

The Packet Structure ICD (SCI-PT-ICD-07527) describes the packet services and low-level packet transfer protocol messages to be available on the Herschel spacecraft for the control and transfer of data between different subsystems. This note defines those services and messages that will be used by the SPIRE instrument.

## 1. APIDS

The Application ID is used to identify the source or destination of a telemetry packet. Herschel uses different APIDs for different types of packet (see AD1) as well as for different instruments. The APIDS to be used by SPIRE are given in the following table:

ID	Telemetry types	APID (hex)
APID1	SPIRE Telecommands, Telecommand Verification and Events	500
APID2	SPIRE Periodic Housekeeping	502
APID3	SPIRE Photometer Science Data	504
APID4	SPIRE Spectrometer Science Data	505
APID5	SPIRE Mechanism Science Data	506

## 2. 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 SPIRE instrument.

Description	Sub-address(es)	Comments
<b>Mode Command</b>	SA 0R	Used to identify the RT addressed in this subframe. The instrument responds only to its own address.
	SA 0T, 31T, 31R	Not Used
<b>Unit Control</b>	SA 1R, 1T	Not Used
<b>Data Send</b>	SA 2T, 3T, 4T, 7T, 9T, 29T	Not Used
<b>Data Receive</b>	SA 2R, 7R, 9R, 15R-26R, 29R	Not Used
<b>Asynchronous Short Commands</b>	SA 3R, 4R	Not used
<b>Event Messages</b>	SA 5R, 5T, 6R, 6T	Not Used
<b>Time Messages</b>	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)
<b>Packet Transfer</b>	TM Transfer Request	Used by instrument to indicate to CDMU that a TM packet is ready to transfer
	TM Transfer Confirmation	Not Used – ignored by the instrument
	TC Transfer Confirmation	Instrument sends a copy of TC Transfer Descriptor to indicate reception of TC
	TC Transfer Descriptor	Used by the instrument to prepare for TC transfer
<b>TM Data Send</b>	SA 11T-26T	Used to transfer TM packets from instrument to CDMU
<b>TC Data Receive</b>	SA 11R-14R	Used to transfer TC packets from CDMU to instrument
<b>Low-level Commands</b>	SA 28T, 28R	Not Used

Data Wrap

SA 30T, 30R

Not Used, TBC

**Note: This is mandatory according to the PS-ICD**

### 3. TELECOMMAND PACKET TYPES

The Packet Structure ICD (AD1) defines many types of service that can be provided by an application. The following table shows the telecommand packet types that will be accepted by the SPIRE instrument.

Description	Service Type	Service Sub-Type	Comments
<b>Telecommand Verification Service</b>	1		N/A
<b>Device Command Distribution</b>	2		Not Used
<b>Housekeeping and Diagnostic Data Reporting</b>			
Define New HK Parameter Report	3	1	
Define New Diagnostic Parameter Report	3	2	
Clear HK Parameter Report Definitions	3	3	
Clear Diagnostic Parameter Report Definitions	3	4	
Report HK Parameter Report Definitions	3	9	
Report Diagnostic Parameter Report Definitions	3	11	
<b>Event Reporting</b>	5		N/A
<b>Memory Management</b>			
Load Memory Using Absolute Addresses	6	2	
Dump Memory Using Absolute Addresses	6	5	
Check Memory Using Absolute Addresses	6	9	
<b>Function Management</b>			
Start Function	8	1	
Stop Function	8	2	
Perform Activity of Function	8	4	
Report Function Status	8	5	
<b>Time Management</b>			
Synchronise User	9	3	Not Used
Enable Time Synchronisation	9	4	Not Used (TBC)
Time Code	9	5	Not Used (TBC)
Verify User Time	9	6	Not Used
Enable Time Verification	9	7	
Synchronise Central Time Reference	9	10	Not Used
<b>On-Board Scheduling</b>	11		Not Used
<b>On-Board Monitoring</b>			
Enable Monitoring of Parameters	12	1	
Disable Monitoring of Parameters	12	2	
Clear Monitoring List	12	4	
Modify Monitoring List	12	5	
Delete Parameters from Monitoring List	12	6	
Report Current Monitoring List	12	8	
<b>Packet Transmission Control</b>			
Enable Generation of Telemetry Packets	14	1	
Disable Generation of Telemetry Packets	14	2	
Report Enabled Telemetry Packets	14	3	
<b>On-Board Storage and Retrieval</b>	15		Not Used
<b>On-Board Traffic Management</b>	16		Not Used
<b>Test Service</b>			
Perform Connection Test	17	1	
<b>On-Board Control procedures</b>	18		Not Used

<b>Action/Event Service</b>	19		Not Used
<b>Information Distribution Service</b>			
Enable Distribution of Information TC Packets	20	1	
Disable Distribution of Information TC Packets	20	2	
Report Distributed Information Packets	20	3	
Information Telecommand	20	4	
<b>Science Data</b>	21		N/A
<b>Context Saving Service</b>			TBD
Report Context	22	1 (TBC)	

#### 4. TELEMETRY PACKET TYPES

The Packet Structure ICD (AD1) 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 SPIRE instrument.

Description	Service Type	Service Sub-Type	Comments
<b>Telecommand Verification Service</b>			
Telecommand Acceptance Report - Success	1	1	
Telecommand Acceptance Report - Failure	1	2	
Telecommand Execution Report - Started	1	3	
Telecommand Execution Report - Progress	1	5	
Telecommand Execution Report - Completed	1	7	
Telecommand Execution Report - Failure	1	8	
Telecommand Contents Report	1	9	Not Used
<b>Device Command Distribution</b>	2		N/A
<b>Housekeeping and Diagnostic Data Reporting</b>			
HK Parameter Report Definitions Report	3	10	
Diagnostic Parameter Definitions Report	3	12	
Housekeeping Parameter Report	3	25	
Diagnostic Parameter Report	3	26	
<b>Event Reporting</b>			
Event Report	5	1	
Exception Report	5	2	
Error/Alarm Report	5	4	
<b>Memory Management</b>			
Memory Dump, Absolute Addresses	6	6	
Memory Check Report, Absolute Addresses	6	10	
<b>Function Management</b>			
Function Status Report	8	6	
<b>Time Management</b>			
Central Time Reference	9	8	Not Used
Time Verification Report	9	9	
<b>On-Board Scheduling</b>	11		Not Used
<b>On-Board Monitoring</b>			
Current Monitoring List Report	12	9	
<b>Packet Transmission Control</b>			
Enabled Telemetry Packets Report	14	4	
<b>On-Board Storage and Retrieval</b>	15		Not Used
<b>Test Service</b>			
Connection Test Report	17	2	

<b>On-Board Control procedures</b>	18		Not Used (TBC)
<b>Action/Event Service</b>	19		Not Used
<b>Information Distribution Service</b>			
Distributed Information Packets Report	20	5	
<b>Science Data</b>			
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	
<b>Context Saving Service</b>	22		TBD
Context Report	22	2 (TBC)	