												
58	58	3SIMHD2	SIM SEA Header Fill -- Fill bits, set to binary (00).													
58	58	3SIMHD3	SIM SEA Header No of Commands -- This field is used to specify the number of 16 bit commands in a command group that follow the header. The maximum number of 16 bit commands in a command group is limited to 63.	3												
59	59	3SEASETH	SIM SEA SET FA HTR ZONE TEMP--The Heater Control command controls the heater power latching relay and the temperature for each FA mounting flexure. Three zones or flexures may be specified and controlled with this command. A set point temperature range of -64 to +63 degrees Celsius may be specified. When the binary value (00) is specified in the Zone field of the command, the SEA will ignore the Temperature field in the command and set the heater power latching relay to its OFF state, which switches off power to heaters on all three flexures. When any oter zone is specifed in the command the SEA will set the heater power relay to its ON state, if it is not already in that state. The SEA software will accept multiple heater control commands within one SEA command group or packet, but it may assume that no more than one		3SFLXAST	NONE	3SFLXBST	NONE	3SFLXCST	NONE	SI	SD				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			command within a single group will cause a change in state of the heater power latching relay. After execution of a command that changes the state of the heater power relay, any subsequent command within the same group that also changes the heater power relay state will be ignored by the SEA software.													
59	59	3SEASTH1	SIM Heater Control Zone -- This field is used to specify the zone or FA mounting flexure which is to be controlled. Binary (01) specifies zone 1 or flexure A, binary (10) specifies zone 2 or flexure B, binary (11) specifies zone 3 or flexure C. Binary (00) set the heater power latching relay to its OFF state which switches off power to heaters in all three zones or flexures.	01	3SFLXAST	NONE	3SFLXBST	NONE	3SFLXCST	NONE	SI	SD				
59	59	3SEASTH2	SIM Heater Control Set Temperature -- This field is a 10 bit signed integer used to specify the temperature set point in degrees C within the specified zone. The allowable range is -64 to +63 degrees C.	0001010000	3SFLXAST	NONE	3SFLXBST	NONE	3SFLXCST	NONE	SI	SD				
60	60	3SEASETH	SIM SEA SET FA HTR ZONE TEMP--The Heater Control command controls the heater power latching relay and the temperature for each FA mounting flexure. Three zones or flexures may be specified and controlled with this command. A set point temperature range of -64 to +63 degrees Celsius may be specified. When the binary value (00) is specified in the Zone field of the command, the SEA will ignore the Temperature field in the command and set the heater power latching relay to its OFF state, which switches off power to heaters on all three flexures. When any oter zone is specifed in the command the SEA will set the heater power relay to its ON state, if it is not already in that state. The SEA		3SFLXAST	NONE	3SFLXBST	NONE	3SFLXCST	NONE	SI	SD				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			software will accept multiple heater control commands within one SEA command group or packet, but it may assume that no more than one command within a single group will cause a change in state of the heater power latching relay. After execution of a command that changes the state of the heater power relay, any subsequent command within the same group that also changes the heater power relay state will be ignored by the SEA software.													
60	60	3SEASTH1	SIM Heater Control Zone -- This field is used to specify the zone or FA mounting flexure which is to be controlled. Binary (01) specifies zone 1 or flexure A, binary (10) specifies zone 2 or flexure B, binary (11) specifies zone 3 or flexure C. Binary (00) set the heater power latching relay to its OFF state which switches off power to heaters in all three zones or flexures.	10	3SFLXAST	NONE	3SFLXBST	NONE	3SFLXCST	NONE	SI	SD				
60	60	3SEASTH2	SIM Heater Control Set Temperature -- This field is a 10 bit signed integer used to specify the temperature set point in degrees C within the specified zone. The allowable range is -64 to +63 degrees C.	0001010000	3SFLXAST	NONE	3SFLXBST	NONE	3SFLXCST	NONE	SI	SD				
61	61	3SEASETH	SIM SEA SET FA HTR ZONE TEMP--The Heater Control command controls the heater power latching relay and the temperature for each FA mounting flexure. Three zones or flexures may be specified and controlled with this command. A set point temperature range of -64 to +63 degrees Celsius may be specified. When the binary value (00) is specified in the Zone field of the command, the SEA will ignore the Temperature field in the command and set the heater power latching relay to its OFF state, which switches off power to heaters on all three flexures. When any oter		3SFLXAST	NONE	3SFLXBST	NONE	3SFLXCST	NONE	SI	SD				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			zone is specifed in the command the SEA will set the heater power relay to its ON state, if it is not already in that state. The SEA software will accept multiple heater control commands within one SEA command group or packet, but it may assume that no more than one command within a single group will cause a change in state of the heater power latching relay. After execution of a command that changes the state of the heater power relay, any subsequent command within the same group that also changes the heater power relay state will be ignored by the SEA software.													
61	61	3SEASTH1	SIM Heater Control Zone -- This field is used to specify the zone or FA mounting flexure which is to be controlled. Binary (01) specifies zone 1 or flexure A, binary (10) specifies zone 2 or flexure B, binary (11) specifies zone 3 or flexure C. Binary (00) set the heater power latching relay to its OFF state which switches off power to heaters in all three zones or flexures.	11	3SFLXAST	NONE	3SFLXBST	NONE	3SFLXCST	NONE	SI	SD				
61	61	3SEASTH2	SIM Heater Control Set Temperature -- This field is a 10 bit signed integer used to specify the temperature set point in degrees C within the specified zone. The allowable range is -64 to +63 degrees C.	0001010000	3SFLXAST	NONE	3SFLXBST	NONE	3SFLXCST	NONE	SI	SD				
62	62	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
62	62	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
63	63	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 76 -- Trim Heater Redundant Enable

Description:

This SCS turns ON the redundant trim heaters.

Main Steps in SCS:

The following heaters are turned ON:

3AC1RTEN	ACIS 1 FITTING -Y,-Z REDUNDANT TRIM HEATER ENABLE
3AC2RTEN	ACIS 2 FITTING +Y,-Z REDUNDANT TRIM HEATER ENABLE
3AC3RTEN	ACIS 3 FITTING +Z REDUNDANT TRIM HEATER ENABLE
3HR1RTEN	HRC 1 FITTING -Y,-Z REDUNDANT TRIM HEATER ENABLE
3HR2RTEN	HRC 2 FITTING +Y,-Z REDUNDANT TRIM HEATER ENABLE
3HR3RTEN	HRC 3 FITTING +Z REDUNDANT TRIM HEATER ENABLE
3PSMRTEN	PSMC REDUNDANT TRIM HEATER ENABLE
3FLCRTEN	FLCA REDUNDANT TRIM HEATER ENABLE
3RCTRTEN	RCTU REDUNDANT TRIM HEATER ENABLE
3SPYRTEN	ACIS SUPPORT STRUCTURE +Y REDUNDANT TRIM HEATER ENABLE
3SMYRTEN	ACIS SUPPORT STRUCTURE -Y REDUNDANT TRIM HEATER ENABLE
3SMZRTEN	ACIS SUPPORT STRUCTURE - Z REDUNDANT TRIM HEATER ENABLE

End SCS command

What Phase is this SCS used in? What Patches are Required for Normal Operations?

This SCS re-enables all the redundant trim heaters that would be disabled for a long eclipse passage.

Constraints:

The heater commands are doubled-up as a group to protect against SEU upset. One minor cycle between adjacent commands, and 16 mc between the groups.

NOTE: The redundant trim heaters are to be enabled 12 hours after the prime trim heaters following a long eclipse. This requirement is implemented by placing a 12 hour time delay in SCS 33 between calls to SCS 75 and SCS 76.

Count	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	3AC1RTEN	ACIS 1 FITTING -Y,-Z REDUNDANT TRIM HEATER ENABLE		3A1THTRB	ENAB					SI	LCC				

Count	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
2	2	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
2	2	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
3	3	3AC2RTEN	ACIS 2 FITTING +Y,-Z REDUNDANT TRIM HEATER ENABLE		3A2THTRB	ENAB					SI	LCC				
4	4	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
4	4	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
5	5	3AC3RTEN	ACIS 3 FITTING +Z REDUNDANT TRIM HEATER ENABLE		3A3THTRB	ENAB					SI	LCC				
6	6	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
6	6	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
7	7	3HR2RTEN	HRC 2 FITTING +Y,-Z REDUNDANT TRIM HEATER ENABLE		3H2THTRB	ENAB					SI	LCC				
8	8	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
8	8	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
9	9	3HR3RTEN	HRC 3 FITTING +Z REDUNDANT TRIM HEATER ENABLE		3H3PZTHB	ENAB					SI	LCC				
10	10	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
10	10	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
11	11	3PSMRTEN	PSMC REDUNDANT TRIM HEATER ENABLE		3APSMTHB	ENAB					SI	LCC				
12	12	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
12	12	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
13	13	3FLCRTEN	FLCA REDUNDANT TRIM HEATER ENABLE		3FLCTHTB	ENAB					SI	LCC				
14	14	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
14	14	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
15	15	3RCTRTEN	RCTU REDUNDANT TRIM HEATER ENABLE		3SITHTRB	ENAB					SI	LCC				
16	16	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
16	16	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
17	17	3SPYRTEN	ACIS SUPPORT STRUCTURE +Y REDUNDANT TRIM HEATER ENABLE		3ASPYTHB	ENAB					SI	LCC				

Count	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
18	18	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
18	18	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
19	19	3SMYRTEN	ACIS SUPPORT STRUCTURE -Y REDUNDANT TRIM HEATER ENABLE		3ASMYTHB	ENAB					SI	LCC				
20	20	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
20	20	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
21	21	3SMZRTEN	ACIS SUPPORT STRUCTURE - Z REDUNDANT TRIM HEATER ENABLE		3ASMZTHB	ENAB					SI	LCC				
22	22	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
22	22	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
23	23	3AC1RTEN	ACIS 1 FITTING -Y,-Z REDUNDANT TRIM HEATER ENABLE		3A1THTRB	ENAB					SI	LCC				
24	24	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
24	24	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
25	25	3AC2RTEN	ACIS 2 FITTING +Y,-Z REDUNDANT TRIM HEATER ENABLE		3A2THTRB	ENAB					SI	LCC				
26	26	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
26	26	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
27	27	3AC3RTEN	ACIS 3 FITTING +Z REDUNDANT TRIM HEATER ENABLE		3A3THTRB	ENAB					SI	LCC				
28	28	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
28	28	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
29	29	3HR2RTEN	HRC 2 FITTING +Y,-Z REDUNDANT TRIM HEATER ENABLE		3H2THTRB	ENAB					SI	LCC				
30	30	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
30	30	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
31	31	3HR3RTEN	HRC 3 FITTING +Z REDUNDANT TRIM HEATER ENABLE		3H3PZTHB	ENAB					SI	LCC				
32	32	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
32	32	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				

Count	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
33	33	3PSMRTEN	PSMC REDUNDANT TRIM HEATER ENABLE		3APSMTHB	ENAB					SI	LCC				
34	34	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
34	34	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
35	35	3FLCRTEN	FLCA REDUNDANT TRIM HEATER ENABLE		3FLCTHTB	ENAB					SI	LCC				
36	36	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
36	36	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
37	37	3RCTRTEN	RCTU REDUNDANT TRIM HEATER ENABLE		3SITHTRB	ENAB					SI	LCC				
38	38	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
38	38	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
39	39	3SPYRTEN	ACIS SUPPORT STRUCTURE +Y REDUNDANT TRIM HEATER ENABLE		3ASPYTHB	ENAB					SI	LCC				
40	40	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
40	40	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
41	41	3SMYRTEN	ACIS SUPPORT STRUCTURE -Y REDUNDANT TRIM HEATER ENABLE		3ASMYTHB	ENAB					SI	LCC				
42	42	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
42	42	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
43	43	3SMZRTEN	ACIS SUPPORT STRUCTURE - Z REDUNDANT TRIM HEATER ENABLE		3ASMZTHB	ENAB					SI	LCC				
44	44	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
44	44	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
45	45	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 77 -- OO - Halt OBC Safing Action

Description:

This is a “common” SCS that is called by a number of Safing Actions to accomplish halting the processor.

Main Steps in SCS:

Halt the OBC

What Phase is this SCS used in? What Patches are Required for Normal Operations?

The SCS, as described herein, is used in the On-Orbit Phase.

This SCS is CALLED by the following SCSs:

- SCS #: 5 -- OO - CCDM RCTU Command Wrap Test
- SCS #: 7 -- OO - IRU Monitor Fault Safing Action
- SCS #: 10 -- OO - Attitude Reference in Eclipse Monitor
- SCS #: 11 -- OO - EPS Sunlight Overload Fault
- SCS #: 12 -- OO - EPS Eclipse Overload Fault
- SCS #: 13 -- OO - PCAD Sensor Processing Fault

Constraints:

If this SCS is edited, be sure that the final action is to Halt the Processor. Many Safing Actions rely on this SCS to halt the processor.

This SCS defaults to enabled upon OBC reset.

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	COSOHALT	SCS HALT OBC								LR	OBC				
2	2	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 78 -- OO - Battery Connection / Halt OBC Safing Action

Description:

This SCS is a “common” SCS called by a number of Safing Actions to accomplish connecting the batteries, turning off the VDE, and halting the processor.

Main Steps in SCS:

1. Call SCS #: 30 -- Battery Connection to Bus Safing Action to connect the batteries to the bus
2. Turn off VDE A
3. Halt the processor.

What Phase is this SCS used in? What Patches are Required for Normal Operations?

The SCS, as described herein, is used in the On-Orbit Phase.

This SCS is CALLED by the following SCSs:

SCS #: 6 -- OO - Attitude/Rate Error Monitor Fault
SCS #: 8 -- OO - Sun Position Monitor Fault Safing Action
SCS #: 9 -- OO - Spacecraft Momentum Monitor Fault Safing Action

Constraints:

If this SCS is edited, be sure that no commands are deleted. Many Safing Actions rely on this SCS to perform the functions identified above.

This SCS defaults to enabled upon OBC reset.

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	COSCALL	SCS CALL SCS								NA	NA				
1	1	COSCALL1	COSCALL - SCS NUMBER -- SCS Number	30												
2	2	AVDEAOF	VDE-A PWR OFF		AVDEAX	OFF					PC	LCC				
3	3	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
3	3	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	5												
4	4	COSOHALT	SCS HALT OBC								LR	OBC				
5	5	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 79 -- OO - NSM Transition

Description:

This SCS is a “common” SCS called by a number of Safing Actions to perform transition PCAD to Normal Sun Mode, and to safe the instruments.

Main Steps in SCS:

1. Set IRU 1 and 2 to High Range
2. Set Yaw Bias to zero
3. Set OBC solar array mode to Autonomous
4. Set Sun Mode control law to Auto
5. Disable reaction momentum bias
6. Transition to NSM
7. Terminate SCS #: 87 -- HRC Scheduled/No Dither HRC-I HV Ramp Down Commands
8. Terminate SCS #: 88 -- HRC Scheduled/No Dither HRC-S HV Ramp Down Commands
9. Activate SCS #: 107 -- Main SI Safing.

What Phase is this SCS used in? What Patches are Required for Normal Operations?

This SCS is used in the On-Orbit Phase.

This SCS is ACTIVATED by the following SCSs:

SCS #: 16 -- Attitude Reference in Sunlight Monitor
SCS #: 23 -- OO - SADA Position or Temperature Monitor Fault
SCS #: 24 -- Unexpected Connection of the Batteries
SCS #: 98 -- Bright Star Normal Sun Mode

Constraints:

If this SCS is edited, be sure that no commands are deleted. Many Safing Actions rely on this SCS to perform the functions identified above.

This SCS defaults to enabled upon OBC reset.

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	AIR1HRP1	IRU-1 HIGH RANGE PRI (CHAN 0)		AIRU1R1X	HIGH	AIRU1R1Y	HIGH	AIRU1R2X	HIGH	EP	SD	4	7	64	K16
2	2	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
2	2	COSRTDL1	Relative Time Delay (SCS Only) – Relative Time Delay (minor cycles)	2												
3	3	AIR1HRP2	IRU-1 HIGH RANGE PRI (CHAN 1)		AIRU1R1X	HIGH	AIRU1R1Y	HIGH	AIRU1R2X	HIGH	EP	SD	4	7	64	K16
4	4	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
4	4	COSRTDL1	Relative Time Delay (SCS Only) – Relative Time Delay (minor cycles)	15												
5	5	AIR1HRR1	IRU-1 HIGH RANGE RDNT (CHAN 0)		AIRU1R1X	HIGH	AIRU1R1Y	HIGH	AIRU1R2X	HIGH	EP	SD	4	7	64	K16
6	6	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
6	6	COSRTDL1	Relative Time Delay (SCS Only) – Relative Time Delay (minor cycles)	2												
7	7	AIR1HRR2	IRU-1 HIGH RANGE RDNT (CHAN 1)		AIRU1R1X	HIGH	AIRU1R1Y	HIGH	AIRU1R2X	HIGH	EP	SD	4	7	64	K16
8	8	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
8	8	COSRTDL1	Relative Time Delay (SCS Only) – Relative Time Delay (minor cycles)	2												
9	9	AIR2HRP1	IRU-2 HIGH RANGE PRI (CHAN 0)		AIRU2R1X	HIGH	AIRU2R1Y	HIGH	AIRU2R2X	HIGH	EP	SD	5	5	64	K24
10	10	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
10	10	COSRTDL1	Relative Time Delay (SCS Only) – Relative Time Delay (minor cycles)	2												
11	11	AIR2HRP2	IRU-2 HIGH RANGE PRI (CHAN 1)		AIRU2R1X	HIGH	AIRU2R1Y	HIGH	AIRU2R2X	HIGH	EP	SD	5	5	64	K24
12	12	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
12	12	COSRTDL1	Relative Time Delay (SCS Only) – Relative Time Delay (minor cycles)	13												
13	13	AIR2HRR1	IRU-2 HIGH RANGE RDNT (CHAN 0)		AIRU2R1X	HIGH	AIRU2R1Y	HIGH	AIRU2R2X	HIGH	EP	SD	5	5	64	K24
14	14	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
14	14	COSRTDL1	Relative Time Delay (SCS Only) – Relative Time Delay (minor cycles)	2												
15	15	AIR2HRR2	IRU-2 HIGH RANGE RDNT (CHAN 1)		AIRU2R1X	HIGH	AIRU2R1Y	HIGH	AIRU2R2X	HIGH	EP	SD	5	5	64	K24
16	16	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
16	16	COSRTDL1	Relative Time Delay (SCS Only) – Relative Time Delay (minor cycles)	2												
17-21	17	AOSETYAW	SET SUN MODE CONTROL LAW YAW BIASES (MULTI-PART)								NA	NA				
17-21	17	AOSETYW1	Set Yaw Bias Cmd 1 -- 1st command of a multipart command													
17-21	17	AOSETYW2	Set Yaw Bias Cmd 2 -- 2nd command of a multipart command													
17-21	17	AOYAWHLD	Sun_Yaw_Bias_Hold -- Yaw Bias Rate for Hold Submode	0.0												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
17-21	17	AOYAWPNT	Sun_Yaw_Bias_Point -- Yaw Bias Rate for Point Submode	0.0												
22	18	AOSAMAUT	OBC SET SOLAR ARRAY MODE AUTONOMOUS		AOSAMDGD	AUTO					NA	NA				
23	19	AOSUNMAU	SET SUN MODE CNTL LAW (SUB MODE) TO AUTO								NA	NA				
24	20	AORWMOMD	DISABLE RW MOMENTUM BIAS		AORWBIAS	DISA					NA	NA				
25	21	AONSMSAF	Transition to Normal Sun Mode Safing		AOPCADMD	NSUN					NA	NA				
26	22	COTERMSX	TERMINATE SCS#								NA	NA				
26	22	COTERMS1	COTERMSX - SCS NUMBER -- SCS Number	87							NA	NA				
27	23	COTERMSX	TERMINATE SCS#								NA	NA				
27	23	COTERMS1	COTERMSX - SCS NUMBER -- SCS Number	88							NA	NA				
28	24	COACTSX	ACTIVATE SCS#								NA	NA				
28	24	COACTS1	COACTSX - SCS NUMBER -- SCS Number	107												
28	24	COACTS2	COACTSX - REPEAT COUNT -- Repeat Count. If this is 0, then SCS is executed once.	0												
29	25	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 80 -- OO - Standby State Timeout

Description:

This SCS is activated when the OBC transitions to Standby Online State (see Figure SCS 80-1). This monitor protects against an OBC reset in the event that an SEU causes the IU to power-cycle. As a result of an IU power-cycle, the Online OBC will be reset and will transition to Standby Online State. This SCS enables the Observatory to continue operating in Normal Sun Mode (no science), and prevents a Safe Mode transition. Reference Flow SCS 80-1

Main Steps in SCS:

1. Turn off VDE A in case thrusters were firing prior to the reset.
2. Transition OBC to Normal Online State (see Figure SCS 80-1).
3. Enable RCTU wrap tests, corresponding SCSs (25-27, 60, 5), and enable Reaction Wheel Safing SCSs (17-22).
4. Reinitialize ADE and WDE EPIC counters
5. Initialize/Activate PCAD via SCS #: 34 -- Configure PCAD, SCS #: 35 -- Activate Sensor Processing, SCS #: 36 -- Enter Standby Mode.
6. Re-initialize Telescope Thermal Control
7. Disable battery thermal and peak power control
8. Disable OTG Motion
9. Enable Telescope Thermal Control Process
10. Enable OBA and HRMA Thermal Control, Select Primary Data Base
11. Initialize EPS Manager and set state to Normal
12. Call SCS #: 118 -- OBC Reset Reconfiguration Tasks
13. Turn on VDE A to re-establish thruster capability
14. Select OTG Primary Data Source
15. Call SCS #: 107 -- Main SI Safing

What Phase is this SCS used in? What Patches are Required for Normal Operations?

This SCS is used in the On-Orbit Phase.

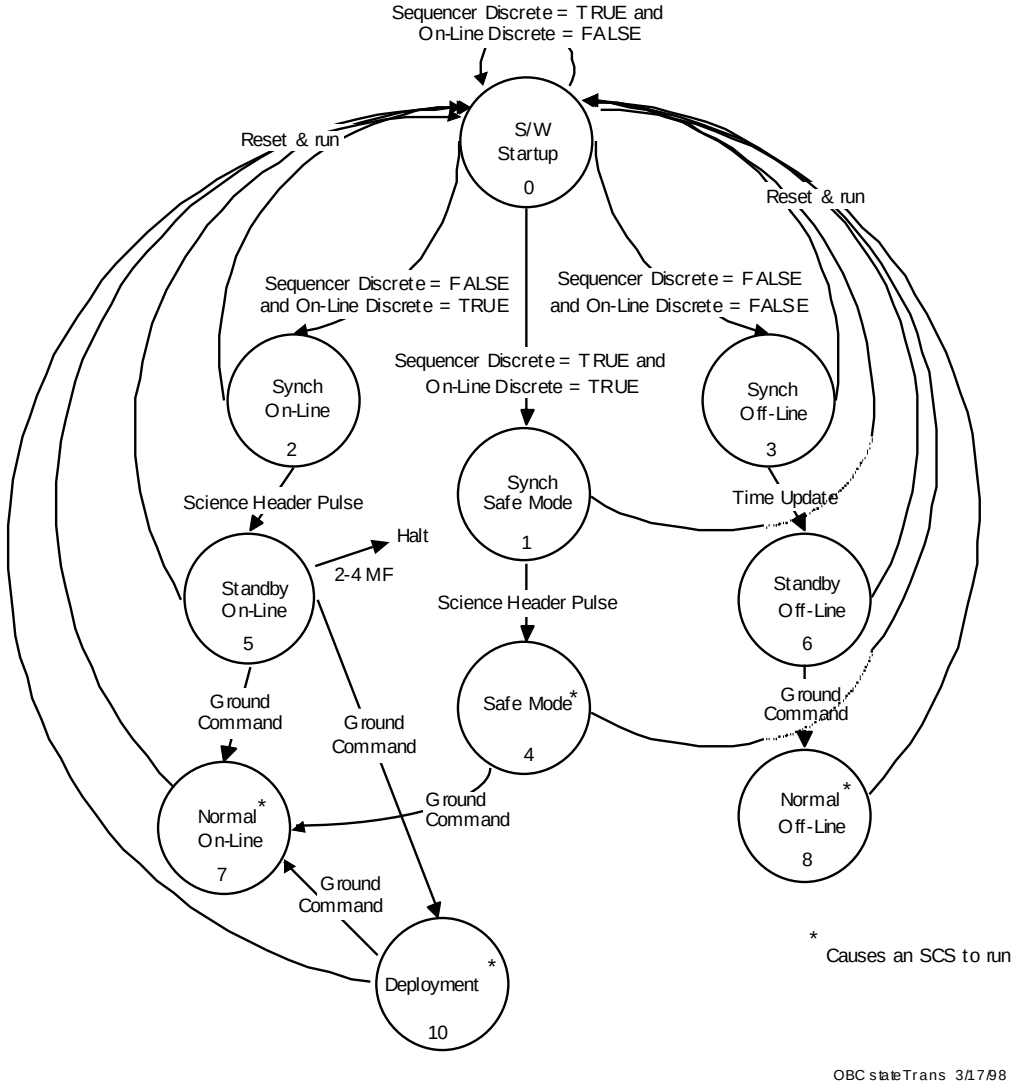
Constraints:

If this SCS is edited, be sure that no commands are deleted. These commands are necessary to ensure that the Observatory is safed in the event of an OBC reset, and that operations continue on “A-side” hardware.

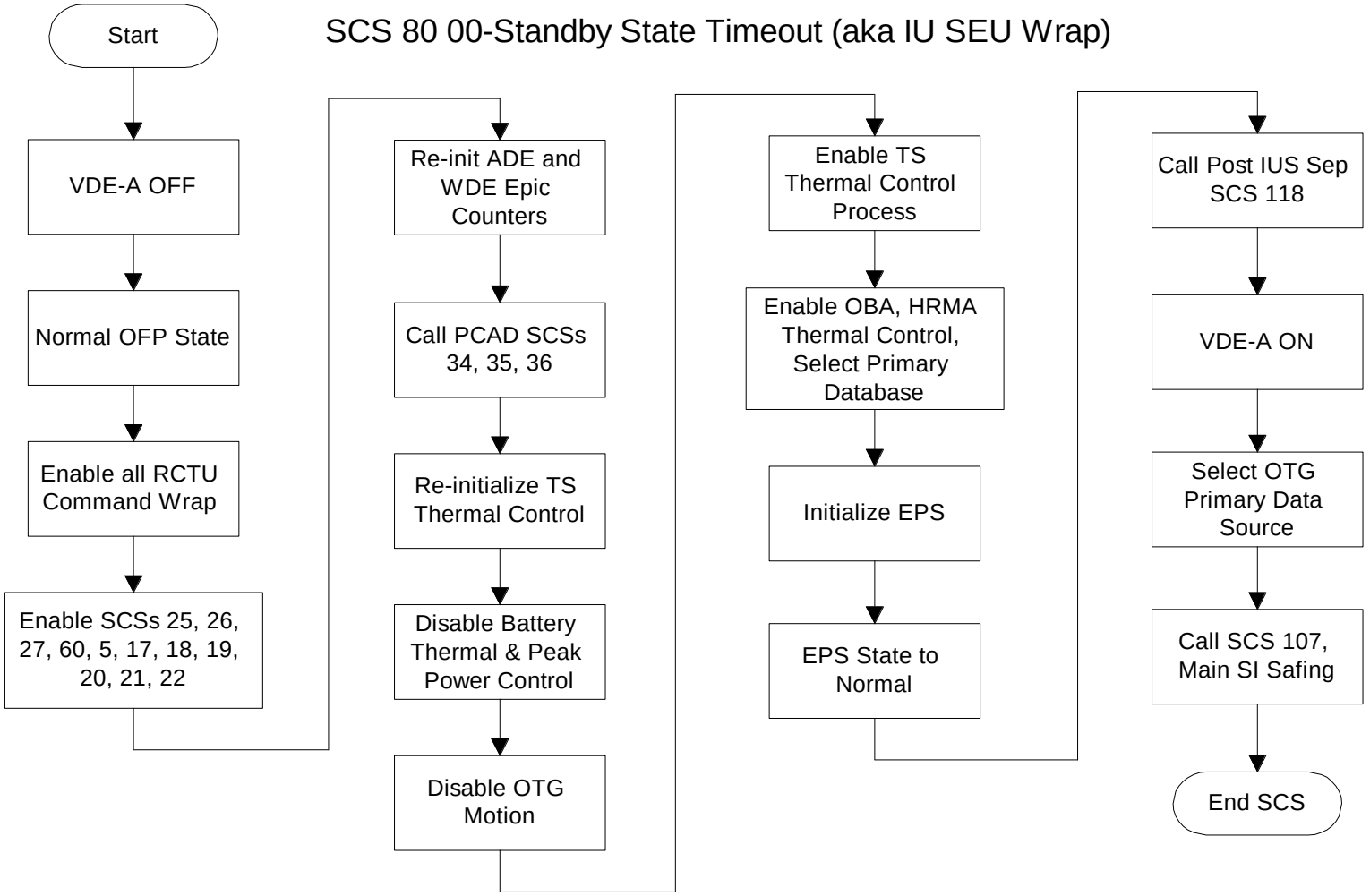
This SCS defaults to enabled upon OBC reset. Disabling this SCS has no effect since the only time it is used is during an OBC reset, and at that time, it will be re-enabled.

If SCS 80 is “deleted” or incapacitated, an OBC reset will result in a Safe Mode transition. Upon reset, the OBC will transition to Standby Online State, and will then time-out after 4-6 Major Frames, causing it to Halt. This will trip the sequencer, and result in Safe Mode.

Figure SCS 80-1. OBC State Transition Diagram



Flow SCS 80-1. SCS 80 Flow Diagram



Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	AVDEAOF	VDE-A PWR OFF		AVDEAX	OFF					PC	LCC				
2	2	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
2	2	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1												
3	3	COOFPNM	NORMAL OFP STATE SELECT		CONLOFP	NRML					NA	NA				
4	4	COWRAPED	Set RCTU Command Wrap Enable/Disable								LR	SD				
4	4	EP_RCTU	EP RCTU -- 0 = Disable Wrap Test 1=Enable Wrap Test	1												
4	4	PC_RCTU	PC RCTU -- 0 = Disable Wrap Test 1=Enable Wrap Test	1												
4	4	TS_RCTU	TE RCTU -- 0 = Disable Wrap Test 1=Enable Wrap Test	1												
4	4	SI_RCTU	SI RCTU -- 0 = Disable Wrap Test 1=Enable Wrap Test	1												
5	5	COENASX	ENABLE SCS#								NA	NA				
5	5	COENAS1	COENASX - SCS NUMBER -- SCS Number	25												
6	6	COENASX	ENABLE SCS#								NA	NA				
6	6	COENAS1	COENASX - SCS NUMBER -- SCS Number	26												
7	7	COENASX	ENABLE SCS#								NA	NA				
7	7	COENAS1	COENASX - SCS NUMBER -- SCS Number	27												
8	8	COENASX	ENABLE SCS#								NA	NA				
8	8	COENAS1	COENASX - SCS NUMBER -- SCS Number	60												
9	9	COENASX	ENABLE SCS#								NA	NA				
9	9	COENAS1	COENASX - SCS NUMBER -- SCS Number	5												
10	10	COENASX	ENABLE SCS#								NA	NA				
10	10	COENAS1	COENASX - SCS NUMBER -- SCS Number	17												
11	11	COENASX	ENABLE SCS#								NA	NA				
11	11	COENAS1	COENASX - SCS NUMBER -- SCS Number	18												
12	12	COENASX	ENABLE SCS#								NA	NA				
12	12	COENAS1	COENASX - SCS NUMBER -- SCS Number	19												
13	13	COENASX	ENABLE SCS#								NA	NA				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
13	13	COENAS1	COENASX - SCS NUMBER -- SCS Number	20												
14	14	COENASX	ENABLE SCS#								NA	NA				
14	14	COENAS1	COENASX - SCS NUMBER -- SCS Number	21												
15	15	COENASX	ENABLE SCS#								NA	NA				
15	15	COENAS1	COENASX - SCS NUMBER -- SCS Number	22												
16	16	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
16	16	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
17-18	17	ADEAO3IN	ADE-A INIT, CT3, SELECT 4.096 MHZ (OBC)--CONTROL COMMAND SERIAL INTERFACE (OBC)		AOADAC3A		AOADAC3C		AOADAC3E		PC	SD				
17-18	17	ADEAO3_1	ADEAO3IN Data Bits D13 to D0 of Data Field --		AOADAC3A		AOADAC3C		AOADAC3E		PC	SD				
17-18	17	ADEAO3_2	Q Odd Parity -- CPE parity bit over ground bits 19-34 of the command.	1	AOADAC3A		AOADAC3C		AOADAC3E		PC	SD				
17-18	17	ADEAO3_3	ADEAO3IN Least Significant Word and First Command Word --		AOADAC3A		AOADAC3C		AOADAC3E		PC	SD				
17-18	17	ADEAO3_4	ADEAO3IN Filler bit --		AOADAC3A		AOADAC3C		AOADAC3E		PC	SD				
17-18	17	ADEAO3_5	ADEAO3IN Address Part of Data Field -- Address part of the data field		AOADAC3A		AOADAC3C		AOADAC3E		PC	SD				
17-18	17	ADEAO3_6	ADEAO3IN Channel Part of Data Field -- Channel part of the data field		AOADAC3A		AOADAC3C		AOADAC3E		PC	SD				
17-18	17	ADEAO3_7	ADEAO3IN Data Bits D15 and D14 -- Data Bits 15 and 14 of second command word		AOADAC3A		AOADAC3C		AOADAC3E		PC	SD				
17-18	17	ADEAO3_8	ADEAO3IN Most Significant Word and Second Word of two word command -- Most Significant word of two word command		AOADAC3A		AOADAC3C		AOADAC3E		PC	SD				
19-20	18	ADEAO4IN	ADE-A INIT, CT3, DIVIDE BY 166 (24.67 KHZ) (OBC)--CONTROL COMMAND SERIAL INTERFACE (OBC)		AOADAC3A		AOADAC3C		AOADAC3E		PC	SD				
19-20	18	ADEAO4_1	ADEAO4IN Data Bits D13 to D0 of Data Field --		AOADAC3A		AOADAC3C		AOADAC3E		PC	SD				
19-20	18	ADEAO4_2	Q Odd Parity -- CPE parity bit over ground bits 19-34 of the command.	1	AOADAC3A		AOADAC3C		AOADAC3E		PC	SD				
19-20	18	ADEAO4_3	ADEAO4IN Least Significant Word		AOADAC3A		AOADAC3C		AOADAC3E		PC	SD				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			and First Command Word --													
19-20	18	ADEAO4_4	ADEAO4IN Filler bit --		AOADAC3A		AOADAC3C		AOADAC3E		PC	SD				
19-20	18	ADEAO4_5	ADEAO4IN Address Part of Data Field -- Address part of the data field		AOADAC3A		AOADAC3C		AOADAC3E		PC	SD				
19-20	18	ADEAO4_6	ADEAO4IN Channel Part of Data Field -- Channel part of the data field		AOADAC3A		AOADAC3C		AOADAC3E		PC	SD				
19-20	18	ADEAO4_7	ADEAO4IN Data Bits D15 and D14 -- Data Bits 15 and 14 of second command word		AOADAC3A		AOADAC3C		AOADAC3E		PC	SD				
19-20	18	ADEAO4_8	ADEAO4IN Most Significant Word and Second Word of two word command -- Most Significant word of two word command		AOADAC3A		AOADAC3C		AOADAC3E		PC	SD				
21	19	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
21	19	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
22-23	20	ADEAO3IN	ADE-A INIT, CT3, SELECT 4.096 MHZ (OBC)--CONTROL COMMAND SERIAL INTERFACE (OBC)		AOADAC3A		AOADAC3C		AOADAC3E		PC	SD				
22-23	20	ADEAO3_1	ADEAO3IN Data Bits D13 to D0 of Data Field --		AOADAC3A		AOADAC3C		AOADAC3E		PC	SD				
22-23	20	ADEAO3_2	Q Odd Parity -- CPE parity bit over ground bits 19-34 of the command.	1	AOADAC3A		AOADAC3C		AOADAC3E		PC	SD				
22-23	20	ADEAO3_3	ADEAO3IN Least Significant Word and First Command Word --		AOADAC3A		AOADAC3C		AOADAC3E		PC	SD				
22-23	20	ADEAO3_4	ADEAO3IN Filler bit --		AOADAC3A		AOADAC3C		AOADAC3E		PC	SD				
22-23	20	ADEAO3_5	ADEAO3IN Address Part of Data Field -- Address part of the data field		AOADAC3A		AOADAC3C		AOADAC3E		PC	SD				
22-23	20	ADEAO3_6	ADEAO3IN Channel Part of Data Field -- Channel part of the data field		AOADAC3A		AOADAC3C		AOADAC3E		PC	SD				
22-23	20	ADEAO3_7	ADEAO3IN Data Bits D15 and D14 -- Data Bits 15 and 14 of second command word		AOADAC3A		AOADAC3C		AOADAC3E		PC	SD				
22-23	20	ADEAO3_8	ADEAO3IN Most Significant Word and Second Word of two word command -- Most Significant word of two word command		AOADAC3A		AOADAC3C		AOADAC3E		PC	SD				
24-25	21	ADEAO4IN	ADE-A INIT, CT3, DIVIDE BY 166 (24.67 KHZ) (OBC)--CONTROL COMMAND SERIAL INTERFACE		AOADAC3A		AOADAC3C		AOADAC3E		PC	SD				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			(OBC)													
24-25	21	ADEAO4_1	ADEAO4IN Data Bits D13 to D0 of Data Field --		AOADAC3A		AOADAC3C		AOADAC3E		PC	SD				
24-25	21	ADEAO4_2	Q Odd Parity -- CPE parity bit over ground bits 19-34 of the command.	1	AOADAC3A		AOADAC3C		AOADAC3E		PC	SD				
24-25	21	ADEAO4_3	ADEAO4IN Least Significant Word and First Command Word --		AOADAC3A		AOADAC3C		AOADAC3E		PC	SD				
24-25	21	ADEAO4_4	ADEAO4IN Filler bit --		AOADAC3A		AOADAC3C		AOADAC3E		PC	SD				
24-25	21	ADEAO4_5	ADEAO4IN Address Part of Data Field -- Address part of the data field		AOADAC3A		AOADAC3C		AOADAC3E		PC	SD				
24-25	21	ADEAO4_6	ADEAO4IN Channel Part of Data Field -- Channel part of the data field		AOADAC3A		AOADAC3C		AOADAC3E		PC	SD				
24-25	21	ADEAO4_7	ADEAO4IN Data Bits D15 and D14 -- Data Bits 15 and 14 of second command word		AOADAC3A		AOADAC3C		AOADAC3E		PC	SD				
24-25	21	ADEAO4_8	ADEAO4IN Most Significant Word and Second Word of two word command -- Most Significant word of two word command		AOADAC3A		AOADAC3C		AOADAC3E		PC	SD				
26	22	COSCALL	SCS CALL SCS								NA	NA				
26	22	COSCALL1	COSCALL - SCS NUMBER -- SCS Number	34												
27	23	COSCALL	SCS CALL SCS								NA	NA				
27	23	COSCALL1	COSCALL - SCS NUMBER -- SCS Number	35												
28	24	COSCALL	SCS CALL SCS								NA	NA				
28	24	COSCALL1	COSCALL - SCS NUMBER -- SCS Number	36												
29	25	4OTELTCR	REINITIALIZE TELESCOPE THERMAL CONTROL		4ORINITC	TRUE					NA	NA				
30	26	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
30	26	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
31	27	4OBATCDS	DISABLE BATTERY THERMAL CONTROL		4OACBATH	DISA					NA	NA				
32	28	4OBAPKDS	DISABLE BATTERY PEAK POWER CONTROL		4OPPMEN	DISA					NA	NA				
33	29	4OOTGDS	DISABLE OTG MOTION		4OOTGMEF	DISA					NA	NA				
34	30	4OTTCPEN	TEL THERMAL CONTROL PROCESS ENABLE		4OTCPEN	ENAB					NA	NA				
35	31	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
35	31	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	5							NA	NA				
36	32	4OOBTCEN	ENABLE OBA THERMAL CONTROL		4OACOBAH	ENAB					NA	NA				
37	33	4OHMTCEN	ENABLE HRMA THERMAL CONTROL		4OACHRMH	ENAB					NA	NA				
38	34	4OTTHCDB	TELE THERM CONTROL DATA BASE SELECT								NA	NA				
38	34	4OTTHCD1	4OTTHCDB- Filler --								NA	NA				
38	34	4OTTHCD2	4OTTHCDB - Data Base to select -- 0-Primary Database 1-Secondary Database 2-Tertiary Database	00							NA	NA				
39	35	EOINISET	Set initialization flag to true		EGCTTEL3	OVRT					NA	NA				
40	36	EOEMGSTN	EPS Manager State (B4) Normal-- Build 4		EGCTTEL1	NORM					NA	NA				
41	37	COSCALL	SCS CALL SCS								NA	NA				
41	37	COSCALL1	COSCALL - SCS NUMBER -- SCS Number	118												
42	38	AVDEAON	VDE-A PWR ON		AVDEAX	ON					PC	LCC				
43	39	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
43	39	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
44	40	AVDEAON	VDE-A PWR ON		AVDEAX	ON					PC	LCC				
45	41	4OOTGPT	SELECT OTG PRIMARY DATA SOURCE		4OOTGDAS	PRI					NA	NA				
46	42	COSCALL	SCS CALL SCS								NA	NA				
46	42	COSCALL1	COSCALL - SCS NUMBER -- SCS Number	107												
47	43	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 81 -- SIM Move to Safe Position

Description:

This SCS positions the SIM so that the x-ray focal point is between the ACIS and HRC detectors.

Main Steps in SCS:

SIMGOTO serial digital command with parameter value [000101101100101]. This is +23336 steps, absolute position. To use this position, divide by 8 to get 2917, then encode to binary.
End SCS command.

What Phase is this SCS used in? What Patches are Required for Normal Operations?

Placing the x-ray focal point between the instruments provides protection against sun radiation impinging on the instruments.
The SCS is called by SCS #: 107 -- Main SI Safing

Constraints:

The SEA that is ON will respond to the command (e.g. no A or B side command sequences required)
All commands require the SIM SEA serial digital header properly filled out.
Two commands minimum - header command and data command.
The SIMGOTO commands are doubled-up to protect against SEU upset. The commands are separated by 1024 minor cycles (65.6 seconds, or two major frames) because of SIM sync requirements.

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	3SIMHD	SIM SEA SERIAL COMMAND HEADER--The SEA will only accept commands in groups or packets preceeded by this SEA Header command. The SEA Header command is the first command in a group or packet sent to the SEA. The SEA Header command contains an 8 bit checksum which is computed such that the low order 8 bits of the sum of all 8 bit bytes in the command group or packet, including the two bytes of the Header command, is zero. The Header command also contains field to specify the number of 16 bit command in the group or packet								SI	SD				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			that follow the Header. The maximum number of commands that may be sent in one group, following the header, is 63. The SEA will not execute any command in a group until the entire group has been received and verified to be correct. An error in the checksum, word count, or an illegal value for any individual command will cause the SEA to reject the entire command group or packet and set the invalid command flag in output telemetry.													
1	1	3SIMHD1	SIM SEA Header Checksum -- This field is used to specify an 8 bit checksum of all command bytes within a command group transmitted to the SIM. The checksum is computed such that the low order 8 bits of the sum of all 8 bit bytes in the command group, including the header word, is zero.	188												
1	1	3SIMHD2	SIM SEA Header Fill -- Fill bits, set to binary (00).													
1	1	3SIMHD3	SIM SEA Header No of Commands -- This field is used to specify the number of 16 bit commands in a command group that follow the header. The maximum number of 16 bit commands in a command group is limited to 63.	3												
2	2	3TSCMBEN	SIM TSC MOTOR ENABLE--The TSC Motor Enable command causes the SEA software to operate latching relays that control which motor is to be driven, and that control the application of power to the motor driver. The SEA software will not apply power to either motor in response to this command, only to the motor driver. The Goto Position command powers on the motor. The TSC Motor Enable command must be issued to select a motor and apply power to the motor driver prior to issuing the Goto Position command. Execution of this command will be held off by		3SMOTPEN	ON	3SMOTSEL	TSC			SI	SD				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			the SEA software until any motor motion already in progress is completed.													
3	3	3TSCGOTO	SIM GO TO POSITION--The SIM Go To Position command causes the SEA software to initiate movement of one of the drive motors. This command will have no effect unless power has already been applied to the motor driver by a previous Motor Enable command. The SEA software will hold off execution of this command until any motor motion already in progress is completed.													
3	3	3TSCGOTO	SIM GOTO Mechanism Position Value -- This field is a signed 15 bit integer used to specify a mechanism position relative to the origin. For the TSC, one LSB equals 160 degrees of motor rotation. For the FA, one LSB equals 20 degrees of motor rotation. The TSC or FA motor is moved depending on which one has been selected with the Motor Enable command.	0001011 0110010 1												
4	4	3TSCMBDS	SIM TSC MOTOR DISABLE--The TSC Motor Disable command causes the SEA software to operate latching relays that control which motor is to be driven, and that control the application of power to the motor driver. The SEA software will not apply or disconnect power to either motor in response to this command, only to the motor driver. Execution of this command will be held off by the SEA software until any motor motion already in progress is completed. Therefore, it cannot be used to stop a motion in progress. The Motor Stop command is used for that purpose.		3SMOTPEN	OFF	3SMOTSEL	TSC			SI	SD				
5	5	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
5	5	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1024							NA	NA				
6	6	3SIMHD	SIM SEA SERIAL COMMAND								SI	SD				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			HEADER--The SEA will only accept commands in groups or packets preceeded by this SEA Header command. The SEA Header command is the first command in a group or packet sent to the SEA. The SEA Header command contains an 8 bit checksum which is computed such that the low order 8 bits of the sum of all 8 bit bytes in the command group or packet, including the two bytes of the Header command, is zero. The Header command also contains field to specify the number of 16 bit command in the group or packet that follow the Header. The maximum number of commands that may be sent in one group, following the header, is 63. The SEA will not execute any command in a group until the entire group has been received and verified to be correct. An error in the checksum, word count, or an illegal value for any individual command will cause the SEA to reject the entire command group or packet and set the invalid command flag in output telemetry.													
6	6	3SIMHD1	SIM SEA Header Checksum -- This field is used to specify an 8 bit checksum of all command bytes within a command group transmitted to the SIM. The checksum is computed such that the low order 8 bits of the sum of all 8 bit bytes in the command group, including the header word, is zero.	188												
6	6	3SIMHD2	SIM SEA Header Fill -- Fill bits, set to binary (00).													
6	6	3SIMHD3	SIM SEA Header No of Commands -- This field is used to specify the number of 16 bit commands in a command group that follow the header. The maximum number of 16 bit commands in a command group is limited to 63.	3												
7	7	3TSCMBEN	SIM TSC MOTOR ENABLE--The		3SMOTPEN	ON	3SMOTSEL	TSC			SI	SD				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			TSC Motor Enable command causes the SEA software to operate latching relays that control which motor is to be driven, and that control the application of power to the motor driver. The SEA software will not apply power to either motor in response to this command, only to the motor driver. The Goto Position command powers on the motor. The TSC Motor Enable command must be issued to select a motor and apply power to the motor driver prior to issuing the Goto Position command. Execution of this command will be held off by the SEA software until any motor motion already in progress is completed.													
8	8	3TSCGOTO	SIM GO TO POSITION--The SIM Go To Position command causes the SEA software to initiate movement of one of the drive motors. This command will have no effect unless power has already been applied to the motor driver by a previous Motor Enable command. The SEA software will hold off execution of this command until any motor motion already in progress is completed.													
8	8	3TSCGOTO	SIM GOTO Mechanism Position Value -- This field is a signed 15 bit integer used to specify a mechanism position relative to the origin. For the TSC, one LSB equals 160 degrees of motor rotation.	0001011 0110010 1												
9	9	3TSCMBDS	SIM TSC MOTOR DISABLE--The TSC Motor Disable command causes the SEA software to operate latching relays that control which motor is to be driven, and that control the application of power to the motor driver. The SEA software will not apply or disconnect power to either motor in response to this command, only to the motor driver. Execution of this command will be		3SMOTPEN	OFF	3SMOTSEL	TSC			SI	SD				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			held off by the SEA software until any motor motion already in progress is completed. Therefore, it cannot be used to stop a motion in progress. The Motor Stop command is used for that purpose.													
10	10	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
10	10	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
11	11	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 82 -- OTG Emergency Halt

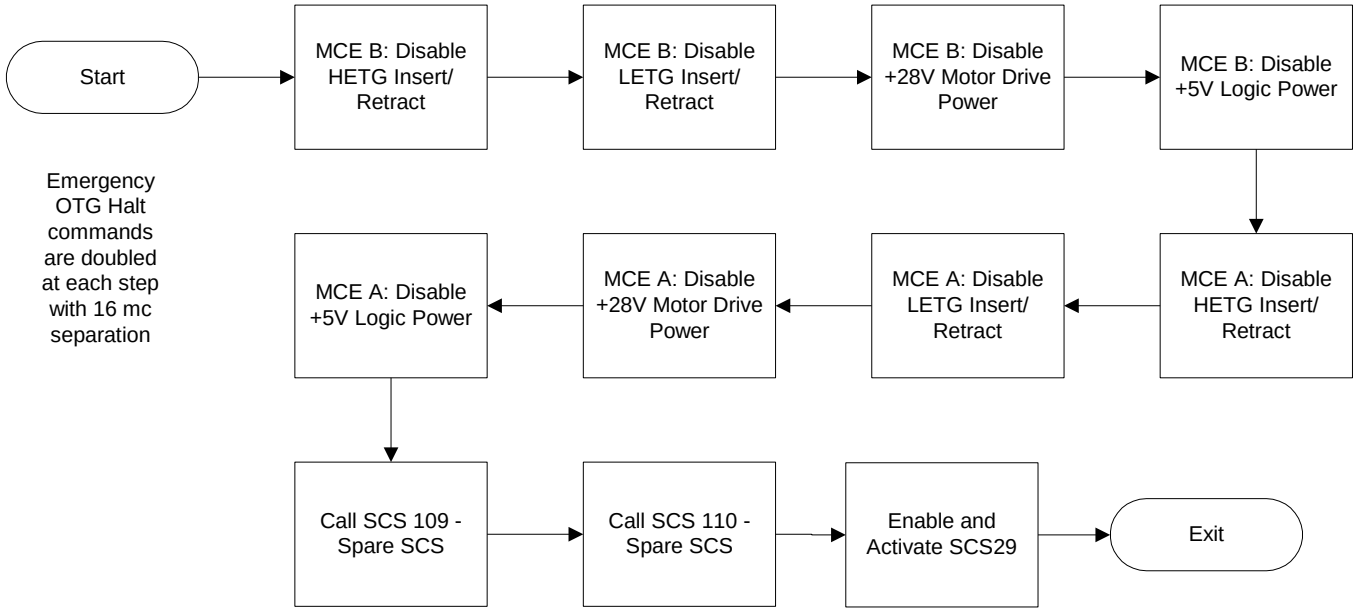
Description:

This SCS halts the motion of either the LETG or the HETG using MCE hardware commands in the event that they are in motion when a safing event occurs. The commanding first disables OTG motion and power supplies using MCE-B commands, then repeats the commanding using MCE-A commands.

Main Steps in SCS:

Refer to Flow SCS 82-1 for the steps in moving the OTGs.

Flow SCS 82-1 Emergency OTG Halt Sequence



What Phase is this SCS used in? What Patches are Required for Normal Operations?

The SCS is used to halt OTG motion in the event that the daily loads are stopped.
This SCS is called by SCS #: 107 -- Main SI Safing

Constraints:

The commands in the sequence will disable any OTG motion that is in process.
Each command is doubled up individually with a separation of 16 mc (1 second).
NOTE: This SCS uses both MCE-B and MCE-A side commands to control the OTGs.

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	4EXHGBDS	MCE B: DISA HETG INSERTION/RETRACTION		4HEXRBX	DISA					TS	HLP				
2	2	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
2	2	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
3	3	4EXHGBDS	MCE B: DISA HETG INSERTION/RETRACTION		4HEXRBX	DISA					TS	HLP				
4	4	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
4	4	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
5	5	4EXLGBDS	MCE B:DISA LETG INSERTION/RETRACTION		4LEXRBX	DISA					TS	HLP				
6	6	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
6	6	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
7	7	4EXLGBDS	MCE B:DISA LETG INSERTION/RETRACTION		4LEXRBX	DISA					TS	HLP				
8	8	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
8	8	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
9	9	4MC28BDS	MCE B: DISA 28 VOLT DC/DC CONV		4M28IRBX	DISA	4MP28BV	0/.6			TS	HLP				
10	10	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
10	10	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
11	11	4MC28BDS	MCE B: DISA 28 VOLT DC/DC CONV		4M28IRBX	DISA	4MP28BV	0/.6			TS	HLP				

12	12	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA					
12	12	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16													
13	13	4MC5BDS	MCE B: DISA 5 VOLT DC/DC CONV		4M5IRBX	DISA	4MP5BV	0/.5			TS	HLP					
14	14	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA					
14	14	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA					
15	15	4MC5BDS	MCE B: DISA 5 VOLT DC/DC CONV		4M5IRBX	DISA	4MP5BV	0/.5			TS	HLP					
16	16	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA					
16	16	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA					
17	17	4EXHGADS	MCE A: DISA HETG INSERTION/RETRACTION		4HEXRAX	DISA					TS	HLP					
18	18	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA					
18	18	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA					
19	19	4EXHGADS	MCE A: DISA HETG INSERTION/RETRACTION		4HEXRAX	DISA					TS	HLP					
20	20	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA					
20	20	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA					
21	21	4EXLGADS	MCE A:DISA LETG INSERTION/RETRACTION		4LEXRAX	DISA					TS	HLP					
22	22	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA					
22	22	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA					
23	23	4EXLGADS	MCE A:DISA LETG INSERTION/RETRACTION		4LEXRAX	DISA					TS	HLP					
24	24	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA					
24	24	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA					
25	25	4MC28ADS	MCE A: DISA 28 VOLT DC/DC CONV		4M28IRAX	DISA	4MP28AV	0/.5			TS	HLP					
26	26	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA					
26	26	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA					
27	27	4MC28ADS	MCE A: DISA 28 VOLT DC/DC CONV		4M28IRAX	DISA	4MP28AV	0/.5			TS	HLP					
28	28	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA					
28	28	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA					

29	29	4MC5ADS	MCE A: DISA 5 VOLT DC/DC CONV		4M5IRAX	DISA	4MP5AV	0/.5			TS	HLP				
30	30	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
30	30	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
31	31	4MC5ADS	MCE A: DISA 5 VOLT DC/DC CONV		4M5IRAX	DISA	4MP5AV	0/.5			TS	HLP				
32	32	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
32	32	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
33	33	COSCALL	SCS CALL SCS								NA	NA				
33	33	COSCALL1	COSCALL - SCS NUMBER -- SCS Number	109												
34	34	COSCALL	SCS CALL SCS								NA	NA				
34	34	COSCALL1	COSCALL - SCS NUMBER -- SCS Number	110												
35	35	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
35	35	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
36	36	COENASX	ENABLE SCS													
36	36	COENAS1	SCS Number	29												
37	37	COACTSX	ACTIVATE SCS#													
37	37	COACTS1	SCS Number	29												
37	37	COACTS2	Repeat Count	0												
38	38	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 83 – No-op SCS

Description:

This SCS was formerly the ACIS High Radiation Command, and a Spare SCS It is now designated a No-op SCS that will contain only a End SCS Command. This SCS is called in the EPS Flight Software Unexpected Connection Fault Handling code and is intended to act as a No-op. See the New Eclipse Handling Plan for rationale.

Main Steps in SCS:

End SCS command.

What Phase is this SCS used in? What Patches are Required for Normal Operations?

This SCS is activated in the event that the Unexpected Connection Fault Handling code executes.

Constraints:

None

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 84 – Command Normal Sun Mode

Description:

This SCS is activated by SCS #: 107 -- Main SI Safing, and will only run in the event that SCS 84 has been enabled.

Prior to the introduction of the Propulsion Temperature Safing Monitor in July 2006, the purpose of SCS 84 was to protect the propulsion lines from an extended period of cold temperatures. If SCS 107 executed, the mission load would stop, possibly leaving the spacecraft at an unfavorable thermal attitude that would allow the lines to get too cold. With SCS 84 commanding a Normal Sun attitude, this would be averted.

With the Propulsion Temperature Safing Monitor in place, SCS 84 has been left in a disabled state and is no longer used operationally to provide thermal protection for the propulsion lines and valves. As such, it can be considered as a "spare" SCS, or be used to support the handling plans for other performance issues or concerns that may arise in the future.

Main Steps in SCS:

1. AONSMSAF -- command Normal Sun Mode as a safing action
2. End SCS command.

What Phase is this SCS used in? What Patches are Required for Normal Operations?

This SCS is activated by SCS 107.

Constraints:

In the case of an unexpected OBC reset (such as those experienced in the 2008 and 2010 IU resets), SCS 84 is enabled by default as part of the OBC startup. In this case, a clean-up action must be taken operationally to disable SCS 84 at the earliest opportunity.

Considering the implementation of the Science Only Safing Action capability, SCS 84 should continue to remain in a disabled state so as not to disrupt Vehicle mission loads for events that only require science instrument safing (for example, a high radiation event). For events where both the Vehicle and Observing loads must be stopped (for example, a Bright Star Hold

event), appropriate commanding has been placed in those safing SCSs to accomplish this task; however, SCS 84 must remain in a disabled state for these cases as well so as not to disrupt an intended transition to Bright Star Hold.

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	AONSMSAF	Transition to Normal Sun Mode Safing		AOPCADMD	NSUN					NA	NA	21	AONSMSAF	Transition to Normal Sun Mode Safing	
2	2	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 85 -- Spare SCS

Description:

This SCS is not used. This SCS was formerly the HRC Radiation High Command sequence, and is now a spare.

Main Steps in SCS:

End SCS command.

What Phase is this SCS used in? What Patches are Required for Normal Operations?

Constraints:

None

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 86 -- Spare SCS

Description:

This SCS is not used. This SCS is formerly the HRC Radiation Low Command sequence. It was actually never defined, and has been empty since before launch.

Main Steps in SCS:

End SCS command.

What Phase is this SCS used in? What Patches are Required for Normal Operations?

Constraints:

None

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 87 -- HRC Scheduled/No Dither HRC-I HV Ramp Down Commands

Description:

This SCS reduces the HRC-I MCP top and bottom plate voltages to safe levels.

Main Steps in SCS:

1. Disable HRC-I current limiting
2. Set HRC-I Top Plate voltage to level 42
3. Set HRC-I Bottom Plate voltage to level 53
4. Wait 32 minor cycles
5. Enable HRC-I current limiting.

What Phase is this SCS used in? What Patches are Required for Normal Operations?

The SCS sets the HRC-I MCP top and bottom plates to levels that will not harm the instrument when AXAF is not in a dither state. This sequence would normally be called by a daily load command as part of normal observation scheduling.

This SCS is TERMINATED by SCS SCS #: 79 -- OO - NSM Transition

This SCS is CALLED by the following SCSs:

SCS #: 91 -- HRC Dither Control

SCS #: 104 -- HRC Safing Part 1

Constraints:

This SCS should only be modified and approved for use by the Chandra X-ray Science Center.

Commands are doubled-up individually to protect against SEUs.

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	2IMCLDS	IMAGING HV CURRENT LIMIT DISABLE--DISABLES IM HV OUTPUT CURRENT LIMITER. BITS 19-26 ARE THE COMMAND NUMBER (04 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=0 DISABLES THE LIMITER.		2IMCLST	DISA					SI	SD				
2	2	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
2	2	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
3	3	2IMCLDS	IMAGING HV CURRENT LIMIT		2IMCLST	DISA					SI	SD				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			DISABLE--DISABLES IM HV OUTPUT CURRENT LIMITER. BITS 19-26 ARE THE COMMAND NUMBER (04 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=0 DISABLES THE LIMITER.													
4	4	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
4	4	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
5	5	2IMTTHV	IMAGING DET TOP PLATE HV SETTING-- SETS VOLTAGE AT TOP OF IM TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.		2IMTPAST	NONE	2IMHBLV	NONE			SI	SD				
5	5	2IMTTHV1	Filler --													
5	5	2IMTTHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF IM TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.	42												
6	6	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
6	6	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
7	7	2IMTTHV	IMAGING DET TOP PLATE HV SETTING-- SETS VOLTAGE AT TOP OF IM TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.		2IMTPAST	NONE	2IMHBLV	NONE			SI	SD				
7	7	2IMTTHV1	Filler --													
7	7	2IMTTHV2	VOLTAGE STEPS -- SETS	42												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			VOLTAGE AT TOP OF IM TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.													
8	8	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
8	8	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
9	9	2IMTBHV	IMAGING DET BOTTOM PLATE HV SETTING-- SETS VOLTAGE AT TOP OF IM BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.		2IMBPAST	NONE	2IMHVLV	NONE			SI	SD				
9	9	2IMTBHV1	Filler --													
9	9	2IMTBHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF IM BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.	53												
10	10	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
10	10	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
11	11	2IMTBHV	IMAGING DET BOTTOM PLATE HV SETTING-- SETS VOLTAGE AT TOP OF IM BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS,		2IMBPAST	NONE	2IMHVLV	NONE			SI	SD				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			037FH=-2540 VOLTS.													
11	11	2IMTBHV1	Filler --													
11	11	2IMTBHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF IM BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.	53												
12	12	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
12	12	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	32												
13	13	2IMCLEN	IMAGING HV CURRENT LIMIT ENABLE--DISABLES IM HV OUTPUT CURRENT LIMITER. BITS 19-26 ARE THE COMMAND NUMBER (04 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=1 ENABLES THE LIMITER.		2IMCLST	ENAB					SI	SD				
14	14	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
14	14	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	32												
15	15	2IMCLEN	IMAGING HV CURRENT LIMIT ENABLE--DISABLES IM HV OUTPUT CURRENT LIMITER. BITS 19-26 ARE THE COMMAND NUMBER (04 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=1 ENABLES THE LIMITER.		2IMCLST	ENAB					SI	SD				
16	16	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
16	16	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
17	17	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 88 -- HRC Scheduled/No Dither HRC-S HV Ramp Down Commands

Description:

This SCS reduces the HRC-S MCP top and bottom plate voltages to safe levels.

Main Steps in SCS:

1. Disable HRC-S current limiting
2. Set HRC-S Top Plate voltage to level 43
3. Set HRC-S Bottom Plate voltage to level 54
4. Wait 32 minor cycles
5. Enable HRC-S current limiting.

What Phase is this SCS used in? What Patches are Required for Normal Operations?

The SCS sets the HRC-S MCP top and bottom plates to levels that will not harm the instrument when AXAF is not in a dither state. This sequence would normally be called by a daily load command as part of normal observation scheduling.
This SCS is TERMINATED by SCS SCS #: 79 -- OO - NSM Transition
This SCS is CALLED by the following SCSs:

SCS #: 91 -- HRC Dither Control
SCS #: 104 -- HRC Safing Part 1

Constraints:

This SCS should only be modified and approved for use by the Chandra X-ray Science Center.
Commands are doubled-up individually to protect against SEUs.

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	2SPCLDS	SPECT HV CURRENT LIMIT DISABLE--DISABLES SP HV OUTPUT CURRENT LIMITER. BITS 19-26 ARE THE COMMAND NUMBER (04 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=0 DISABLES THE LIMITER.		2SPCLST	DISA					SI	SD				
2	2	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
2	2	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
3	3	2SPCLDS	SPECT HV CURRENT LIMIT		2SPCLST	DISA					SI	SD				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			DISABLE--DISABLES SP HV OUTPUT CURRENT LIMITER. BITS 19-26 ARE THE COMMAND NUMBER (04 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=0 DISABLES THE LIMITER.													
4	4	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
4	4	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
5	5	2SPTTHV	SPECT DET TOP PLATE HV SETTING-- SETS VOLTAGE AT TOP OF SP TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.		2SPTPAST	NONE	2SPHBLV	NONE			SI	SD				
5	5	2SPTTHV1	Filler --													
5	5	2SPTTHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF SP TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.	43												
6	6	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
6	6	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
7	7	2SPTTHV	SPECT DET TOP PLATE HV SETTING-- SETS VOLTAGE AT TOP OF SP TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.		2SPTPAST	NONE	2SPHBLV	NONE			SI	SD				
7	7	2SPTTHV1	Filler --													
7	7	2SPTTHV2	VOLTAGE STEPS -- SETS	43												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			VOLTAGE AT TOP OF SP TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.													
8	8	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
8	8	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
9	9	2SPTBHV	SPECT DET BOTTOM PLATE HV SETTING-- SETS VOLTAGE AT TOP OF SP BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.		2SPBPAST	NONE	2SPHVLV	NONE			SI	SD				
9	9	2SPTBHV1	Filler --													
9	9	2SPTBHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF SP BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.	54												
10	10	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
10	10	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
11	11	2SPTBHV	SPECT DET BOTTOM PLATE HV SETTING-- SETS VOLTAGE AT TOP OF SP BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS,		2SPBPAST	NONE	2SPHVLV	NONE			SI	SD				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			037FH=-2540 VOLTS.													
11	11	2SPTBHV1	Filler --													
11	11	2SPTBHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF SP BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.	54												
12	12	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
12	12	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	32												
13	13	2SPCLEN	SPECT HV CURRENT LIMIT ENABLE--DISABLES SP HV OUTPUT CURRENT LIMITER. BITS 19-26 ARE THE COMMAND NUMBER (04 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=1 ENABLES THE LIMITER.		2SPCLST	ENAB					SI	SD				
14	14	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
14	14	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	32												
15	15	2SPCLEN	SPECT HV CURRENT LIMIT ENABLE--DISABLES SP HV OUTPUT CURRENT LIMITER. BITS 19-26 ARE THE COMMAND NUMBER (04 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=1 ENABLES THE LIMITER.		2SPCLST	ENAB					SI	SD				
16	16	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
16	16	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
17	17	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 89 -- HRC Scheduled/Dither HRC-I HV Ramp Up Commands

Description:

This SCS performs a controlled ramp-up of HRC-I MCP high voltages for observations.
This SCS was modified via patch during the OAC period to change the last step voltage levels.

Main Steps in SCS:

Refer to Flow SCS 89-1 for the main sequence of commands. Time delays are not shown.

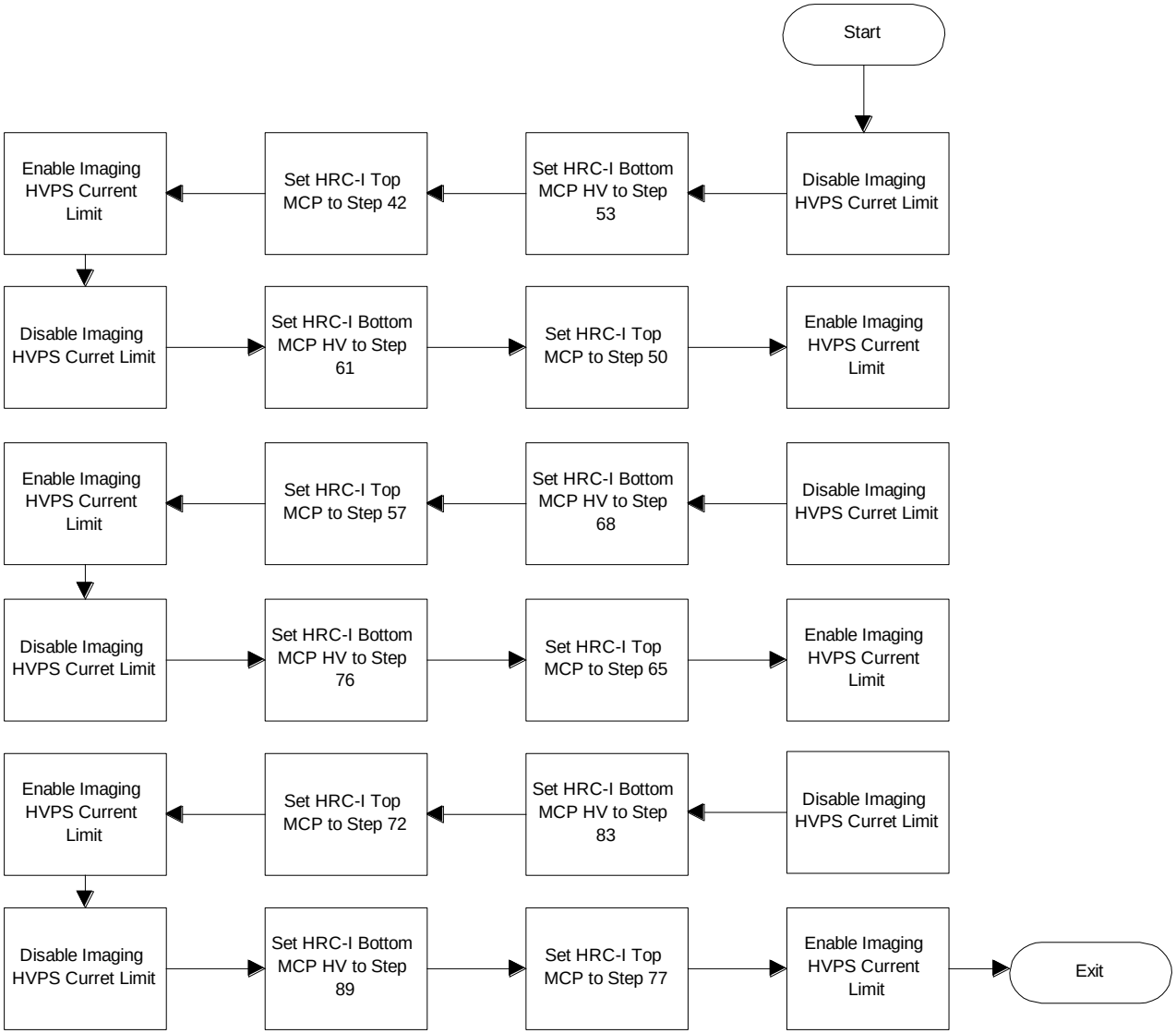
What Phase is this SCS used in? What Patches are Required for Normal Operations?

This SCS is used to step up the HRC-I MCP high voltage for an observation.
This SCS is CALLED by SCS #: 91 -- HRC Dither Control
This SCS is TERMINATED by SCS #: 104 -- HRC Safing Part 1
This SCS is DISABLED by SCS #: 104 -- HRC Safing Part 1

Constraints:

This SCS should only be modified and approved for use by the Chandra X-ray Science Center.
Command are doubled-up individually to protect against SEUs.

Flow SCS 89-1 HRC-I MCP HV Ramp Up



Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	2IMCLDS	IMAGING HV CURRENT LIMIT DISABLE--DISABLES IM HV OUTPUT CURRENT LIMITER. BITS 19-26 ARE THE COMMAND NUMBER (04 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=0 DISABLES THE LIMITER.		2IMCLST	DISA					SI	SD				
2	2	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
2	2	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
3	3	2IMCLDS	IMAGING HV CURRENT LIMIT DISABLE--DISABLES IM HV OUTPUT CURRENT LIMITER. BITS 19-26 ARE THE COMMAND NUMBER (04 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=0 DISABLES THE LIMITER.		2IMCLST	DISA					SI	SD				
4	4	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
4	4	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
5	5	2IMTBHV	IMAGING DET BOTTOM PLATE HV SETTING-- SETS VOLTAGE AT TOP OF IM BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.		2IMBPAST	NONE	2IMHVLV	NONE			SI	SD				
5	5	2IMTBHV1	Filler --		2IMBPAST	NONE	2IMHVLV	NONE			SI	SD				
5	5	2IMTBHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF IM BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.	53	2IMBPAST	NONE	2IMHVLV	NONE			SI	SD				
6	6	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
6	6	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
7	7	2IMTBHV	IMAGING DET BOTTOM PLATE HV SETTING-- SETS VOLTAGE AT TOP OF IM BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.		2IMBPAST	NONE	2IMHVLV	NONE			SI	SD				
7	7	2IMTBHV1	Filler --													
7	7	2IMTBHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF IM BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.	53												
8	8	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
8	8	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
9	9	2IMTTHV	IMAGING DET TOP PLATE HV SETTING-- SETS VOLTAGE AT TOP OF IM TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.		2IMTPAST	NONE	2IMHBLV	NONE			SI	SD				
9	9	2IMTTHV1	Filler --		2IMTPAST	NONE	2IMHBLV	NONE			SI	SD				
9	9	2IMTTHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF IM TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.	42	2IMTPAST	NONE	2IMHBLV	NONE			SI	SD				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
10	10	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
10	10	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
11	11	2IMTTHV	IMAGING DET TOP PLATE HV SETTING-- SETS VOLTAGE AT TOP OF IM TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.		2IMTPAST	NONE	2IMHBLV	NONE			SI	SD				
11	11	2IMTTHV1	Filler --													
11	11	2IMTTHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF IM TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.	42												
12	12	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
12	12	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	32												
13	13	2IMCLEN	IMAGING HV CURRENT LIMIT ENABLE--DISABLES IM HV OUTPUT CURRENT LIMITER. BITS 19-26 ARE THE COMMAND NUMBER (04 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=1 ENABLES THE LIMITER.		2IMCLST	ENAB					SI	SD				
14	14	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
14	14	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	32												
15	15	2IMCLEN	IMAGING HV CURRENT LIMIT ENABLE--DISABLES IM HV OUTPUT CURRENT LIMITER. BITS 19-26 ARE THE COMMAND NUMBER (04 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=1 ENABLES THE LIMITER.		2IMCLST	ENAB					SI	SD				
16	16	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
16	16	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	469							NA	NA				
17	17	2IMCLDS	IMAGING HV CURRENT LIMIT DISABLE--DISABLES IM HV OUTPUT CURRENT LIMITER. BITS 19-26 ARE THE COMMAND NUMBER (04 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=0 DISABLES THE LIMITER.		2IMCLST	DISA					SI	SD				
18	18	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
18	18	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
19	19	2IMCLDS	IMAGING HV CURRENT LIMIT DISABLE--DISABLES IM HV OUTPUT CURRENT LIMITER. BITS 19-26 ARE THE COMMAND NUMBER (04 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=0 DISABLES THE LIMITER.		2IMCLST	DISA					SI	SD				
20	20	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
20	20	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
21	21	2IMTBHV	IMAGING DET BOTTOM PLATE HV SETTING-- SETS VOLTAGE AT TOP OF IM BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.		2IMBPAST	NONE	2IMHVLV	NONE			SI	SD				
21	21	2IMTBHV1	Filler --													
21	21	2IMTBHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF IM BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.	61												
22	22	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
22	22	COSRTDL1	Relative Time Delay (SCS Only) --	16												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			Relative Time Delay (minor cycles)													
23	23	2IMTBHV	IMAGING DET BOTTOM PLATE HV SETTING-- SETS VOLTAGE AT TOP OF IM BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.		2IMBPAST	NONE	2IMHVLV	NONE			SI	SD				
23	23	2IMTBHV1	Filler --													
23	23	2IMTBHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF IM BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.	61												
24	24	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
24	24	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
25	25	2IMTTHV	IMAGING DET TOP PLATE HV SETTING-- SETS VOLTAGE AT TOP OF IM TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.		2IMTPAST	NONE	2IMHBLV	NONE			SI	SD				
25	25	2IMTTHV1	Filler --													
25	25	2IMTTHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF IM TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS,	50												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			027FH=-5080 VOLTS.													
26	26	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
26	26	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
27	27	2IMTTHV	IMAGING DET TOP PLATE HV SETTING-- SETS VOLTAGE AT TOP OF IM TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.		2IMTPAST	NONE	2IMHBLV	NONE			SI	SD				
27	27	2IMTTHV1	Filler --													
27	27	2IMTTHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF IM TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.	50												
28	28	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
28	28	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	32							NA	NA				
29	29	2IMCLEN	IMAGING HV CURRENT LIMIT ENABLE--DISABLES IM HV OUTPUT CURRENT LIMITER. BITS 19-26 ARE THE COMMAND NUMBER (04 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=1 ENABLES THE LIMITER.		2IMCLST	ENAB					SI	SD				
30	30	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
30	30	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	32												
31	31	2IMCLEN	IMAGING HV CURRENT LIMIT ENABLE--DISABLES IM HV OUTPUT CURRENT LIMITER. BITS 19-26 ARE THE COMMAND NUMBER (04 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=1 ENABLES THE LIMITER.		2IMCLST	ENAB					SI	SD				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
32	32	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
32	32	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	469							NA	NA				
33	33	2IMCLDS	IMAGING HV CURRENT LIMIT DISABLE--DISABLES IM HV OUTPUT CURRENT LIMITER. BITS 19-26 ARE THE COMMAND NUMBER (04 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=0 DISABLES THE LIMITER.		2IMCLST	DISA					SI	SD				
34	34	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
34	34	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
35	35	2IMCLDS	IMAGING HV CURRENT LIMIT DISABLE--DISABLES IM HV OUTPUT CURRENT LIMITER. BITS 19-26 ARE THE COMMAND NUMBER (04 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=0 DISABLES THE LIMITER.		2IMCLST	DISA					SI	SD				
36	36	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
36	36	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
37	37	2IMTBHV	IMAGING DET BOTTOM PLATE HV SETTING-- SETS VOLTAGE AT TOP OF IM BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.		2IMBPAST	NONE	2IMHVLV	NONE			SI	SD				
37	37	2IMTBHV1	Filler --													
37	37	2IMTBHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF IM BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.	68												
38	38	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
38	38	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
39	39	2IMTBHV	IMAGING DET BOTTOM PLATE HV SETTING-- SETS VOLTAGE AT TOP OF IM BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.		2IMBPAST	NONE	2IMHVLV	NONE			SI	SD				
39	39	2IMTBHV1	Filler --													
39	39	2IMTBHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF IM BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.	68												
40	40	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
40	40	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
41	41	2IMTTHV	IMAGING DET TOP PLATE HV SETTING-- SETS VOLTAGE AT TOP OF IM TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.		2IMTPAST	NONE	2IMHBLV	NONE			SI	SD				
41	41	2IMTTHV1	Filler --													
41	41	2IMTTHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF IM TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX	57												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			= 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.													
42	42	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
42	42	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
43	43	2IMTTHV	IMAGING DET TOP PLATE HV SETTING-- SETS VOLTAGE AT TOP OF IM TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.		2IMTPAST	NONE	2IMHBLV	NONE			SI	SD				
43	43	2IMTTHV1	Filler --													
43	43	2IMTTHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF IM TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.	57												
44	44	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
44	44	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	32							NA	NA				
45	45	2IMCLEN	IMAGING HV CURRENT LIMIT ENABLE--DISABLES IM HV OUTPUT CURRENT LIMITER. BITS 19-26 ARE THE COMMAND NUMBER (04 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=1 ENABLES THE LIMITER.		2IMCLST	ENAB					SI	SD				
46	46	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
46	46	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	32												
47	47	2IMCLEN	IMAGING HV CURRENT LIMIT ENABLE--DISABLES IM HV OUTPUT CURRENT LIMITER. BITS 19-26 ARE THE COMMAND NUMBER (04 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=1		2IMCLST	ENAB					SI	SD				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			ENABLES THE LIMITER.													
48	48	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
48	48	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	469							NA	NA				
49	49	2IMCLDS	IMAGING HV CURRENT LIMIT DISABLE--DISABLES IM HV OUTPUT CURRENT LIMITER. BITS 19-26 ARE THE COMMAND NUMBER (04 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=0 DISABLES THE LIMITER.		2IMCLST	DISA					SI	SD				
50	50	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
50	50	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
51	51	2IMCLDS	IMAGING HV CURRENT LIMIT DISABLE--DISABLES IM HV OUTPUT CURRENT LIMITER. BITS 19-26 ARE THE COMMAND NUMBER (04 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=0 DISABLES THE LIMITER.		2IMCLST	DISA					SI	SD				
52	52	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
52	52	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
53	53	2IMTBHV	IMAGING DET BOTTOM PLATE HV SETTING-- SETS VOLTAGE AT TOP OF IM BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.		2IMBPAST	NONE	2IMHVLV	NONE			SI	SD				
53	53	2IMTBHV1	Filler --													
53	53	2IMTBHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF IM BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.	76												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
54	54	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
54	54	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
55	55	2IMTBHV	IMAGING DET BOTTOM PLATE HV SETTING-- SETS VOLTAGE AT TOP OF IM BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.		2IMBPAST	NONE	2IMHVLV	NONE			SI	SD				
55	55	2IMTBHV1	Filler --													
55	55	2IMTBHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF IM BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.	76												
56	56	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
56	56	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
57	57	2IMTTHV	IMAGING DET TOP PLATE HV SETTING-- SETS VOLTAGE AT TOP OF IM TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.		2IMTPAST	NONE	2IMHBLV	NONE			SI	SD				
57	57	2IMTTHV1	Filler --													
57	57	2IMTTHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF IM TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER	65												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.													
58	58	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
58	58	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
59	59	2IMTTHV	IMAGING DET TOP PLATE HV SETTING-- SETS VOLTAGE AT TOP OF IM TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.		2IMTPAST	NONE	2IMHBLV	NONE			SI	SD				
59	59	2IMTTHV1	Filler --													
59	59	2IMTTHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF IM TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.	65												
60	60	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
60	60	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	32							NA	NA				
61	61	2IMCLEN	IMAGING HV CURRENT LIMIT ENABLE--DISABLES IM HV OUTPUT CURRENT LIMITER. BITS 19-26 ARE THE COMMAND NUMBER (04 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=1 ENABLES THE LIMITER.		2IMCLST	ENAB					SI	SD				
62	62	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
62	62	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	32												
63	63	2IMCLEN	IMAGING HV CURRENT LIMIT ENABLE--DISABLES IM HV OUTPUT CURRENT LIMITER. BITS 19-26 ARE THE COMMAND NUMBER (04 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=1		2IMCLST	ENAB					SI	SD				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			ENABLES THE LIMITER.													
64	64	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
64	64	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	469							NA	NA				
65	65	2IMCLDS	IMAGING HV CURRENT LIMIT DISABLE--DISABLES IM HV OUTPUT CURRENT LIMITER. BITS 19-26 ARE THE COMMAND NUMBER (04 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=0 DISABLES THE LIMITER.		2IMCLST	DISA					SI	SD				
66	66	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
66	66	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
67	67	2IMCLDS	IMAGING HV CURRENT LIMIT DISABLE--DISABLES IM HV OUTPUT CURRENT LIMITER. BITS 19-26 ARE THE COMMAND NUMBER (04 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=0 DISABLES THE LIMITER.		2IMCLST	DISA					SI	SD				
68	68	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
68	68	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
69	69	2IMTBHV	IMAGING DET BOTTOM PLATE HV SETTING-- SETS VOLTAGE AT TOP OF IM BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.		2IMBPAST	NONE	2IMHVLV	NONE			SI	SD				
69	69	2IMTBHV1	Filler --													
69	69	2IMTBHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF IM BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.	83												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
70	70	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
70	70	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
71	71	2IMTBHV	IMAGING DET BOTTOM PLATE HV SETTING-- SETS VOLTAGE AT TOP OF IM BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.		2IMBPAST	NONE	2IMHVLV	NONE			SI	SD				
71	71	2IMTBHV1	Filler --													
71	71	2IMTBHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF IM BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.	83												
72	72	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
72	72	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
73	73	2IMTTHV	IMAGING DET TOP PLATE HV SETTING-- SETS VOLTAGE AT TOP OF IM TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.		2IMTPAST	NONE	2IMHBLV	NONE			SI	SD				
73	73	2IMTTHV1	Filler --													
73	73	2IMTTHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF IM TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER	72												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.													
74	74	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
74	74	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
75	75	2IMTTHV	IMAGING DET TOP PLATE HV SETTING-- SETS VOLTAGE AT TOP OF IM TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.		2IMTPAST	NONE	2IMHBLV	NONE			SI	SD				
75	75	2IMTTHV1	Filler --													
75	75	2IMTTHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF IM TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.	72												
76	76	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
76	76	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	32												
77	77	2IMCLEN	IMAGING HV CURRENT LIMIT ENABLE--DISABLES IM HV OUTPUT CURRENT LIMITER. BITS 19-26 ARE THE COMMAND NUMBER (04 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=1 ENABLES THE LIMITER.		2IMCLST	ENAB					SI	SD				
78	78	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
78	78	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	32												
79	79	2IMCLEN	IMAGING HV CURRENT LIMIT ENABLE--DISABLES IM HV OUTPUT CURRENT LIMITER. BITS 19-26 ARE THE COMMAND NUMBER (04 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=1		2IMCLST	ENAB					SI	SD				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			ENABLES THE LIMITER.													
80	80	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
80	80	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	469							NA	NA				
81	81	2IMCLDS	IMAGING HV CURRENT LIMIT DISABLE--DISABLES IM HV OUTPUT CURRENT LIMITER. BITS 19-26 ARE THE COMMAND NUMBER (04 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=0 DISABLES THE LIMITER.		2IMCLST	DISA					SI	SD				
82	82	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
82	82	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
83	83	2IMCLDS	IMAGING HV CURRENT LIMIT DISABLE--DISABLES IM HV OUTPUT CURRENT LIMITER. BITS 19-26 ARE THE COMMAND NUMBER (04 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=0 DISABLES THE LIMITER.		2IMCLST	DISA					SI	SD				
84	84	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
84	84	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
85	85	2IMTBHV	IMAGING DET BOTTOM PLATE HV SETTING-- SETS VOLTAGE AT TOP OF IM BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.		2IMBPAST	NONE	2IMHVLV	NONE			SI	SD				
85	85	2IMTBHV1	Filler --													
85	85	2IMTBHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF IM BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.	89												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
86	86	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
86	86	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
87	87	2IMTBHV	IMAGING DET BOTTOM PLATE HV SETTING-- SETS VOLTAGE AT TOP OF IM BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.		2IMBPAST	NONE	2IMHVLV	NONE			SI	SD				
87	87	2IMTBHV1	Filler --													
87	87	2IMTBHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF IM BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.	89												
88	88	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
88	88	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
89	89	2IMTTHV	IMAGING DET TOP PLATE HV SETTING-- SETS VOLTAGE AT TOP OF IM TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.		2IMTPAST	NONE	2IMHBLV	NONE			SI	SD				
89	89	2IMTTHV1	Filler --													
89	89	2IMTTHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF IM TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER	77												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.													
90	90	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
90	90	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
91	91	2IMTTHV	IMAGING DET TOP PLATE HV SETTING-- SETS VOLTAGE AT TOP OF IM TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.		2IMTPAST	NONE	2IMHBLV	NONE			SI	SD				
91	91	2IMTTHV1	Filler --													
91	91	2IMTTHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF IM TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.	77												
92	92	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
92	92	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	32							NA	NA				
93	93	2IMCLEN	IMAGING HV CURRENT LIMIT ENABLE--DISABLES IM HV OUTPUT CURRENT LIMITER. BITS 19-26 ARE THE COMMAND NUMBER (04 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=1 ENABLES THE LIMITER.		2IMCLST	ENAB					SI	SD				
94	94	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
94	94	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	32												
95	95	2IMCLEN	IMAGING HV CURRENT LIMIT ENABLE--DISABLES IM HV OUTPUT CURRENT LIMITER. BITS 19-26 ARE THE COMMAND NUMBER (04 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=1		2IMCLST	ENAB					SI	SD				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			ENABLES THE LIMITER.													
96	96	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
96	96	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
97	97	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 90 -- HRC Scheduled/Dither HRC-S HV Ramp Up Commands

Description:

This SCS performs a controlled ramp-up of HRC-S MCP high voltages for observations.

Main Steps in SCS:

Refer to Flow SCS 90-1 for the main sequence of commands. Time delays are not shown.

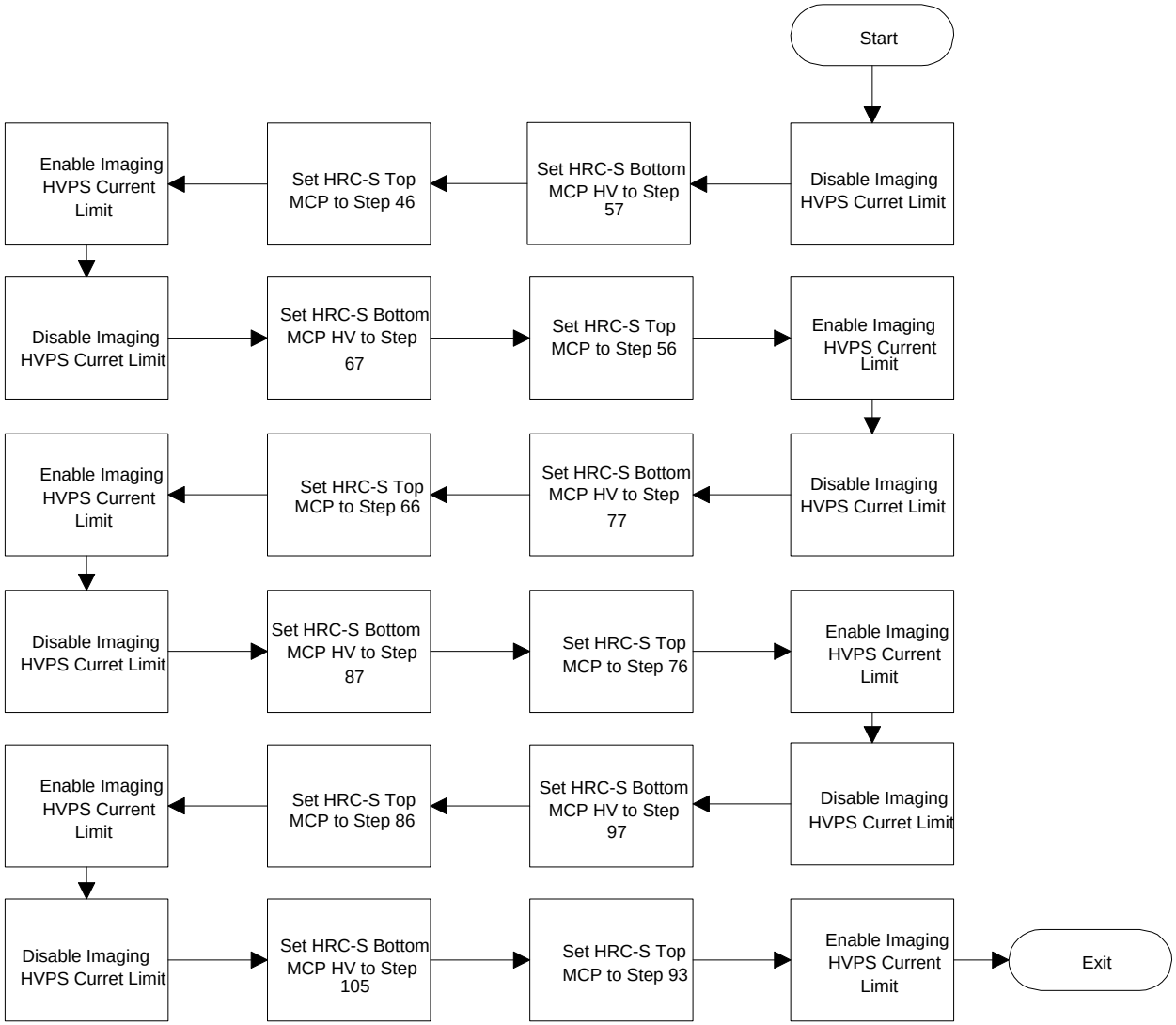
What Phase is this SCS used in? What Patches are Required for Normal Operations?

This SCS is used to step up the HRC-S MCP high voltage for an observation.
This SCS is CALLED by SCS #: 91 -- HRC Dither Control
This SCS is TERMINATED by SCS #: 104 -- HRC Safing Part 1
This SCS is DISABLED by SCS #: 104 -- HRC Safing Part 1

Constraints:

This SCS should only be modified and approved for use by the Chandra X-ray Science Center.
Command are doubled-up individually to protect against SEUs.

Flow SCS 90-1 HRC-S MCP HV Ramp Up



Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	2SPCLDS	SPECT HV CURRENT LIMIT DISABLE--DISABLES SP HV OUTPUT CURRENT LIMITER. BITS 19-26 ARE THE COMMAND NUMBER (04 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=0 DISABLES THE LIMITER.		2SPCLST	DISA					SI	SD				
2	2	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
2	2	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
3	3	2SPCLDS	SPECT HV CURRENT LIMIT DISABLE--DISABLES SP HV OUTPUT CURRENT LIMITER. BITS 19-26 ARE THE COMMAND NUMBER (04 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=0 DISABLES THE LIMITER.		2SPCLST	DISA					SI	SD				
4	4	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
4	4	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
5	5	2SPTBHV	SPECT DET BOTTOM PLATE HV SETTING-- SETS VOLTAGE AT TOP OF SP BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.		2SPBPAST	NONE	2SPHVLV	NONE			SI	SD				
5	5	2SPTBHV1	Filler --													
5	5	2SPTBHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF SP BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.	57												
6	6	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
6	6	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
7	7	2SPTBHV	SPECT DET BOTTOM PLATE HV SETTING-- SETS VOLTAGE AT TOP OF SP BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.		2SPBPAST	NONE	2SPHVLV	NONE			SI	SD				
7	7	2SPTBHV1	Filler --													
7	7	2SPTBHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF SP BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.	57												
8	8	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
8	8	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
9	9	2SPTTHV	SPECT DET TOP PLATE HV SETTING-- SETS VOLTAGE AT TOP OF SP TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.		2SPTPAST	NONE	2SPHBLV	NONE			SI	SD				
9	9	2SPTTHV1	Filler --													
9	9	2SPTTHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF SP TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.	46												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
10	10	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
10	10	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
11	11	2SPTTHV	SPECT DET TOP PLATE HV SETTING-- SETS VOLTAGE AT TOP OF SP TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.		2SPTPAST	NONE	2SPHBLV	NONE			SI	SD				
11	11	2SPTTHV1	Filler --													
11	11	2SPTTHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF SP TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.	46												
12	12	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
12	12	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	32							NA	NA				
13	13	2SPCLEN	SPECT HV CURRENT LIMIT ENABLE--DISABLES SP HV OUTPUT CURRENT LIMITER. BITS 19-26 ARE THE COMMAND NUMBER (04 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=1 ENABLES THE LIMITER.		2SPCLST	ENAB					SI	SD				
14	14	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
14	14	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	32												
15	15	2SPCLEN	SPECT HV CURRENT LIMIT ENABLE--DISABLES SP HV OUTPUT CURRENT LIMITER. BITS 19-26 ARE THE COMMAND NUMBER (04 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=1 ENABLES THE LIMITER.		2SPCLST	ENAB					SI	SD				
16	16	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
16	16	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	469							NA	NA				
17	17	2SPCLDS	SPECT HV CURRENT LIMIT DISABLE--DISABLES SP HV OUTPUT CURRENT LIMITER. BITS 19-26 ARE THE COMMAND NUMBER (04 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=0 DISABLES THE LIMITER.		2SPCLST	DISA					SI	SD				
18	18	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
18	18	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
19	19	2SPCLDS	SPECT HV CURRENT LIMIT DISABLE--DISABLES SP HV OUTPUT CURRENT LIMITER. BITS 19-26 ARE THE COMMAND NUMBER (04 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=0 DISABLES THE LIMITER.		2SPCLST	DISA					SI	SD				
20	20	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
20	20	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
21	21	2SPTBHV	SPECT DET BOTTOM PLATE HV SETTING-- SETS VOLTAGE AT TOP OF SP BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.		2SPBPAST	NONE	2SPHVLV	NONE			SI	SD				
21	21	2SPTBHV1	Filler --													
21	21	2SPTBHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF SP BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.	67												
22	22	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
22	22	COSRTDL1	Relative Time Delay (SCS Only) --	16												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			Relative Time Delay (minor cycles)													
23	23	2SPTBHV	SPECT DET BOTTOM PLATE HV SETTING-- SETS VOLTAGE AT TOP OF SP BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.		2SPBPAST	NONE	2SPHVLV	NONE			SI	SD				
23	23	2SPTBHV1	Filler --													
23	23	2SPTBHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF SP BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.	67												
24	24	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
24	24	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
25	25	2SPTTHV	SPECT DET TOP PLATE HV SETTING-- SETS VOLTAGE AT TOP OF SP TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.		2SPTPAST	NONE	2SPHBLV	NONE			SI	SD				
25	25	2SPTTHV1	Filler --													
25	25	2SPTTHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF SP TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS,	56												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			027FH=-5080 VOLTS.													
26	26	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
26	26	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
27	27	2SPTTHV	SPECT DET TOP PLATE HV SETTING-- SETS VOLTAGE AT TOP OF SP TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.		2SPTPAST	NONE	2SPHBLV	NONE			SI	SD				
27	27	2SPTTHV1	Filler --													
27	27	2SPTTHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF SP TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.	56												
28	28	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
28	28	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	32							NA	NA				
29	29	2SPCLEN	SPECT HV CURRENT LIMIT ENABLE--DISABLES SP HV OUTPUT CURRENT LIMITER. BITS 19-26 ARE THE COMMAND NUMBER (04 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=1 ENABLES THE LIMITER.		2SPCLST	ENAB					SI	SD				
30	30	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
30	30	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	32												
31	31	2SPCLEN	SPECT HV CURRENT LIMIT ENABLE--DISABLES SP HV OUTPUT CURRENT LIMITER. BITS 19-26 ARE THE COMMAND NUMBER (04 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=1 ENABLES THE LIMITER.		2SPCLST	ENAB					SI	SD				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
32	32	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
32	32	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	469							NA	NA				
33	33	2SPCLDS	SPECT HV CURRENT LIMIT DISABLE--DISABLES SP HV OUTPUT CURRENT LIMITER. BITS 19-26 ARE THE COMMAND NUMBER (04 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=0 DISABLES THE LIMITER.		2SPCLST	DISA					SI	SD				
34	34	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
34	34	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
35	35	2SPCLDS	SPECT HV CURRENT LIMIT DISABLE--DISABLES SP HV OUTPUT CURRENT LIMITER. BITS 19-26 ARE THE COMMAND NUMBER (04 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=0 DISABLES THE LIMITER.		2SPCLST	DISA					SI	SD				
36	36	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
36	36	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
37	37	2SPTBHV	SPECT DET BOTTOM PLATE HV SETTING-- SETS VOLTAGE AT TOP OF SP BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.		2SPBPAST	NONE	2SPHVLV	NONE			SI	SD				
37	37	2SPTBHV1	Filler --													
37	37	2SPTBHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF SP BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.	77												
38	38	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
38	38	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
39	39	2SPTBHV	SPECT DET BOTTOM PLATE HV SETTING-- SETS VOLTAGE AT TOP OF SP BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.		2SPBPAST	NONE	2SPHVLV	NONE			SI	SD				
39	39	2SPTBHV1	Filler --													
39	39	2SPTBHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF SP BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.	77												
40	40	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
40	40	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
41	41	2SPTTHV	SPECT DET TOP PLATE HV SETTING-- SETS VOLTAGE AT TOP OF SP TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.		2SPTPAST	NONE	2SPHBLV	NONE			SI	SD				
41	41	2SPTTHV1	Filler --													
41	41	2SPTTHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF SP TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX	66												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			= 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.													
42	42	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
42	42	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
43	43	2SPTTHV	SPECT DET TOP PLATE HV SETTING-- SETS VOLTAGE AT TOP OF SP TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.		2SPTPAST	NONE	2SPHBLV	NONE			SI	SD				
43	43	2SPTTHV1	Filler --													
43	43	2SPTTHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF SP TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.	66												
44	44	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
44	44	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	32							NA	NA				
45	45	2SPCLEN	SPECT HV CURRENT LIMIT ENABLE--DISABLES SP HV OUTPUT CURRENT LIMITER. BITS 19-26 ARE THE COMMAND NUMBER (04 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=1 ENABLES THE LIMITER.		2SPCLST	ENAB					SI	SD				
46	46	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
46	46	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	32												
47	47	2SPCLEN	SPECT HV CURRENT LIMIT ENABLE--DISABLES SP HV OUTPUT CURRENT LIMITER. BITS 19-26 ARE THE COMMAND NUMBER (04 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=1		2SPCLST	ENAB					SI	SD				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			ENABLES THE LIMITER.													
48	48	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
48	48	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	469							NA	NA				
49	49	2SPCLDS	SPECT HV CURRENT LIMIT DISABLE--DISABLES SP HV OUTPUT CURRENT LIMITER. BITS 19-26 ARE THE COMMAND NUMBER (04 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=0 DISABLES THE LIMITER.		2SPCLST	DISA					SI	SD				
50	50	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
50	50	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
51	51	2SPCLDS	SPECT HV CURRENT LIMIT DISABLE--DISABLES SP HV OUTPUT CURRENT LIMITER. BITS 19-26 ARE THE COMMAND NUMBER (04 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=0 DISABLES THE LIMITER.		2SPCLST	DISA					SI	SD				
52	52	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
52	52	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
53	53	2SPTBHV	SPECT DET BOTTOM PLATE HV SETTING-- SETS VOLTAGE AT TOP OF SP BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.		2SPBPAST	NONE	2SPHVLV	NONE			SI	SD				
53	53	2SPTBHV1	Filler --													
53	53	2SPTBHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF SP BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.	87												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
54	54	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
54	54	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
55	55	2SPTBHV	SPECT DET BOTTOM PLATE HV SETTING-- SETS VOLTAGE AT TOP OF SP BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.		2SPBPAST	NONE	2SPHVLV	NONE			SI	SD				
55	55	2SPTBHV1	Filler --													
55	55	2SPTBHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF SP BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.	87												
56	56	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
56	56	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
57	57	2SPTTHV	SPECT DET TOP PLATE HV SETTING-- SETS VOLTAGE AT TOP OF SP TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.		2SPTPAST	NONE	2SPHBLV	NONE			SI	SD				
57	57	2SPTTHV1	Filler --													
57	57	2SPTTHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF SP TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER	76												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.													
58	58	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
58	58	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
59	59	2SPTTHV	SPECT DET TOP PLATE HV SETTING-- SETS VOLTAGE AT TOP OF SP TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.		2SPTPAST	NONE	2SPHBLV	NONE			SI	SD				
59	59	2SPTTHV1	Filler --													
59	59	2SPTTHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF SP TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.	76												
60	60	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
60	60	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	32							NA	NA				
61	61	2SPCLEN	SPECT HV CURRENT LIMIT ENABLE--DISABLES SP HV OUTPUT CURRENT LIMITER. BITS 19-26 ARE THE COMMAND NUMBER (04 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=1 ENABLES THE LIMITER.		2SPCLST	ENAB					SI	SD				
62	62	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
62	62	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	32												
63	63	2SPCLEN	SPECT HV CURRENT LIMIT ENABLE--DISABLES SP HV OUTPUT CURRENT LIMITER. BITS 19-26 ARE THE COMMAND NUMBER (04 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=1		2SPCLST	ENAB					SI	SD				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			ENABLES THE LIMITER.													
64	64	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
64	64	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	469							NA	NA				
65	65	2SPCLDS	SPECT HV CURRENT LIMIT DISABLE--DISABLES SP HV OUTPUT CURRENT LIMITER. BITS 19-26 ARE THE COMMAND NUMBER (04 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=0 DISABLES THE LIMITER.		2SPCLST	DISA					SI	SD				
66	66	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
66	66	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
67	67	2SPCLDS	SPECT HV CURRENT LIMIT DISABLE--DISABLES SP HV OUTPUT CURRENT LIMITER. BITS 19-26 ARE THE COMMAND NUMBER (04 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=0 DISABLES THE LIMITER.		2SPCLST	DISA					SI	SD				
68	68	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
68	68	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
69	69	2SPTBHV	SPECT DET BOTTOM PLATE HV SETTING-- SETS VOLTAGE AT TOP OF SP BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.		2SPBPAST	NONE	2SPHVLV	NONE			SI	SD				
69	69	2SPTBHV1	Filler --													
69	69	2SPTBHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF SP BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.	97												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
70	70	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
70	70	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
71	71	2SPTBHV	SPECT DET BOTTOM PLATE HV SETTING-- SETS VOLTAGE AT TOP OF SP BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.		2SPBPAST	NONE	2SPHVLV	NONE			SI	SD				
71	71	2SPTBHV1	Filler --													
71	71	2SPTBHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF SP BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.	97												
72	72	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
72	72	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
73	73	2SPTTHV	SPECT DET TOP PLATE HV SETTING-- SETS VOLTAGE AT TOP OF SP TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.		2SPTPAST	NONE	2SPHBLV	NONE			SI	SD				
73	73	2SPTTHV1	Filler --													
73	73	2SPTTHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF SP TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER	86												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.													
74	74	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
74	74	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
75	75	2SPTTHV	SPECT DET TOP PLATE HV SETTING-- SETS VOLTAGE AT TOP OF SP TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.		2SPTPAST	NONE	2SPHBLV	NONE			SI	SD				
75	75	2SPTTHV1	Filler --													
75	75	2SPTTHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF SP TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.	86												
76	76	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
76	76	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	32							NA	NA				
77	77	2SPCLEN	SPECT HV CURRENT LIMIT ENABLE--DISABLES SP HV OUTPUT CURRENT LIMITER. BITS 19-26 ARE THE COMMAND NUMBER (04 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=1 ENABLES THE LIMITER.		2SPCLST	ENAB					SI	SD				
78	78	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
78	78	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	32												
79	79	2SPCLEN	SPECT HV CURRENT LIMIT ENABLE--DISABLES SP HV OUTPUT CURRENT LIMITER. BITS 19-26 ARE THE COMMAND NUMBER (04 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=1		2SPCLST	ENAB					SI	SD				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			ENABLES THE LIMITER.													
80	80	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
80	80	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	469							NA	NA				
81	81	2SPCLDS	SPECT HV CURRENT LIMIT DISABLE--DISABLES SP HV OUTPUT CURRENT LIMITER. BITS 19-26 ARE THE COMMAND NUMBER (04 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=0 DISABLES THE LIMITER.		2SPCLST	DISA					SI	SD				
82	82	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
82	82	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
83	83	2SPCLDS	SPECT HV CURRENT LIMIT DISABLE--DISABLES SP HV OUTPUT CURRENT LIMITER. BITS 19-26 ARE THE COMMAND NUMBER (04 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=0 DISABLES THE LIMITER.		2SPCLST	DISA					SI	SD				
84	84	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
84	84	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
85	85	2SPTBHV	SPECT DET BOTTOM PLATE HV SETTING-- SETS VOLTAGE AT TOP OF SP BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.		2SPBPAST	NONE	2SPHVLV	NONE			SI	SD				
85	85	2SPTBHV1	Filler --													
85	85	2SPTBHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF SP BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.	105												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
86	86	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
86	86	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
87	87	2SPTBHV	SPECT DET BOTTOM PLATE HV SETTING-- SETS VOLTAGE AT TOP OF SP BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.		2SPBPAST	NONE	2SPHVLV	NONE			SI	SD				
87	87	2SPTBHV1	Filler --													
87	87	2SPTBHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF SP BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.	105												
88	88	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
88	88	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
89	89	2SPTTHV	SPECT DET TOP PLATE HV SETTING-- SETS VOLTAGE AT TOP OF SP TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.		2SPTPAST	NONE	2SPHBLV	NONE			SI	SD				
89	89	2SPTTHV1	Filler --													
89	89	2SPTTHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF SP TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER	93												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.													
90	90	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
90	90	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
91	91	2SPTTHV	SPECT DET TOP PLATE HV SETTING-- SETS VOLTAGE AT TOP OF SP TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.		2SPTPAST	NONE	2SPHBLV	NONE			SI	SD				
91	91	2SPTTHV1	Filler --													
91	91	2SPTTHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF SP TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.	93												
92	92	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
92	92	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	32							NA	NA				
93	93	2SPCLEN	SPECT HV CURRENT LIMIT ENABLE--DISABLES SP HV OUTPUT CURRENT LIMITER. BITS 19-26 ARE THE COMMAND NUMBER (04 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=1 ENABLES THE LIMITER.		2SPCLST	ENAB					SI	SD				
94	94	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
94	94	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	32												
95	95	2SPCLEN	SPECT HV CURRENT LIMIT ENABLE--DISABLES SP HV OUTPUT CURRENT LIMITER. BITS 19-26 ARE THE COMMAND NUMBER (04 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=1		2SPCLST	ENAB					SI	SD				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			ENABLES THE LIMITER.													
96	96	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
96	96	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
97	97	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 91 -- HRC Dither Control

Description:

This SCS controls the HRC High Voltage levels during an observation based on whether Chandra is dithering or not.

The SCS contains “event waits”, pauses in the execution of the SCS until a condition is met. The first event wait watches for the event “F_Dither_On= 1 (TRUE)”. If the event is satisfied, the SCS calls the two on-board SCSs that ramp up the HRC MCP high voltages (SCS #: 89 -- HRC Scheduled/Dither HRC-I HV Ramp Up Commands, SCS #: 90 -- HRC Scheduled/Dither HRC-S HV Ramp Up Commands) and the observation is started. The SCS that is enabled by the daily load command sequence is the one that actually executes, the one that controls the active detector for the immediate observation. The SCS sequence stops at the next event wait, which is “F_Dither_On= 0 (FALSE)”. When the event is satisfied (AXAF is no longer dithering), the SCS continues, calling the on-board SCS that ramp down the HRC MCP HV (SCS #: 87 -- HRC Scheduled/No Dither HRC-I HV Ramp Down Commands, SCS #: 88 -- HRC Scheduled/No Dither HRC-S HV Ramp Down Commands).

Post-OAC changes were made to provide continuous dithering capability. The change that affects the running of this SCS is as follows: Patch PCAD Subfunction "PCAD Scheduling" to change the flag F_Dither_On:

from:

F_Dither_On = (PCAD Mode=NPM) AND (ACA Sequence=Kalman) AND (F_Dither=Enabled)

to:

F_Dither_On = ((PCAD Mode=NPM) OR (PCAD Mode=NMM)) AND (F_Dither=Enabled)

Main Steps in SCS:

Refer to Flow SCS 91-1 for the major steps in this SCS.

What Phase is this SCS used in? What Patches are Required for Normal Operations?

This SCS is used in the normal observation phase. At the beginning of each HRC observation, SCS 91 is activated.

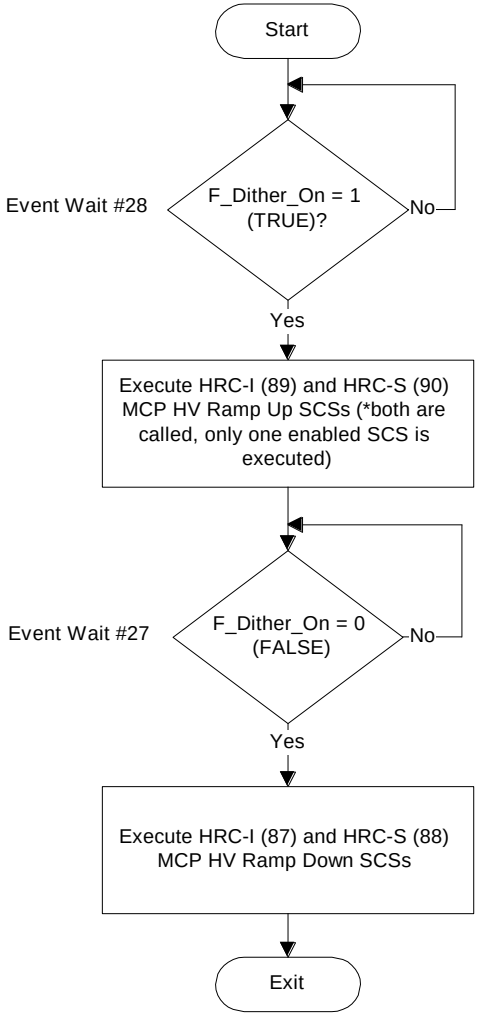
Constraints:

All commands are software commands, so command doubling is not necessary.

The ground is responsible for enabling the correct MCP HV ramp-up SCSs for a particular observation. This is part of HRC observation scheduling.

SCS 91 must be activated for each individual HRC observation to provide the proper dither protection.

Flow SCS 91-1 HRC Dither Control SCS



F_Dither_On = ((PCAD Mode=NPM) OR (PCAD Mode=NMM)) AND (F_Dither=Enabled)

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	COSEVTWT	EVENT WAIT (SCS ONLY)								NA	NA				
1	1	COSEVTW1	COSEVTWT -Pointer into K-Constant Event Table -- Event Number in K Constant Table	28												
2	2	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
2	2	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
3	3	COSCALL	SCS CALL SCS								NA	NA				
3	3	COSCALL1	COSCALL - SCS NUMBER -- SCS Number	89												
4	4	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
4	4	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
5	5	COSCALL	SCS CALL SCS								NA	NA				
5	5	COSCALL1	COSCALL - SCS NUMBER -- SCS Number	90												
6	6	COSEVTWT	EVENT WAIT (SCS ONLY)								NA	NA				
6	6	COSEVTW1	COSEVTWT -Pointer into K-Constant Event Table -- Event Number in K Constant Table	27							NA	NA				
7	7	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
7	7	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
8	8	COSCALL	SCS CALL SCS								NA	NA				
8	8	COSCALL1	COSCALL - SCS NUMBER -- SCS Number	87												
9	9	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
9	9	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
10	10	COSCALL	SCS CALL SCS								NA	NA				
10	10	COSCALL1	COSCALL - SCS NUMBER -- SCS Number	88												
11	11	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 92 -- HRC-I MCP HV On

Description:

This SCS turns on and prepares the HRC-I MCP for an observation.

Main Steps in SCS:

Refer to Flow SCS 92-1 for the main steps in the sequence. Time delays are not shown.

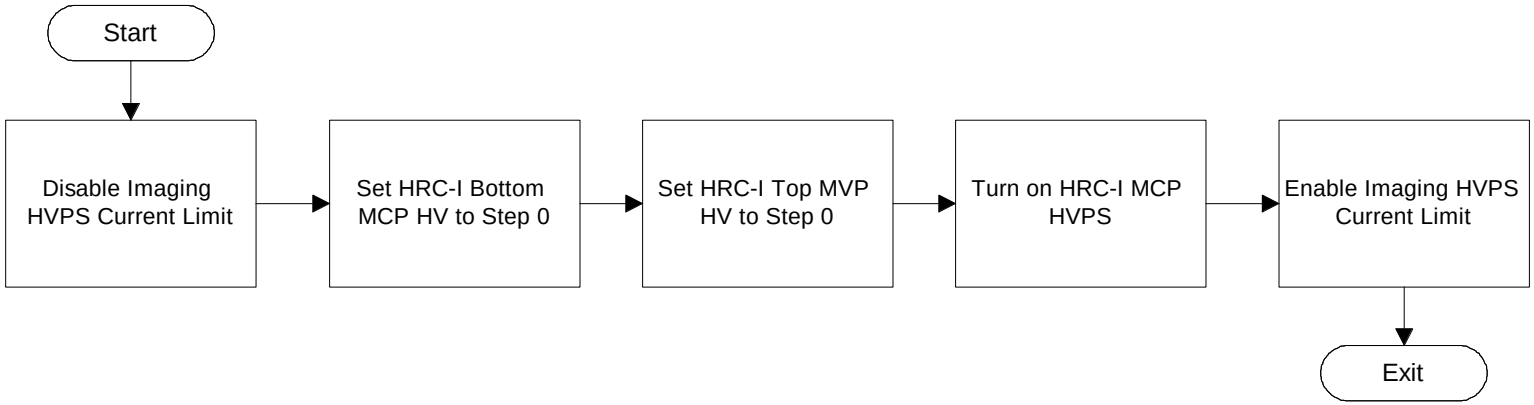
What Phase is this SCS used in? What Patches are Required for Normal Operations?

This SCS is used for normal HRC observations. It is not accessed by any on-board protected SCS.

Constraints:

This SCS should only be modified and approved for use by the Chandra X-ray Science Center.
Commands are doubled up individually to protect against SEUs.

Flow SCS 92-1, HRC-I MCP HV On



Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	2IMCLDS	IMAGING HV CURRENT LIMIT DISABLE--DISABLES IM HV OUTPUT CURRENT LIMITER. BITS 19-26 ARE THE COMMAND NUMBER (04 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=0 DISABLES THE LIMITER.		2IMCLST	DISA					SI	SD				
2	2	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
2	2	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
3	3	2IMCLDS	IMAGING HV CURRENT LIMIT DISABLE--DISABLES IM HV OUTPUT CURRENT LIMITER. BITS 19-26 ARE THE COMMAND NUMBER (04 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=0 DISABLES THE LIMITER.		2IMCLST	DISA					SI	SD				
4	4	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
4	4	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
5	5	2IMTTHV	IMAGING DET TOP PLATE HV SETTING-- SETS VOLTAGE AT TOP OF IM TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.		2IMTPAST	NONE	2IMHBLV	NONE			SI	SD				
5	5	2IMTTHV1	Filler --													
5	5	2IMTTHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF IM TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.	0												
6	6	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
6	6	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
7	7	2IMTTHV	IMAGING DET TOP PLATE HV SETTING-- SETS VOLTAGE AT TOP OF IM TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.		2IMTPAST	NONE	2IMHBLV	NONE			SI	SD				
7	7	2IMTTHV1	Filler --													
7	7	2IMTTHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF IM TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.	0												
8	8	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
8	8	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
9	9	2IMTBHV	IMAGING DET BOTTOM PLATE HV SETTING-- SETS VOLTAGE AT TOP OF IM BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.		2IMBPAST	NONE	2IMHVLV	NONE			SI	SD				
9	9	2IMTBHV1	Filler --													
9	9	2IMTBHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF IM BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.	0												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
10	10	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
10	10	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
11	11	2IMTBHV	IMAGING DET BOTTOM PLATE HV SETTING-- SETS VOLTAGE AT TOP OF IM BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.		2IMBPAST	NONE	2IMHVLV	NONE			SI	SD				
11	11	2IMTBHV1	Filler --													
11	11	2IMTBHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF IM BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.	0												
12	12	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
12	12	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
13	13	2IMHVON	IMAGING DET HV ON--TURNS ON IM HVPS. BITS 19-26 ARE THE COMMAND NUMBER (01 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=1 TURNS ON THE SUPPLY.		2IMONST	ON					SI	SD				
14	14	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
14	14	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
15	15	2IMHVON	IMAGING DET HV ON--TURNS ON IM HVPS. BITS 19-26 ARE THE COMMAND NUMBER (01 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=1 TURNS ON THE SUPPLY.		2IMONST	ON					SI	SD				
16	16	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
16	16	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	32												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
17	17	2IMCLEN	IMAGING HV CURRENT LIMIT ENABLE--DISABLES IM HV OUTPUT CURRENT LIMITER. BITS 19-26 ARE THE COMMAND NUMBER (04 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=1 ENABLES THE LIMITER.		2IMCLST	ENAB					SI	SD				
18	18	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
18	18	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
19	19	2IMCLEN	IMAGING HV CURRENT LIMIT ENABLE--DISABLES IM HV OUTPUT CURRENT LIMITER. BITS 19-26 ARE THE COMMAND NUMBER (04 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=1 ENABLES THE LIMITER.		2IMCLST	ENAB					SI	SD				
20	20	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 93 -- HRC-S MCP HV On

Description:

This SCS turns on and prepares the HRC-S MCP for an observation.

Main Steps in SCS:

Refer to Flow SCS 93-1 for the main steps in the sequence. Time delays are not shown.

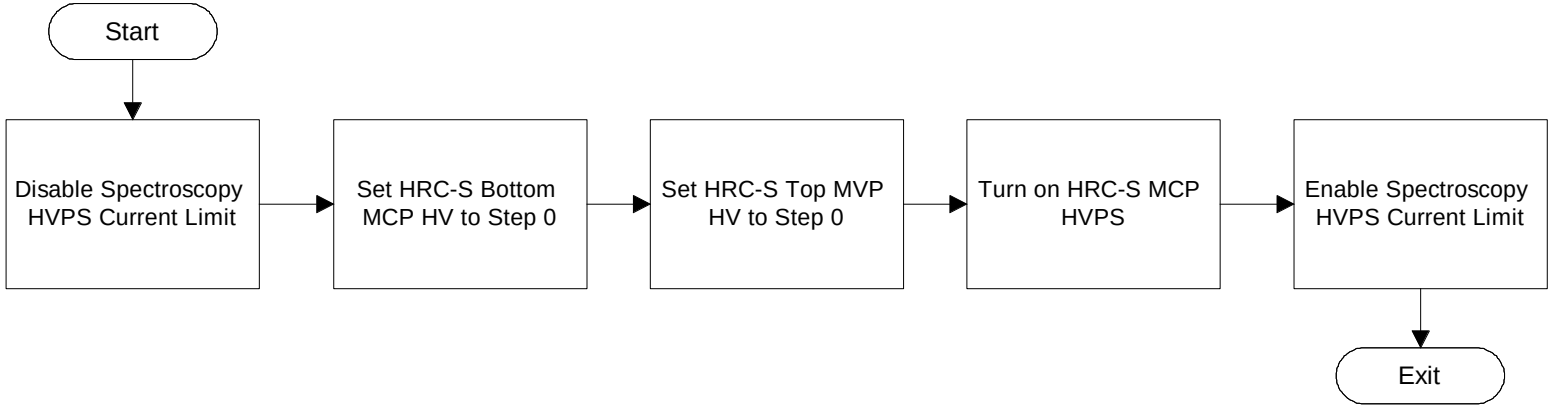
What Phase is this SCS used in? What Patches are Required for Normal Operations?

This SCS is used for normal HRC observations. It is not accessed by any on-board protected SCS.

Constraints:

This SCS should only be modified and approved for use by the Chandra X-ray Science Center.
Commands are doubled up individually to protect against SEUs.

Flow SCS 93-1, HRC-S MCP HV On



Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	2SPCLDS	SPECT HV CURRENT LIMIT DISABLE--DISABLES SP HV OUTPUT CURRENT LIMITER. BITS 19-26 ARE THE COMMAND NUMBER (04 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=0 DISABLES THE LIMITER.		2SPCLST	DISA					SI	SD				
2	2	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
2	2	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
3	3	2SPCLDS	SPECT HV CURRENT LIMIT DISABLE--DISABLES SP HV OUTPUT CURRENT LIMITER. BITS 19-26 ARE THE COMMAND NUMBER (04 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=0 DISABLES THE LIMITER.		2SPCLST	DISA					SI	SD				
4	4	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
4	4	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
5	5	2SPTTHV	SPECT DET TOP PLATE HV SETTING-- SETS VOLTAGE AT TOP OF SP TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.		2SPTPAST	NONE	2SPHBLV	NONE			SI	SD				
5	5	2SPTTHV1	Filler --													
5	5	2SPTTHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF SP TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.	0												
6	6	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
6	6	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
7	7	2SPTTHV	SPECT DET TOP PLATE HV SETTING-- SETS VOLTAGE AT TOP OF SP TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.		2SPTPAST	NONE	2SPHBLV	NONE			SI	SD				
7	7	2SPTTHV1	Filler --													
7	7	2SPTTHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF SP TOP CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (02 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -40 VOLTS PER COUNT. EXAMPLES: 0200 HEX = 0 VOLTS, 0220H=-640 VOLTS, 027FH=-5080 VOLTS.	0												
8	8	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
8	8	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
9	9	2SPTBHV	SPECT DET BOTTOM PLATE HV SETTING-- SETS VOLTAGE AT TOP OF SP BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.		2SPBPAST	NONE	2SPHVLV	NONE			SI	SD				
9	9	2SPTBHV1	Filler --													
9	9	2SPTBHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF SP BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.	0												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
10	10	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
10	10	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
11	11	2SPTBHV	SPECT DET BOTTOM PLATE HV SETTING-- SETS VOLTAGE AT TOP OF SP BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.		2SPBPAST	NONE	2SPHVLV	NONE			SI	SD				
11	11	2SPTBHV1	Filler --													
11	11	2SPTBHV2	VOLTAGE STEPS -- SETS VOLTAGE AT TOP OF SP BOTTOM CHANNEL PLATE. BITS 19-26 ARE THE COMMAND NUMBER (03 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT -20 VOLTS PER COUNT. EXAMPLES: 0300 HEX = 0 VOLTS, 0320H=-320 VOLTS, 037FH=-2540 VOLTS.	0												
12	12	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
12	12	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
13	13	2SPHVON	SPECT DET HV ON--TURNS ON SP HVPS. BITS 19-26 ARE THE COMMAND NUMBER (01 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=1 TURNS ON THE SUPPLY.		2SPONST	ON					SI	SD				
14	14	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
14	14	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
15	15	2SPHVON	SPECT DET HV ON--TURNS ON SP HVPS. BITS 19-26 ARE THE COMMAND NUMBER (01 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=1 TURNS ON THE SUPPLY.		2SPONST	ON					SI	SD				
16	16	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
16	16	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	32												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
17	17	2SPCLEN	SPECT HV CURRENT LIMIT ENABLE--DISABLES SP HV OUTPUT CURRENT LIMITER. BITS 19-26 ARE THE COMMAND NUMBER (04 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=1 ENABLES THE LIMITER.		2SPCLST	ENAB					SI	SD				
18	18	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
18	18	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
19	19	2SPCLEN	SPECT HV CURRENT LIMIT ENABLE--DISABLES SP HV OUTPUT CURRENT LIMITER. BITS 19-26 ARE THE COMMAND NUMBER (04 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=1 ENABLES THE LIMITER.		2SPCLST	ENAB					SI	SD				
20	20	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 94 -- OBA Heater Enable

Description:

This SCS enables OBA heater control.

A consequence of long eclipse events is that OBA thermal control must be managed. The object is to assure the OBA heaters are not restarted during the eclipse event, but also make sure they do get restarted before or after the event. This is discussed below:

SCS #: 26 -- TS RCTU Monitor or Telescope Thermal Control Fault is the TS-RCTU wrap test SCS action, and SCS 26 and SCS 94 together is the telescope thermal control safing action. SCS 94 is called from SCS 26. OBA thermal control during long eclipse events is controlled by the ability to enable or disable SCS 94 from other SCSs.

The Eclipse ATS and SCS 32 for long eclipse will contain the commands to disable SCS 94, and SCS 33 will contain the commands to re-enable SCS 94. Therefore, going into the eclipse, either by design or by fault, SCS 94 is prevented from running and restarting OBA thermal control if SCS 26 is triggered. Upon exit from eclipse, SCS 33 restarts OBA thermal control, but also re-enables SCS 94, so that subsequent calls to SCS 26 and hence SCS 94 will execute.

If SCS 32 were to execute by a subsequent fault between the long eclipses, and disable SCS 94, CHANDRA will detect that it is in sunlight, disconnect the batteries, and SCS 33 will run, thereby restarting thermal control and re-enabling SCS 94. Refer to Figure SCS 94-1 for a diagram depicting use of SCS 94.

Main Steps in SCS:

Reset Telescope Thermal Control

Enable OBA Thermal Control

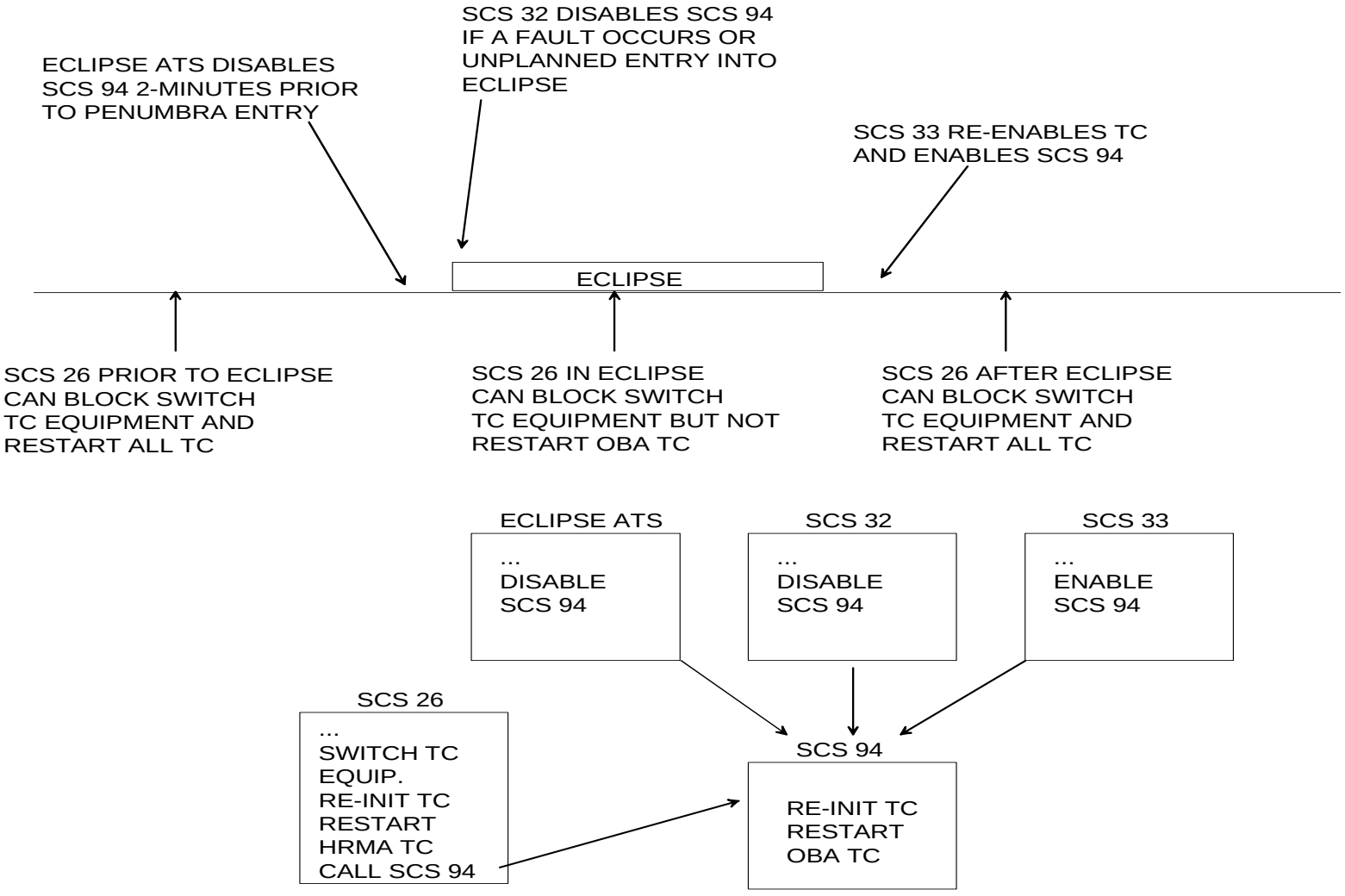
End SCS

What Phase is this SCS used in? What Patches are Required for Normal Operations?

This SCS is for on-orbit use.

Constraints:

Figure SCS 94-1 OBA Thermal Control Management for Long Eclipses



Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	4OTELTCR	REINITIALIZE TELESCOPE THERMAL CONTROL		4ORINITC	TRUE					NA	NA				
2	2	4OOBTCEN	ENABLE OBA THERMAL CONTROL		4OACOBAH	ENAB					NA	NA				
3	3	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 95 -- EPHIN Failure

Description:

This SCS is activated by the FSW in the event the IEPHIN instrument is detected failed.

Main Steps in SCS:

Disable Radiation Monitor Function
Call SCS #: 107 -- Main SI Safing
End SCS command

What Phase is this SCS used in? What Patches are Required for Normal Operations?

The same action that is taken in a high radiation environment is taken when the IEPHIN has been detected failed.

Constraints:

Software commands only, therefore command doubling is not required.

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	OORMPDS	RADIATION MONITOR PROCESS DISABLE		CORADMEN	DISA					NA	NA				
2	2	COSCALL	SCS CALL SCS								NA	NA				
2	2	COSCALL1	COSCALL - SCS NUMBER -- SCS Number	107												
3	3	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 96 – PEA Reset

Description:

This SCS performs a function if the sixth-bit of the ACA global status word indicates that the PEA has experienced a reset. At this time there is not action to be taken, but this SCS is a placeholder.

Main Steps in SCS:

End SCS command

What Phase is this SCS used in? What Patches are Required for Normal Operations?

This SCS would be used in the on-orbit phase.

Constraints:

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 97 -- Spare SCS

Description:

This SCS is not used. This SCS was formerly the ACA Processing Initialization. It was cleared out as part of patch request PR93 when it no longer was being used by anyone.

Main Steps in SCS:

What Phase is this SCS used in? What Patches are Required for Normal Operations?

Constraints:

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 98 -- Bright Star Normal Sun Mode

Description:

This SCS is used as part of Bright Star/Commanded Attitude Monitor response. It is called by SCS #: 28 -- Bright Star or Commanded Attitude Monitor.

This SCS is normally disabled whenever observation attitudes are such that the sun is within the Fine Sun Sensor FOV. Whenever it is planned to observe a target at an attitude where the sun is NOT in the Fine Sun Sensor FOV, then this SCS is enabled. It provides extra protection to the Observatory by transiting to Normal Sun Mode instead of Bright Star Mode when observing very close to sun exclusion limits.

If executed, this SCS activates SCS #: 79 -- OO - NSM Transition and disables SCS #: 99 -- Bright Star SI Safing to keep it from running when it is subsequently called by SCS 28.

Main Steps in SCS:

Four Minor Cycle relative time delay

Activate SCS 79

Disable SCS 99

What Phase is this SCS used in? What Patches are Required for Normal Operations?

This SCS is used in the on-orbit phase.

Constraints:

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
1	1	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	4												
2	2	COACTSX	ACTIVATE SCS#								NA	NA				
2	2	COACTS1	COACTSX - SCS NUMBER -- SCS Number	79												
2	2	COACTS2	COACTSX - REPEAT COUNT -- Repeat Count. If this is 0, then SCS is executed once.	0												
3	3	CODISASX	DISABLE SCS#								NA	NA				
3	3	CODISASX	CODISASX - SCS NUMBER -- SCS Number	99							NA	NA				
4	4	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 99 -- Bright Star SI Safing

Description:

This SCS is used as part of Bright Star/Commanded Attitude Monitor response. It is called by SCS #: 28 -- Bright Star or Commanded Attitude Monitor.

When this SCS is executed, it is because the Bright Star/Commanded Attitude Monitor tripped, and the Observatory is going to sit where it is on the stars that it sees, even though it may not know where it is. SCS 99 activates SCS #: 107 -- Main SI Safing to safe the instruments. SCS 99 is executed only when SCS #: 98 -- Bright Star Normal Sun Mode is disabled (also called by SCS 28) and that only occurs when an observation attitude is such that the sun is within the Fine Sun Sensor FOV.

Main Steps in SCS:

Activate SCS 107

End SCS

What Phase is this SCS used in? What Patches are Required for Normal Operations?

This SCS is used in the on-orbit phase.

Constraints:

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	COACTSX	ACTIVATE SCS#								NA	NA				
1	1	COACTS1	COACTSX - SCS NUMBER -- SCS Number	107												
1	1	COACTS2	COACTSX - REPEAT COUNT -- Repeat Count. If this is 0, then SCS is executed once.	0												
2	2	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 100 – Spare SCS

Description:

This SCS is not used.

Main Steps in SCS:

End SCS command

What Phase is this SCS used in? What Patches are Required for Normal Operations?

Constraints:

None

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 101 – Checksum CPE Patches

Description:

This SCS is used to patch the CPE, making it possible to achieve the result of installing all checksummed patches upon Safe Mode entry, without complications due to checksum differences. This SCS contains all CPE checksummed patches, so that it can be assured that all patches will be installed correctly, and the proper order.

SCS 101 is enabled and activated only from SCS #: 31 -- Safe Mode Reconfiguration in the event of Safe Mode entry.

This SCS is to be updated when future CPE checksum code modifications are made.

CPE patches included in this SCS are as follows:

1. Update of Momentum Auto-unload Deadzone K-constant which was directly uplinked to the CPE via PR-178 in June, 2004.
2. Update of Momentum Auto-unload Threshold K-constant which was directly uplinked to the CPE via PR-319 in August, 2012

Main Steps in SCS:

The steps for this SCS are to:

1. Set Subformat to EPS (necessary to patch CPE)
2. Patch CPE with Momentum Auto-unload System K-constant patches
3. Set Subformat to Normal

What Phase is this SCS used in? What Patches are Required for Normal Operations?

This SCS is used in the on-orbit phase.

Constraints:

None

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	OFMTSEPS	OBC TLM SMODE SLCT EPS DATA--OBC Telemetry Sub-Mode Format Select - EPS calculated or processed data		COTLRDSF	EPS					NA	NA				
2	2	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
2	2	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
3	3	ACMEMLCL	CPE CLEAR MEMORY LOAD BUFFER								PC	SD				
4	4	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
4	4	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
5	5	ACPMMLD0	CPE Ram Load Command Header--This command specifies the first serial digital h/w command in a CPE RAM Load sequence. Additional information may be found in the CPE DM05 section 3.2.2.3.2 CPE RAM Memory Load.								NA					
5	5	ACPECN02	CPE Memory Load Header Constant -- This field is defined with a constant, a value of binary (0000 0000) - essentially a space filler since the CPE requires word pairs.													
6	6	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
6	6	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
7	7	ACPMMLD1	CPE Ram Load Command Word Count--This command specifies the second serial digital h/w command in a CPE RAM Load sequence. Additional information may be found in the CPE DM05 section 3.2.2.3.2 CPE RAM Memory Load.								NA					
7	7	ACPECB12	CPE Memory Load Checksum Bypass Flag -- This flag, when set, alerts the CPE firmware that the contents of the buffer are modifying a defined checksummed region of CPE RAM memory. A new expected checksum must be loaded in the sequence if load is performed within a checksummed region of	1												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			CPE RAM memory.													
7	7	ACPESQ13	CPE Memory Load Sequence Flag -- This flag, when set, indicates that the current load buffer is the last in a sequence of load buffers or the only load buffer in a sequence.	1												
7	7	ACPEWL14	CPE Memory Load Word Count -- This field is used to specifiy the number of data (byte pairs) or word that follow in the load sequence. 0 represents 64 data byte pairs follow. Each data byte pair is a sequence of two commands carring the 8 MSBs and the 8 LSBs of a single CPE data word.	4												
8	8	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
8	8	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
9	9	ACPMMLD2	CPE Ram Load Command MSB Start Address--This command specifies the third serial digital h/w command in a CPE RAM Load sequence. Additional information may be found in the CPE DM05 section 3.2.2.3.2 CPE RAM Memory Load.								NA					
9	9	ACPEAD22	CPE Memory Load MSByte Start Address -- This field is used to specify the most significant byte of a 16-bit start address at which the data load begins.	96												
10	10	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
10	10	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
11	11	ACPMMLD3	CPE Ram Load Command LSB Start Address--This command specifies the fourth serial digital h/w command in a CPE RAM Load sequence. Additional information may be found in the CPE DM05 section 3.2.2.3.2 CPE RAM Memory Load.								NA					
11	11	ACPEAD32	CPE Memory Load LSByte Start Address -- This field is used to specify the least significant byte of a 16-bit start address at which the data load begins.	191												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
12	12	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
12	12	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
13	13	ACPMMLD4	CPE Ram Load Command MSB Data--This command specifies the fifth serial digital h/w command in a CPE RAM Load sequence and may repeat up to 64 times in a load sequence. Additional information may be found in the CPE DM05 section 3.2.2.3.2 CPE RAM Memory Load.								NA					
13	13	ACPEDT42	CPE Memory Load MSByte Of Data -- This field is used to specify the most significant byte of a 16-bit data word. A single CPE Load Command sequence may consist of 64 data byte pairs.	80												
14	14	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
14	14	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
15	15	ACPMMLD5	CPE Ram Load Command LSB Data--This command specifies the sixth serial digital h/w command in a CPE RAM Load sequence and may repeat up to 64 times in a load sequence. Additional information may be found in the CPE DM05 section 3.2.2.3.2 CPE RAM Memory Load.								NA					
15	15	ACPEDT52	CPE Memory Load LSByte Of Data -- This field is used to specify the least significant byte of a 16-bit data word. A single CPE Load Command sequence may consist of 64 data byte pairs.	0												
16	16	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
16	16	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
17	17	ACPMMLD4	CPE Ram Load Command MSB Data--This command specifies the fifth serial digital h/w command in a CPE RAM Load sequence and may repeat up to 64 times in a load sequence. Additional information may be found in the CPE DM05 section 3.2.2.3.2 CPE RAM								NA					

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			Memory Load.													
17	17	ACPEDT42	CPE Memory Load MSByte Of Data -- This field is used to specify the most significant byte of a 16-bit data word. A single CPE Load Command sequence may consist of 64 data byte pairs.	0												
18	18	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
18	18	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
19	19	ACPMMLD5	CPE Ram Load Command LSB Data--This command specifies the sixth serial digital h/w command in a CPE RAM Load sequence and may repeat up to 64 times in a load sequence. Additional information may be found in the CPE DM05 section 3.2.2.3.2 CPE RAM Memory Load.								NA					
19	19	ACPEDT52	CPE Memory Load LSByte Of Data -- This field is used to specify the least significant byte of a 16-bit data word. A single CPE Load Command sequence may consist of 64 data byte pairs.	4												
20	20	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
20	20	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
21	21	ACPMMLD4	CPE Ram Load Command MSB Data--This command specifies the fifth serial digital h/w command in a CPE RAM Load sequence and may repeat up to 64 times in a load sequence. Additional information may be found in the CPE DM05 section 3.2.2.3.2 CPE RAM Memory Load.								NA					
21	21	ACPEDT42	CPE Memory Load MSByte Of Data -- This field is used to specify the most significant byte of a 16-bit data word. A single CPE Load Command sequence may consist of 64 data byte pairs.	100												
22	22	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
22	22	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
23	23	ACPMMLD5	CPE Ram Load Command LSB Data--This command specifies the sixth serial digital h/w command in a CPE RAM Load sequence and may repeat up to 64 times in a load sequence. Additional information may be found in the CPE DM05 section 3.2.2.3.2 CPE RAM Memory Load.								NA					
23	23	ACPEDT52	CPE Memory Load LSByte Of Data -- This field is used to specify the least significant byte of a 16-bit data word. A single CPE Load Command sequence may consist of 64 data byte pairs.	0												
24	24	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
24	24	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
25	25	ACPMMLD4	CPE Ram Load Command MSB Data--This command specifies the fifth serial digital h/w command in a CPE RAM Load sequence and may repeat up to 64 times in a load sequence. Additional information may be found in the CPE DM05 section 3.2.2.3.2 CPE RAM Memory Load.								NA					
25	25	ACPEDT42	CPE Memory Load MSByte Of Data -- This field is used to specify the most significant byte of a 16-bit data word. A single CPE Load Command sequence may consist of 64 data byte pairs.	0												
26	26	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
26	26	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
27	27	ACPMMLD5	CPE Ram Load Command LSB Data--This command specifies the sixth serial digital h/w command in a CPE RAM Load sequence and may repeat up to 64 times in a load sequence. Additional information may be found in the CPE DM05 section 3.2.2.3.2 CPE RAM Memory Load.								NA					
27	27	ACPEDT52	CPE Memory Load LSByte Of Data -- This field is used to specify the	6												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			least significant byte of a 16-bit data word. A single CPE Load Command sequence may consist of 64 data byte pairs.													
28	28	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
28	28	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
29	29	ACPMMLD6	Ram Load Command MSB CPE Memory Checksum-- Additional information may be found in the CPE DM05 section 3.2.2.3.2 CPE RAM Memory Load.								NA					
29	29	ACPECS62	CPE Memory Load MSByte of CPE Memory Checksum -- This field is used to specify the most significant byte of a 16-bit memory load checksum.	96												
30	30	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
30	30	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
31	31	ACPMMLD7	Ram Load Command LSB CPE Memory Checksum-- Additional information may be found in the CPE DM05 section 3.2.2.3.2 CPE RAM Memory Load.								NA					
31	31	ACPECS72	CPE Memory Load LSByte of CPE Memory Checksum -- This field is used to specify the least significant byte of a 16-bit memory load checksum.	93												
32	32	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
32	32	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
33	33	ACPMMLD8	Ram Load Command MSB Buffer Checksum--This command specifies the second to the last serial digital h/w command in a CPE RAM Load sequence. Additional information may be found in the CPE DM05 section 3.2.2.3.2 CPE RAM Memory Load.								NA					
33	33	ACPECS82	CPE Memory Load MSByte of Memory Buffer Checksum -- This field is used to specify the most significant byte of a 16-bit memory load buffer checksum.	3												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
34	34	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
34	34	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
35	35	ACPMMLD9	Ram Load Command LSB Buffer Checksum--This command specifies the last serial digital h/w command in a CPE RAM Load sequence. Additional information may be found in the CPE DM05 section 3.2.2.3.2 CPE RAM Memory Load.								NA					
35	35	ACPECS92	CPE Memory Load LSByte of Memory Buffer Checksum -- This field is used to specify the least significant byte of a 16-bit memory load buffer checksum.	94												
36	36	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
36	36	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
37	37	ACMEMLD	CPE COMPLETE MEMORY LOAD								PC	SD				
38	38	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
38	38	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
39	39	OFMTSNRM	OBC TLM SMODE SLCT NORM DATA--OBC Telemetry Sub-Mode Format Select - EPS calculated or processed data		COTLRDSF	NORM					NA	NA				
40	40	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 102 – Spare SCS

Description:

This SCS is not used.

Main Steps in SCS:

End SCS command

What Phase is this SCS used in? What Patches are Required for Normal Operations?

Constraints:

None

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 103 – Spare SCS

Description:

This SCS is not used.

Main Steps in SCS:

End SCS command

What Phase is this SCS used in? What Patches are Required for Normal Operations?

Constraints:

None

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 104 -- HRC Safing Part 1

Description:

This SCS was created as part of the SI safing enhancement and was later modified to take out all HRC mechanism commanding. This SCS is called by SCS #: 107 -- Main SI Safing. This SCS terminates HRC SCSs that may be running before ramping down the HV and turning off the A&B Shield HVPS.

Main Steps in SCS:

1. Terminate the following SCSs:
   SCS #: 89 -- HRC Scheduled/Dither HRC-I HV Ramp Up Commands
   SCS #: 90 -- HRC Scheduled/Dither HRC-S HV Ramp Up Commands
   SCS #: 91 -- HRC Dither Control
2. Call SCS #: 87 -- HRC Scheduled/No Dither HRC-I HV Ramp Down Commands
3. Call SCS #: 88 -- HRC Scheduled/No Dither HRC-S HV Ramp Down Commands
4. Disable SCS #: 89 -- HRC Scheduled/Dither HRC-I HV Ramp Up Commands
5. Disable SCS #: 90 -- HRC Scheduled/Dither HRC-S HV Ramp Up Commands
6. Turn off A&B Shield HVPS and set levels to zero volts
7. End SCS command

What Phase is this SCS used in? What Patches are Required for Normal Operations?

This SCS is used for on-orbit SI Safing.

Constraints:

None

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	COTERMSX	TERMINATE SCS#								NA	NA				
1	1	COTERMS1	COTERMSX - SCS NUMBER -- SCS Number	89												
2	2	COTERMSX	TERMINATE SCS#								NA	NA				
2	2	COTERMS1	COTERMSX - SCS NUMBER -- SCS Number	90												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
3	3	COTERMSX	TERMINATE SCS#								NA	NA				
3	3	COTERMS1	COTERMSX - SCS NUMBER -- SCS Number	91												
4	4	COSCALL	SCS CALL SCS								NA	NA				
4	4	COSCALL1	COSCALL - SCS NUMBER -- SCS Number	87												
5	5	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
5	5	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
6	6	COSCALL	SCS CALL SCS								NA	NA				
6	6	COSCALL1	COSCALL - SCS NUMBER -- SCS Number	88												
7	7	CODISASX	DISABLE SCS#								NA	NA				
7	7	CODISAS1	CODISASX - SCS NUMBER -- SCS Number	89												
8	8	CODISASX	DISABLE SCS#								NA	NA				
8	8	CODISAS1	CODISASX - SCS NUMBER -- SCS Number	90												
9	9	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
9	9	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
10	10	2S1HVOF	SHIELD HVPS A OFF--TURNS OFF SHIELD HVPS A. BITS 19-26 ARE THE COMMAND NUMBER (05 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=0 TURNS OFF THE SUPPLY.		2S1ONST	OFF					SI	SD				
11	11	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
11	11	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
12	12	2S1HVOF	SHIELD HVPS A OFF--TURNS OFF SHIELD HVPS A. BITS 19-26 ARE THE COMMAND NUMBER (05 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=0 TURNS OFF THE SUPPLY.		2S1ONST	OFF					SI	SD				
13	13	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
13	13	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
14	14	2S2HVOF	SHIELD HVPS B OFF--TURNS OFF SHIELD HVPS B. BITS 19-26 ARE THE COMMAND NUMBER (05 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=0 TURNS OFF		2S2ONST	OFF					SI	SD				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			THE SUPPLY.													
15	15	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
15	15	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
16	16	2S2HVOF	SHIELD HVPS B OFF--TURNS OFF SHIELD HVPS B. BITS 19-26 ARE THE COMMAND NUMBER (05 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=0 TURNS OFF THE SUPPLY.		2S2ONST	OFF					SI	SD				
17	17	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
17	17	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
18	18	2S1STHV	SHIELD HVPS A STEP-- SETS VOLTAGE ACROSS PMT A BLEEDER STRING. BITS 19-26 ARE THE COMMAND NUMBER (06 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT 16 VOLTS PER COUNT. EXAMPLES: 0600 HEX = 0 VOLTS, 0620H=48 VOLTS, 067FH=2032 VOLTS.		2S1HVST	NONE					SI	SD				
18	18	2S1STHV1	Filler --													
18	18	2S1STHV2	VOLTAGE STEPS -- SETS VOLTAGE ACROSS PMT A BLEEDER STRING. BITS 19-26 ARE THE COMMAND NUMBER (06 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT 16 VOLTS PER COUNT. EXAMPLES: 0600 HEX = 0 VOLTS, 0620H=48 VOLTS, 067FH=2032 VOLTS.	0												
19	19	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
19	19	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
20	20	2S1STHV	SHIELD HVPS A STEP-- SETS VOLTAGE ACROSS PMT A BLEEDER STRING. BITS 19-26 ARE THE COMMAND NUMBER (06 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT 16 VOLTS PER COUNT. EXAMPLES: 0600 HEX = 0 VOLTS, 0620H=48 VOLTS,		2S1HVST	NONE					SI	SD				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			067FH=2032 VOLTS.													
20	20	2S1STHV1	Filler --													
20	20	2S1STHV2	VOLTAGE STEPS -- SETS VOLTAGE ACROSS PMT A BLEEDER STRING. BITS 19-26 ARE THE COMMAND NUMBER (06 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT 16 VOLTS PER COUNT. EXAMPLES: 0600 HEX = 0 VOLTS, 0620H=48 VOLTS, 067FH=2032 VOLTS.	0												
21	21	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
21	21	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
22	22	2S2STHV	SHIELD HVPS B STEP-- SETS VOLTAGE ACROSS PMT B BLEEDER STRING. BITS 19-26 ARE THE COMMAND NUMBER (06 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT 16 VOLTS PER COUNT. EXAMPLES: 0600 HEX = 0 VOLTS, 0620H=48 VOLTS, 067FH=2032 VOLTS.		2S2HVST	NONE					SI	SD				
22	22	2S2STHV1	Filler --													
22	22	2S2STHV2	VOLTAGE STEPS -- SETS VOLTAGE ACROSS PMT B BLEEDER STRING. BITS 19-26 ARE THE COMMAND NUMBER (06 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT 16 VOLTS PER COUNT. EXAMPLES: 0600 HEX = 0 VOLTS, 0620H=48 VOLTS, 067FH=2032 VOLTS.	0												
23	23	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
23	23	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
24	24	2S2STHV	SHIELD HVPS B STEP-- SETS VOLTAGE ACROSS PMT B BLEEDER STRING. BITS 19-26 ARE THE COMMAND NUMBER (06 HEX), BIT 27 IS A DONT CARE, AND BITS 28-34 SET THE VOLTAGE AT 16 VOLTS PER COUNT. EXAMPLES: 0600 HEX		2S2HVST	NONE					SI	SD				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			= 0 VOLTS, 0620H=48 VOLTS, 067FH=2032 VOLTS.													
24	24	2S2STHV1	Filler --													
24	24	2S2STHV2	VOLTAGE STEPS -- SETS VOLTAGE ACROSS PMT B BLEEDER STRING. BITS 19-26 ARE THE COMMAND NUMBER (06 HEX), BIT 27 IS A DON'T CARE, AND BITS 28-34 SET THE VOLTAGE AT 16 VOLTS PER COUNT. EXAMPLES: 0600 HEX = 0 VOLTS, 0620H=48 VOLTS, 067FH=2032 VOLTS.	0												
25	25	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
25	25	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
26	26	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
26	26	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	80							NA	NA				
27	27	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 105 -- HRC Safing Part 2, Door Partially Close

Description:

This SCS was created as part of the SI safing enhancement. This SCS is called by SCS #: 104 -- HRC Safing Part 1, which is originally called by SCS #: 107 -- Main SI Safing. This SCS is part 2 of a 2-part HRC safing response.

This SCS has been modified from the original version of the HRC Part 2 SCS. This version no longer opens the door all the way to the snubbers. This SCS now only partially closes the HRC door.

A summary of the patch request change is as follows:

All commanding associated with opening the door is eliminated

In the door "mostly" close commanding there are 3 changes (6 command changes):

1) Primary close limit switch changed from disable to enable
2) Number of step high-byte load changed to 35
3) Number of step low-byte load changed to 40

The net result of all the changes should be to move 9000 steps toward the closed limit switch from wherever it happens to be without first opening the door. With both the primary and secondary closed limit switches enabled we are protected from running hard against the closed position in the event of a single limit switch failure.

Main Steps in SCS:

Mostly close HRC door.

What Phase is this SCS used in? What Patches are Required for Normal Operations?

This SCS is used for on-orbit SI safing

Constraints:

None

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
1	1	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
2	2	2MCMRASL	MOTION CONTROL MODE RESET--PREVENTS MOTION CONTROL MODES 2MVPSAEX, 2MVLAAEX, 2MVLBAEX, 2NSTAAEX, AND 2NSTBAEX FROM BEING EXECUTED. BITS 19-26 ARE THE COMMAND NUMBER (6F HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=1 SETS THIS MODE.		2MCMDARS	RSET					SI	SD				
3	3	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
3	3	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
4	4	2MCMRASL	MOTION CONTROL MODE RESET--PREVENTS MOTION CONTROL MODES 2MVPSAEX, 2MVLAAEX, 2MVLBAEX, 2NSTAAEX, AND 2NSTBAEX FROM BEING EXECUTED. BITS 19-26 ARE THE COMMAND NUMBER (6F HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=1 SETS THIS MODE.		2MCMDARS	RSET					SI	SD				
5	5	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
5	5	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
6	6	2DRMTASL	DOOR MOTOR SELECT-- SELECTS DOOR MOTOR FOR CONTROL. BITS 19-26 ARE THE COMMAND NUMBER (71 HEX), BITS 27-34 ARE DONT CARE.		2DRMTAST	SEL					SI	SD				
7	7	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
7	7	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
8	8	2DRMTASL	DOOR MOTOR SELECT-- SELECTS DOOR MOTOR FOR CONTROL. BITS 19-26 ARE THE COMMAND NUMBER (71 HEX), BITS 27-34 ARE DONT CARE.		2DRMTAST	SEL					SI	SD				
9	9	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
9	9	COSRTDL1	Relative Time Delay (SCS Only) --	16							NA	NA				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			Relative Time Delay (minor cycles)													
10	10	2STFLADI	CLEAR STOP FLAGS-- CLEARS LATCHING INDICATORS FOR SECONDARY LIMIT SWITCHES. BITS 19-26 ARE THE COMMAND NUMBER (54 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=0 SETS THIS MODE.		2SFLGAST	DISA					SI	SD				
11	11	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
11	11	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
12	12	2STFLADI	CLEAR STOP FLAGS-- CLEARS LATCHING INDICATORS FOR SECONDARY LIMIT SWITCHES. BITS 19-26 ARE THE COMMAND NUMBER (54 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=0 SETS THIS MODE.		2SFLGAST	DISA					SI	SD				
13	13	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
13	13	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
14	14	2STFLAEN	ENABLE STOP FLAGS-- ENABLES LATCHING INDICATORS FOR SECONDARY LIMIT SWITCHES. BITS 19-26 ARE THE COMMAND NUMBER (54 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=1 SETS THIS MODE.		2SFLGAST	ENAB					SI	SD				
15	15	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
15	15	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
16	16	2STFLAEN	ENABLE STOP FLAGS-- ENABLES LATCHING INDICATORS FOR SECONDARY LIMIT SWITCHES. BITS 19-26 ARE THE COMMAND NUMBER (54 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=1 SETS THIS MODE.		2SFLGAST	ENAB					SI	SD				
17	17	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
17	17	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
18	18	2SMOIADI	SELECTED MTR OVERCURRENT PROTECTION DISABLE-- DISABLES MOTOR		2DROIAST	DISA					SI	SD				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			OVERCURRENT PROTECTION. BITS 19-26 ARE THE COMMAND NUMBER (49 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=0 SETS THIS MODE.													
19	19	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
19	19	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
20	20	2SMOIADI	SELECTED MTR OVERCURRENT PROTECTION DISABLE-- DISABLES MOTOR OVERCURRENT PROTECTION. BITS 19-26 ARE THE COMMAND NUMBER (49 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=0 SETS THIS MODE.		2DROIAST	DISA					SI	SD				
21	21	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
21	21	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
22	22	2SMOTAEN	SELECTED MTR OVERTEMP PROTECTION ENABLE-- ENABLES MOTOR OVERTEMPERATURE PROTECTION. BITS 19-26 ARE THE COMMAND NUMBER (4A HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=1 SETS THIS MODE.		2DROTAST	ENAB					SI	SD				
23	23	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
23	23	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
24	24	2SMOTAEN	SELECTED MTR OVERTEMP PROTECTION ENABLE-- ENABLES MOTOR OVERTEMPERATURE PROTECTION. BITS 19-26 ARE THE COMMAND NUMBER (4A HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=1 SETS THIS MODE.		2DROTAST	ENAB					SI	SD				
25	25	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
25	25	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
26	26	2CHPLAEN	CLOSE / HOME PRI LIMIT SWITCH ENABLE-- ENABLES CLOS/HOME POSITION PRIMARY		2CPLSAST	ENAB					SI	SD				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			LIMIT SWITCH FOR SELECTED MOTOR. BITS 19-26 ARE THE COMMAND NUMBER (50 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=1 SETS THIS MODE.													
27	27	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
27	27	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
28	28	2CHPLAEN	CLOSE / HOME PRI LIMIT SWITCH ENABLE-- ENABLES CLOS/HOME POSITION PRIMARY LIMIT SWITCH FOR SELECTED MOTOR. BITS 19-26 ARE THE COMMAND NUMBER (50 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=1 SETS THIS MODE.		2CPLSAST	ENAB					SI	SD				
29	29	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
29	29	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
30	30	2CHSLAEN	CLOSE / HOME SECONDARY LIMIT SWITCH ENABLE-- ENABLES CLOS/HOME POSITION SECONDARY LIMIT SWITCH FOR SELECTED MOTOR. BITS 19-26 ARE THE COMMAND NUMBER (51 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=1 SETS THIS MODE.		2CSLSAST	ENAB					SI	SD				
31	31	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
31	31	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
32	32	2CHSLAEN	CLOSE / HOME SECONDARY LIMIT SWITCH ENABLE-- ENABLES CLOS/HOME POSITION SECONDARY LIMIT SWITCH FOR SELECTED MOTOR. BITS 19-26 ARE THE COMMAND NUMBER (51 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=1 SETS THIS MODE.		2CSLSAST	ENAB					SI	SD				
33	33	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
33	33	COSRTDLY	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
34	34	2OMPLADI	OPEN/MAX PRI LIMIT SWITCH DIS-- DISABLES OPEN/MAX POSITION PRIMARY LIMIT		2OPLSAST	DISA					SI	SD				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			SWITCH FOR SELECTED MOTOR. BITS 19-26 ARE THE COMMAND NUMBER (52 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=0 SETS THIS MODE.													
35	35	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
35	35	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
36	36	2OMPLADI	OPEN/MAX PRI LIMIT SWITCH DIS-- DISABLES OPEN/MAX POSITION PRIMARY LIMIT SWITCH FOR SELECTED MOTOR. BITS 19-26 ARE THE COMMAND NUMBER (52 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=0 SETS THIS MODE.		2OPLSAST	DISA					SI	SD				
37	37	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
37	37	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
38	38	2OMSLADI	OPEN/MAX SECONDARY LIMIT SWITCH DISA-- DISABLES OPEN/MAX POSITION SECONDARY LIMIT SWITCH FOR SELECTED MOTOR. BITS 19-26 ARE THE COMMAND NUMBER (53 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=0 SETS THIS MODE.		2OSLSAST	DISA					SI	SD				
39	39	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
39	39	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
40	40	2OMSLADI	OPEN/MAX SECONDARY LIMIT SWITCH DISA-- DISABLES OPEN/MAX POSITION SECONDARY LIMIT SWITCH FOR SELECTED MOTOR. BITS 19-26 ARE THE COMMAND NUMBER (53 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=0 SETS THIS MODE.		2OSLSAST	DISA					SI	SD				
41	41	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
41	41	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
42	42	2MDRVAEN	MOTOR DRIVE ENABLE-- REMOVES POWER FROM SELECTED MOTOR CIRCUIT.		2MDRVAST	ENAB					SI	SD				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			BITS 19-26 ARE THE COMMAND NUMBER (68 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=1 SETS THIS MODE.													
43	43	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
43	43	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
44	44	2MDRVAEN	MOTOR DRIVE ENABLE-- REMOVES POWER FROM SELECTED MOTOR CIRCUIT. BITS 19-26 ARE THE COMMAND NUMBER (68 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=1 SETS THIS MODE.		2MDRVAST	ENAB					SI	SD				
45	45	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
45	45	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
46	46	2PSHBALD	MOT CTRL POS WORD HI BYTE LOAD-- SETS VALUE OF THE MOTOR CONTROL POSITION WORD HIGH BYTE. BITS 19-26 ARE THE COMMAND NUMBER (18 HEX), AND BITS 27-34 SET THE VALUE.		2SCTHAST	NONE					SI	SD				
46	46	2PSHBAL1	MOT CTRL POS WORD HI STEPS -- SETS VALUE OF THE MOTOR CONTROL POSITION WORD (NUMBER OF STEPS) HIGH BYTE. BITS 19-26 ARE THE COMMAND NUMBER (18 HEX), AND BITS 27-34 SET THE VALUE.	35												
47	47	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
47	47	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
48	48	2PSHBALD	MOT CTRL POS WORD HI BYTE LOAD-- SETS VALUE OF THE MOTOR CONTROL POSITION WORD HIGH BYTE. BITS 19-26 ARE THE COMMAND NUMBER (18 HEX), AND BITS 27-34 SET THE VALUE.		2SCTHAST	NONE					SI	SD				
48	48	2PSHBAL1	MOT CTRL POS WORD HI STEPS -- SETS VALUE OF THE MOTOR CONTROL POSITION WORD (NUMBER OF STEPS) HIGH BYTE. BITS 19-26 ARE THE COMMAND NUMBER (18 HEX),	35												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			AND BITS 27-34 SET THE VALUE.													
49	49	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
49	49	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
50	50	2PSLBALD	MOT CTRL POS WORD LO BYTE LOAD-- SETS VALUE OF THE MOTOR CONTROL POSITION WORD LOW BYTE. BITS 19-26 ARE THE COMMAND NUMBER (19 HEX), AND BITS 27-34 SET THE VALUE.		2SCTHAST	NONE					SI	SD				
50	50	2PSLBAL1	MOT CTRL POS WORD LO STEPS -- SETS VALUE OF THE MOTOR CONTROL POSITION WORD (NUMBER OF STEPS) LOW BYTE. BITS 19-26 ARE THE COMMAND NUMBER (19 HEX), AND BITS 27-34 SET THE VALUE.	40												
51	51	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
51	51	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
52	52	2PSLBALD	MOT CTRL POS WORD LO BYTE LOAD-- SETS VALUE OF THE MOTOR CONTROL POSITION WORD LOW BYTE. BITS 19-26 ARE THE COMMAND NUMBER (19 HEX), AND BITS 27-34 SET THE VALUE.		2SCTHAST	NONE					SI	SD				
52	52	2PSLBAL1	MOT CTRL POS WORD LO STEPS -- SETS VALUE OF THE MOTOR CONTROL POSITION WORD (NUMBER OF STEPS) LOW BYTE. BITS 19-26 ARE THE COMMAND NUMBER (19 HEX), AND BITS 27-34 SET THE VALUE.	40												
53	53	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
53	53	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
54	54	2NSTAAEX	MOVE N STEPS TOWARD CLOSE/HOME LS -- THIS COMMAND IS INTENDED FOR USE IN STOWING THE DOOR AND SHUTTERS BEFORE LAUNCH BY DRIVING PAST THE PRIMARY LIMIT SWITCHES TO THE SECONDARY SWITCHES.		2MCNAAMD	CMD					SI	SD				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			---------- MOVES TOWARD LIMIT SWITCH A (HOME) BY THE AMOUNT OF STEPS HELD IN THE POSITION COUNTER.													
55	55	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
55	55	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
56	56	2NSTAAEX	MOVE N STEPS TOWARD CLOSE/HOME LS -- THIS COMMAND IS INTENDED FOR USE IN STOWING THE DOOR AND SHUTTERS BEFORE LAUNCH BY DRIVING PAST THE PRIMARY LIMIT SWITCHES TO THE SECONDARY SWITCHES. ---------- MOVES TOWARD LIMIT SWITCH A (HOME) BY THE AMOUNT OF STEPS HELD IN THE POSITION COUNTER.		2MCNAAMD	CMD					SI	SD				
57	57	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
57	57	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1920												
58	58	2MDRVADI	MOTOR DRIVE DISABLE-- APPLIES POWER TO SELECTED MOTOR CIRCUIT. BITS 19-26 ARE THE COMMAND NUMBER (68 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=0 SETS THIS MODE.		2MDRVAST	DISA					SI	SD				
59	59	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
59	59	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
60	60	2MDRVADI	MOTOR DRIVE DISABLE-- APPLIES POWER TO SELECTED MOTOR CIRCUIT. BITS 19-26 ARE THE COMMAND NUMBER (68 HEX), BITS 27-33 ARE DONT CARE, AND BIT 34=0 SETS THIS MODE.		2MDRVAST	DISA					SI	SD				
61	61	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
61	61	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
62	62	2ALMTADS	ALL MOTORS DESELECT-- DESELECTS ALL MOTORS. BITS		2ALMTAST	NSEL					SI	SD				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			19-26 ARE THE COMMAND NUMBER (70 HEX), BITS 27-34 ARE DONT CARE.													
63	63	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
63	63	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
64	64	2ALMTADS	ALL MOTORS DESELECT-- DESELECTS ALL MOTORS. BITS 19-26 ARE THE COMMAND NUMBER (70 HEX), BITS 27-34 ARE DONT CARE.		2ALMTAST	NSEL					SI	SD				
65	65	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
65	65	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16												
66	66	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 106 – ACIS Safing

Description:

This SCS was created as part of the SI safing enhancement. This SCS is called by SCS #: 107 -- Main SI Safing.
This patch was not created using the SCS tool, since it utilized ACIS command packets. These packets are supplied by the CXC, and are not resident in the Command Data Base.

Main Steps in SCS:

AA00000000, Stop Science
1 Second Delay
AA00000000, Stop Science
10 Second Delay
WSPOW00000, Power down Video Boards and FEPs
20 Second Delay
RS_0000001, Dump System Configuration

What Phase is this SCS used in? What Patches are Required for Normal Operations?

Constraints:

None
SCS in hex format:

Step	Command Hex	Command Description
1	D800003	ACIS Command Packet
2	3060	ACIS Command Packet
3	3001300	ACIS Command Packet
4	9800010	COSRTDLY, COSRTDLY=16
5	D800003	ACIS Command Packet
6	3060	ACIS Command Packet
7	3001300	ACIS Command Packet
8	98000A0	COSRTDLY, COSRTDLY=160

Step	Command Hex	Command Description
9	D800007	ACIS Command Packet
10	7030	ACIS Command Packet
11	5002000	ACIS Command Packet
12	0	ACIS Command Packet
13	10000	ACIS Command Packet
14	9800140	COSRTDLY, COSRTDLY=320
15	D800003	ACIS Command Packet
16	3004	ACIS Command Packet
17	2002100	ACIS Command Packet
18	C800000	OBC_END_SCS

SCS #: 107 -- Main SI Safing

Description:

SCS 107 is the Main SI Safing SCS. It was created to replace the set of safing actions that were in place at launch and through OAC. Early in the mission it was discovered that the radiation belts were having a deleterious affect on the ACIS instrument, specifically the FI chips. It was found that moving the ACIS instrument out of the HRMA FOV, into the Next In Line location, stopped the degradation to the FI chips. The next step was to change the on-board safing actions to make sure the ACIS was removed to the NIL position. Additional changes were also made to consolidate all the safing actions into one main SCS.

Refer to Table 4 Safe Modes Summary Flow Chart

Main Steps in SCS:

1. Disable Radmon Process
2. Call SCS #: 123 -- Terminate and Disable Observing SCSs 131 - 135
3. Disable Angular Momentum Unloading Logic (Subfunction 21)
4. Disable VDE A&B MUPS Hi-Side Valve Power
5. Disable S/C Momentum Monitor Safing Action (SCS #: 9 -- OO - Spacecraft Momentum Monitor Fault Safing Action)
6. Disable RW Momentum Bias
7. Activate SCS #: 82 -- OTG Emergency Halt, OTG Retraction
8. Call SCS #: 108 – SIM Move to HRC-S
9. Call SCS #: 106 – ACIS Safing
10. Call SCS #: 104 -- HRC Safing Part 1 (+ SCS #: 105 -- HRC Safing Part 2, Door Partially Close)
11. 432-Second Time Delay. This was originally included in the SCS to allow time for the OTGs to Retract, but this is no longer done since SCS 82 has been modified to halt OTG motion. Now this time delay is intended to give the SIM TSC enough time to move before enabling the momentum monitor safing action. The longest move takes about 300 seconds. This time delay provides adequate pad time for commands to be issued by the SEA and for overcurrents that could slow TSC moves.
12. Enable Angular Momentum Unloading Logic (Subfunction 21)
13. Enable S/C Momentum Monitor Safing Action (SCS 9)
14. Enable RW Momentum Bias
15. Activate SCS #: 84 – Command Normal Sun Mode
16. Disable SCS 107
17. Turn off FID lights

Timing of SCS 107 Actions:

Description of Action	Timing (~sec)
1. Disable Radmon Process	1.025
2. Call SCS 123 (Disable SCSs 131 to 135)	
3. Disable Angular Momentum Unloading Logic (Subfunction 21)	
4. Disable VDE A&B MUPS Hi-Side Valve Power	
5. Disable S/C Momentum Monitor Safing Action (SCS #: 9 -- OO - Spacecraft Momentum Monitor Fault Safing Action)	
6. Disable RW Momentum Bias	
7. Activate SCS #: 82 – Halt OTG motion	
8. Call SCS #: 108 - SIM Move to HRC-S	0 (All 16 seconds run in parallel with step 8)
9. Call SCS #: 106 - ACIS Safing	65.66
10. Stop Science (AA00000000)	
• 1 second delay	-
• Stop Science (AA00000000)	1.025
• 10 Second Delay	-
• Power down video boards and FEPs (WSPOW00000)	10.25
• 20 Second Delay	-
• Dump System Config (RS_0000001)	20.5
• Call SCS #: 104 -- HRC Safing Part 1	-
11. Terminate SCSs 89, 90, and 91	
• Call SCS 87 – Ramp down HRC-I HV	-
• SCS 104 Delay	9.29
• Call SCS 88 – Ramp down HRC-S HV	1.025
• Disable SCSs 89, 90	10.25
• 1 second delay	-

• SCS 104 – Safe HRC	1.025
• **7**-Minute Time Delay to allow the SIM to move to HRC-S before re-enabling the Momentum Monitor	13.325
12. Enable Angular Momentum Unloading Logic (Subfunction 21)	432 (6744 mc)
13. Enable S/C Momentum Monitor Safing Action (SCS 9)	-
14. Enable RW Momentum Bias	
15. Activate SCS 84	
16. Disable SCS 107	
17. FLCA Configuration Reset (turn off all FID lights)	
18. **TOTAL TIME**	
	565 (9.42 minutes)

What Phase is this SCS used in? What Patches are Required for Normal Operations?

This SCS is used in all phases.

Constraints:

None

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	OORMPDS	RADIATION MONITOR PROCESS DISABLE		CORADMEN	DISA					NA	NA				
2	2	COSCALL	SCS CALL SCS								NA	NA				
2	2	COSCALL1	COSCALL - SCS NUMBER -- SCS Number	123												
3	3	AOFUNCDS	PCAD SUBFUNCTION DISABLE								NA	NA				
3	3	AOPCADSD	PCAD_Subfunction	21												
4-5	4	AVAMPOOF	VDE-A VLV PWR SWITCHING CMDS, PBO, MUPS PWR OFF (OBC)--CONTROL COMMAND		AOVAMPWR	DISA					PC	SD				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			SERIAL INTERFACE (OBC)													
4-5	4	AVAMPOB1	AVAMPOOF Data Bits D13 to D0 of Data Field --		AOVAMPWR	DISA					PC	SD				
4-5	4	AVAMPOB2	Q Odd Parity -- CPE parity bit over ground bits 19-34 of the command.	1	AOVAMPWR	DISA					PC	SD				
4-5	4	AVAMPOB3	AVAMPOOF Least Significant Word and First Command Word --		AOVAMPWR	DISA					PC	SD				
4-5	4	AVAMPOB4	AVAMPOOF Filler bit --		AOVAMPWR	DISA					PC	SD				
4-5	4	AVAMPOB5	AVAMPOOF Address Part of Data Field -- Address part of the data field		AOVAMPWR	DISA					PC	SD				
4-5	4	AVAMPOB6	AVAMPOOF Channel Part of Data Field -- Channel part of the data field		AOVAMPWR	DISA					PC	SD				
4-5	4	AVAMPOB7	AVAMPOOF Data Bits D15 and D14 -- Data Bits 15 and 14 of second command word		AOVAMPWR	DISA					PC	SD				
4-5	4	AVAMPOB8	AVAMPOOF Most Significant Word and Second Word of two word command -- Most Significant word of two word command		AOVAMPWR	DISA					PC	SD				
6-7	5	AVBMPOOF	VDE-B VLV PWR SWITCHING CMDS, PBO, MUPS PWR OFF (OBC)--CONTROL COMMAND SERIAL INTERFACE (OBC)		AOVBMPWR	DISA					PC	SD				
6-7	5	AVBMPOH1	AVBMPOOF Data Bits D13 to D0 of Data Field --		AOVBMPWR	DISA					PC	SD				
6-7	5	AVBMPOH2	Q Odd Parity -- CPE parity bit over ground bits 19-34 of the command.	0	AOVBMPWR	DISA					PC	SD				
6-7	5	AVBMPOH3	AVBMPOOF Least Significant Word and First Command Word --		AOVBMPWR	DISA					PC	SD				
6-7	5	AVBMPOH4	AVBMPOOF Filler bit --		AOVBMPWR	DISA					PC	SD				
6-7	5	AVBMPOH5	AVBMPOOF Address Part of Data Field -- Address part of the data field		AOVBMPWR	DISA					PC	SD				
6-7	5	AVBMPOH6	AVBMPOOF Channel Part of Data Field -- Channel part of the data field		AOVBMPWR	DISA					PC	SD				
6-7	5	AVBMPOH7	AVBMPOOF Data Bits D15 and D14 -- Data Bits 15 and 14 of second command word		AOVBMPWR	DISA					PC	SD				
6-7	5	AVBMPOH8	AVBMPOOF Most Significant Word and Second Word of two word command -- Most Significant word of two word command		AOVBMPWR	DISA					PC	SD				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
8	6	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
8	6	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
9-10	7	AVAMPOOF	VDE-A VLV PWR SWITCHING CMDS, PBO, MUPS PWR OFF (OBC)--CONTROL COMMAND SERIAL INTERFACE (OBC)		AOVAMPWR	DISA					PC	SD				
9-10	7	AVAMPOB1	AVAMPOOF Data Bits D13 to D0 of Data Field --		AOVAMPWR	DISA					PC	SD				
9-10	7	AVAMPOB2	Q Odd Parity -- CPE parity bit over ground bits 19-34 of the command.	1	AOVAMPWR	DISA					PC	SD				
9-10	7	AVAMPOB3	AVAMPOOF Least Significant Word and First Command Word --		AOVAMPWR	DISA					PC	SD				
9-10	7	AVAMPOB4	AVAMPOOF Filler bit --		AOVAMPWR	DISA					PC	SD				
9-10	7	AVAMPOB5	AVAMPOOF Address Part of Data Field -- Address part of the data field		AOVAMPWR	DISA					PC	SD				
9-10	7	AVAMPOB6	AVAMPOOF Channel Part of Data Field -- Channel part of the data field		AOVAMPWR	DISA					PC	SD				
9-10	7	AVAMPOB7	AVAMPOOF Data Bits D15 and D14 -- Data Bits 15 and 14 of second command word		AOVAMPWR	DISA					PC	SD				
9-10	7	AVAMPOB8	AVAMPOOF Most Significant Word and Second Word of two word command -- Most Significant word of two word command		AOVAMPWR	DISA					PC	SD				
11-12	8	AVBMPOOF	VDE-B VLV PWR SWITCHING CMDS, PBO, MUPS PWR OFF (OBC)--CONTROL COMMAND SERIAL INTERFACE (OBC)		AOVBMPWR	DISA					PC	SD				
11-12	8	AVBMPOH1	AVBMPOOF Data Bits D13 to D0 of Data Field --		AOVBMPWR	DISA					PC	SD				
11-12	8	AVBMPOH2	Q Odd Parity -- CPE parity bit over ground bits 19-34 of the command.	0	AOVBMPWR	DISA					PC	SD				
11-12	8	AVBMPOH3	AVBMPOOF Least Significant Word and First Command Word --		AOVBMPWR	DISA					PC	SD				
11-12	8	AVBMPOH4	AVBMPOOF Filler bit --		AOVBMPWR	DISA					PC	SD				
11-12	8	AVBMPOH5	AVBMPOOF Address Part of Data Field -- Address part of the data field		AOVBMPWR	DISA					PC	SD				
11-12	8	AVBMPOH6	AVBMPOOF Channel Part of Data Field -- Channel part of the data field		AOVBMPWR	DISA					PC	SD				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
11-12	8	AVBMPOH7	AVBMPOOF Data Bits D15 and D14 -- Data Bits 15 and 14 of second command word		AOVBMPWR	DISA					PC	SD				
11-12	8	AVBMPOH8	AVBMPOOF Most Significant Word and Second Word of two word command -- Most Significant word of two word command		AOVBMPWR	DISA					PC	SD				
13	9	CODISASX	DISABLE SCS#								NA	NA				
13	9	CODISAS1	CODISASX - SCS NUMBER -- SCS Number	9							NA	NA				
14	10	AORWMOMD	DISABLE RW MOMENTUM BIAS		AORWBIAS	DISA					NA	NA				
15	11	COACTSX	ACTIVATE SCS#								NA	NA				
15	11	COACTS1	COACTSX - SCS NUMBER -- SCS Number	82												
15	11	COACTS2	COACTSX - REPEAT COUNT -- Repeat Count. If this is 0, then SCS is executed once.	0												
16	12	COSCALL	SCS CALL SCS								NA	NA				
16	12	COSCALL1	COSCALL - SCS NUMBER -- SCS Number	108												
17	13	COSCALL	SCS CALL SCS								NA	NA				
17	13	COSCALL1	COSCALL - SCS NUMBER -- SCS Number	106												
18	14	COSCALL	SCS CALL SCS								NA	NA				
18	14	COSCALL1	COSCALL - SCS NUMBER -- SCS Number	104												
19	15	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
19	15	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	6744							NA	NA				
20	16	AOFUNCEN	PCAD SUBFUNCTION ENABLE / REINIT								NA	NA				
20	16	AOPCADSE	PCAD Subfunction for EN	21												
21	17	COENASX	ENABLE SCS#								NA	NA				
21	17	COENAS1	COENASX - SCS NUMBER -- SCS Number	9												
22	18	AORWMOME	ENABLE RW MOMENTUM BIAS		AORWBIAS	ENAB					NA	NA				
23	19	COACTSX	ACTIVATE SCS#								NA	NA				
23	19	COACTS1	COACTSX - SCS NUMBER -- SCS Number	84												
23	19	COACTS2	COACTSX - REPEAT COUNT -- Repeat Count. If this is 0, then SCS is executed once.	0												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
24	20	CODISASX	DISABLE SCS#								NA	NA				
24	20	CODISAS1	CODISASX - SCS NUMBER -- SCS Number	107							NA	NA				
25	21	AFLCRSET	FLCA Configuration Reset (turn off all FID lights)								SI	S				
26	22	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 108 – SIM Move to HRC-S

Description:

This SCS is used to move the SIM translation table to place HRC-S in the HRMA FOV, and move the ACIS into the NIL (Next in Line) position. This is used to "safe" ACIS from the deleterious effects of the radiation belts.

This SCS is identical to SCS #: 81 -- SIM Move to Safe Position, the original SIM move to the safe (midpoint) position, except for the absolute location.

Main Steps in SCS:

SIMGOTO serial digital command with parameter value (translation coordinate) –99612 steps, absolute position. To use this position, divide by 8 then encode to binary. Note Mod 2^{15} since only 15 bits are used for the position.

End SCS command.

What Phase is this SCS used in? What Patches are Required for Normal Operations?

The SCS is called by SCS #: 107 -- Main SI Safing

Constraints:

The SIM SEA that is ON will respond to the command (e.g. no A or B side command sequences required)

All commands require the SIM SEA serial digital header properly filled out.

Two commands minimum - header command and data command.

The SIMGOTO commands are doubled-up to protect against SEU upset. The commands are separated by 1024 minor cycles (65.6 seconds, or two major frames) because of SIM sync requirements.

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	3SIMHD	SIM SEA SERIAL COMMAND HEADER--The SEA will only accept commands in groups or packets preceeded by this SEA Header command. The SEA Header command is the first command in a group or packet sent to the SEA. The SEA Header command contains an 8 bit checksum which is computed such that the low order 8 bits of the sum of all 8 bit bytes in the command group or packet, including the two bytes of the Header command, is zero. The								SI	SD				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			Header command also contains field to specify the number of 16 bit command in the group or packet that follow the Header. The maximum number of commands that may be sent in one group, following the header, is 63. The SEA will not execute any command in a group until the entire group has been received and verified to be correct. An error in the checksum, word count, or an illegal value for any individual command will cause the SEA to reject the entire command group or packet and set the invalid command flag in output telemetry.													
1	1	3SIMHD1	SIM SEA Header Checksum -- This field is used to specify an 8 bit checksum of all command bytes within a command group transmitted to the SIM. The checksum is computed such that the low order 8 bits of the sum of all 8 bit bytes in the command group, including the header word, is zero.	129												
1	1	3SIMHD2	SIM SEA Header Fill -- Fill bits, set to binary (00).													
1	1	3SIMHD3	SIM SEA Header No of Commands -- This field is used to specify the number of 16 bit commands in a command group that follow the header. The maximum number of 16 bit commands in a command group is limited to 63.	3												
2	2	3TSCMBEN	SIM TSC MOTOR ENABLE--The TSC Motor Enable command causes the SEA software to operate latching relays that control which motor is to be driven, and that control the application of power to the motor driver. The SEA software will not apply power to either motor in response to this command, only to the motor driver. The Goto Position command powers on the motor. The TSC Motor Enable command must be issued to select a motor and apply power to the		3SMOTPEN	ON	3SMOTSEL	TSC			SI	SD				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			motor driver prior to issuing the Goto Position command. Execution of this command will be held off by the SEA software until any motor motion already in progress is completed.													
3	3	3TSCGOTO	SIM GO TO POSITION--The SIM Go To Position command causes the SEA software to initiate movement of one of the drive motors. This command will have no effect unless power has already been applied to the motor driver by a previous Motor Enable command. The SEA software will hold off execution of this command until any motor motion already in progress is completed.													
3	3	3TSCGOTO	SIM GOTO Mechanism Position Value -- This field is a signed 15 bit integer used to specify a mechanism position relative to the origin. For the TSC, one LSB equals 160 degrees of motor rotation.	20316												
4	4	3TSCMBDS	SIM TSC MOTOR DISABLE--The TSC Motor Disable command causes the SEA software to operate latching relays that control which motor is to be driven, and that control the application of power to the motor driver. The SEA software will not apply or disconnect power to either motor in response to this command, only to the motor driver. Execution of this command will be held off by the SEA software until any motor motion already in progress is completed. Therefore, it cannot be used to stop a motion in progress. The Motor Stop command is used for that purpose.		3SMOTPEN	OFF	3SMOTSEL	TSC			SI	SD				
5	5	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
5	5	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1024							NA	NA				
6	6	3SIMHD	SIM SEA SERIAL COMMAND HEADER--The SEA will only accept commands in groups or packets								SI	SD				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			preceeded by this SEA Header command. The SEA Header command is the first command in a group or packet sent to the SEA. The SEA Header command contains an 8 bit checksum which is computed such that the low order 8 bits of the sum of all 8 bit bytes in the command group or packet, including the two bytes of the Header command, is zero. The Header command also contains field to specify the number of 16 bit command in the group or packet that follow the Header. The maximum number of commands that may be sent in one group, following the header, is 63. The SEA will not execute any command in a group until the entire group has been received and verified to be correct. An error in the checksum, word count, or an illegal value for any individual command will cause the SEA to reject the entire command group or packet and set the invalid command flag in output telemetry.													
6	6	3SIMHD1	SIM SEA Header Checksum -- This field is used to specify an 8 bit checksum of all command bytes within a command group transmitted to the SIM. The checksum is computed such that the low order 8 bits of the sum of all 8 bit bytes in the command group, including the header word, is zero.	129												
6	6	3SIMHD2	SIM SEA Header Fill -- Fill bits, set to binary (00).													
6	6	3SIMHD3	SIM SEA Header No of Commands -- This field is used to specify the number of 16 bit commands in a command group that follow the header. The maximum number of 16 bit commands in a command group is limited to 63.	3												
7	7	3TSCMBEN	SIM TSC MOTOR ENABLE--The TSC Motor Enable command causes the SEA software to operate		3SMOTPEN	ON	3SMOTSEL	TSC			SI	SD				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			latching relays that control which motor is to be driven, and that control the application of power to the motor driver. The SEA software will not apply power to either motor in response to this command, only to the motor driver. The Goto Position command powers on the motor. The TSC Motor Enable command must be issued to select a motor and apply power to the motor driver prior to issuing the Goto Position command. Execution of this command will be held off by the SEA software until any motor motion already in progress is completed.													
8	8	3TSCGOTO	SIM GO TO POSITION--The SIM Go To Position command causes the SEA software to initiate movement of one of the drive motors. This command will have no effect unless power has already been applied to the motor driver by a previous Motor Enable command. The SEA software willhold off execution of this command until any motor motion already in progress is completed.													
8	8	3TSCGOTO	SIM GOTO Mechanism Position Value -- This field is a signed 15 bit integer used to specify a mechanism position relative to the origin. For the TSC, one LSB equals 160 degrees of motor rotation.	20316												
9	9	3TSCMBDS	SIM TSC MOTOR DISABLE--The TSC Motor Disable command causes the SEA software to operate latching relays that control which motor is to be driven, and that control the application of power to the motor driver. The SEA software will not apply or disconnect power to either motor in response to this command, only to the motor driver. Execution of this command will be held off by the SEA software until any motor motion already in		3SMOTPEN	OFF	3SMOTSEL	TSC			SI	SD				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			progress is completed. Therefore, it cannot be used to stop a motion in progress. The Motor Stop command is used for that purpose.													
10	10	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
10	10	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
11	11	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 109 -- Spare SCS

Description:

This SCS is not used.

Main Steps in SCS:

End SCS command

What Phase is this SCS used in? What Patches are Required for Normal Operations?

Constraints:

None

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 110 -- Spare SCS

Description:

This SCS is not used.

Main Steps in SCS:

End SCS command

What Phase is this SCS used in? What Patches are Required for Normal Operations?

Constraints:

None

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 111 -- Spare SCS

Description:

This SCS is not used.

Main Steps in SCS:

End SCS command

What Phase is this SCS used in? What Patches are Required for Normal Operations?

Constraints:

None

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 112 -- Spare SCS

Description:

This SCS is not used.

Main Steps in SCS:

End SCS command

What Phase is this SCS used in? What Patches are Required for Normal Operations?

Constraints:

None

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 113 -- Spare SCS

Description:

This SCS is not used.

Main Steps in SCS:

End SCS command

What Phase is this SCS used in? What Patches are Required for Normal Operations?

Constraints:

None

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 114 -- Spare SCS

Description:

This SCS is not used.

Main Steps in SCS:

End SCS command

What Phase is this SCS used in? What Patches are Required for Normal Operations?

Constraints:

None

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 115 -- Spare SCS

Description:

This SCS is not used.

Main Steps in SCS:

End SCS command

What Phase is this SCS used in? What Patches are Required for Normal Operations?

Constraints:

None

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 116 -- Spare SCS

Description:

This SCS is not used.

Main Steps in SCS:

End SCS command

What Phase is this SCS used in? What Patches are Required for Normal Operations?

Constraints:

None

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 117 -- Spare SCS

Description:

This SCS is not used.

Main Steps in SCS:

End SCS command

What Phase is this SCS used in? What Patches are Required for Normal Operations?

Constraints:

None

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 118 -- OBC Reset Reconfiguration Tasks

Description:

This SCS is called by SCS 80 upon an OBC reset in order to activate the proper PCAD control mode function and MUPS momentum control. In addition, important safing SCSs that default to disabled after an OBC reset are enabled and selected heater functions are enabled. It calls SCS 37 in order to enter Normal Sun Mode.

Main Steps in SCS:

1. Enable kinematic integration process
2. Enable MUPS momentum control
3. Enable MUPS valve power
4. Delay 1 minute, then set PCAD to normal sun mode 1st entry, Call to SCS #: 37 -- OO - Normal Sun Mode First Entry
5. Enable safing SCS's and safe mode monitors (SCS's 6-9, 11-14, 23-27, 29, 30)
6. Enable heater systems (ox tank, fuel tank, FA6 SIM abort, SIM trim heaters)
7. Enable SCS 32 (fault load shed) & SCS 33 (power recovery)

What Phase is this SCS used in? What Patches are Required for Normal Operations?

This is used in all phases. It is called by SCS #: 80 -- OO - Standby State Timeout.

Constraints:

All hardware commands contain 64 ms command spacing and are doubled up with 1.025 s spacing between sets to overcome SEU's.

No time delays were inserted between OBC commands (i.e. commands with 2nd character = "O")

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	COOFPNM	NORMAL OFP STATE SELECT		CONLOFP	NRML					NA	NA				
2	2	AOFUNCEN	PCAD SUBFUNCTION ENABLE / REINIT								NA	NA				
2	2	AOPCADSE	PCAD Subfunction for EN	11												
3	3	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
3	3	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
4	4	AOMUPSEL	SELECT THRUSTERS MUPS		AOFTHRST	MUPS					NA	NA				
5	5	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
5	5	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
6-7	6	AVAMPOON	VDE-A VLV PWR SWITCHING CMDS, PBO, MUPS PWR ON (OBC)--CONTROL COMMAND SERIAL INTERFACE (OBC)		AOVAMPWR	ENAB					PC	SD				
6-7	6	AVAMPOB1	AVAMPOON Data Bits D13 to D0 of Data Field --		AOVAMPWR	ENAB					PC	SD				
6-7	6	AVAMPOB2	Q Odd Parity -- CPE parity bit over ground bits 19-34 of the command.	1	AOVAMPWR	ENAB					PC	SD				
6-7	6	AVAMPOB3	AVAMPOON Least Significant Word and First Command Word --		AOVAMPWR	ENAB					PC	SD				
6-7	6	AVAMPOB4	AVAMPOON Filler bit --		AOVAMPWR	ENAB					PC	SD				
6-7	6	AVAMPOB5	AVAMPOON Address Part of Data Field -- Address part of the data field		AOVAMPWR	ENAB					PC	SD				
6-7	6	AVAMPOB6	AVAMPOON Channel Part of Data Field -- Channel part of the data field		AOVAMPWR	ENAB					PC	SD				
6-7	6	AVAMPOB7	AVAMPOON Data Bits D15 and D14 -- Data Bits 15 and 14 of second command word		AOVAMPWR	ENAB					PC	SD				
6-7	6	AVAMPOB8	AVAMPOON Most Significant Word and Second Word of two word command -- Most Significant word of two word command		AOVAMPWR	ENAB					PC	SD				
8	7	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
8	7	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
9-10	8	AVAMPOON	VDE-A VLV PWR SWITCHING CMDS, PBO, MUPS PWR ON (OBC)--CONTROL COMMAND SERIAL INTERFACE (OBC)		AOVAMPWR	ENAB					PC	SD				
9-10	8	AVAMPOB1	AVAMPOON Data Bits D13 to D0 of Data Field --		AOVAMPWR	ENAB					PC	SD				
9-10	8	AVAMPOB2	Q Odd Parity -- CPE parity bit over ground bits 19-34 of the command.	1	AOVAMPWR	ENAB					PC	SD				
9-10	8	AVAMPOB3	AVAMPOON Least Significant Word and First Command Word --		AOVAMPWR	ENAB					PC	SD				
9-10	8	AVAMPOB4	AVAMPOON Filler bit --		AOVAMPWR	ENAB					PC	SD				
9-10	8	AVAMPOB5	AVAMPOON Address Part of Data Field -- Address part of the data field		AOVAMPWR	ENAB					PC	SD				
9-10	8	AVAMPOB6	AVAMPOON Channel Part of Data		AOVAMPWR	ENAB					PC	SD				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
			Field -- Channel part of the data field													
9-10	8	AVAMPOB7	AVAMPOON Data Bits D15 and D14 -- Data Bits 15 and 14 of second command word		AOVAMPWR	ENAB					PC	SD				
9-10	8	AVAMPOB8	AVAMPOON Most Significant Word and Second Word of two word command -- Most Significant word of two word command		AOVAMPWR	ENAB					PC	SD				
11	9	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
11	9	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	937							NA	NA				
12	10	COSCALL	SCS CALL SCS								NA	NA				
12	10	COSCALL1	COSCALL - SCS NUMBER -- SCS Number	37												
13	11	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
13	11	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
14	12	COENASX	ENABLE SCS#								NA	NA				
14	12	COENAS1	COENASX - SCS NUMBER -- SCS Number	6												
15	13	COENASX	ENABLE SCS#								NA	NA				
15	13	COENAS1	COENASX - SCS NUMBER -- SCS Number	7												
16	14	COENASX	ENABLE SCS#								NA	NA				
16	14	COENAS1	COENASX - SCS NUMBER -- SCS Number	8												
17	15	COENASX	ENABLE SCS#								NA	NA				
17	15	COENAS1	COENASX - SCS NUMBER -- SCS Number	9												
18	16	COENASX	ENABLE SCS#								NA	NA				
18	16	COENAS1	COENASX - SCS NUMBER -- SCS Number	11												
19	17	COENASX	ENABLE SCS#								NA	NA				
19	17	COENAS1	COENASX - SCS NUMBER -- SCS Number	12												
20	18	COENASX	ENABLE SCS#								NA	NA				
20	18	COENAS1	COENASX - SCS NUMBER -- SCS Number	13												
21	19	COENASX	ENABLE SCS#								NA	NA				
21	19	COENAS1	COENASX - SCS NUMBER -- SCS Number	14												

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
22	20	COENASX	ENABLE SCS#								NA	NA				
22	20	COENAS1	COENASX - SCS NUMBER -- SCS Number	23												
23	21	COENASX	ENABLE SCS#								NA	NA				
23	21	COENAS1	COENASX - SCS NUMBER -- SCS Number	24												
24	22	COENASX	ENABLE SCS#								NA	NA				
24	22	COENAS1	COENASX - SCS NUMBER -- SCS Number	25												
25	23	COENASX	ENABLE SCS#								NA	NA				
25	23	COENAS1	COENASX - SCS NUMBER -- SCS Number	26												
26	24	COENASX	ENABLE SCS#								NA	NA				
26	24	COENAS1	COENASX - SCS NUMBER -- SCS Number	27												
27	25	COENASX	ENABLE SCS#								NA	NA				
27	25	COENAS1	COENASX - SCS NUMBER -- SCS Number	29												
28	26	COENASX	ENABLE SCS#								NA	NA				
28	26	COENAS1	COENASX - SCS NUMBER -- SCS Number	30												
29	27	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
29	27	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
30	28	ASMMONEN	CPE ENABLE SAFE MODE STATUS MONITOR--IOC Command, Serial interface		AIOESWD3	ENAB					PC	SD				
31	29	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
31	29	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
32	30	ASMMONEN	CPE ENABLE SAFE MODE STATUS MONITOR--IOC Command, Serial interface		AIOESWD3	ENAB					PC	SD				
33	31	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
33	31	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
34	32	PTOXHPEN	OX TANK HTR PRI ENAB		PXTHTRPR	ENAB					LR	HLP				
35	33	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
35	33	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
36	34	PTOXHREN	OX TANK HTR RDNT ENAB		PXTHTRRD	ENAB					EP	HLP				
37	35	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
37	35	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
38	36	PFTPHEN	FUEL TANK HTR PRI ENAB		EFTHTRPR	ENAB					LR	HLP				
39	37	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
39	37	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
40	38	PFTRHEN	FUEL TANK HTR RDNT ENAB		EFTHTRRD	ENAB					EP	HLP				
41	39	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
41	39	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
42	40	3FA6PAEN	FOCUS ASSEMBLY 6 PRIME ABORT HEATER ENABLE		3AZF6HTA	ENAB					SI	LCC				
43	41	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
43	41	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
44	42	3SPYPTEN	ACIS SUPPORT STRUCTURE +Y PRIME TRIM HEATER ENABLE		3ASPYTHA	ENAB					SI	LCC				
45	43	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
45	43	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
46	44	3SMYPTEN	ACIS SUPPORT STRUCTURE -Y PRIME TRIM HEATER ENABLE		3ASMYTHA	ENAB					SI	LCC				
47	45	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
47	45	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
48	46	3PSMPTEN	PSMC PRIME TRIM HEATER ENABLE		3APSMTHA	ENAB					SI	LCC				
49	47	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
49	47	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
50	48	3FLCPTEN	FLCA PRIME TRIM HEATER ENABLE		3FLCTHTA	ENAB					SI	LCC				
51	49	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
51	49	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
52	50	3RCTPTEN	RCTU PRIME TRIM HEATER ENABLE		3SITHTRA	ENAB					SI	LCC				
53	51	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
53	51	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
54	52	3AC1PTEN	ACIS 1 FITTING -Y,-Z PRIME TRIM HEATER ENABLE		3A1THTRA	ENAB					SI	LCC				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
55	53	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
55	53	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
56	54	3AC2PTEN	ACIS 2 FITTING +Y,-Z PRIME TRIM HEATER ENABLE		3A2THTRA	ENAB					SI	LCC				
57	55	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
57	55	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
58	56	3AC3PTEN	ACIS 3 FITTING +Z PRIME TRIM HEATER ENABLE		3A3THTRA	ENAB					SI	LCC				
59	57	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
59	57	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
60	58	3HR1PTEN	HRC 1 FITTING -Y,-Z PRIME TRIM HEATER ENABLE		3H1THTRA	ENAB					SI	LCC				
61	59	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
61	59	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
62	60	3HR2PTEN	HRC 2 FITTING +Y,-Z PRIME TRIM HEATER ENABLE		3H2THTRA	ENAB					SI	LCC				
63	61	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
63	61	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
64	62	3HR3PTEN	HRC 3 FITTING +Z PRIME TRIM HEATER ENABLE		3H3PZTHA	ENAB					SI	LCC				
65	63	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
65	63	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	16							NA	NA				
66	64	PTOXHPEN	OX TANK HTR PRI ENAB		PXTHTRPR	ENAB					LR	HLP				
67	65	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
67	65	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
68	66	PTOXHREN	OX TANK HTR RDNT ENAB		PXTHTRRD	ENAB					EP	HLP				
69	67	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
69	67	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
70	68	PFTPHEN	FUEL TANK HTR PRI ENAB		EFTHTRPR	ENAB					LR	HLP				
71	69	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
71	69	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
72	70	PFTRHEN	FUEL TANK HTR RDNT ENAB		EFTHTRRD	ENAB					EP	HLP				
73	71	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
73	71	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
74	72	3FA6PAEN	FOCUS ASSEMBLY 6 PRIME ABORT HEATER ENABLE		3AZF6HTA	ENAB					SI	LCC				
75	73	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
75	73	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
76	74	3SPYPTEN	ACIS SUPPORT STRUCTURE +Y PRIME TRIM HEATER ENABLE		3ASPYTHA	ENAB					SI	LCC				
77	75	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
77	75	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
78	76	3SMYPTEN	ACIS SUPPORT STRUCTURE -Y PRIME TRIM HEATER ENABLE		3ASMYTHA	ENAB					SI	LCC				
79	77	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
79	77	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
80	78	3PSMPTEN	PSMC PRIME TRIM HEATER ENABLE		3APSMTHA	ENAB					SI	LCC				
81	79	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
81	79	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
82	80	3FLCPTEN	FLCA PRIME TRIM HEATER ENABLE		3FLCTHTA	ENAB					SI	LCC				
83	81	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
83	81	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
84	82	3RCTPTEN	RCTU PRIME TRIM HEATER ENABLE		3SITHTRA	ENAB					SI	LCC				
85	83	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
85	83	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
86	84	3AC1PTEN	ACIS 1 FITTING -Y,-Z PRIME TRIM HEATER ENABLE		3A1THTRA	ENAB					SI	LCC				
87	85	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
87	85	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
88	86	3AC2PTEN	ACIS 2 FITTING +Y,-Z PRIME TRIM HEATER ENABLE		3A2THTRA	ENAB					SI	LCC				
89	87	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
89	87	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
90	88	3AC3PTEN	ACIS 3 FITTING +Z PRIME TRIM HEATER ENABLE		3A3THTRA	ENAB					SI	LCC				
91	89	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
91	89	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
92	90	3HR1PTEN	HRC 1 FITTING -Y,-Z PRIME TRIM HEATER ENABLE		3H1THTRA	ENAB					SI	LCC				
93	91	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
93	91	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
94	92	3HR2PTEN	HRC 2 FITTING +Y,-Z PRIME TRIM HEATER ENABLE		3H2THTRA	ENAB					SI	LCC				
95	93	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
95	93	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	1							NA	NA				
96	94	3HR3PTEN	HRC 3 FITTING +Z PRIME TRIM HEATER ENABLE		3H3PZTHA	ENAB					SI	LCC				
97	95	COENASX	ENABLE SCS#								NA	NA				
97	95	COENAS1	COENASX – SCS NUMBER -- SCS Number	32												
98	96	COENASX	ENABLE SCS#								NA	NA				
98	96	COENAS1	COENASX – SCS NUMBER -- SCS Number	33												
99	97	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 119 -- Spare SCS

Description:

This SCS is not used.

Main Steps in SCS:

End SCS command

What Phase is this SCS used in? What Patches are Required for Normal Operations?

Constraints:

None

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 120 – Momentum Unload Cutoff Monitor

Description:

This SCS provides a means to limit the duration of a momentum unload that could possibly be overextended from anomalous thruster behavior. It is intended that this SCS be activated with a repeat count of 255 for continuous execution of the SCS.

Main Steps in SCS:

1. If no unload is detected at the beginning of this SCS (i.e., F_Unload_State, which is event number 33 in the OFP Event Table, equals MONITOR), the SCS drops down to the 8 second delay step

2. If a momentum unload is detected (F_Unload_State equals GROUND or AUTO), there is a 400 second (6240 minor cycles) wait period to allow an unload to complete before the subsequent commands are executed to stop any unload from continuing. The 400 second value is based on the worst-case time estimate to execute an autounload from the trip threshold of 40 ft-lb-sec.

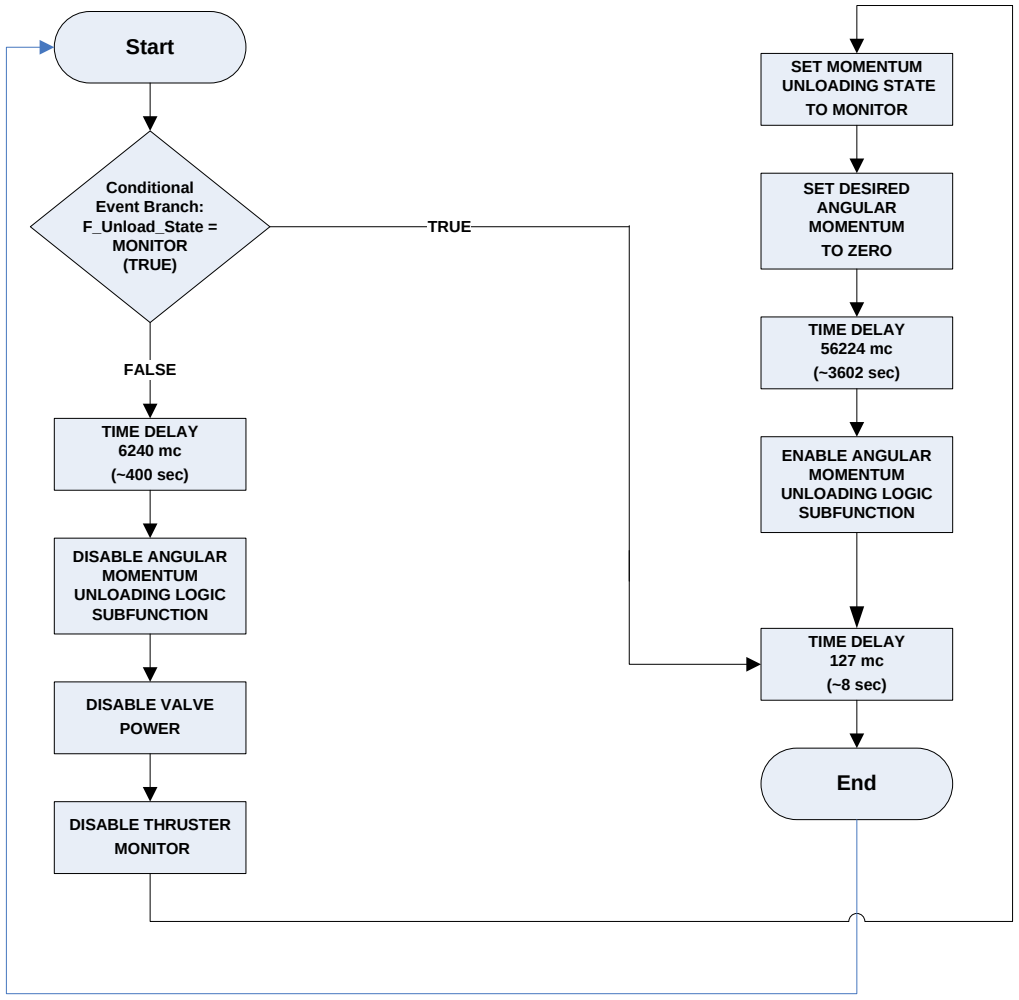
    a. The cutoff sequence consists of the following:

        1. Disable the PCAD angular momentum unloading subfunction (number 21)
        2. Disable the Valve Drive Electronics (VDE) A MUPS valve power
        3. Disable the VDE-A thruster monitor
        4. Set the momentum unloading state to monitor
        5. Set the desired angular momentum to zero

    b. After the cutoff actions are complete, an additional delay of one hour (56224 minor cycles) is initiated to prevent 'back to back' momentum unloads which would be thermally unfavorable to the MUPS thruster valves. After this delay, the angular momentum unloading sub-function is re-enabled. The SCS then drops down to the 8 second delay step.

3. Delay for 8 seconds (127 minor cycles) and end the check for, and response to, an active momentum unload event. If the SCS was activated with a repeat count of 255, SCS execution will loop back to the start of the SCS. This 8 second delay serves to control the number of times the monitor will run in a major frame.

Figure SCS 120-1. Momentum Unload Cutoff Monitor



What Phase is this SCS used in? What Patches are Required for Normal Operations?

This SCS is used during the On-Orbit Phase. A patch may be required for this SCS if VDE-B becomes the primary unit.

Constraints:

This SCS defaults to disabled upon OBC reset, and is enabled and activated by ground command in preparation for resuming mission activities.

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	OCNDEVBR	CONDITIONAL EVENT BRANCH								NA	NA				
1	1	OCNDEVB1	OCCURRENCE FLAG -- 0 - EVENT FAILED TO OCCUR 1 - EVENT OCCURED	1							NA	NA				
1	1	OCNDEVB2	OCNDEVB1 EV NUMBER -- CONDITIONAL EVENT NUMBER BEING INTERROGATED.	33							NA	NA				
1	1	OCNDEVB3	OCNDEVBR SCS STEP -- SCS STEP NUMBER AT WHICH THE PROCESSING WILL CONTINUE	17							NA	NA				
2	2	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
2	2	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	6240							NA	NA				
3	3	AOFUNCDS	PCAD SUBFUNCTION DISABLE								NA	NA				
3	3	AOPCADSD	PCAD_Subfunction – See DM05	21	AOPSAMUL	DISA					NA	NA				
4-5	4	AVAMPOOF	VDE-A VLV PWR SWITCHING CMDS, PBO, MUPS PWR OFF (OBC)--CONTROL COMMAND SERIAL INTERFACE (OBC)		AOVAMPWR	DISA					PC	SD				
4-5	4	AVAMPOB1	AVAMPOOF Data Bits D13 to D0 of Data Field --		AOVAMPWR	DISA					PC	SD				
4-5	4	AVAMPOB2	Q Odd Parity -- CPE parity bit over ground bits 19-34 of the command.	1	AOVAMPWR	DISA					PC	SD				
4-5	4	AVAMPOB3	AVAMPOOF Least Significant Word and First Command Word --		AOVAMPWR	DISA					PC	SD				
4-5	4	AVAMPOB4	AVAMPOOF Filler bit --		AOVAMPWR	DISA					PC	SD				
4-5	4	AVAMPOB5	AVAMPOOF Address Part of Data Field -- Address part of the data field		AOVAMPWR	DISA					PC	SD				
4-5	4	AVAMPOB6	AVAMPOOF Channel Part of Data Field -- Channel part of the data field		AOVAMPWR	DISA					PC	SD				

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
4-5	4	AVAMPOB7	AVAMPOOF Data Bits D15 and D14 -- Data Bits 15 and 14 of second command word		AOVAMPWR	DISA					PC	SD				
4-5	4	AVAMPOB8	AVAMPOOF Most Significant Word and Second Word of two word command -- Most Significant word of two word command		AOVAMPWR	DISA					PC	SD				
6	5	AVTA1DS	VDE-A Thruster Monitor Disabled (Channel 0)		PVDETMA1	DISA	PVDETMA2	DISA			EP	SD				
7	6	AVTA2DS	VDE-A Thruster Monitor Disabled (Channel 1)		PVDETMA2	DISA	PVDETMA1	DISA			EP	SD				
8	7	AOMUNLMO	OBC SET ANGULAR MOMENTUM UNLOADING STATE MONITOR		AOUNLOAD	MON					NA	NA				
9-14	8	AODESMOS	SET DESIRED SPACECRAFT ANGULAR MOMENTUM (Stored)-- There are Real and Stored Versions of this command		AOSYMOM1		AOSYMOM2		AOSYMOM3		NA	NA				
9-14	8	AODESMS1	Set Desired System Angular Momentum Command 1 -- 1st command of a multipart command								NA	NA				
9-14	8	AODESMS2	Set Desired System Angular Momentum Command 2 -- 2nd command of a multipart command								NA	NA				
9-14	8	AODESMS3	Mom_Tot_Cmd(1) -- Desired system Momentum vector	0.0							NA	NA				
9-14	8	AODESMS4	Mom_Tot_Cmd(2) -- Desired system Momentum vector	0.0							NA	NA				
9-14	8	AODESMS5	Mom_Tot_Cmd(3) -- Desired system Momentum vector	0.0							NA	NA				
15	9	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
15	9	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	56224							NA	NA				
16	10	AOFUNCEN	PCAD SUBFUNCTION ENABLE / REINIT								NA	NA				
16	10	AOPCADSE	PCAD Subfunction for EN -- PCAD Subfunction Number. See DMO5	21	AOPSAMUL	ACT					NA	NA				
17	11	COSRTDLY	SCS RELATIVE TIME DELAY								NA	NA				
17	11	COSRTDL1	Relative Time Delay (SCS Only) -- Relative Time Delay (minor cycles)	127							NA	NA				
18	12	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 121 -- Spare SCS

Description:

This SCS is not used.

Main Steps in SCS:

End SCS command

What Phase is this SCS used in? What Patches are Required for Normal Operations?

Constraints:

None

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 122 -- Spare SCS

Description:

This SCS is not used.

Main Steps in SCS:

End SCS command

What Phase is this SCS used in? What Patches are Required for Normal Operations?

Constraints:

None

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 123 -- Terminate and Disable Observing SCSs 131 - 135

Description:

This SCS terminates and disables all observation SCSs (131 – 133) plus 134 and 135, which are reserved for possible Science Instrument use. SCS 123 is called from SCS #: 107 -- Main SI Safing

Main Steps in SCS:

1. Terminate SCS 131.
2. Terminate SCS 132.
3. Terminate SCS 133.
4. Terminate SCS 134.
5. Terminate SCS 135.
6. Disable SCS 131.
7. Disable SCS 132.
8. Disable SCS 133.
9. Disable SCS 134.
10. Disable SCS 135.

What Phase is this SCS used in? What Patches are Required for Normal Operations?

This SCS is used in all phases. No patches are required for Normal Operations.

Constraints:

None.

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	COTERMSX	TERMINATE SCS#								NA	NA				
1	1	COTERMS1	COTERMSX - SCS NUMBER -- SCS Number	131							NA	NA				
2	2	COTERMSX	TERMINATE SCS#								NA	NA				
2	2	COTERMS1	COTERMSX - SCS NUMBER -- SCS Number	132							NA	NA				
3	3	COTERMSX	TERMINATE SCS#								NA	NA				
3	3	COTERMS1	COTERMSX - SCS NUMBER -- SCS Number	133							NA	NA				
4	4	COTERMSX	TERMINATE SCS#								NA	NA				
4	4	COTERMS1	COTERMSX - SCS NUMBER -- SCS Number	134							NA	NA				
5	5	COTERMSX	TERMINATE SCS#								NA	NA				
5	5	COTERMS1	COTERMSX - SCS NUMBER -- SCS Number	135							NA	NA				
6	6	CODISASX	DISABLE SCS#								NA	NA				
6	6	CODISAS1	CODISASX - SCS NUMBER -- SCS Number	131							NA	NA				
7	7	CODISASX	DISABLE SCS#								NA	NA				
7	7	CODISAS1	CODISASX - SCS NUMBER -- SCS Number	132							NA	NA				
8	8	CODISASX	DISABLE SCS#								NA	NA				
8	8	CODISAS1	CODISASX - SCS NUMBER -- SCS Number	133							NA	NA				
9	9	CODISASX	DISABLE SCS#								NA	NA				
9	9	CODISAS1	CODISASX - SCS NUMBER -- SCS Number	134							NA	NA				
10	10	CODISASX	DISABLE SCS#								NA	NA				
10	10	CODISAS1	CODISASX - SCS NUMBER -- SCS Number	135							NA	NA				
11	11	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 124 -- Spare SCS

Description:

This SCS is not used.

Main Steps in SCS:

End SCS command

What Phase is this SCS used in? What Patches are Required for Normal Operations?

Constraints:

None

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 125 -- Spare SCS

Description:

This SCS is not used.

Main Steps in SCS:

End SCS command

What Phase is this SCS used in? What Patches are Required for Normal Operations?

Constraints:

None

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 126 -- Spare SCS

Description:

This SCS is not used.

Main Steps in SCS:

End SCS command

What Phase is this SCS used in? What Patches are Required for Normal Operations?

Constraints:

None

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	COSCSEND	END SCS (SCS ONLY)								NA	NA				

SCS #: 127 -- Spare SCS

Description:

This SCS is not used.

Main Steps in SCS:

End SCS command

What Phase is this SCS used in? What Patches are Required for Normal Operations?

Constraints:

None

Step	Count	Mnemonic	Command Description	Par	Cmd Ver 1	State 1	Cmd Ver 2	State 2	Cmd Ver 3	State 3	RCTU	Ch	V	H	Per	Relay
1	1	COSCSEND	END SCS (SCS ONLY)								NA	NA				