

Manual CTR Synchronisation
File: H_CRP_AOC_DCTR.xls
Author: dsalt-hp



Procedure Summary

Objectives

The synchronisation of the ACC onboard time with the CTR is achieved autonomously onboard for both Herschel and Planck and in the nominal necessary to command the synchronisation by TC (the onboard synchronisation mechanisms are different for Herschel and Planck). The ACC hardware is able maintain the OBt with high accuracy even if CTR data are not received. The BSW can restore the synchronisation automatically after a period during which the time synchronisation transactions are absent on the system bus (the transactions include the time distribution broadcast and the time synchronisation mode code) if the error in the ACC OBt when the time distribution is re-established by the CDMU does not exceed 100 microsec.

The initial synchronisation may fail if time distribution data are not present on the system bus when the synchronisation is carried out; prolonged absence of communication with the CDMU may also cause the ACC OBt to drift of the 100 microsec error window in which resynchronisation is achieved automatically. In this case the ground must send TC(9,4) to the ACC ASW which calls a BSW SVC to resynchronise the ACC OBt.

Summary of Constraints

Applied only in case of failed initial synchronisation or synchronisation loss as discussed in the "Objectives" section.

Spacecraft Configuration

Start of Procedure

End of Procedure

Reference File(s)

Input Command Sequences

Output Command Sequences
HRADCTR1

Referenced Displays

ANDs GRDs SLDs

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ZAA00999
 ZAA08999
 ZAD08999
 ZAD51999

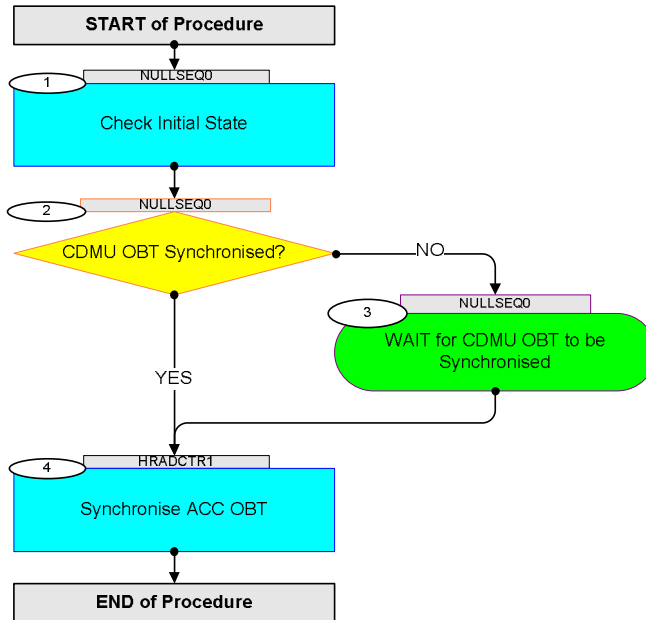
Configuration Control Information

DATE	FOP ISSUE	VERSION	MODIFICATION DESCRIPTION	AUTHOR	SPR REF
21/04/09	2.3	1	Created	dsalt-hp	
04/05/09	2.4	2	Updated based on TAS-I comment to incorporate Step 6 & 7 from H_CRP_AOC_DOBT, which can then be removed from the FOP	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				
<p>TC Seq. Name : NULLSEQ0 ()</p> <p>TimeTag Type: Sub Schedule ID:</p> <p style="text-align: center;">□</p>				
1		Check Initial State		Next Step: 2
		<p>NOTE 1: OBT variables in TM</p> <p>The ACMS ETM packet provides a set of parameters which indicate the current state of the OBT function. The following list is derived from the ACMS volume of the system UM with additional information from the BSW UM.</p> <p>DID_BSW_OBT_CYC_BOUNDARY (AEGVF050) provides the OBT at previous SW cycle boundary. The format is that of CTR time; i.e., the parameter contains 48 bits with 32 bits providing time in seconds, and the least significant 16 bits specifying fractions of a second. The increment between two consecutive ACC cycles should be 0x4000 (=16384).</p> <p>DID_BSW_OBT_DIFF (AEGX0050) is expressed in two complement format with a size of 64 bit. The value represents the offset between the ACC OBT and the CTR at the moment when synchronisation was established. The LSB corresponds to 2⁻²⁴ seconds.</p> <p>DID_BSW_OBT_ELAPSED_INIT (AEGXF050) is the time elapsed since the initialisation of the BSW expressed in standard CTR format.</p> <p>DID_BSW_OBT_NCO (AEGY0050) is the current value of the programmable frequency divider through which the OBT function the LSB corresponding to 2⁻²⁴ seconds.</p> <p>DID_BSW_OBT_STATE (AEGZF050) is the current state of the OBT state machine. The parameter can take the following values: 00 = INIT 01 = NOMINAL 02 = TIMEOUT 03 = FAIL 04 = RESYNCH BSW documentation provides more details on the logic of the OBT function and the interpretation of the states listed above.</p>		
		Verify Telemetry <p style="text-align: center;">FreeRunning</p> <p style="text-align: right;">AEYYY109</p>	= FREERUNING	AND=ZAA00999
		Verify Telemetry <p style="text-align: center;">BSW_ObtCycBound</p> <p style="text-align: right;">AEGVF050</p>	<in 1970s>	AND=ZAA08999
		Verify Telemetry <p style="text-align: center;">BSW_OBT_SDB</p> <p style="text-align: right;">AEGYF050</p>	<in 1970s>	AND=ZAA08999

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Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
		Verify Telemetry BSW_OBT_STATE AEGZF050	= Nominal	AND=ZAA08999
		<p>***** WARNING *****</p> <p>If parameter BSW_OBT_STATE = "TIMEOUT", the procedure should be aborted as the resynchronisation will fail.</p>		
		<p><i>NOTE 2: Diagnosing the OBT state</i></p> <p>The "NOMINAL" OBT state indicates that the function is running with expected accuracy under the control of the smooth synchronisation algorithm.</p> <p>The "INIT" and "FAIL" states indicate the need for resynchronisation. The procedure should not be attempted when the OBT is in the "TIMEOUT" state, since this indicates that CTR data is not being received on the system bus.</p> <p>The "RESYNCH" state is temporary and is entered in response to a re-synchronisation request".</p> <p>Further useful information can be obtained from other OBT variables.</p> <p>The value of DID_BSW_OBT_DIFF set to 0 indicates that the ACC OBT has not been synchronised with the CTR since the last initialisation of the BSW.</p> <p>DID_BSW_OBT_SDB should normally be updated once a second. If the value remains frozen, either the time distribution broadcast or the time synchronisation mode code message are not being received on the system bus.</p> <p>Finally, DID_BSW_OBT_SMOOTH_ERR can be used to access the accuracy of ACC OBT synchronisation. Typically, the values remain within 10 - 20 LSB's.</p>		
2		CDMU OBT Synchronised?		Next Step: NO 3 YES 4
		<p>Check the substeps below to identify whether the CDMU is synchronised or not. CDMU OBT synchronised?</p> <p>YES -> GO TO STEP 5</p> <p>NO -> GO TO STEP 7</p>		
2.1		Case 1 : CDMU synchronised		<input type="checkbox"/>

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Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
		Verify Telemetry BSW_ObtCycBound DEL50160	<current time>	AND=ZAD08999
2.2		Case 2 : CDMU unsynchronised		<input type="checkbox"/>
		Verify Telemetry BSW_ObtCycBound DEL50160	<in 1970s>	AND=ZAD08999
3		WAIT for CDMU OBT to be Synchronised		Next Step: 4
		Wait for the CDMU engineer to synchronise the CDMU OBT; once synchronised the signature is:		
		Verify Telemetry BSW_ObtCycBound DEL50160	<current time>	AND=ZAD08999
		Verify Telemetry BSW_OBT_STATE DEL7F160	= Nominal	AND=ZAD51999
<p>TC Seq. Name : HRADCTR1 (SynchroniseAccObt)</p> <p>TimeTag Type: Sub Schedule ID: <input type="checkbox"/></p>				
4		Synchronise ACC OBT		Next Step: END
4.1		Load sequence HRADCTRA on the Manual Stack		<input type="checkbox"/>
4.2		Uplink entire block of commands (tagged with release times)		<input type="checkbox"/>
		Execute Telecommand Enable Time Sync TC Control Flags : Subsch. ID : 20 Det. descr. : TC(9,4) Enable Time Synchronisation	AC094001 GBM IL DSE --Y -- --	
		***** WAIT 60 seconds *****		
4.3		Verify reception of time verification report		<input type="checkbox"/>

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Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch
		Verify Packet Reception Time Verification Report Packet Details: APID: 512 Type: 9 Subtype: 9 PI1: PI2:	A99TMVERF001	
		Verify Packet Telemetry (Pkt = A99TMVERF001) CTR Time Copy AE9TM001	<current time>	
		NOTE 3: Use of DTM's Contrary to what is sometimes claimed, verification of OBT synchronisation and accuracy does not require DTM's, since all necessary data are present in the ACC ETM.		
4.4		Verify synchronisation of ACC OBT		<input type="checkbox"/>
		Verify Telemetry FreeRunning AEYYY109	= SYNCHRONISED	AND=ZAA00999
		Verify Telemetry BSW_ObtCycBound AEGVF050	<current time>	AND=ZAA08999
		Verify Telemetry BSW_OBT_SDB AEGYF050	<current time>	AND=ZAA08999
		Verify Telemetry BSW_OBT_STATE AEGZF050	= Nominal	AND=ZAA08999
End of Procedure				