

Recovery from SIR
File: H_CRP_AOC_XA2C.xls
Author: dsalt-hp



Procedure Summary

Objectives

The objective of this Herschel ACMS contingency procedure is to recover from a system level event has declared the Satellite In Reconfiguration (SIR).

The procedure involves the following activities:

- checks of initial S/C conditions & verify gyro health
- make Star Tracker functional (calls H_FCP_AOC_4S01)
- update Sun Earth Ephemerides (calls H_FCP_AOC_3M03)
- verify RCS status & health
- perform transition to OCM (calls H_FCP_AOC_00CM)
- declare RWL assembly operational (calls H_FCP_AOC_4R14)
- command transition to SCM (calls H_FCP_AOC_0SCM)
- switch off RCS heaters

NOTE:

All necessary TPFs must have been created and delivered by Flight Dynamics in order to execute this procedure.

Summary of Constraints

All system level activities required to support these ACSM activities must have been performed successfully before executing this procedure.

Spacecraft Configuration

Start of Procedure

Spacecraft initial conditions:
- ACMS mode is SAM Coarse pointing

End of Procedure

Spacecraft initial conditions:
- ACMS recovered back to original mode, prior to SIR

Reference File(s)

Input Command Sequences

Output Command Sequences

HRAXA2CB

Referenced Displays

ANDs GRDs SLDs

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ZAA01999
 ZAA06999
 ZAA07999
 ZAA02999
 WALC2584
 ZAZ30999
 ZAZ31999
 ZAA04999
 ZAA00999
 WALC1584

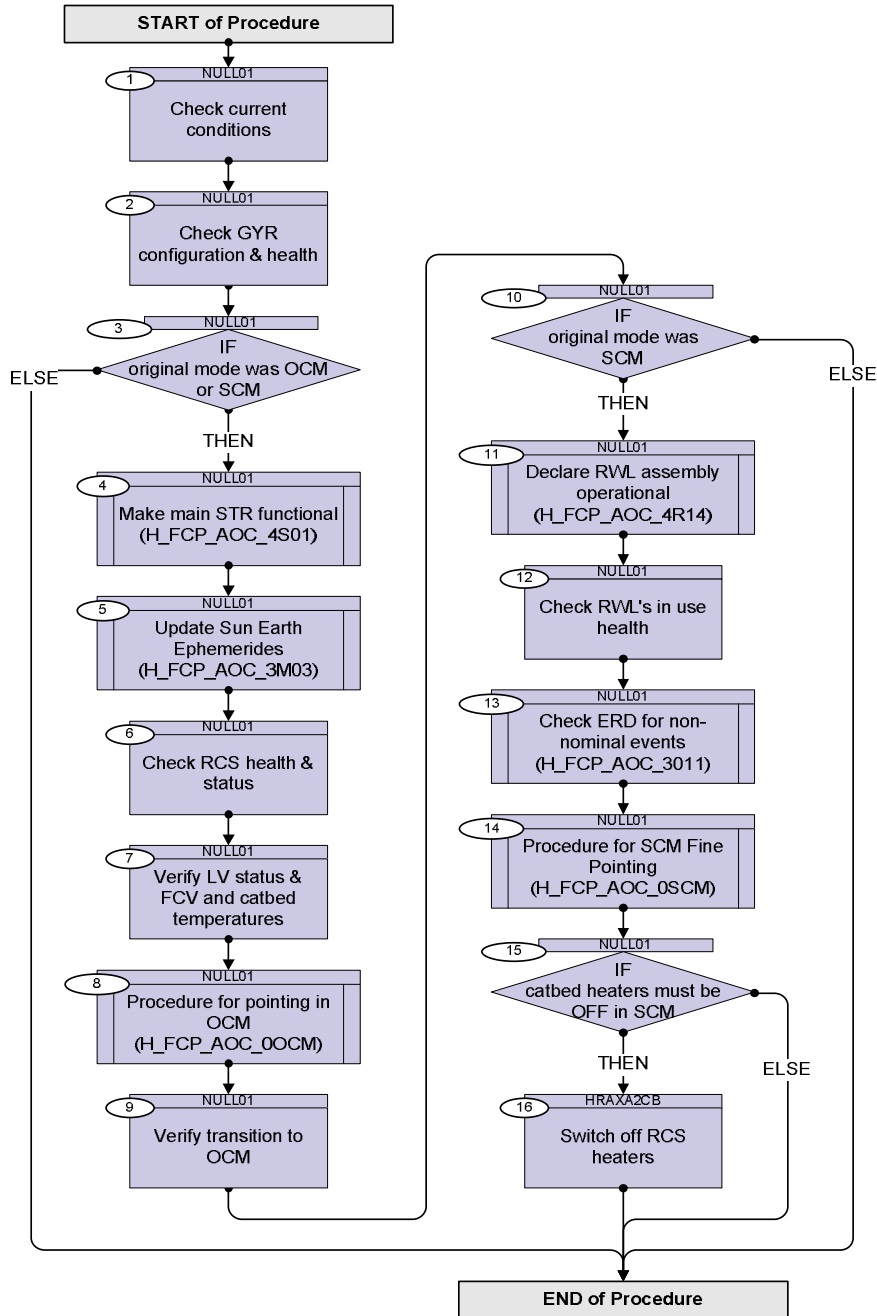
Configuration Control Information

DATE	FOP ISSUE	VERSION	MODIFICATION DESCRIPTION	AUTHOR	SPR REF
01/08/08	1	1	Created	dsalt-hp	
03/12/08	2	2	Step 8-10 & Step 14-18 modified to ensure minimum period in RCS Fine. RCS catbed heater switch OFF at Step 19 now optional.	dsalt-hp	
22/03/09		3	Updated to enable both OCM and SCM pointing TC execution with RCS in Coarse as nominal (for see Step 15 and subsequent call to H_FCP_AOC_4R34) with option to use RCS Fine if necessary, as per Section 2.1.2 of H-P-4-DS-MA-007 (Issue 2, Rev.5) NOTE: The additional TCs defined in MA-007 are linked to the TPF=RWL to ensure autonomous loading during routine Delta-Vs and all other OCM-to-SCM transitions that require wheel bias/hold conditions	dsalt-hp	
24/03/09	2.2	4	Procedure rationalised by adding calls to separate procedures for: - attitude change in OCM (calls H_FCP_AOC_0OCM) at Step 8 - transition to SCM (calls H_FCP_AOC_0SCM) at Step 16 NOTE: Both called procedures include all TCs to disable/desensitise relevant checks	dsalt-hp	
20/05/09	2.5	5	SETTLE_COUNTER update steps (13 & 14) removed as ACC ASW now contains these values	dsalt-hp	

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Procedure Flowchart Overview



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Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
Beginning of Procedure				
TC Seq. Name : NULL01 (Null Sequence 01)				
TimeTag Type: Sub Schedule ID: <input type="checkbox"/>				
1		Check current conditions		Next Step: 2
		Verify Telemetry AcmsMode AESMG002	= SAM	AND=ZAA01999
		Verify Telemetry AcmsSubstate AESMF002	= SAM Sun Point	AND=ZAA01999
		Verify Telemetry AcmsMain AID AESM3002	= SAM pnt coarse	AND=ZAA01999
		<i>Check that SIR signal has been cleared</i>		
		Verify Telemetry SirStatus AESMM002	= FALSE	AND=ZAA01999
		Verify Telemetry CMDU SIR nom AMCSN100		AND=ZAA06999
		Verify Telemetry CMDU SIR red AMCSR100		AND=ZAA07999
2		Check GYR configuration & health		Next Step: 3
		<i>The checks must be conditional to cover all valid configurations of the GYR assembly. In particular, normal operations are possible with one GYR channel excluded from the hardware configuration and checks must be executed only for the GYR channels included in the current configuration in use.</i>		
2.1		Check GYR configuration		<input type="checkbox"/>
		Verify Telemetry Curr GYRs use AES19002	= GYR 1-2-3 = GYR 1-2-3-4 = GYR 1-2-4 = GYR 1-3-4 = GYR 2-3-4	AND=ZAA01999
		Verify Telemetry Curr GYRE use AES20002	= GYRE 1 = GYRE 2	AND=ZAA01999
2.2		Check GYR health		<input type="checkbox"/>

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Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
		NOTE: GYR 2-3-4 excludes GYR1 GYR 1-3-4 excludes GYR2 GYR 1-2-4 excludes GYR3 GYR 1-2-3 excludes GYR4		
		Verify Telemetry GYR1 Health Sts AES41002	= Healthy	AND=ZAA02999
		Verify Telemetry GYR2 Health Sts AES42002	= Healthy	AND=ZAA02999
		Verify Telemetry GYR3 Health Sts AES43002	= Healthy	AND=ZAA02999
		Verify Telemetry GYR4 Health Sts AES44002	= Healthy	AND=ZAA02999
2.3		Check GYR-E health		<input type="checkbox"/>
		Verify Telemetry GYRE1 Hlth Sts AESK3002	= Healthy	AND=ZAA02999
		Verify Telemetry GYRE2 Hlth Sts AESK4002	= Healthy	AND=ZAA02999
3		IF original mode was OCM or SCM		Next Step: THEN 4 ELSE END
4		Make main STR functional (H_FCP_AOC_4S01)		Next Step: 5
		Execute Procedure: H_FCP_AOC_4S01 Declare STR Operational for first Delta-V		
5		Update Sun Earth Ephemerides (H_FCP_AOC_3M03)		Next Step: 6
		Execute Procedure: H_FCP_AOC_3M03 Update Sun Earth Ehpemerides		
6		Check RCS health & status		Next Step: 7
6.1		Check health of RCS branch flagged as nominal		<input type="checkbox"/>

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Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
		Verify Telemetry Nom Conf RCS AESCF002	= RCS-A = RCS-B	AND=ZAA01999
		Check the following TM if RCSA is flagged as Nominal		
		Verify Telemetry RCSA Health Sts AESK1002	= Healthy	AND=ZAA02999
		Check the following TM if RCSB is flagged as Nominal		
		Verify Telemetry RCSB Health Sts AESK2002	= Healthy	AND=ZAA02999
6.2		Check LCL status for the RCS		<input type="checkbox"/>
		Verify Telemetry RcsThrsA_L45_1S WM22D565	= ON	AND=WALC2584
		Verify Telemetry RcsThrsA_L45_2S WM22J565	= ON	AND=WALC2584
		Verify Telemetry RcsThrsB_L46_1S WM92D565	= ON	AND=WALC2584
		Verify Telemetry RcsThrsB_L46_2S WM92J565	= ON	AND=WALC2584
		Verify Telemetry RcsLvA_L47_1S WM12E565	= ON	AND=WALC2584
		Verify Telemetry AccLvA_L47_2S WM12J565	= ON	AND=WALC2584
		Verify Telemetry AccLvB_L48_1S WMA2E565	= ON	AND=WALC2584
		Verify Telemetry AccLvB_L48_2S WMA2J565	= ON	AND=WALC2584
		LCL's 45 - 48 power the latch valve, the flow control valves and the heaters of the two RCS branches. <u>All of these LCL's must be closed throughout the mission.</u> An explicit check is added before any operation involving the RCS to protect against inadvertent switching of these LCL's.		
7		Verify LV status & FCV and catbed temperatures		Next Step: 8
7.1		Verify LV status for MAIN branch RCS		<input type="checkbox"/>

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7.1.1		Verify LV status for RCS-A, if MAIN branch		<input type="checkbox"/>
		Verify Telemetry RCS-A LV closed AMTL2109	= FALSE	AND=ZAA06999
		Verify Telemetry RCS-A LV open AMTL1109	= TRUE	AND=ZAA06999
7.1.2		Verify LV status for RCS-B, if MAIN branch		<input type="checkbox"/>
		Verify Telemetry RCS-B LV open AMTL3109	= TRUE	AND=ZAA07999
		Verify Telemetry RCS-B LV closed AMTL4109	= FALSE	AND=ZAA07999
7.2		Verify FCV temps for MAIN branch RCS		<input type="checkbox"/>
7.2.1		Verify FCV temps for RCS-A, if MAIN branch		<input type="checkbox"/>
		NOTE: The temperatures used in the verification criteria above are those the CDMU ASW derives by averaging data from three individual thermistors mounted on the same thermal node. The positions of the nodes are as follows: #22 - FCV A1A #42 - FCV A2A #41 - FCV C1A #23 - FCV C2A #44 - FCV C3A #51 - FCV C4A		
		Verify Telemetry ThermAvgTemp022 DEA8D170	< 65.0 deg C > 10.0 deg C	AND=ZAZ30999
		Verify Telemetry ThermAvgTemp042 DEAA1170	< 65.0 deg C > 10.0 deg C	AND=ZAZ31999
		Verify Telemetry ThermAvgTemp041 DEAA0170	< 65.0 deg C > 10.0 deg C	AND=ZAZ31999
		Verify Telemetry ThermAvgTemp023 DEAA8E170	< 65.0 deg C > 10.0 deg C	AND=ZAZ30999
		Verify Telemetry ThermAvgTemp044 DEAA3170	< 65.0 deg C > 10.0 deg C	AND=ZAZ31999

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Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
		Verify Telemetry ThermAvgTemp051 DEAAA170	< 65.0 deg C > 10.0 deg C	AND=ZAZ31999
7.2.2		Verify FCV temps for RCS-B, if MAIN branch		□
		NOTE: The temperatures used in the verification criteria above are those the CDMU ASW derives by averaging data from three individual thermistors mounted on the same thermal node. The positions of the nodes are as follows: #03 - FCV A1B #09 - FCV A2B #08 - FCV C1B #04 - FCV C2B #28 - FCV C3B #10 - FCV C4B		
		Verify Telemetry ThermAvgTemp003 DEA7A170	< 65.0 deg C > 10.0 deg C	AND=ZAZ30999
		Verify Telemetry ThermAvgTemp009 DEA80170	< 65.0 deg C > 10.0 deg C	AND=ZAZ30999
		Verify Telemetry ThermAvgTemp008 DEA7F170	< 65.0 deg C > 10.0 deg C	AND=ZAZ30999
		Verify Telemetry ThermAvgTemp004 DEA7B170	< 65.0 deg C > 10.0 deg C	AND=ZAZ30999
		Verify Telemetry ThermAvgTemp028 DEA93170	< 65.0 deg C > 10.0 deg C	AND=ZAZ30999
		Verify Telemetry ThermAvgTemp010 DEA81170	< 65.0 deg C > 10.0 deg C	AND=ZAZ30999
7.3		Verify catbed temps for MAIN branch		□
7.3.1		Verify catbed temps of Acceleration thruster		□
		Check the following if OCM will use A1		
		Verify Telemetry A1D1 Ttemp act AETTA001	> 453.23 K	AND=ZAA04999
		Check the following if OCM will use A2		

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Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
		Verify Telemetry A2D2 Ttemp act AETTB001	> 453.23 K	AND=ZAA04999
7.3.2		Verify catbed temps of Control thrusters		<input type="checkbox"/>
		Verify Telemetry C1F1 Ttemp act AETTC001	> 453.23 K	AND=ZAA04999
		Verify Telemetry C2F2 Ttemp act AETTD001	> 453.23 K	AND=ZAA04999
		Verify Telemetry C3U1 Ttemp act AETTE001	> 453.23 K	AND=ZAA04999
		Verify Telemetry C4U2 Ttemp act AETTF001	> 453.23 K	AND=ZAA04999
7.4		Verify RCS Thrusters operating temperature		<input type="checkbox"/>
		Check to be performed on RCTs in use and to be used for Delta V to ensure they remain above some reasonable "pre-heated" level (200 deg C)		
		Verify Telemetry A1D1 Ttemp act AETTA001		AND=ZAA04999
		Verify Telemetry A2D2 Ttemp act AETTB001		AND=ZAA04999
		Verify Telemetry C1F1 Ttemp act AETTC001		AND=ZAA04999
		Verify Telemetry C2F2 Ttemp act AETTD001		AND=ZAA04999
		Verify Telemetry C3U1 Ttemp act AETTE001		AND=ZAA04999
		Verify Telemetry C4U2 Ttemp act AETTF001		AND=ZAA04999
		Verify Telemetry A1D1 Ttmp unuse AETUA001		AND=ZAA04999
		Verify Telemetry A2D2 Ttmp unuse AETUB001		AND=ZAA04999
		Verify Telemetry C1F1 Ttmp unuse AETUC001		AND=ZAA04999
		Verify Telemetry C2F2 Ttmp unuse AETUD001		AND=ZAA04999
		Verify Telemetry C3U1 Ttmp unuse AETUE001		AND=ZAA04999

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Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
		Verify Telemetry C4U2 Ttmp unuse AETUF001		AND=ZAA04999
8		Procedure for pointing in OCM (H_FCP_AOC_0OCM)		Next Step: 9
		Execute Procedure: H_FCP_AOC_0OCM Procedure for pointing in OCM		
9		Verify transition to OCM		Next Step: 10
9.1		Check the control state is reached within the specified period T_slew (AHHD1002)		<input type="checkbox"/>
		Verify Telemetry AcmsMode AESMG002	= OCM	AND=ZAA01999
		Verify Telemetry AcmsSubstate AESMF002	= OCM Pointing	AND=ZAA01999
		Verify Telemetry AcmsMain AID AESM3002	= OCM pnt coarse	AND=ZAA01999
9.2		Check attitude quaternion is close to commanded target		<input type="checkbox"/>
		Verify Telemetry Est Attitude Q1 AESA6001	as commanded	AND=ZAA00999
		Verify Telemetry Est Attitude Q2 AESA7001	as commanded	AND=ZAA00999
		Verify Telemetry Est Attitude Q3 AESA8001	as commanded	AND=ZAA00999
		Verify Telemetry Est Attitude Q4 AESA9001	as commanded	AND=ZAA00999
9.3		Check attitude errors		<input type="checkbox"/>
		Verify Telemetry Attitude err X AESBX002	= +/- 0.50 deg	AND=ZAA00999
		Verify Telemetry Attitude err Y AESBY002	= +/- 0.25 deg	AND=ZAA00999
		Verify Telemetry Attitude err Z AESBZ002	= +/- 0.25 deg	AND=ZAA00999

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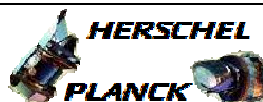
Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
10		IF original mode was SCM		Next Step: THEN 11 ELSE END
11		Declare RWL assembly operational (H_FCP_AOC_4R14)		Next Step: 12
		Execute Procedure: H_FCP_AOC_4R14 Declare RWL assembly operational		
12		Check RWL's in use health		Next Step: 13
		The logic is the same as for the gyros, but for the wheels the power status has to be checked as well.		
12.1		IF RWL in use not RWL 2-3-4		<input type="checkbox"/>
		Verify Telemetry Curr RWLs use AES21002 <> RWL 2-3-4		AND=ZAA01999
12.2		Verify RWL1 Power and Health		<input type="checkbox"/>
		Verify Telemetry RWL1 power AE4P3002 = ON		AND=ZAA0999
		Verify Telemetry RWL1 Health Sts AES45002 = Healthy		AND=ZAA02999
12.3		IF RWL in use not RWL 1-3-4		<input type="checkbox"/>
		Verify Telemetry Curr RWLs use AES21002 <> RWL 1-3-4		AND=ZAA01999
12.4		Verify RWL2 Power and Health		<input type="checkbox"/>
		Verify Telemetry RWL2 power AE4P4002 = ON		AND=ZAA01999
		Verify Telemetry RWL2 Health Sts AES46002 = Healthy		AND=ZAA02999
12.5		IF RWL in use not RWL 1-2-4		<input type="checkbox"/>
		Verify Telemetry Curr RWLs use AES21002 <> RWL 1-2-4		AND=ZAA01999

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Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
12.6		Verify RWL3 Power and Health		<input type="checkbox"/>
		Verify Telemetry RWL3 power AE4P5002	= ON	AND=ZAA01999
		Verify Telemetry RWL3 Health Sts AES47002	= Healthy	AND=ZAA02999
12.7		IF RWL in use not RWL 1-2-3		<input type="checkbox"/>
		Verify Telemetry Curr RWLs use AES21002	<> RWL 1-2-3	AND=ZAA01999
12.8		Verify RWL4 Power and Health		<input type="checkbox"/>
		Verify Telemetry RWL4 power AE4P6002	= ON	AND=ZAA01999
		Verify Telemetry RWL4 Health Sts AES48002	= Healthy	AND=ZAA02999
13		Check ERD for non-nominal events (H_FCP_AOC_3011)		Next Step: 14
		Execute Procedure: H_FCP_AOC_3011 ERD buffer dump		
14		Procedure for SCM Fine Pointing (H_FCP_AOC_0SCM)		Next Step: 15
		Execute Procedure: H_FCP_AOC_0SCM Procedure for SCM Fine Pointing		
15		IF catbed heaters must be OFF in SCM		Next Step: THEN 16 ELSE END
<p>TC Seq. Name :HRAXA2CB (RCS heaters OFF)</p> <p>TimeTag Type: Sub Schedule ID:</p> <p><input type="checkbox"/></p>				
16		Switch off RCS heaters		Next Step: END

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		Verify Telemetry Nom Conf RCS AESCF002	= RCS-A = RCS-B	AND=ZAA01999
16.1		Switch OFF thruster heaters for RCS-A, if used		<input type="checkbox"/>
		Execute Telecommand All HTR RCS-A OFF	ACZE6109	
		Command Parameter(s) : RCSCfg DF86 Cmd AH8R3001 RCSCfg DD86 Cmd AH8R4001	Enable 86 Enable 86	
		TC Control Flags : GBM IL DSE --Y -- ---		
		Subsch. ID : 20 Det. descr. : TC(8,1) Command RCS config - Herschel All HTR RCS-A OFF		
		Execute Telecommand Fire Cmd RCS config	ACZ2M109	
		Command Parameter(s) : FireFun DF86Cmd AH8F1001 FireFun DD86Cmd AH8F2001	Enable 86 Enable 86	
		TC Control Flags : GBM IL DSE --Y -- ---		
		Subsch. ID : 20 Det. descr. : TC(8,4) Fire Command - Fire Cmd RCS config		
16.2		Check RCS catbed heater status & current		<input type="checkbox"/>
		Verify Telemetry CBH_N_L17_S WMA2H565	= OFF	AND=WALC1584
		Verify Telemetry CBH_N_L17_I WMA13565	< 0.01 A >= 0.5 A changes to	AND=WALC1584
		Verify Telemetry CBH_R_L18_S WM12H565	= OFF	AND=WALC1584
		Verify Telemetry CBH_R_L18_I WM113565	0	AND=WALC1584
16.3		Switch OFF thruster heaters for RCS-B, if used		<input type="checkbox"/>

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		Execute Telecommand All HTR RCS-B OFF Command Parameter(s) : RCSCfg DF86 Cmd AH8R3001 Enable 86 RCSCfg DD86 Cmd AH8R4001 Enable 86 TC Control Flags : GBM IL DSE --Y -- -- Subsch. ID : 20 Det. descr. : TC(8,1) Command RCS config - Herschel All HTR RCS-B OFF	ACZE7109	
		Execute Telecommand Fire Cmd RCS config Command Parameter(s) : FireFun DF86Cmd AH8F1001 Enable 86 FireFun DD86Cmd AH8F2001 Enable 86 TC Control Flags : GBM IL DSE --Y -- -- Subsch. ID : 20 Det. descr. : TC(8,4) Fire Command - Fire Cmd RCS config	ACZ2M109	
16.4		Check RCS catbed heater status & current		<input type="checkbox"/>
		Verify Telemetry CBH_N_L17_S WMA2H565 = OFF		AND=WALC1584
		Verify Telemetry CBH_N_L17_I WMA13565 0		AND=WALC1584
		Verify Telemetry CBH_R_L18_S WM12H565 = OFF		AND=WALC1584
		Verify Telemetry CBH_R_L18_I WM113565 < 0.01 A >= 0.5 A changes to		AND=WALC1584
16.5		Verify decreasing catbed temps for MAIN branch		<input type="checkbox"/>
		Observe <u>decreasing values</u> of the catbed temperatures		
		Verify Telemetry A1D1 Ttemp act AETTA001		AND=ZAA04999
		Verify Telemetry A2D2 Ttemp act AETTB001		AND=ZAA04999

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		Verify Telemetry C1F1 Ttemp act AETTC001		AND=ZAA04999
		Verify Telemetry C2F2 Ttemp act AETTD001		AND=ZAA04999
		Verify Telemetry C3U1 Ttemp act AETTE001		AND=ZAA04999
		Verify Telemetry C4U2 Ttemp act AETTF001		AND=ZAA04999
End of Procedure				