Reinforce V501/503 & V103/106 Opening
File: H_CRP_CCU_VLV0.xls
Author: E. Picallo

Procedure Summary

Objectives

This procedure describes the steps needed to to open the CCU
valves V501/V503 and V103/V106.

Summary of Constraints

The valves will be open after launch and it is not
foreseen to command them anymore. This means that this procedure
is only considered as a back-up path to be used in contingency
situation (dry-loop commands failure)

Valves commnading is performed under ground visibility and only
on ground request.

Monitoring and arming can be simultaneous but in this case the
monitoring sequence performance is not guaranteed. Therfore it is
recommended to stop the monitoring before the valves actuation,
but not mandatory.

To check the valves status the CCU shall be in monitoring mode
(required TM included in CCU monitoring data). Therfore in this
procedure monitoring mode is not stopped.

One arming mode can be reached when the CCU is not in another
arming mode. This is only valid for valves which are on the same
CCU side i.e. it IS possible to get one armed status on CCU-A and
another one on CCU-B

Arming mode returns directly to Idle mode if corresponding Valve
TC is received <1 sec or is not received within 180 sec

Spacecraft Configuration

Start of Procedure

CDMU in default configuration
The CCU monitoring function active
The 1553 interface CDMS, CCU-A and CCU-B shall be enable
Valves V501/V503 and/or V103/V106 closed

End of Procedure

CDMU in default configuration
The CCU monitoring function active
The 1553 interface CDMS, CCU-A and CCU-B shall be enable
Valves V501/V503 and V103/V106 open

Reference File(s)

Input Command Sequences

Output Command Sequences

HRKVLV0

Referenced Displays

Status   : Version 5 - Unchanged
Last Checkin: 25/03/09

```
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```
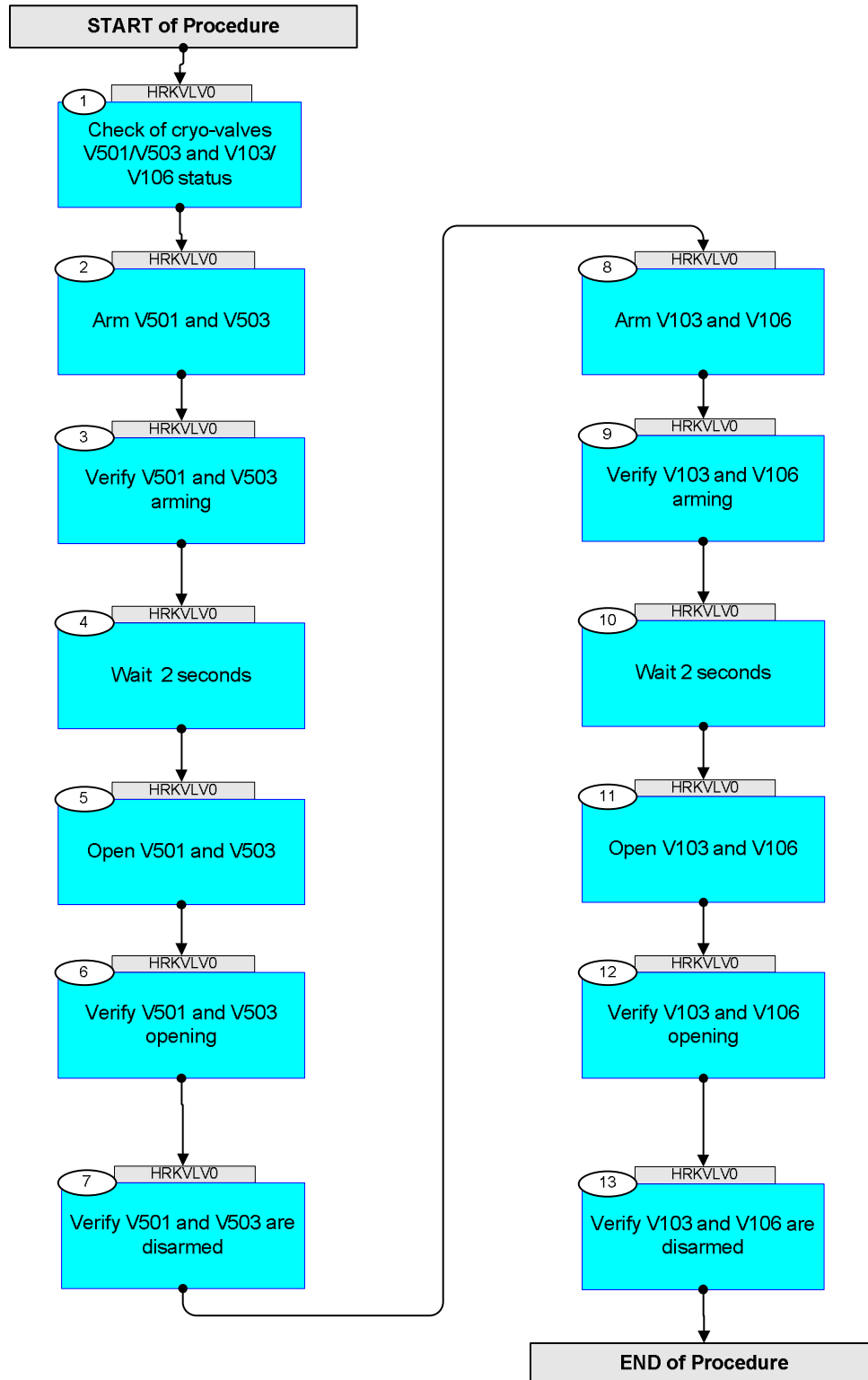
ANDs   GRDs   SLDs
ZAZ9K999

Configuration Control Information

DATE	FOP ISSUE	VERSION	MODIFICATION DESCRIPTION	AUTHOR	SPR REF
30/07/08	1	1	Created	E. Picallo	
26/11/08		2	Valves polarity relays verifications added	E. Picallo	
26/11/08	2	3	deleted steps to stop and restart monitoring	E. Picallo	
25/03/09		4	Summary of constraints updated: One arming mode can be reached when the CCU is not in another arming mode is only valid for valves which are on the same CCU side	E. Picallo	
25/03/09	2.2	5	valves polarity check removed	E. Picallo	

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Procedure Flowchart Overview

```
START of Procedure
   │
   1  HRKVLV0
   Check of cryo-valves
   V501/V503 and V103/
   V106 status
   │
   2  HRKVLV0
   Arm V501 and V503
   │
   3  HRKVLV0
   Verify V501 and V503
   arming
   │
   4  HRKVLV0
   Wait 2 seconds
   │
   5  HRKVLV0
   Open V501 and V503
   │
   6  HRKVLV0
   Verify V501 and V503
   opening
   │
   7  HRKVLV0
   Verify V501 and V503 are
   disarmed
```

```
   8  HRKVLV0
   Arm V103 and V106
   │
   9  HRKVLV0
   Verify V103 and V106
   arming
   │
   10  HRKVLV0
   Wait 2 seconds
   │
   11  HRKVLV0
   Open V103 and V106
   │
   12  HRKVLV0
   Verify V103 and V106
   opening
   │
   13  HRKVLV0
   Verify V103 and V106 are
   disarmed
   │
   END of Procedure
```

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Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch	AIT Comment
		Beginning of Procedure			
	HRKVLV0	*TC Seq. Name :*HRKVLV0 (V503/501/106/103OPEN) V501/503 & V103/106 Opening *TimeTag Type:* N *Sub Schedule ID:*			
1		Check of cryo-valves V501/V503 and V103/V106 status		Next Step: 2	
		During the launch of the Herschel satellite, four commands to each CCU will be initiated by the Ariane 5 launcher. **Nominally the status of the valves V501/V503 and V103/V106 should be OPEN at 1st AOS.** **In case of dry loop commnad failure one of these valves may remain CLOSED.**			
		The valves status are included in CCU monitoring Periodic TM(3,25) and Diagnostic TM (3,26).			
1.1		Check of cryo-valves V501/V503 status			
		Verify IF V501 remains closed in Telemetry **Valv_Stat_VS501 KM270302**		AND=ZAZ9K999	
		Verify IF V503 remains closed in Telemetry **Valv_Stat_VS503 KM270303**		AND=ZAZ9K999	
		The Helium control system remains shut off until the fairing jettisoning, then the vent line is evacuated to less than the vapour pressure in the HTT (23 mbar for 1.9 K) into the space vacuum via valves V501/V503 openning by a command from the launcher.			
1.2		Check of cryo-valves V103/V106 status			
		Verify IF V103 remains closed in Telemetry **Valv_Stat_VS103 KM269302**		AND=ZAZ9K999	
		Verify IF V106 remains closed in Telemetry **Valv_Stat_VS106 KM269303**		AND=ZAZ9K999	
		The PPS is started up by opening the valves V103/V106 by launcher command to avoid the liquid soaking through the porous plug under zero gravity conditions.			
2		Arm V501 and V503		Next Step: 3	

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Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch	AIT Comment

		Execute Telecommand
		
		           CCUA_Arm_V501
		
		TC Control Flags :
		           GBM IL DSE
		           --Y -- ---
		Subsch. ID : 10
		Det. descr. : TC(8,4,8,1) for CCUA Valve V501 Arming
			ZC0Z4999	TC	

		Execute Telecommand
		
		           CCUB_Arm_V503
		
		TC Control Flags :
		           GBM IL DSE
		           --Y -- ---
		Subsch. ID : 10
		Det. descr. : TC(8,4,8,1) for CCUB Valve V503 Arming
			ZC0ZD999	TC	

3		Verify V501 and V503 arming		Next Step: 4	
		Verify Telemetry **Arm_V501** **KM120300**	**= ARMED**	AND=ZAZ9K999	
		Verify Telemetry **Arm_V503** **KM120301**	**= ARMED**	AND=ZAZ9K999	
4		Wait 2 seconds		Next Step: 5	
		There is a constrainst that the command to open or close the valves shall not be received less than one second before the arming execution time and 1 second on one hand, and not after the arming execution time and 180 seconds on the other hand.			
5		Open V501 and V503		Next Step: 6	

		Execute Telecommand
		
		           CCUA_Open_V501
		
		TC Control Flags :
		           GBM IL DSE
		           --Y -- ---
		Subsch. ID : 10
		Det. descr. : TC(8,4,8,1) for CCUA Valve V501 Opening
			ZC0Z5999	TC	

		Execute Telecommand
		
		           CCUB_Open_V503
		
		TC Control Flags :
		           GBM IL DSE
		           --Y -- ---
		Subsch. ID : 10
		Det. descr. : TC(8,4,8,1) for CCUB Valve V503 Opening
			ZC0ZE999	TC	

6		Verify V501 and V503 opening		Next Step: 7	

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Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch	AIT Comment
		Verify Telemetry **Valv_Stat_VS501** KM270302	**= OPEN**	AND=ZAZ9K999	
		Verify Telemetry **Valv_Stat_VS503** KM270303	**= OPEN**	AND=ZAZ9K999	
7		Verify V501 and V503 are disarmed		Next Step: 8	
		Verify Telemetry **Arm_V501** KM120300	**= DISARMED**	AND=ZAZ9K999	
		Verify Telemetry **Arm_V503** KM120301	**= DISARMED**	AND=ZAZ9K999	
8		Arm V103 and V106		Next Step: 9	

		Execute Telecommand
		          CCUA_Arm_V103 **ZC0Z1999**
		
		TC Control Flags :
		          GBM IL DSE
		          --Y -- ---
		Subsch. ID : 10
		Det. descr. : TC(8,4,8,1) for CCUA Valve V103 Arming
				TC	

		Execute Telecommand
		          CCUB_Arm_V106 **ZC0ZA999**
		
		TC Control Flags :
		          GBM IL DSE
		          --Y -- ---
		Subsch. ID : 10
		Det. descr. : TC(8,4,8,1) for CCUB Valve V106 Arming
				TC	

9		Verify V103 and V106 arming		Next Step: 10	
		Verify Telemetry **Arm_V103** KM110300	**= ARMED**	AND=ZAZ9K999	
		Verify Telemetry **Arm_V106** KM110301	**= ARMED**	AND=ZAZ9K999	
10		Wait 2 seconds		Next Step: 11	
		There is a constrainst that the command to open or close the valves shall not be received less than one second before the arming execution time and 1 second on one hand, and not after the arming execution time and 180 seconds on the other hand.			
11		Open V103 and V106		Next Step: 12	

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Step No.	Time	Activity/Remarks	TC/TLM	Display/ Branch	AIT Comment
		Execute Telecommand CCUA_Open_V103 *TC Control Flags :* GBM IL DSE --Y -- --- *Subsch. ID : 10* Det. descr. : TC(8,4,8,1) for CCUA Valve V103 Opening	ZC0Z2999	TC	
		Execute Telecommand CCUB_Open_V106 *TC Control Flags :* GBM IL DSE --Y -- --- *Subsch. ID : 10* Det. descr. : TC(8,4,8,1) for CCUB Valve V106 Opening	ZC0ZB999	TC	
12		Verify V103 and V106 opening		Next Step: 13	
		Verify Telemetry Valv_Stat_VS103 KM269302	= OPEN	AND=ZAZ9K999	
		Verify Telemetry Valv_Stat_VS106 KM269303	= OPEN	AND=ZAZ9K999	
13		Verify V103 and V106 are disarmed		Next Step: END	
		Verify Telemetry Arm_V103 KM110300	= DISARMED	AND=ZAZ9K999	
		Verify Telemetry Arm_V106 KM110301	= DISARMED	AND=ZAZ9K999	
		End of Sequence			
		End of Procedure			