

Perform SCM Raster Pointing
File: H_FCP_AOC_3S02.xls
Author: dsalt-hp



Procedure Summary

Objectives

The objective of this Herschel ACMS procedure is for the execution of a single raster pointing.

The procedure involves the following activities:

- check ACMS configuration
- select & uplink the Raster Pointing command
- verify slew start
- verify raster execution
- verify pointing at end of activity

The procedure is based on the same assumption as for the single-target fine pointing (i.e. it is supposed to be used during normal operations when the ACMS is already in SCM). The design of the subsystem allows all SCM pointing commands, including rasters, to be issued also in SAM and OCM, but this option will not be used during operations in flight.

Summary of Constraints

Prior to the execution of TC_PERFORM_SCM_RASTER_POINTING in routine operations, the ACMS must be in conditions which will prevent the triggering of TC execution checks. All necessary conditions are verified by calling procedure Verify SCM Configuration, which carries out the following checks:

1. ACMS in SCM and pointing.
2. ACMS configuration allows execution of SCM pointing commands; i.e., the following conditions must be satisfied:
 - 2.1. No SIR
 - 2.2. No CIR
 - 2.3. No critical TC flag raised.
3. Unit configuration is sufficient to carry out an SCM pointing. The procedure accepts any valid unit configuration for SCM and is not limited to the defaults (RWL 1-2-3-4, GYR 1-2-3, STR1),
 - 3.1 One STR in active configuration, powered and healthy. STR mode = AAD, STR submode = ATFAD.
 - 3.2. At least three wheels in active configuration, powered and healthy
 - 3.3. One GYRE selected, powered and healthy.
 - 3.4. Three GYR sensors in active configuration are healthy

Spacecraft Configuration

Start of Procedure

Type Pre-condition Here

End of Procedure

Type Post-condition Here

Reference File(s)

Input Command Sequences

Output Command Sequences

Status : Version 3 - Unchanged
Last Checkin: 13/05/09

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AERAS_00

Referenced Displays

ANDs **GRDs** **SLDs**
 ZAA50999
 ZAALH999
 ZAA52999

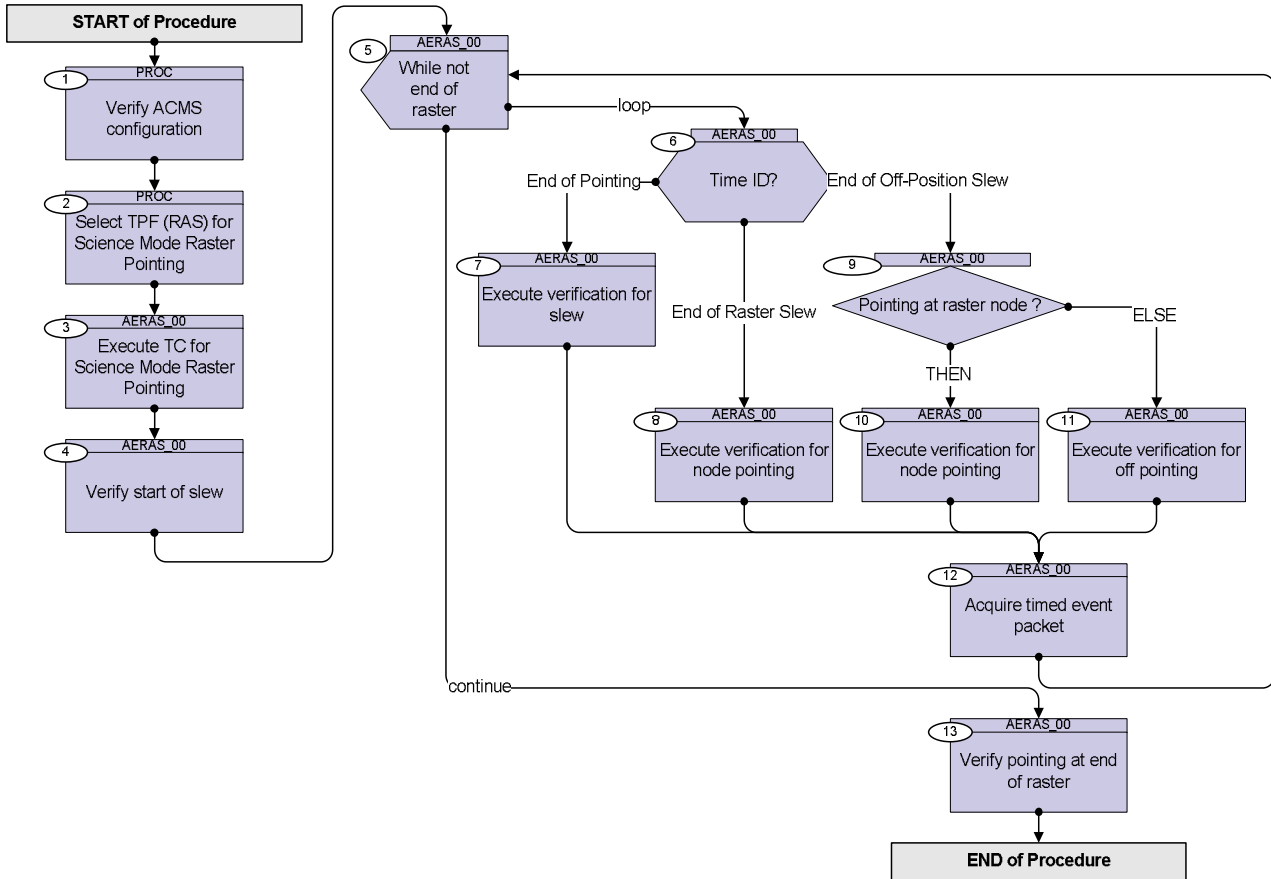
Configuration Control Information

DATE	FOP ISSUE	VERSION	MODIFICATION DESCRIPTION	AUTHOR	SPR REF
03/08/08	1	1	Created	dsalt-hp	
13/05/09		2	TC in Step 3 regenerated to ensure CP calibrations are coherent with MIB updates	dsalt-hp	
13/05/09	2.5	3	Time-tag of TC in Step 3 changed from relative to standard delta	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				
PROC Procedure Properties				
SSID :				
1		Verify ACMS configuration		Next Step: 2
		Run checks by calling procedure H_FCP_AOC_3001		
		Execute Procedure: H_FCP_AOC_3001 Verify SCM Configuration		
2		Select TPF (RAS) for Science Mode Raster Pointing		Next Step: 3
		Check with Flight Dynamics the exact name of the TPF instance to be uplinked		
<p>TC Seq. Name :AERAS_00 (Command Raster Point)</p> <p>TimeTag Type: B Sub Schedule ID: 20 Formal Parameter List :</p> <pre> AcmsH STR IL STRILACE= AcmsH CP CALPOINT= AcmsH Cmd TQ1r Q_1ST_X= <dec> AcmsH Cmd TQ2r Q_1ST_Y= <dec> AcmsH Cmd TQ3r Q_1ST_Z= <dec> AcmsH Cmd TQ4r Q_1ST_S= <dec> AcmsH N lines N_LINES= <dec> AcmsH M steps N_STEPS= <dec> AcmsH tiltangle TILT_ANG= deg </pre> <pre> AcmsH d1 steps D_STEP= arcs AcmsH d2 lines D_LINE= arcs AcmsH T_slew T_SLEW_1= s AcmsH T_p T_POINT= s AcmsH T_pp T_SL_STP= s AcmsH T_ll T_SL_LIN= s AcmsH Cmd OQ1r Q_OFF_X= <dec> AcmsH Cmd OQ2r Q_OFF_Y= <dec> AcmsH Cmd OQ3r Q_OFF_Z= <dec> AcmsH Cmd OQ4r Q_OFF_S= <dec> AcmsH K OFF K_OFF= <dec> AcmsH T_sop T_SL_OFF= s AcmsH T_op T_PT_OFF= s AcmsH T_opinit T_PT_INI= s </pre>				
3		Execute TC for Science Mode Raster Pointing		Next Step: 4

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Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
	ET=+00.00.00 UT=+	Execute Telecommand SCM Raster pointing Command Parameter(s) : ASW Function ID XH319990 AcmsH AID Cmd XH320990 AcmsH DF86 Cmd XH322990 AcmsH DD86 Cmd XH323990 AcmsH STR IL XH324990 AcmsH CP XH325990 AcmsH Cmd TQ1r XH327990 AcmsH Cmd TQ2r XH328990 AcmsH Cmd TQ3r XH329990 AcmsH Cmd TQ4r XH330990 AcmsH N lines XH331990	XC072990 ACMSMain (Def) SCM prep rast (Def) Enable 86 Enable 86 STRILACE CALPOINT Q_1ST_X Q_1ST_Y Q_1ST_Z Q_1ST_S N_LINES	
		AcmsH M steps XH332990 AcmsH tiltangle XH333990 AcmsH d1 steps XH334990 AcmsH d2 lines XH335990 AcmsH T_slew XH336990 AcmsH T_p XH337990 AcmsH T_pp XH338990 AcmsH T_ll XH339990 AcmsH Cmd OQ1r XH340990 AcmsH Cmd OQ2r XH341990 AcmsH Cmd OQ3r XH342990 AcmsH Cmd OQ4r XH343990 AcmsH K OFF XH344990 AcmsH T_sop XH345990 AcmsH T_op XH346990	N_STEPS TILT_ANG D_STEP D_LINE T_SLEW_1 T_POINT T_SL_STP T_SL_LIN Q_OFF_X Q_OFF_Y Q_OFF_Z Q_OFF_S K_OFF T_SL_OFF T_PT_OFF	
		AcmsH T_opinit XH347990 TC Control Flags : GBM IL DSE --Y -- --- Subsch. ID : 20 Det. descr. : TC_PERFORM_SCM_RASTER_POINTING	T_PT_INI	
4		Verify start of slew		Next Step: 5
		Verify Telemetry ScmType AESMC002	= Slew	AND=ZAA50999
		Verify Telemetry OnTargetFlag AESM002	= LOW	AND=ZAA50999

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Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch										
		<p>There is no check on either AcmsMain AID or AcmsSubstate at the start of a raster because these parameters can take on different values depending on whether or not a path planner-controlled slew to the first raster node is required (the procedure allows the user to arrive at the start of the raster using a fine pointing command and start a raster without an additional slew).</p> <p>In general there are no checks on ACMSMain AID during slews within the raster because the parameter can take multiple values. However, as the ACMS always does a rate correction/attitude correction slew, the AID will always be slewing init for some time</p>												
5		While not end of raster		Next Step: loop 6 continue 13										
		Verify Packet Reception AccAsw TM_5_1_16441 - Mode Timedevent Packet Details: <table style="margin-left: 20px;"> <tr><td>APID:</td><td>512</td></tr> <tr><td>Type:</td><td>5</td></tr> <tr><td>Subtype:</td><td>1</td></tr> <tr><td>PI1:</td><td>16441</td></tr> <tr><td>PI2:</td><td>0</td></tr> </table>	APID:	512	Type:	5	Subtype:	1	PI1:	16441	PI2:	0	A51T1MEVE109	
APID:	512													
Type:	5													
Subtype:	1													
PI1:	16441													
PI2:	0													
		Verify Telemetry AcmsMain AID AESM3002	<> SCM pnt R rdy <> SCM pnt R0 rdy	AND=ZAA50999										
		<p>The loop which verifies the status of the ACMS during each phase of the raster should continue until TM indicates that pointing at the last point of the raster has been completed. This condition is detected using the value of AcmsMain AID which should indicate one of "ready" states (i.e., continuing pointing after the end of the commanded pointing time). The last point of a raster could be a node or the off position and the procedure therefore checks against both values.</p>												
		<p>The decision criterion in the switch below is based on the Time_Id parameter in the Mode Timedevent packet. The while block therefore starts by waiting for the arrival of the event packet.</p>												
6		Time ID?		Next Step: End of Raster Slew 8 End of Off- Position Slew 9 End of Pointing 7										

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Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
		NOTE: Three types of Time ID are foreseen: 1. see steps/TM for End of Raster Slew 2. see steps/TM for End of Off-Position Slew 3. see steps/TM for End of Pointing Slew		
6.1		End of pointing		<input type="checkbox"/>
		Verify Telemetry Time_Id AE5FG109	= Time Id Top = Time Id Tp	AND=ZAALH999
		The two conditions should be combined through a logical OR. The Time_Id parameter indicates which of the commanded manoeuvre phases has been completed. The logic specified here detects the beginning of the slew which can start either after a raster node (Time Id Tp) or the off position (Time Id Top).		
6.2		End of raster slew		<input type="checkbox"/>
		Verify Telemetry Time_Id AE5FG109	= Time Id T11 = Time Id Tpp = Time Id Tslew	AND=ZAALH999
		This check uses an OR of values corresponding to three slew options, all of which lead to the start of pointing at a new raster node (line-to-line and point-to-point slew and the initial slew to the first raster node). A node could also be reached from the off position, but this is covered separately in the next substep.		
6.3		End of off position slew		<input type="checkbox"/>
		Verify Telemetry Time_Id AE5FG109	= Time Id Tsop	AND=ZAALH999
7		Execute verification for slew		Next Step: 12
		Verify Telemetry AcmsSubstate AESMF002	= SCM Tracking	AND=ZAA50999
		Verify Telemetry ScmType AESMC002	= Slew	AND=ZAA50999
		Verify Telemetry OnTargetFlag AESM002	= LOW	AND=ZAA50999

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Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
		<i>The steps below are meant to be operator instructions to verify the correct incrementing of the node and off position counters.</i>		
8		Execute verification for node pointing		Next Step: 12
		Verify Telemetry AcmsSubstate AESMF002	= SCM Pointing	AND=ZAA50999
		Verify Telemetry ScmType AESMC002	= Point	AND=ZAA50999
		Verify Telemetry OnTargetFlag AESM0002	= HIGH	AND=ZAA50999
		Verify Telemetry AcmsMain AID AESM3002	= SCM Pnt Raster	AND=ZAA50999
		<i>The steps below are intended to be used operator instructions to verify the correct incrementing of node and off position counters. The counters are incremented at the start of the slew towards the next positions and the values are maintained until the end of the pointing. The off position counter is reset to 0 when a slew towards the off position starts.</i>		
		Verify Telemetry AcmsH Cur Lin N AEHAN002	as expected from raster plan	AND=ZAA50999
		Verify Telemetry AcmsH Cur Stp M AEHAM002	as expected from raster plan	AND=ZAA50999
		Verify Telemetry AcmsH Cur OFF K AEHAK002	as expected from raster plan	AND=ZAA50999
		Checks of STR status		
		Verify Telemetry STRM Mode AEX04001	= Auto attdetect	AND=ZAA50999
		Verify Telemetry STRM Submode AEX03001	= STB nom ATFAD	AND=ZAA50999
		Verify Telemetry STRM IL sts AEXJ1002	= value of Interlacing	AND=ZAA52999
9		Pointing at raster node ?		Next Step: THEN 10 ELSE 11
		Verify Telemetry Timed_Event_K AE5GZ002	<> 0 <dec>	AND=ZAALH999

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Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
		The same Time_Id code (Tsop) is used for both slews towards the off position and back to the raster. In order to distinguish between the two situation, an additional IF is added here which is the off position counter (K). The counter is reset to 0 at the start of the slew towards the off position and start counting again when the spacecraft is slewed to the next raster node.		
10		Execute verification for node pointing		Next Step: 12
		Verify Telemetry AcmsSubstate AESMF002	= SCM Pointing	AND=ZAA50999
		Verify Telemetry ScmType AESMC002	= Point	AND=ZAA50999
		Verify Telemetry OnTargetFlag AESM0002	= HIGH	AND=ZAA50999
		Verify Telemetry AcmsMain AID AESM3002	= SCM Pnt Raster	AND=ZAA50999
		Verify Telemetry AcmsH Cur Lin N AEHAN002	as expected from raster plan	AND=ZAA50999
		Verify Telemetry AcmsH Cur Stp M AEHAM002	as expected from raster plan	AND=ZAA50999
		Verify Telemetry AcmsH Cur OFF K AEHAK002	as expected from raster plan	AND=ZAA50999
		Checks of STR status		
		Verify Telemetry STRM Mode AEX04001	= Auto attdetect	AND=ZAA50999
		Verify Telemetry STRM Submode AEX03001	= STB nom ATFAD	AND=ZAA50999
		Verify Telemetry STRM IL sts AEXJ1002	= value of Interlacing	AND=ZAA52999
		All steps above are exactly the same as those in the first pointing verification block above. They are repeated only because of restrictions imposed by MOIS on the complexity of logical flow in the procedure.		
11		Execute verification for off pointing		Next Step: 12

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Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
		Verify Telemetry AcmsSubstate AESMF002	= SCM Pointing	AND=ZAA50999
		Verify Telemetry ScmType AESMC002	= Point	AND=ZAA50999
		Verify Telemetry OnTargetFlag AESM0002	= HIGH	AND=ZAA50999
		Verify Telemetry AcmsMain AID AESM3002	= SCM pnt RasOff	AND=ZAA50999
		Checks of STR status		
		Verify Telemetry STRM Mode AEX04001	= Auto attdetect	AND=ZAA50999
		Verify Telemetry STRM Submode AEX03001	= STB nom ATFAD	AND=ZAA50999
		Verify Telemetry STRM IL sts AEXJ1002	= value of Interlacing	AND=ZAA52999
		<i>The checks at the off position are similar to those executed at each raster node, but a different AcmsMain AID is expected. Checks on N, M, and K are skipped since they are only meaningful at raster nodes (during off position pointing N and M are the same as at the last node and K is always 0).</i>		
12		Acquire timed event packet		Next Step: 5
		<i>This is only a placeholder to close the while loop. The verification of event packet acquisition is done at the top of the loop.</i>		
13		Verify pointing at end of raster		Next Step: END
		<i>A placeholder which may include any manual checks normally carried out at the end of a raster pointing. These checks may include verification of estimated attitude and attitude errors, STR parameters such as attitude quality, number of tracked stars, wheel momentum, etc.</i>		
End of Procedure				