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**Herschel PACS
DPU OBS
Detailed Design Document**

Ref.: PACS-CR-DD-023
Issue: Issue 3.3
Date: 14 July 2009
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Herschel PACS

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Date: 14 July 2009

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Document Status Sheet

Document Title: DPU On Board Software Detailed Design Document			
Issue	Revision	Date	Reason for change
Draft 1		6th September 2002	First version for AVM tests
1	0	24th February 2006	Version for code review
2	0	5th April 2007	Version for PACS DRB (OBSW version 8.46)
2	1	20th April 2007	OBSW version 8.47
2	2	15th June 2007	OBSW version 8.48
3	0	13th June 2008	OBSW version 9.00
3	1	30th December 2008	OBSW version 9.01
3	2	18th February 2009	OBSW version 9.03
3	3	13th July 2009	OBSW version 9.04

Document Change Records

Document Title: DPU On Board Software Detailed Design Document	
Document Reference Number: PACS-CR-DD-023	
Document Issue/Revision Number: 3/3	
Section	Reason For Change
Appendix 1	Modules changed: DmcCmd.h, L9_GRATP.c, SEQ_BUFF.h, T1_INIT.c, T1_INIT.h, T5_HKMON.c, T9_OBCP.c
Appendix 3	All sections. Doxygen version is now 1.5.7 (was 1.5.2)



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Ich habe mir nie eine System gemacht,
wie es kluge Frauen tun,
nie eine Weltanschauung mir irgendwo befestigt,
wie es noch klügere Männer tun[...]
Else Lasker-Schüler, "MEIN HERZ,
Ein Liebesroman mit Bildern und wirklich lebenden Menschen"

1 Introduction

This document presents the OBS of the DPU, part of the warm electronics of the PACS instrument. The SW considered is Version 9.04.

1.1 References documents

ID	Title	Number/version/date
RD1	Guide to applying the ESA software engineering standards to small software projects	BSSC(96)2 Issue 1. May 1996
RD2	Herschel/PLANCK Packet Structure Interface Control Document	SCI-PT-ICD-07527 Issue 5.0. 20 July 2004
RD3	DPU On Board Software User Requirements Document	PACS-CR-RD-001 Issue 3.0. 5 May 2006
RD4	DPU OBS Software Specifications Document	PACS-CR-SR-013 Issue 3.1. 5 May 2006
RD5	DPU/ICU On Board Software Product Assurance Plan	IFSI/OBS/PL/2000-001 Issue 1.1. 2 April 2001
RD6	Virtuoso user guide for Version 4.1 - ADSP-21020	VUG41R203.1 ©2000 Eonic Systems, Inc.

2 Overview

In order to simplify the reading of the different parts, the document has been splitted in appendices: Appendix 1 contains the complete listing of the source code; Appendix 2 contains an overview of the SW modules; Appendix 3 contains the complete reference manual. Each appendix has its own cover and follows its own page numbering starting from page 1.

In the following some condensed informations are reported

2.1 Tasks

The operating system (Virtuoso) is based on tasks: "A Virtuoso task is an independent module, written in C, with its own thread of execution and set of system resources. It performs a well-defined function or set of functions and talks to other tasks using the other system objects" (quoted from RD6).

The following tasks are used in DPU OBSW: Name is the name of the task inside Virtuoso; Priority gives the order of execution: a task with higher priority (the lowest the number the higher the priority) stops the execution of a task with lower priority; Entry Point is the name of the main function for that task; Tasksize is the number of words of data memory that are reserved for task usage (mainly local variables and context switch saving); Purpose gives a brief description of the task.



Name	Prio	Entry Point	Tasksize	Purpose
T1_INIT	5	Francesco	5000	Initialization of SW and of drivers
T2_TMTCIF	8	thoth	10000	1553 interface handling
T3_IRQ1SV	9	Ginevra	10000	1355 interface handling
T4_CNTRLR	10	Iside	10000	TC acceptance and processing; commands for subsystems
T5_HKMON	11	ma_cgig	10000	HK collection, checking and packing; handling of autonomy functions
T6_MECRX	12	mumon	5000	Data reception from DEC
T7_SPSRX	12	Hunahpu	5000	Data reception from short wavelength SPU
T8_SPLRX	12	Ixbalamque	5000	Data reception from long wavelength SPU
T9_OBCP	13	answered_prayers	10000	OBCP execution

2.2 Virtuoso objects

2.2.1 FIFO's

FIFO stands for First In First Out and is a sort of stack used for tasks intercommunications. The OBSW uses two FIFO's: CALLINIT is a dummy FIFO used to "freeze" the status of T1_INIT after its execution is completed. Since this task is never called again, its status could be set to aborted but the possibility to wake it up again has been left in case some special actions with the highest priority will be necessary in future versions of the software.

The second FIFO is named TC_QUEUE and is used to send from T2_TMTCIF to T4_CNTRLR the info necessary to process the last telecommand received from the satellite. T4_CNTRLR is started only if this FIFO has been filled in AND no other higher priority task is ready for execution.

2.2.2 Events

An Event is an object that can take on the value 0 and 1. Many tasks wait for an event to be signaled. Here is the list of events used in the OBSW

Name	Purpose
ISR_1553_EVENT	Event to start T2_TMTCIF execution
INT_DEC	Event to start T6_MECRX execution
INT_SPS	Event to start T7_SPSRX execution
INT_SPL	Event to start T8_SPLRX execution
STARTPROC	Event to start T9_OBCP execution



2.2.3 Semaphores

Semaphores are like Events but can take on values larger than 1. A task that waits for a semaphore will continue its execution until the semaphore gets the value 0. The following semaphores are used in the OBSW

Name	Purpose
SEMA_1355_INT	Semaphore used to start T3_IRQ1SV execution
SEMA_WAIT	Semaphore associated to the timer internal to task T9_OBCP
SEMA_HK	Semaphore associated to the timer internal to task T5_HKMON
SEMA_ACK	Semaphore associated to the timer internal to task T6, T7 and T8 (wait for ACK from subsystems)
SEMA_CONTROLLER	Semaphore associated to the timer internal to task T4_CNTRLR

2.2.4 Resources

Resources are Virtuoso internal flags used to avoid that two or more concurrent tasks call the same non-reentrant routine. The following resources are used in the OBSW

Name	Purpose
TM_BUFFER	Used to protect the generic telemetry buffer
TM_EV_BUFFER	Used to protect the event telemetry buffer
TX_1355	Used to ensure that no commands are sent to the subsystems before the ACK of the previous command has been received (or the timeout of 200 ms has expired)

A Listing of Source Files

See external document Appendix 1

B Project Overview

See external document Appendix 2

C Reference Manual

See external document Appendix 3