



**IFSI
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**Herschel PACS
DPU OBSW
PS-ICD Usage**

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Date: 13 June 2008
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Herschel PACS

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Date: 13 June 2008

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1 Introduction

The Packet Structure ICD (SCI-PT-ICD-07527, Issue 5, 20 July 2004, hereinafter PS-ICD) describes the packet services and the low-level packet transfer protocol messages available on the Herschel spacecraft for the control and transfer of data between different subsystems. This note defines the services and messages used by the PACS DPU on board software.

2 APID allocation

The Application ID is used to identify the source or destination of a telemetry packet. Herschel uses different APIDs for different types of packet as well as for different instruments. The APIDs available to PACS are defined in the PS-ICD and reported in the following table:

Telemetry types	APID (hex)	
	Nominal	Redundant
PACS Telecommands	480	480
All telemetry packets (including the essential HK packet but excluding the nominal HK packet and science data)	480	481
PACS Periodic housekeeping	482	483
Not Used	484	485
PACS Diagnostic data	486	487
PACS Science data (red SPU)	488	489
PACS Science data (blue SPU)	48A	48B

3 Packet Transfer Protocol

At the low-level the Packet Transfer Protocol provides a series of sub-address messages to control and transfer data between subsystems. Some of these implement the packet transfer itself, others provide alternative methods of transferring data and controlling the transfer. This section identifies the sub-addresses used/accepted by the PACS instrument.

Description	Sub-address(es)	Comments
Mode Command	SA 0R	Used to identify the RT addressed in this sub-frame. The instrument responds only to its own address
	SA 0T, 31T, 31R	Not Used
Unit Control	SA 1R	Not Used
Data Send	SA 1T	Used to transmit instrument status
	SA 2T, 3T, 4T, 7T, 9T, 29T	Not Used
Data Receive	SA 2R, 7R, 9R, 15R–26R, 29R	Not Used
Asynchronous Short Commands	SA 3R, 4R	Not Used
Event Messages	SA 5R, 5T, 6R, 6T	Not Used
Time Messages	SA 8T	Not Used
	SA 8R	Used to transfer spacecraft time from CDMU to instrument (in subframe 33) rather than use packet service (9,5)
Packet Transfer		



TM Transfer Request	SA 10T	Used by instrument to indicate to CDMU that a TM packet is ready to transfer
TM Transfer Confirmation	SA 10R	Not Used - ignored by the instrument
TC Transfer Confirmation	SA 27T	Instrument sends a copy of TC Transfer Descriptor to indicate reception of TC
TC Transfer Descriptor	SA 27R	Used by the instrument to prepare for TC transfer
TM Data Send	SA 11T-26T	Used to transfer TM packets from instrument to CDMU
TC Data Receive	SA 11R-14R	Used to transfer TC packets from CDMU to instrument
Low-level Commands	SA 28T, 28R	Not Used
Data Wrap	SA 30T, 30R	Not Used, TBC Note: This is mandatory according to the PS-ICD

4 Telecommand Packet Types

The Packet Structure ICD defines many types of service that can be provided by an application. The following table shows the action taken by the PACS instrument according to the following conventions:

- Accepted: the command is accepted and executed;
- Rejected: the reception of such type/subtype causes DPU to reject the command (with a TM packet (1,2), TC Acceptance - Failure);
- Ignored: the command is acknowledged with a TM(1,1) or TM(1,2) but it does not have any effect;
- Executed/Ignored: this command is accepted by DPU, but its execution depends on the status of the DPU and, in some case, can be ignored (for instance, a request to delete an On-Board Procedure which is running at the moment of reception of the command).

Description	Service Type	Service Sub-Type	Action
Telecommanding and TC-Verification	1	Any	Rejected
Device Command Distribution Service	2	Any	Rejected
Housekeeping and Diagnostic Data Reporting	3	Any	Rejected
Not Used	4	Any	Rejected
Event Reporting	5	Any	Rejected
Memory Management			
Load Memory Using Absolute Addresses	6	2	Executed
Dump Memory Using Absolute Addresses	6	5	Executed
Check Memory Using Absolute Addresses	6	9	Executed
Not Used	7	Any	Rejected
Function Management			
Start Function	8	1	Ignored
Stop Function	8	2	Ignored
Perform Activity of Function	8	4	Executed
Report Function Status	8	5	Ignored
Time Management Service			
Synchronise User	9	3	Rejected
Enable Time Synchronisation	9	4	Rejected
Time Code	9	5	Rejected
Verify User Time	9	6	Rejected



Enable Time Verification	9	7	Executed
Synchronise Central Time Reference	9	10	Rejected
Not Used	10	Any	Rejected
On-board Operations Scheduling Service	11	Any	Rejected
On-board Monitoring Service	12	Any	Rejected
Not Used	13	Any	Rejected
Packet Transmission Control Service			
Enable Generation of Telemetry Packets	14	1	Executed
Disable Generation of Telemetry Packets	14	2	Executed ¹
Report Enabled Telemetry Packets	14	3	Executed
On-board Storage and Retrieval Service	15	Any	Rejected
On-board Traffic Management	16	Any	Rejected
Test Service			
Perform Connection Test	17	1	Executed
On-board Control Procedure Services			
Load Procedure	18	1	Executed/Ignored
Delete Procedure	18	2	Executed/Ignored
Start Procedure	18	3	Executed/Ignored
Stop Procedure	18	4	Executed/Ignored
Suspend Procedure	18	5	Executed/Ignored
Resume Procedure	18	6	Executed/Ignored
Communicate Parameters to a Procedure	18	7	Executed/Ignored
Report List of On-board Control Procedures	18	8	Executed
Report List of Active On-board Control Procedure	18	10	Executed
Report OBCP Status	18	12	Executed
Dump OBCP Contents	18	14	Rejected
Event/Action Service	19	Any	Rejected
Information Distribution CDMS-Users	20	Any	Rejected
Science Data Transfer Service	21	Any	Rejected
Context Saving	22	Any	Rejected
Undefined	Any>22	Any	Rejected

¹see PACS DPU OBSW User Manual for details on this service

5 Telemetry Packet Types

The Packet Structure ICD defines many types of service that can be provided by an application. The following table shows the telemetry packet types that will be produced by the PACS instrument

Description	Service Type	Service Sub-Type	Comments
Telecommand Verification Service			
Telecommand Acceptance Report - Success	1	1	
Telecommand Acceptance Report - Failure	1	2	
Telecommand Execution Report - Started	1	3	
Telecommand Execution Report - Progress	1	5	Not Used
Telecommand Execution Report - Completed	1	7	
Telecommand Execution Report - Failure	1	8	
Telecommand Contents Report	1	9	Not Used
Device Command Distribution	2		N/A



Housekeeping and Diagnostic Data Reporting			
HK Parameter Report Definitions Report	3	10	Not Used
Diagnostic Parameter Definitions Report	3	12	Not Used
Housekeeping Parameter Report	3	25	
Diagnostic Parameter Report	3	26	Not Used
Event Reporting			
Event Report	5	1	
Execution Report	5	2	
Error/Alarm Report	5	4	
Memory Management			
Memory Dump, Absolute Addresses	6	6	
Memory Check Report, Absolute Addresses	6	10	
Function Management			
Function Status Report	8	6	Not Used
Time Management			
Central Time Reference	9	8	Not Used
Time Verification Report	9	9	
On-Board Scheduling	11		Not Used
On-Board Monitoring	12		Not Used
Packet Transmission Control			
Enabled Telemetry Packets Report	14	4	
On-Board Storage and Retrieval	15		Not Used
On-Board Traffic Management	16		N/A
Test Service			
Connection Test Report	17	2	
On-Board Control Procedure			
On-board Control Procedures List Report	18	9	
Active OBCPs List Report	18	11	
OBCP Status Report	18	13	
OBCP Contents Report	18	15	Not Used
Event/Action Service	19		Not Used
Information Distribution Service	20		Not Used
Science Data			
Nominal Science Data Report	21	1	
Science Type B Data Report	21	2	
Diagnostic Science Data Report	21	3	
Auxiliary Science Data Report	21	4	Not Used
Context Saving Service	22		Not Used