



HERSCHEL / PLANCK

EGSE INTERFACE Requirements Specification

H-P-1-ASPI-IS-0121

Product Code: 00000

		Date	Signature
Rédigé par/Written by	EGSE Engineer Bernard DUBOIS	8/11/02	
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Entité Emettrice: Alcatel Space - Cannes
(détentrice de l'original) :



The logo for the HERSCHEL / PLANCK mission, featuring the text "HERSCHEL / PLANCK" in a bold, sans-serif font, set against a dark, rectangular background with a gradient.

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ENREGISTREMENT DES EVOLUTIONS / *CHANGE RECORDS*

ISSUE	DATE	§ : DESCRIPTION DES EVOLUTIONS § : <i>CHANGE RECORD</i>	REDACTEUR <i>AUTHOR</i>
01	07/Nov/01	First issue.	
02	04/June/02	H-P-ASPI-CR-0123 H-P-ASPI-CR-0124	B.DUBOIS
03	18/June/02	H-P-ASPI-CR-0156 H-P-ASPI-CR-0157	B.DUBOIS
3.1	08/Nov/02	Par 4.1.1 : PIPE message length calculation IFRQT-0042 : PIPE priority messages Par 4.1.2 : precision on Communication Link Par 4.1.5 : ReqID set to 0 for TC Echo message Par 4.1.5 : PIPE Header description Table split in 2 parts (RC/RM) Par 4.1.6.1 : RM Field description Table split in 3 parts Par 4.1.6.2 : RC Field description Table split in 3 parts Table 11 : Message ID list updated Par 4.1.8 : New paragraph describing Control Flow scheme Par 4.2 : TC description Table refers to unique table of paragraph 4.1.5 Par 4.3 : RC description Table refers to unique table of paragraph 4.1.5 and 4.1.6.2 Par 4.3 : Common RC messages table added Par 4.4 and 4.5 : TM description Table refers to unique table of paragraph 4.1.5 Par 4.6 : RM description Table refers to unique table of paragraph 4.1.5 and 4.1.6.1 Par 4.6.4 : Periodic and Asynchronous RM packet definition added → To Be Confirmed Par 4.7 : precision added on ACKRC flow control Par 4.7 : ACKRC description Table refers to unique table of paragraph 4.1.5 and 4.1.6.1 Par 4.7.3 to 4.7.6 deleted Par 4.8 : precision added on ACKTC flow control Par 4.8 : ACKTC description Table refers to unique table of paragraph 4.1.5 and 4.1.6.1 Par 4.8.2 : Failure code signification updated Par 4.9 : TC Echo description Table refers to unique table of paragraph 4.1.5 and 4.1.6.1 Par 4.10 : TC Report description Table refers to unique table of paragraph 4.1.5 and 4.1.6.1 Par 4.11 : RM packet Alive description Table refers to unique table of paragraph 4.1.5 and 4.1.6.1 Par 4.12.1 : Generic Interface Name Table updated according to H-P-4-TE-MA-0020	B.DUBOIS

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1 SCOPE

The purpose of this document is to establish, in a single document, and in an unambiguous way, the interface definitions that are used by the different EGSE constituents (Platform and Instrument), to communicate between each other.

This document is composed of two main parts :

- **§ 4 - EGSE INTERNAL INTERFACE REQUIREMENTS** describes the communication protocol used between CCS and all EGSE's item in order to emit commands and receive data.
RC and RM mean Remote Commanding/Remote Monitoring of SCOE's and Front Ends by the CCS, different from Satellite TC and TM.
RC and RM paragraphs are split according to the LAN used to transmit data (SCOE/DFE LAN or IS LAN).
- **§ 5 - EGSE EXTERNAL INTERFACE REQUIREMENTS** describes all electrical characteristics :
 - between each EGSE and the UUT (SVM, PLM, Spacecraft)
 - between EGSE item (ex : TT&C SCOE TM/TC DFE)

Nota : All TBD's to be defined during phase B.

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2 DOCUMENTS

2.1 Standard Documents

Ref.	Reference of document	Title
S1	H-P-1-ASPI-SP-0110	Ground Support Equipment Applicability Matrix of ECSS-E-40B
S2	ESA-PSS-04-105	TM Packet Standard
S3	ESA-PSS-04-106	TC Packet Standard
S4	SCI-PT-IF-07527	Herschel/Planck Packet Structure Interface Control Document (PS-ICD)

2.2 Reference Documents

Ref.	Reference of document	Title
RD1	HSCDT-TN-017	Understanding of the Interfaces between the CCS and the Herschel Instrument EGSEs in the IST
RD2	H-P-SP-AI-0014	PCDU REQUIREMENT SPECIFICATION
RD3	H-P-SP-AI-0003	CDMU Hardware REQUIREMENT SPECIFICATION
RD4	H-P-SP-AI-0011	ACMS REQUIREMENT SPECIFICATION
RD5	H-P-1-SP-AI-0015	SAS REQUIREMENT SPECIFICATION
RD6	H-P-1-SP-AI-0022	Batteries REQUIREMENT SPECIFICATION
RD7	H-P-SP-AI-0012	X/X Band Transponder Specification
RD8	H-P-SP-AI-0023	RFDN Specification
RD9	H-P-SP-AI-0024	X Band LGA Specification
RD10	H-P-SP-AI-0025	X Band MGA Specification
RD11	HP-2-ASED-TN-0048	Description of the PLM-FM Cryo Control Instrumentation
RD12		ARIANE 5 User's Manual
RD13	S2K-MCS-ICD-0014-TOS-GCI	SCOS-2000 OBSM External Interfaces Control Document

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2.3 Applicable Documents

Ref.	Reference of document	Title
AD1	H-P-1-ASPI-SP-0045	EGSE General Requirements Specifications
AD2	H-P-1-ASPI-SP-0082	H-P System Database Specification
AD3	H-P-4-TE-ID-8020	CCS External Interface Control Document
AD4	NDIU3-DR-0001-GSY ROS-MOC-NDIU-0001-GSY DTOS-SST-ICD-0554-TOS-GMS DTOS-SST-URD-0552-TOS-GMS	NDIU3 for ROSETTA SVT's Design Report (NDIU full) NDIU3 for ROSETTA SVT's User Manual (NDIU full) SIMSAT Generic NDIU_{Lite} ICD Template Generic NDIU_{Lite} User Requirements
AD6	H-P-1-ASPI-SP-0141	Naming convention
AD7	H-P-1-ASPI-SP-0027	General Design and Interface Requirements
AD8	SCI-PT-ICD-07418	Space/Ground Interface Control Document
AD9	H-P-1-ASPI-TN-0127	EGSE Quick Load/Dump Interfaces

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2.4 Acronyms

Abbreviation	Signification
AIT	Assembly, Integration and Test
BCE	Battery Charge Equipment
BER	Bit Error Rate
BHC	Bloc House Console
BOB	Break Out Box
BPSK	Bi Phase Shift Keying
CCS	Central Checkout System
CCSDS	Consultative Committee for Space Data Systems
CLCW	Command Link Control Word
CLTU	Command Link Transmission Unit
COTE	Check Out Terminal Equipment
CUC	CCSDS Unsegmented time Code
EGSE	Electrical Ground Support Equipment
EMC	ElectroMagnetic Compatibility
FEE	Front End Equipment
HK	House Keeping
HPsDB	Herschel/Planck System DataBase
IF or I/F	InterFaces
JU	Junction Unit
LAN	Local Area Network
MMI	Man Machine Interface
MTBF	Mean Time Between Failure ¹
MTTR	Mean Time To Repair ²
MOC	Mission Operation Center
NA	Non Applicable
NDIU	Network Data Interface Unit
NRZ-L	Non Return to Zero-Level
NRZ-M	Non Return to Zero-Mark
OBCP	On-board Control Procedures
OBSW	On Board SoftWare
PIPE	Packet Interface Protocol for EGSE
RF	Radio Frequency
SAS	Solar Array Simulator
SCOE	Specific Check Out Equipment
TAI	Temps Atomique International
TBC	To Be Confirmed
TBD	To Be Defined
TM/TC	Telemetry & Telecommand
UTC	Universal Time Coordinated
UUT	Unit Under Test
VC	Virtual Channels

¹ Average time between two breakdown of the system

² Average time before complete repair of the system

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3 GENERAL DESCRIPTION

3.1 FUNCTIONAL DESCRIPTION

This document is applicable to each EGSE equipment used for system AIT.

This document is the interface control document which contains the interface description applicable to the EGSE constituents as designed for the Herschel/Planck Satellites.

Following communication paths between the CCS and the SCOE's are defined :

- Telemetry
- Telecommand
- SCOE Monitoring
- SCOE Commands

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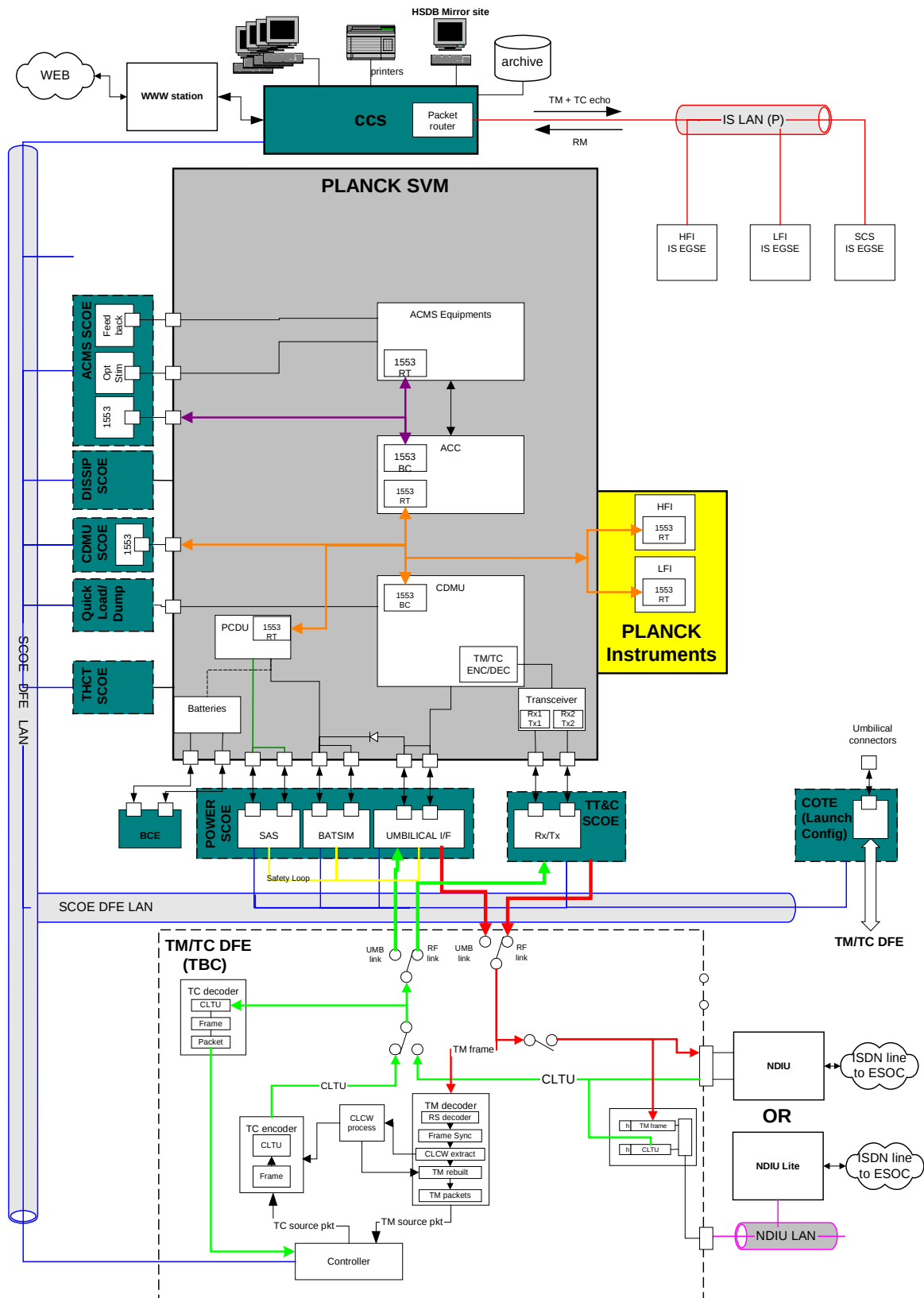


Figure 1 : Overview of the PLANCK EGSE architecture

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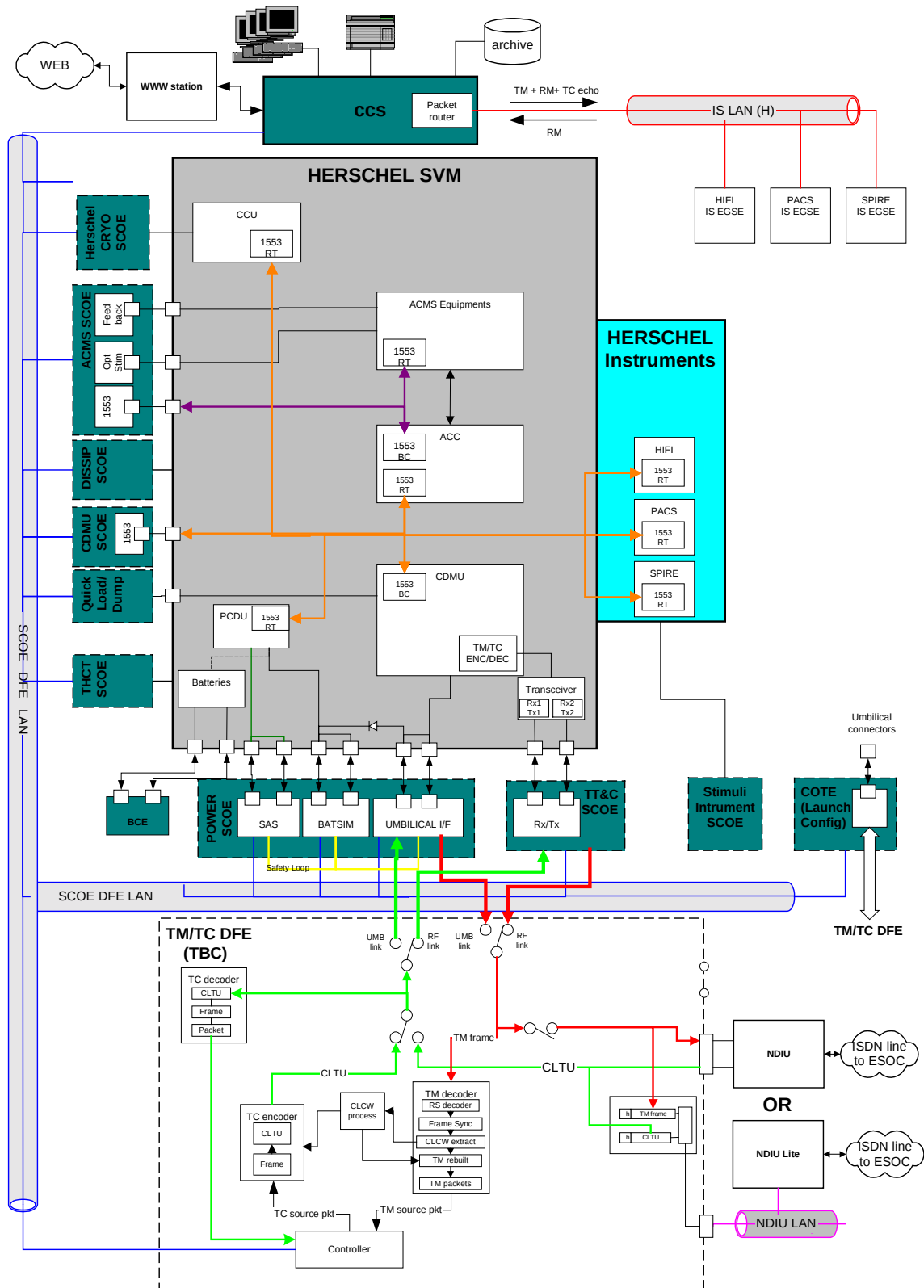


Figure 2 : Overview of the HERSCHEL EGSE architecture

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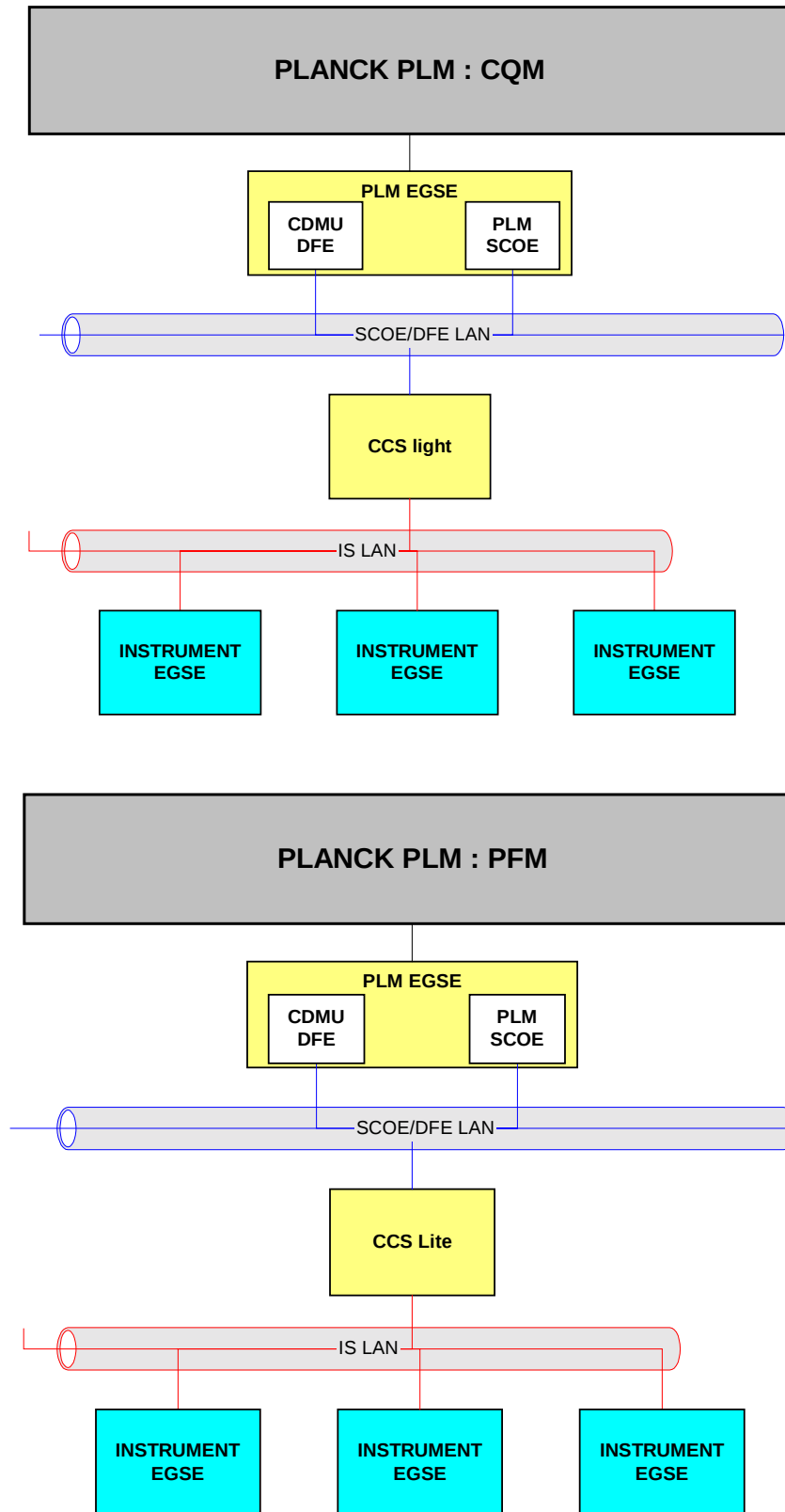


Figure 3 : EGSE PLANCK PLM Configuration

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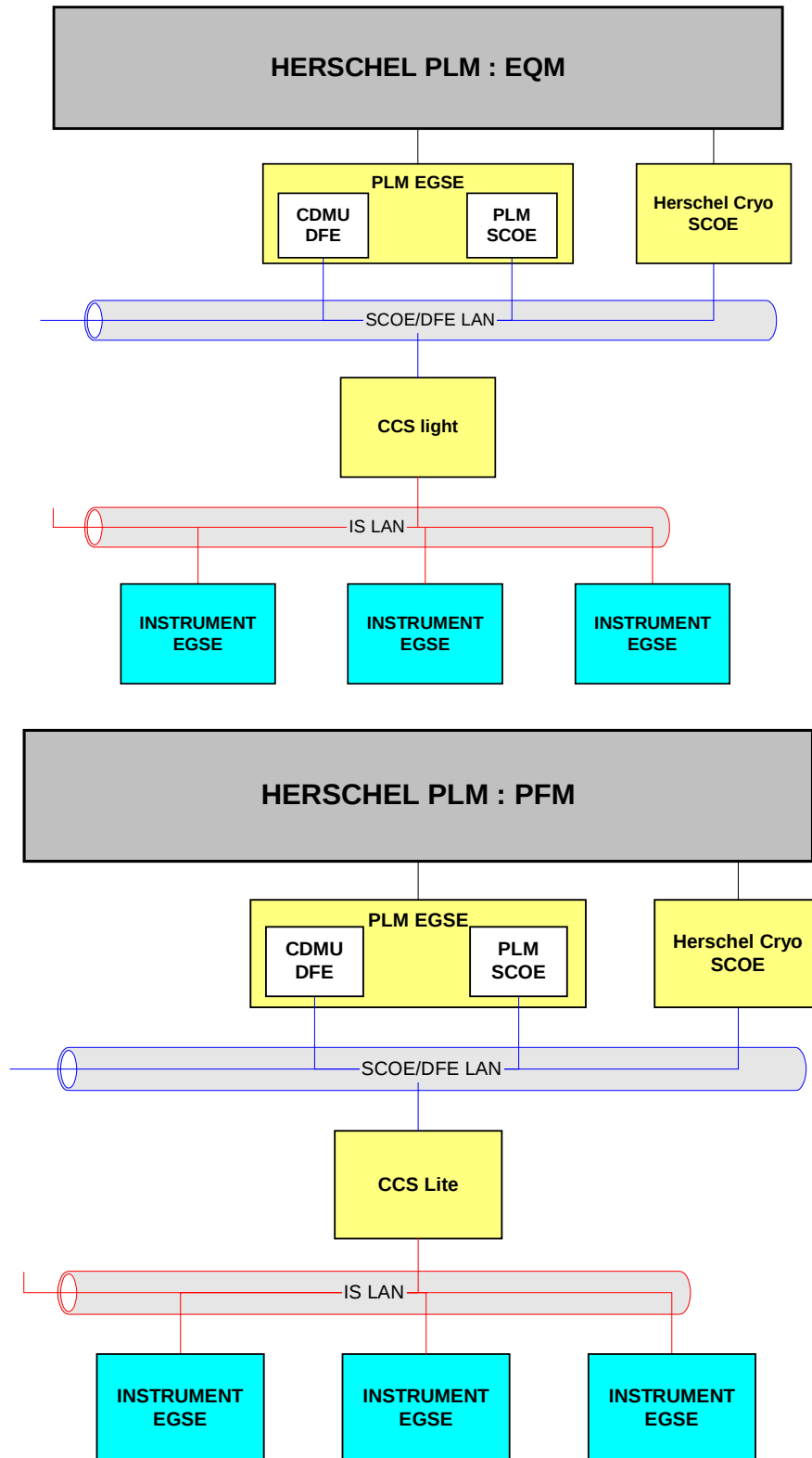


Figure 4 : EGSE HERSCHEL PLM Configuration

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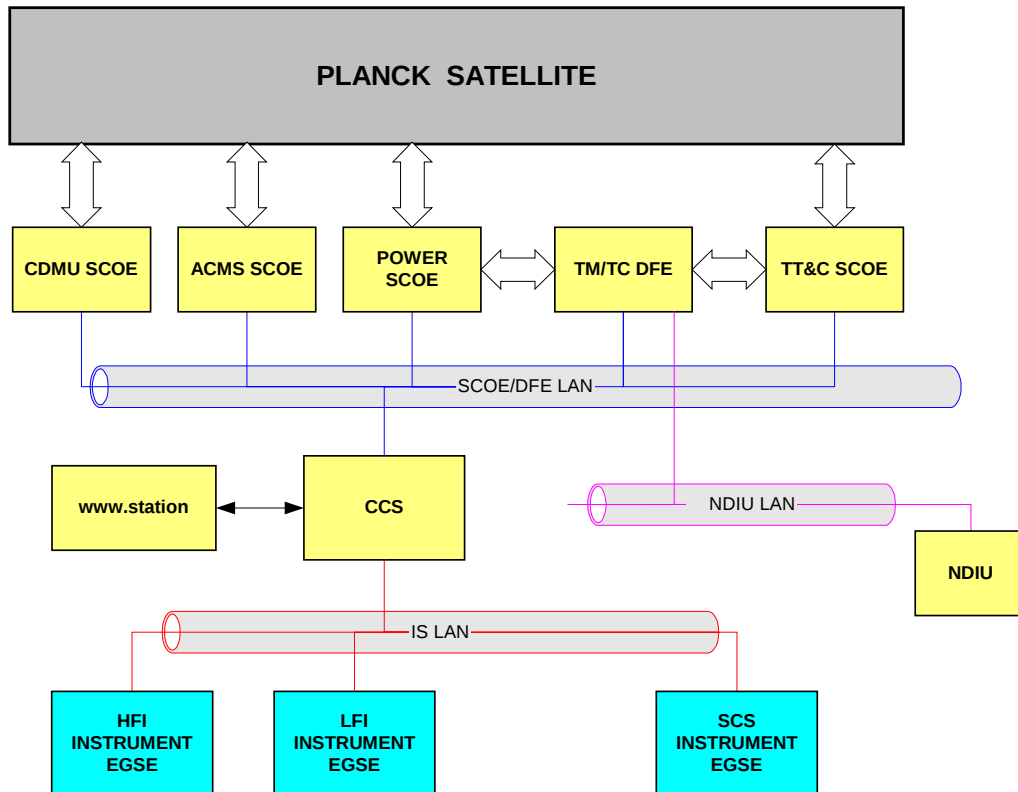


Figure 5 : EGSE PLANCK S/C Configuration

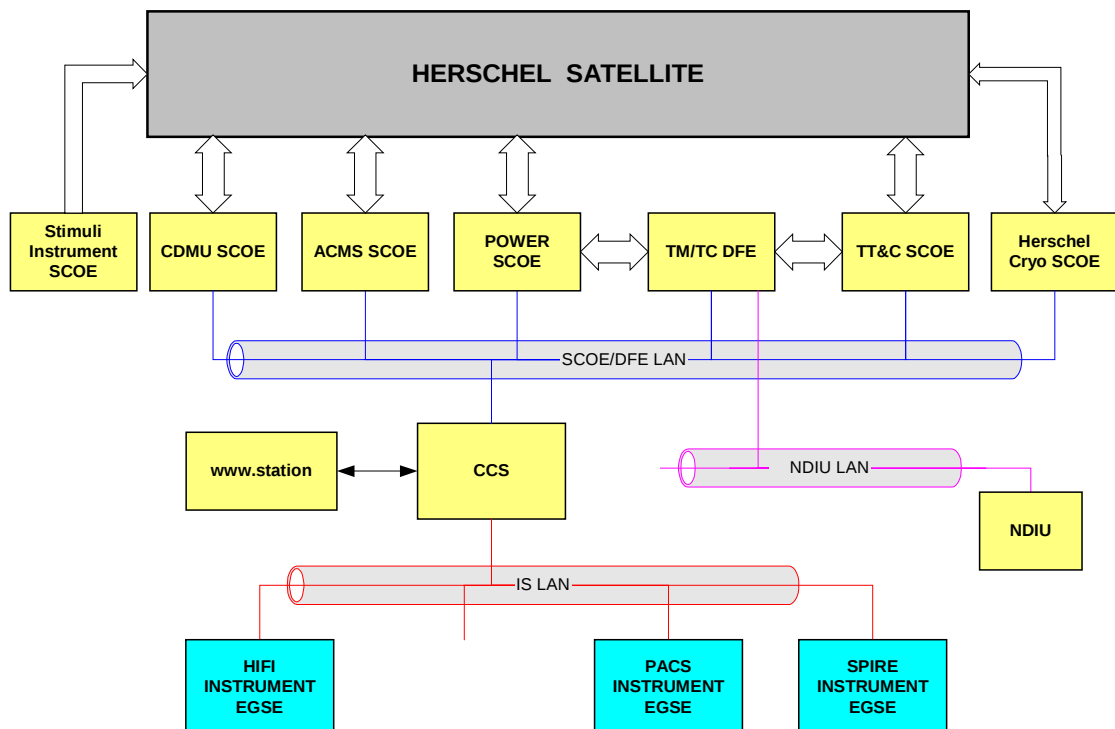


Figure 6 : EGSE HERSCHEL S/C Configuration

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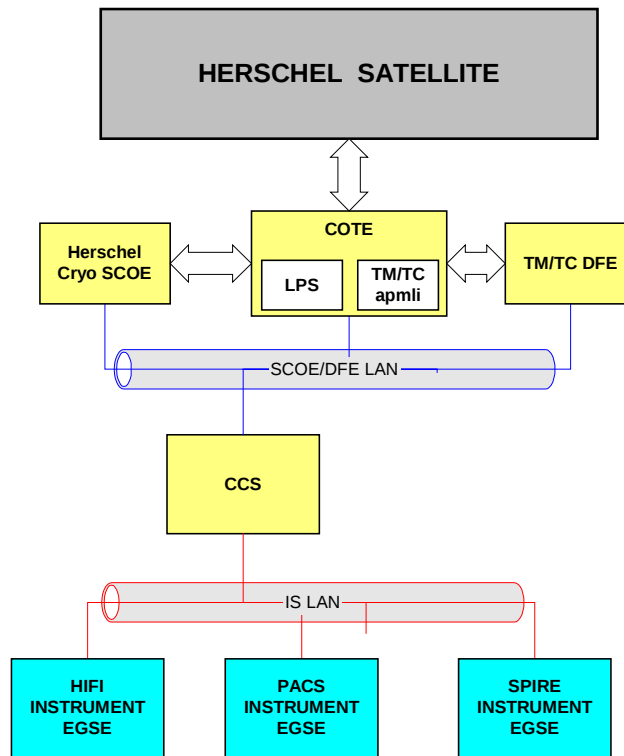


Figure 7 : HERSCHEL EGSE Launch Configuration

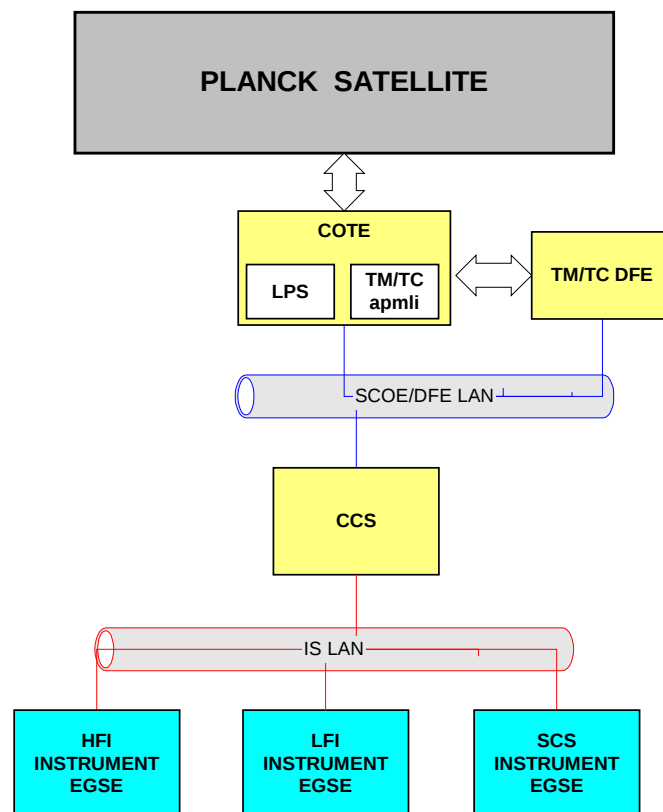


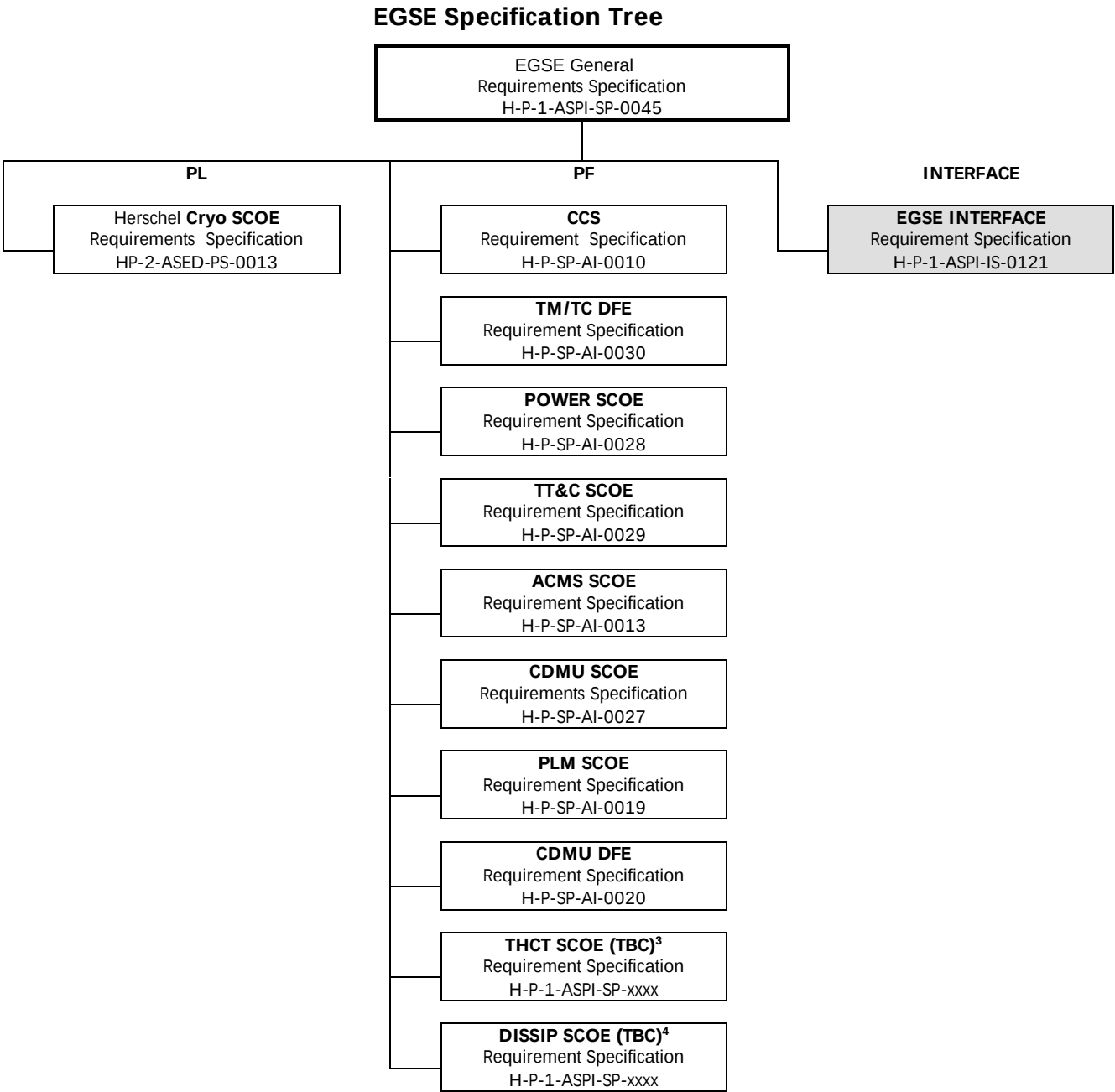
Figure 8 : PLANCK EGSE Launch Configuration

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³ SCOE neither specify, procure and use by Alenia

⁴ SCOE neither specify, procure and use by Alenia

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3.2 SPECIFIC TERMS AND DEFINITION

There are a number of concepts that have been adopted within the EGSE that have an effect on the specification of the interfaces described in this document. These can be summarised as the following:

The CCS is solely responsible for sending telecommands and commanding the SCOE's.

In the following paragraph, DFE will design :

1. **TM/TC DFE** in EGSE SVM configuration, S/C configuration and Launch configuration (CCS will interface with S/C for TM and TC via TM/TC DFE)
2. **CDMU DFE** in EGSE PLM configuration (Herschel and Planck), (CCS Lite will interface with PLM for TM and TC via CDMU DFE)

The SCOE's shall be able to be controlled completely from the CCS without intervention on the SCOE

The CCS is responsible for archiving all Low rate Telemetry, Telecommand Data and all other CCS/SCOE traffic

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4 EGSE INTERNAL INTERFACE REQUIREMENTS

4.1 PROTOCOL DEFINITION

4.1.1 General

Assuming that source packet are provided as the highest level data units for both TM and TC, typical EGSE and simulation systems would require a data routing mechanism that allows Packets to be transferred from one system to another.

The simplest solution can be found in routing the Source Packet from one location to another without any additional information or encapsulation. Analysis shows however that even in a simple environment, additional information would be required.

This solution allows PIPE protocol to adopt the following concepts:

- Allow for separate TM and TC data link
- Allow for dedicated command link (RC)
- Allow for Acknowledge RC
- Allow for Acknowledge TC
- Allow for SCOE/DFE/IS monitoring link (RM)
- Allow for Telemetry distribution link
- Allow for TC Echo link

The main purpose of PIPE protocol is to allow Packets exchange between EGSE items connected via LAN.

The protocol is structured in such a way that Packets are transferred without any changes. This is achieved by the attachment of an information header that contain additional information required for proper routing and processing of the Packets. This complete data structure is referred to as a PIPE message.

The header contains a number of fixed fields that can be used to identify and allow further processing of the Packet.

Following the header, a complete (unchanged) TM/TC Packet is embedded into the message. Theoretically the Packet can have a maximum length of [65529](#) Bytes as dictated by [S2] and [S3] [with the limitation of residue PIPE header. However, for Herschel-Planck, the maximum length of a complete TC Packet \(and RC Packet\) is 248 bytes, and the maximum length of a complete TM Packet \(and RM Packet\) is 1024 bytes as mentioned in \[S4\] \(H-P PS-ICD\).](#)

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[IFRQT-0010]

[Analysis]

The communication and control interface between EGSE item shall be based under 100 Mb/s ETHERNET network using TCP/IP with a class B IP network addressing.

- Communication between CCS and SCOE shall be done via SCOE/DFE LAN
- Communication between CCS and Instrument Station shall be done via IS LAN
- Communication between CCS and www station shall be done via standard LAN and is not covered by this specification
- Communication between TM/TC DFE and NDIU shall be done via [AD4]

[IFRQT-0020]

[Analysis]

This control/command exchange is based on the PIPE protocol dedicated to real time communication.

[IFRQT-0030]

[Analysis]

They are two types of exchanged data:

Control Flow.

- Telecommand Packets sending on-board (TC)
- EGSE Remote Command (RC) → (Packets sent by CCS to SCOE for commanding this SCOE (configuration, set value, synch...))

Monitoring Flow.

- On-board Telemetry Packets (TM)
- EGSE Remote Message Packets (RM) → (Packet generated by each SCOE (one packet per SCOE identified by APID) sent to CCS containing its internal data like status, logging message, error report, data acquisition...):
 - Periodic packets containing vital data acquired/measured by SCOE
 - Asynchronous packets containing special SCOE/DFE/IS event/error/warning
- Acknowledge RC packets
- Acknowledge TC packets
- TC Echo distribution

[IFRQT-0040]

[Analysis]

It shall be foreseen to have a single TCP/IP socket for each connection between SCOE/DFE/IS and CCS

[IFRQT-0042]

[Test]

EGSE application Software shall manage two levels of priority of PIPE messages :

High priority : TC / ACKTC messages and TM acquisition

Low priority : All other messages

Note : In any case, TM Acquisition messages shall never be lost.

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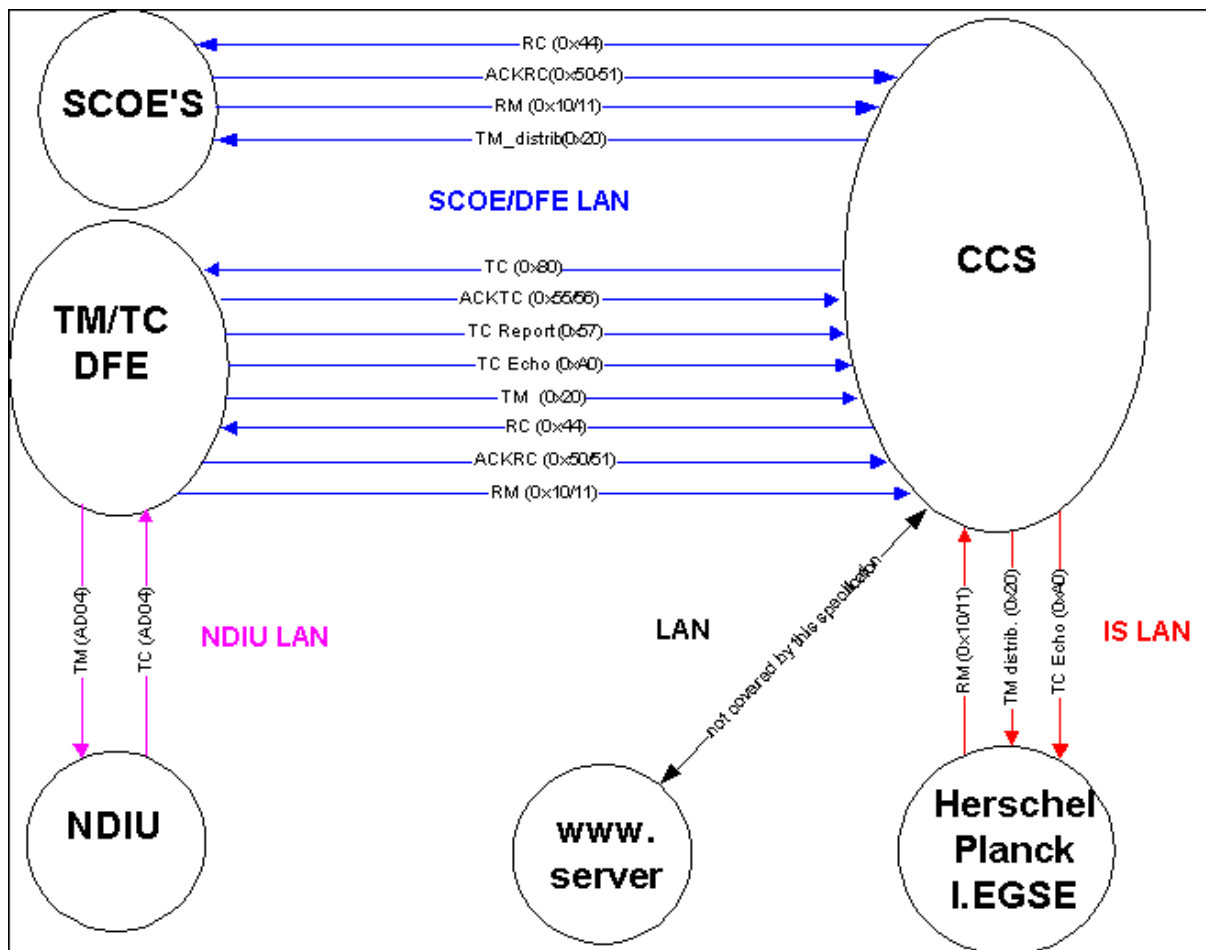
[IFRQT-0043]

[Test]

In order to avoid the lost of message, application software shall foresee to manage a buffer for each kind of PIPE message.

[IFRQT-0044]

[Test]



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4.1.2 Communication Link

[IFRQT-0045]

[Test]

The communication links between CCS and SCOE/DFE/IS shall be managed following a Client/Server philosophy where the CCS acts as a Client and the SCOE/DFE/IS is the Servers accepting connection and service requests.

[IFRQT-0050]

[Test]

Each SCOE, DFE or Instrument Station (IS) shall automatically accept a "connection request" coming from the CCS in order to try to establish the connection after the On-line software start-up and in general every time the connection itself is dropped or failed.

[IFRQT-0070]

[Test]

The connection between the CCS and a SCOE/DFE/IS shall be considered open as soon as TCP/IP connection has been successfully established.

[IFRQT-0080]

[Test]

The CCS Shall expect to receive at least one *message* from each SCOE/DFE/IS every 60 seconds.

[IFRQT-0100]

[Test]

In case of logical connection broken or any problem to open/close a connection, the CCS and the SCOE/DFE/IS concerned shall automatically raise an alarm to local operator I/F

[IFRQT-0102]

[Test]

Following error type shall automatically drop the connection and raise an alarm to local operator I/F:

- PIPE Header Error - inconsistent Length
- PIPE Header Error – inconsistent Synchro Word
- Whole PIPE message reading not possible in the time of 5 seconds
- No data received for more than 60 seconds
- SCOE connection error (port not free, unrecoverable communication error)

[IFRQT-0103]

[Test]

Following error type shall automatically raise an alarm to local operator I/F:

- PIPE Header Error- Unknown Message ID
- PIPE Header Error - illegal VCID
- TM packet format error
- RM packet format error

[IFRQT-0104]

[Test]

The CCS user shall be able to open and close the connection on explicit user command

[IFRQT-0105]

[Test]

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[IFRQT-0110]

[Test]

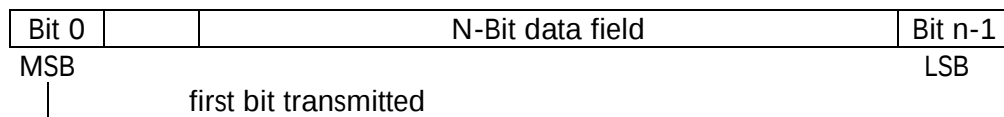
As soon as the connection between the CCS and a SCOE/DFE/IS is established, the SCOE/DFE/IS shall send to the CCS its own Remote Message packet (RM) whatever its mode is (Local or Remote).

(See 4.6 MONITORING FLOW – Remote Message Packets)

4.1.3 Byte order

In this document the following convention is used to identify each bit in a forward-justified N-bit field.

The first bit in the field to be transmitted is defined to be 'Bit 0'; the following bit is called 'Bit 1' and so on, up to 'Bit n-1'. When the field is used to express a binary value (such as an integer), the Most Significant Bit (MSB) shall be the first transmitted bit of the field (i.e., 'Bit 0').



The byte order is 'big endianity'

4.1.4 Message Structure

[IFRQT-0120]

[Analysis]

All the TCP-IP messages exchanged between the CCS, the TM/TC DFE and other SCOE start with the PIPE Header followed by the Body.

The PIPE header is added/removed by PIPE layer (it is not seen at application level)

All the Integer value are under IEEE format

PIPE Header	Body message
8 bytes	User defined (14 bytes < < 65542 bytes)

Table 1 : PIPE message lay-out

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4.1.5 PIPE Message HEADER

The PIPE Header consists of a fixed number of 10 bytes split up in several fields whose minimum length is one byte.

The detailed structure of the PIPE header is depicted in the figure below:

Field	Length (byte)	DESCRIPTION	TYPE
Message ID	1	Identification of the message	integer
VCID	1	Filled only for TM message. 0x00 otherwise.	integer
Remaining length	2	Length of the message excluding the first 4 bytes	integer
<u>Request ID</u>	<u>4</u>	<u>TC/RC identification</u>	<u>integer</u>
Synchronisation Word	2	Synchro of PIPE message	integer

Table 2 : PIPE message Header

Message ID

In order to support a number of different messages with different purpose, a PIPE message starts with a one byte message identifier. This ID can be used to make a distinction between different control, status and data messages.

VCID

The one-byte Virtual Channel ID field indicates on which VCID are downlinked the TM source packet. This field is filled by TM/TC DFE.

Remaining Message length

The message length is a two-byte length field indicating the remaining length of the message including the remaining header fields and data.

Request ID

The 4 bytes field identifies which TC (RC) will be sent. This value will be checked with that one return by the ACKTC (ACKRC) and TC Report messages. The Request ID field of TC Echo message will be fixed to 0. The Request ID wraps around from "full-scale" to zero

Synchronisation Word

The two-bytes field is used to assure the PIPE protocol management.
This field will be forced to 0xFADE

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PIPE structure	Field Description	Size	Values	TYPE
Header	Message ID	1 byte	Variable	integer
	VCID	1 byte	Variable	integer
	Remaining length	2 bytes	Variable	integer
	Request ID	4 bytes	Variable	integer
	Synchronisation Word	2 bytes	Forced to 0xFADE	integer

Table 3 : Monitoring Flow (TM/RM) PIPE Header

PIPE structure	Field Description	Size	Values	TYPE
Header	Message ID	1 byte	Variable	integer
	VCID	1 byte	Forced to 0x00	integer
	Remaining length	2 bytes	Variable	integer
	Request ID	4 bytes	Variable	integer
	Synchronisation Word	2 bytes	Forced to 0xFADE	integer

Table 4 : Command Flow (TC/RC) PIPE Header

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4.1.6 Body message

The Body Message is constituted of one Header Field and of one Data Field.

The Header Field have a total length of 6 bytes.

The Data Fields can have a minimum length of 14 bytes and a maximum length of 65536 bytes as dictated by the CCSDS & ESA packet standards [S2] and [S3].

The Message Body of a PIPE message consists of Herschel-Planck TM/TC source packets, with structures and limitations conformant to the H-P PS-ICD [S4].

For the purpose of message verification it is recommended to check the packet size against the maximum packet size applicable for TM and TC packets in H-P, respectively.

4.1.6.1 Monitoring Flow message (SCOE's/DFE/IS → CCS)

[IFRQT-0130]

[Analysis]

For **on-board Telemetry Packet**, the complete body message shall be used to embed a Packet without any modifications to the contents or length of the Packet in question

[IFRQT-0140]

[Analysis]

For **Remote Message (RM) Packets** provided by SCOE's, the complete body message shall be formatted as **TM** source packet and shall have the following structure :

SOURCE PACKET HEADER (48 bits)						PACKET DATA FIELD (VARIABLE)			
Packet Identification				Packet Sequence Control		Packet Length	Data Field Header	Source Data	Packet Error Ctrl
Version Number	Type	Data Fields Header Flag	Application Process ID	Segmentation Flags	Source Sequence count				
3	1	1	11	2	14				
16 bits				16 bits		16 bits	80 bits	N x 16 bits	16 bits

Spare	TM Source Packet PUS Version Number	Spare	Packet Type	Packet Sub-Type	Spare	Time
(1 bits)	(3 bits)	(4 bits)	(8 bits)	(8 bits)	(8 bits)	(48 bits)

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field	length	VALUE	TYPE
Source Packet Header			
Version number	3 bits	forced to '000'	binary
Type	1 bit	forced to '0'	binary
Data field header flag	1 bit	forced to '1'	binary
Application process ID	11 bits	SCOE/DFE/IS APID (Refer to Table 15 page 84)	integer
Segmentation flags	2 bits	forced to '11'	binary
Source sequence count	14 bits	Packet count per APID	binary
Packet length	2 bytes	length of packet data field - 1	Integer
	6 bytes		

Table 5 : RM Source Packet Header

field	length	VALUE	TYPE
Spare	1 bits	forced to '0'	binary
PUS version number	3 bits	forced to '000'	binary
Spare	4 bits	forced to '0000'	binary
Packet type	1 byte	depend on the service type	integer
Packet sub-type	1 byte	depend on the service sub type	integer
Spare	1 byte	forced to 0x00	integer
Time	6 bytes	SCOE/DFE/IS time	CUC
	10 bytes		

Table 6 : RM Data Field Header

field	length	VALUE	TYPE
Source data	Nx1 byte	SCOE/DFE/IS parameter list	variable
Packet error control	2 bytes	Not Used	Integer

Table 7 : RM Remaining Packet Data Field

Application process ID

The APID field indicating uniquely identifies the source of the packet.

For **Remote Message** Packet, the APID identifies the SCOE/DFE/IS emitting the packet.

Packet length

The Packet Length field specifies the number of octets contained within the Packet Data Field, including the Data Field Header. The number is an unsigned integer "C" where

C = (Number of octets in Packet Data Field) - 1

Packet Type:

This indicates the Service to which this telemetry source packet relates.

Packet Subtype:

Together with the Packet Type, the Subtype uniquely identifies the nature of the Service constituted by this telemetry source packet.

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Time:

This field represents the EGSE reference time of the packet, expressed in CUC. Details of the time field are given in appendix 6 of [S4]

Source Data (Variable)

The source data constitutes the data element of the RM packet. It contains all internal parameter of each SCOE's.

Packet Error Control (PEC) (16 bits)

The Packet Error Control field shall transport an error detection code that can be used by the ground to verify the integrity of the complete telemetry source packet → **not used for RM**

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4.1.6.2 Control Flow message (CCS → SCOE's/DFE/IS)

[IFRQT-0150]

[Analysis]

For **Telecommand Packets**, the complete body message shall be used to embed a Packet without any modifications to the contents or length of the Packet in question

[IFRQT-0160]

[Analysis]

For **Remote Command (RC) Packets** sent to SCOE's, the complete body message shall be formatted as **TC** packet and shall have the following structure :

SOURCE PACKET HEADER (48 bits)						PACKET DATA FIELD (VARIABLE)			
Packet Identification				Packet Sequence Control		Packet Length	Data Field Header	Application Data	Packet Error Ctrl
Version Number	Type	Data Fields Header Flag	Application Process ID	Sequence Flags	Sequence count				
3	1	1	11	2	14				
16 bits				16 bits					
						16 bits	32 bits	N x 16 bits	16 bits
		Seq flag (3 bits)		Seq Count (11 bits)					
CCSDS Secondary Header flag (1 bit)		TC Source Packet PUS Version Nbr (3 bits)		Acknowledge (4 bits)		Packet Type (8 bits)	Packet Sub-Type (8 bits)	Spare (8 bits)	

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field	length	VALUE	TYPE
Source Packet Header			
Version number	3 bits	forced to '000'	binary
Type	1 bit	forced to '1'	binary
Data field header flag	1 bit	forced to '1'	binary
Application process ID	11 bits	SCOE/DFE/IS destination address (Refer to Table 15 page 84)	integer
Segmentation flags	2 bits	forced to '11'	binary
Sequence count			binary
Source part	3 bits	forced to '111'	binary
Sequence part	11 bits	Packet count per APID	binary
Packet length	2 bytes	length of packet data field - 1	Integer
	6 bytes		

Table 8 : RC Source Packet Header

field	length	VALUE	TYPE
CCSDS Sec Header flag	1 bits	forced to '0'	binary
PUS version number	3 bits	forced to '000'	binary
Acknowledge	4 bits	forced to '0001'	binary
Packet type	1 byte	depend on the message type	integer
Packet sub-type	1 byte	depend on the service sub type	integer
Spare	1 byte	forced to 0x00	integer
	4 bytes		

Table 9 : RC Data Field Header

field	length	VALUE	TYPE
Application data	Nx1 byte	parameter list	variable
Packet error control	2 bytes	Not Used for RC only	Integer

Table 10 : RC Remaining Packet Data Field

Application process ID

The Application Process ID defines the application or unit that the Telecommand is addressed to.

For **Remote Command** Packet, the APID identifies the SCOE/DFE/IS receiving the packet.

Sequence Count: (14 bits):

This field is provided to identify a particular Telecommand packet so that it can be traced within the end-to-end Telecommand system. The field is divided into two parts as follows:

Source part (3 most significant bits) identifies the generator or source of a certain command as follows:

[111](#) = Ground, all sources (maintained by ground)

Sequence part (11 bits) shall be used to represent the actual Sequence Count. The Sequence Count is maintained by the Telecommand source for each Application Process ID. The

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sequence count shall be incremented by 1 whenever a command is generated with that Application Process ID. The counter wraps around from "full-scale" to zero. When an acknowledgement of a TC-packet is required (see "Ack" field in the data field header below), it is mandatory that the full Sequence Control field is included in the telemetry acknowledge packet as the identifier of the Telecommand packet being acknowledged (see §4.7). No check is to be performed by the addressed application regarding the monotony of the sequence counter, **the application shall accept commands regardless of the sequence counter.**

Packet length

The Packet Length field specifies the number of octets contained within the Packet Data Field, including the Data Field Header. The number is an unsigned integer "C" where
 $C = (\text{Number of octets in Packet Data Field}) - 1$

Packet Type:

This indicates the Service to which this telecommand source packet relates.

Packet Subtype:

Together with the Packet Type, the Subtype uniquely identifies the nature of the Service constituted by this telecommand source packet.

Ack:

This field is used to indicate which acknowledgements, in the form of Telecommand verification packets, are required to notify acceptance and to verify execution of this Telecommand packet. This relates only to acknowledgement of successful acceptance and execution, since failure reports shall be generated by default.

The bit settings shall be as follows:

- 1 (bit 3 of the Ack field set): **mandatory**, acknowledge acceptance of the packet by the Application Process

Application Data

The Telecommand application data constitute the data element of the Remote Command to be used by the CCS to command SCOE's.

Packet Error Control (PEC) (16 bits)

The purpose of the mandatory Packet Error Control field is to transport an error detection code that shall be used by the receiving Application Process to verify the integrity of the complete Telecommand Packet → **Not used for RC**

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4.1.7 Message ID List

Message ID	TYPE	Description	(Type, SubType)	Source	Dest.	[IFRQT-]
0x80	TC	S/C TELECOMMAND Packets		CCS	DFE	0170
0x44	RC	SCOE Command Packets		CCS	SCOE/DFE	0200
0x20	TM	On-Board Telemetry Packets acquisition		DFE	CCS	0500
0x20	TM	Telemetry Packets Distribution		CCS	SCOE/DFE/IS	0520
0x10	RM	SCOE Periodic Telemetry	(3,25)	SCOE/DFE/IS	CCS	0562
0x10	RM	SCOE Asynch. Telemetry	(5,1)	SCOE/DFE/IS	CCS	0563
0x11	RM	SCOE Idle Packet (Alive Packet)		SCOE/DFE/IS	CCS	0809-2
0x50	ACKRC	RC Acceptance report – Success	(1,1)	SCOE/DFE	CCS	0803
0x51	ACKRC	RC Acceptance report – Failure	(1,2)	SCOE/DFE	CCS	0804
0x55	ACKTC	TC Acceptance report – Success	(1,1)	DFE	CCS	0808-2
0x56	ACKTC	TC Acceptance report – Failure	(1,2)	DFE	CCS	0808-3
0xA0	TC Echo	TC Echo		DFE	CCS	0809
				CCS	IS station	
0x57	TC Report	TC Report – Success	(5,1)	DFE	CCS	0809-1
		TC Report – transmission failure	(5,4)			

Table 11 : Message ID

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4.1.8 Message Control Flow description

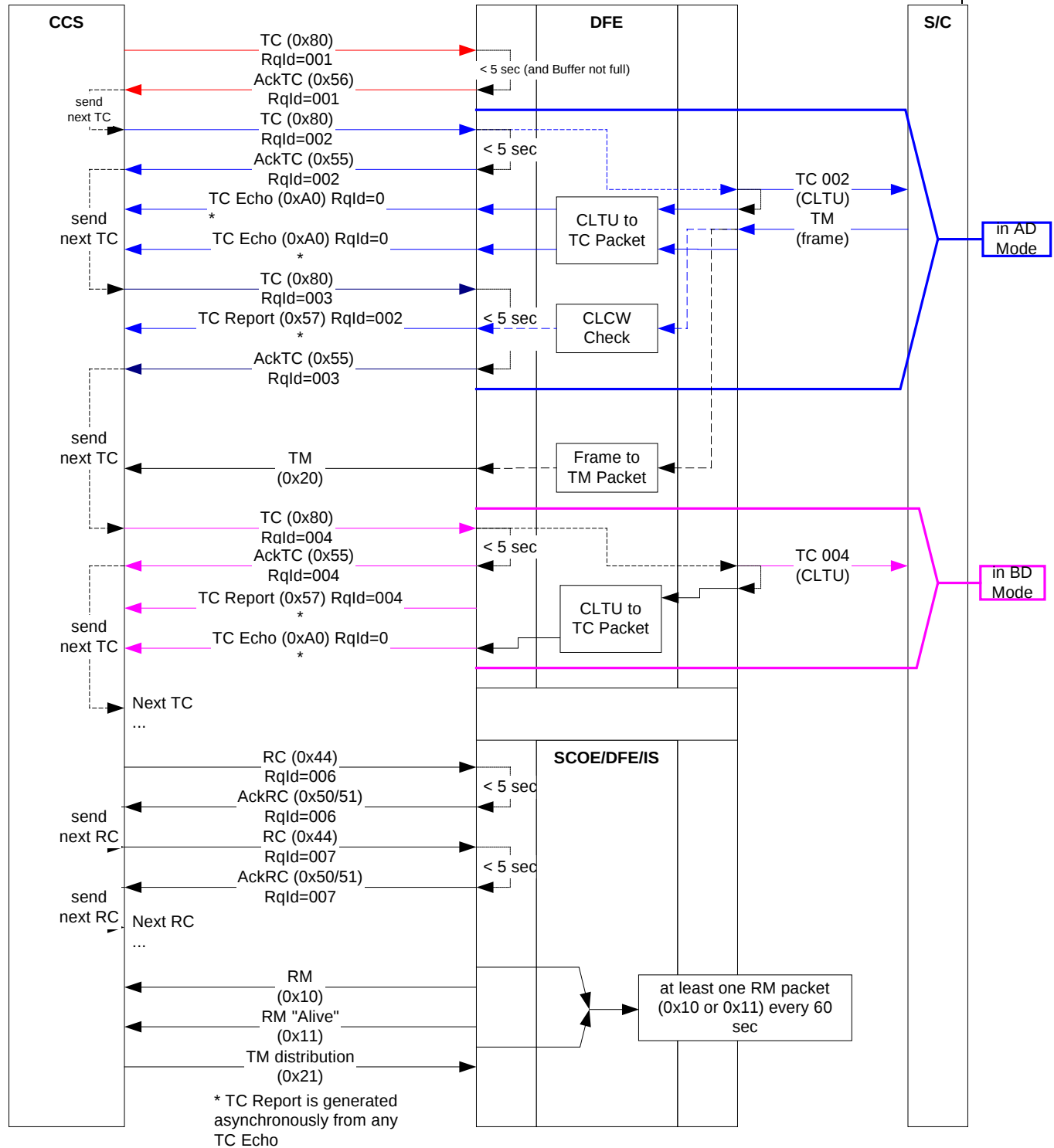


Figure 9 : Control Flow message description

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[IFRQT-0161]

[Test]

The exchange of TC Source Packet between a client (CCS) and a server (TM/TC DFE) shall respect the following interactions :

1. Client (CCS) issues a **TC Source Packet** message (0x80) to a Server (TM/TC DFE)
2. TM/TC DFE checks if this TC Source Packet could be accepted (dangerous list, TC encoder status, DFE status, ...)
3. After these verifications, TM/TC DFE will sent a TC acknowledge message (**ACKTC**) to the CCS : "**Success**" (0x55) if TC Source Packet is being queued, "**Failure**" (0x56) otherwise.
4. DFE shall maintain a TC buffer. In case this buffer become full, DFE shall stop sending ACKTC message until buffer there is again available space in buffer.
5. Once ACKTC message received (Success or Failure), the CCS could issue an other TC Source Packet (step 1 to 3)
6. In the case of Positive ACKTC, TM/TC DFE will encode TC Source Packet into CLTU
7. TM/TC DFE will then decode the resulting CLTU bitstream into a TC Source Packet (nominally identical to the original TC Source Packet). This TC Source Packet will be sent to CCS in a dedicated message called **TC Echo message** (0xA0)
8. TM/TC DFE will generate a **TC Report** (0x57) message both in AD and BD mode (but only uses the CLCW information when in AD mode).
The TC Report is a guaranteed one-to-one "final confirmation of transmission" for all TC Packets (irrespective of mode) and is generated always (also in case of ACKTC=Failure).

[IFRQT-0162]

[Test]

CCS shall wait for RC acceptance/failure report (ACKRC) before sending the next RC command

[IFRQT-0163]

[Test]

CCS shall wait for TC acceptance/failure report (ACKTC) before sending the next Telecommand

[IFRQT-0164]

[Test]

Request ID mechanism :

1. Field filled by CCS when generating a TC (resp RC) message
2. TM/TC DFE has to fill in the field with the same Request ID when sending back ACKTC and TC Report message (resp ACKRC message)

[IFRQT-0165]

[Test]

Timeout response :

The acknowledgement shall be sent by the receiver as soon as possible without any artificial delay.

CCS shall expect ACKTC (or ACKRC) messages in less than 5 seconds after sending TC (or RC) command.

[IFRQT-0166]

[Test]

TC Report (0x57) shall be generated asynchronously from any TC Echo (0xA0).

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4.2 CONTROL FLOW – TELECOMMAND Packets

[IFRQT-0170]

[Test]

CCS shall send **Telecommand Packets** to DFE using the following format

Source	CCS
<u>Destination</u>	<u>DFE</u>
Rate	4 kb/s
LAN	SCOE/DFE LAN

PIPE structure	Field Description	Size	Values	TYPE
<u>Header</u>	<u>Refer to Table 4 page 26 with :</u> <u>Message ID = Refer to Table 11 page 33</u> <u>Request ID = Variable (initiated by CCS)</u>			
<u>Body</u>	<u>TC Packet</u>	<u>variable</u>	<u>variable</u>	<u>variable</u>

[IFRQT-0180]

[Analysis]

Deleted

[IFRQT-0190]

[Analysis]

Deleted

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4.3 CONTROL FLOW – CCS REMOTE Commanding Packets

Source	CCS
Destination	SCOE/DFE
Rate	N/A
LAN	SCOE/DFE LAN

[IFRQT-0200]

[Analysis]

CCS shall send **Remote Command (RC) Packets** to SCOE's/DFE using the following format

PIPE structure	Field Description	Size	Values	TYPE
Header	Refer to Table 4 page 26 with : Message ID = Refer to Table 11 page 33			
Body	Source Packet Header	Refer to Table 8 page 31		
	Data field header	Refer to Table 9 page 31 with : Packet Type = 0x 03 Packet sub-type = 0x 19		
	Application data	<u>variable</u>	<u>Parameter list</u>	<u>variable</u>
	<u>Packet error control</u>	<u>2 bytes</u>	<u>Not Used</u>	<u>integer</u>

[IFRQT-0201]

[Analysis]

All the Remote Command listed in the hereafter paragraphs are defined inside HPSDB and shall never be hard-coded in SCOE application S/W.

~~[IFRQT-0210] Deleted~~

~~[Analysis]~~

[IFRQT-0220]

[Analysis]

Each Remote Command shall be identified by one unique mnemonic defined in HPSDB (as for TC.)

[IFRQT-0230]

[Analysis]

Application data shall be composed of: **RC_ID** field (which identify uniquely the RC) and parameters fields (optional)

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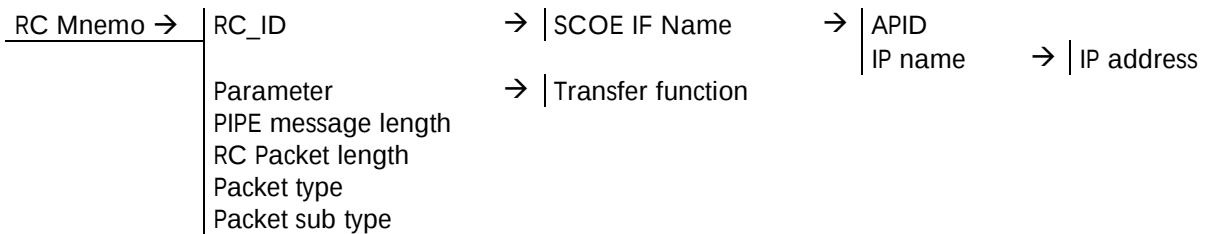
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[IFRQT-0240]

[Analysis]

HPsDB will link the RC mnemonic with all the data in order to built the RC packet message and to identify the target IP address and name:



[IFRQT-0245]

[Information]

The list of commands and parameters contained in **Application Data** field is non exhaustive; It shall be filled by the Sub-Contractor of each SCOE.

[IFRQT-0246]

[Information]

All SCOE/DFE shall have a common set of mandatory Remote Commands :

RC mnemonic	RC_ID number	packet type	packet sub-type	parameter field	Name	Type	Transfer function	Parameter Min value	Max value	Operational description

RC mnemonic	Operational description
	Execute Self-test
	Switch the SCOE to ON line
	Switch the SCOE to OFF line
	Switch the SCOE to LOCAL Mode
	Switch the SCOE to REMOTE Mode
	Enable of archive
	Disable of archive
	Stop the running Application Software (All power supply set to 0, all relays Open)

Table 12 : Common Remote Commands

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4.3.1 COMMUNICATION VIA SCOE/DFE LAN

4.3.1.1 CCS Commands

[IFRQT-0250] N/A [Analysis]

4.3.1.2 CCS → CDMU SCOE Commands

[IFRQT-0260] To Be Completed [Test]

CDMU SCOE shall accept from CCS at least the following command

RC mnemonic	Operational description
	Common RC (refer to Table 12 page 38)
	Switch ON the simulation of each unit (instruments, RTU)
	Switch OFF the simulation of each unit (instruments, RTU)
	Switch ON the TM packet production for each simulated unit and for each type of packet
	Switch OFF the TM packet production for each simulated unit and for each type of packet
	Switch ON the Bus monitoring function.
	Switch OFF the Bus monitoring function.
	Start Simulation of Experiment Telemetry as defined in the simulation files and send then onto the 1553 Bus
	Stop Simulation of Experiment Telemetry
	Enable the Telemetry End-to-End loop
	Disable the Telemetry End-to-End loop
	Enable the Telecommand End-to-End loop
	Disable the Telecommand End-to-End loop
	Execute a pre-programmed sequences of commands
	Switch between the nominal and redundant 1553 Bus
	Enable the 1553 Bus traffic Acquisition and monitoring function
	Disable the 1553 Bus traffic Acquisition and monitoring function

4.3.1.3 CCS → ACMS SCOE Commands

[IFRQT-0270] To Be Completed [Test]

ACMS SCOE shall accept from CCS at least command to :

RC mnemonic	Operational description
	Common RC (refer to Table 12 page 38)
	Start/hold/suspend/terminate/kill an Application Test Program

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4.3.1.4 CCS → TT&C SCOE Commands

[IFRQT-0280] To Be Completed

[Test]

TT&C SCOE shall accept from CCS at least the following command

RC mnemonic	Operational description
	Common RC (refer to Table 12 page 38)
	Switch between antenna paths
	Switch up/down link signal to measurement devices
	Set up-link and down-link frequency
	Execute measurements passing arguments to automated routines.
	Select up-link modes
	Select ranging tone
	Sweep uplink carrier
	Select modulation index
	Set attenuation
	Uplink Carrier Acquisition Threshold
	Lock Maintenance
	Uplink Command Execution Threshold
	Up link RF Power Measurements
	Down link RF Power Measurements
	Phase Noise Measurement
	Modulation index measurement
	Ranging Group Delay Measurement
	Ranging Amplitude Response
	Frequency Stability Measurement

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4.3.1.5 CCS → TM/TC DFE Commands

[IFRQT-0290]

[Test]

TM/TC DFE SCOE shall accept from CCS at least the following command

RC mnemonic	Operational description
	Common RC (refer to Table 12 page 38)
	Select Bypass TM link
	Select Nominal TM link (nominal on-board processor) (PM_ID)
	Select Redundant TM link (redundant on-board processor) (PM_ID)
	Select RF TM link
	Select Bypass TC link
	Select Nominal TC link (nominal on-board decoder) (VC_ID)
	Select Redundant TC link (redundant on-board decoder) (VC_ID)
	Select RF TC link
	Select TC source to CCS
	Select TC source to NDIU
	Open TM frame link to NDIU
	Close TM frame link to NDIU
	Enable of Transfer Frame (TM and TC) archive
	Disable of Transfer Frame (TM and TC) archive
	Enable of Source Packets (TM and TC) archive
	Disable of Source Packets (TM and TC) archive
	Start Replay management
	Stop Replay management
	Start Simulation management
	Stop Simulation management
	Enable COP-1 management
	Disable COP-1 management
	Enable AD service
	Enable BC service
	Enable BD service
	Start of Data distribution request
	Stop Data distribution request

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4.3.1.6 CCS → Umbilical I/F Module Commands

[IFRQT-0300] To Be Completed

[Test]

POWER SCOE shall accept from CCS at least command to :

RC mnemonic	Operational description
	Common RC (refer to Table 12 page 38)
	Set Safety Loop Delay (from 0.5ms to TBD)
	Open Nominal Separation switch 1
	Close Nominal Separation switch 1
	Open Nominal Separation switch 2
	Close Nominal Separation switch 2
	Open Nominal Separation switch 3
	Close Nominal Separation switch 3
	Open Redundant Separation switch 1
	Close Redundant Separation switch 1
	Open Redundant Separation switch 2
	Close Redundant Separation switch 2
	Open Redundant Separation switch 3
	Close Redundant Separation switch 3
	Send High Priority Commands 1
	Send High Priority Commands n
	Set On Line Power supply output
	Set Off Line Power supply output
	Open Nominal Umbilical switch
	Close Nominal Umbilical switch 1
	Open Redundant Umbilical switch
	Close Redundant Umbilical switch 1
	Set power supply to the specific voltage value
	Set power supply to the specific current value

4.3.1.7 CCS → BATSIM SCOE Commands

[IFRQT-0310] To Be Completed

[Test]

Battery Simulator SCOE shall accept from CCS at least command to :

RC mnemonic	Operational description
	Common RC (refer to Table 12 page 38)
	Set Battery Voltage characteristics
	Set Battery Current characteristics
	Set power supply to the specific voltage value
	Set power supply to the specific current value
	Set battery temperature 1 value
	Set battery temperature 2 value
	Set Over-Voltage value
	Set Over-Current value

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	Start Simulation Mode
	Stop Simulation Mode
	Simulate of battery nominal mode (sun presence)
	Simulate of battery discharge mode (eclipse)
	Simulate of battery charge mode (sun presence after eclipse)
	Simulate of battery Taper mode

4.3.1.8 CCS → SAS SCOE Commands

[IFRQT-0320] To Be Completed

[Test]

Solar Array Simulator shall accept from CCS at least command to :

<u>RC mnemonic</u>	<u>Operational description</u>
	<u>Common RC (refer to Table 12 page 38)</u>
	Set all SAS section relays On-Line
	Set all SAS section relays Off-Line
	Set all SAS section relays 1 On-Line
	Set all SAS section relays 1 Off-Line
	...
	Set all SAS section relays 2 to 29 On-Line
	Set all SAS section relays 2 to 29 Off-Line
	...
	Set all SAS section relays 30 On-Line
	Set all SAS section relays 30 Off-Line
	Set Voltage characteristic for SAS section 1
	Set Current characteristic for SAS section 1
	Set Voltage characteristic for SAS section 2 to 29
	Set Current characteristic for SAS section 2 to 29
	Set Voltage characteristic for SAS section 30
	Set Current characteristic for SAS section 30
	Start transition from Sunlit to Eclipse
	Start transition from Eclipse to Sunlit
	Set Section Number val1 to val2 current, with val3 seconds duration
	Set all power supply current to 0 AMP , with Val seconds duration
	Set Over-Voltage value
	Set Over-Current value
	Set thermistor 1 to val1
	Set thermistor 1 to val2

4.3.1.9 CCS → BCE SCOE Commands

[IFRQT-0330] N/A (no interface with CCS)

[Test]

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4.3.1.10 CCS → LAUNCH POWER SUPPLY Commands

[IFRQT-0340] To Be Completed

[Test]

<u>RC mnemonic</u>	<u>Operational description</u>
	<u>Common RC (refer to Table 12 page 38)</u>
	Send High Priority Commands 1
	Send High Priority Commands n
	Set On Line Power supply output
	Set Off Line Power supply output
	Open Nominal Umbilical switch
	Close Nominal Umbilical switch 1
	Open Redundant Umbilical switch
	Close Redundant Umbilical switch 1
	Set power supply to the specific voltage value
	Set power supply to the specific current value

4.3.1.11 CCS → SIS SCOE Commands

[IFRQT-0350]

[Test]

Deleted

4.3.1.12 CCS → PLM SCOE Commands

[IFRQT-0360] To Be Completed

[Test]

<u>RC mnemonic</u>	<u>Operational description</u>
	<u>Common RC (refer to Table 12 page 38)</u>
	Send High Priority Commands 1
	Send High Priority Commands n
	Set On Line Power supply output
	Set Off Line Power supply output
	Set power supply to the specific voltage value
	Set power supply to the specific current value
	Set ON/OFF power line LCL 1
	Set ON/OFF power line LCL ...
	Set ON/OFF power line LCL n
	Reset LCL Safety Loop
	Set OVP threshold detection
	Start/hold/suspend/terminate/kill an Application Test Program

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4.3.1.13 CCS → Herschel Cryo SCOE Commands

[IFRQT-0370] To Be Completed [Test]

<u>RC mnemonic</u>	<u>Operational description</u>
	<u>Common RC (refer to Table 12 page 38)</u>
	Set arming command valve 1
	Switch ON to OFF valve 1
	Switch OFF to ON valve 1
	...
	Read sensors
	Set Measuring mode to CONTNUOUS
	Set Measuring mode to FIX_TIME_PERIOD
	Set Measuring period to nn Seconds
	Set arming command heater 1
	Switch ON to OFF heater 1
	Switch OFF to ON heater 1
	...
	Switch ON current for Liquid Level measurement
	Switch OFF current for Liquid Level measurement

4.3.1.14 CCS → Planck PLM SCOE Commands

[IFRQT-0380] Deleted [Test]

4.3.1.15 CCS → Planck Sorption SCOE Commands

[IFRQT-0390] Deleted [Test]

4.3.1.16 CCS → CDMU DFE Commands

[IFRQT-0400] To Be Completed [Test]

<u>RC mnemonic</u>	<u>Operational description</u>
	<u>Common RC (refer to Table 12 page 38)</u>
	<u>Start/hold/suspend/terminate/kill an Application Test Program</u>
	Switch ON the simulation of each unit (instruments, RTU)
	Switch OFF the simulation of each unit (instruments, RTU)
	Switch ON the TM packet production for each simulated unit and for each type of packet
	Switch OFF the TM packet production for each simulated unit and for each type of packet

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	Switch ON the Bus monitoring function.
	Switch OFF the Bus monitoring function.
	Start Simulation of Experiment Telemetry as defined in the simulation files and send then onto the 1553 Bus
	Stop Simulation of Experiment Telemetry
	Execute a pre-programmed sequences of commands
	Switch between the nominal and redundant 1553 Bus
	Enable the 1553 Bus traffic Acquisition and monitoring function
	Disable the 1553 Bus traffic Acquisition and monitoring function
	Send High Level Command number <i>val</i>
	Send Low Level Command number <i>val</i>
	Send Memory Load Command number <i>val</i>

4.3.1.17 CCS → 1553 Bus Probe Commands

[IFRQT-0405] N/A

[Test]

4.3.1.18 CCS → Quick Load Commands

[IFRQT-0410]

[Test]

N/A

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4.3.2 COMMUNICATION VIA Instrument Station LAN

4.3.2.1 CCS → Instrument Stimuli SCOE Commands

[IFRQT-0420] Deleted [Test]

4.3.2.2 CCS → HFI EGSE Commands

[IFRQT-0430] Deleted [Test]

4.3.2.3 CCS → LFI EGSE Commands

[IFRQT-0440] Deleted [Test]

4.3.2.4 CCS → HCSS SCOE Commands

[IFRQT-0450] Deleted [Test]

4.3.2.5 CCS → HIFI EGSE Commands

[IFRQT-0460] Deleted [Test]

4.3.2.6 CCS → PACS EGSE Commands

[IFRQT-0470] Deleted [Test]

4.3.2.7 CCS → SPIRE EGSE Commands

[IFRQT-0480] Deleted [Test]

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4.3.3 COMMUNICATION VIA www LAN

4.3.3.1 CCS → www.Server Commands

[IFRQT-0490] Deleted

[Test]

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4.4 MONITORING FLOW - On-Board Telemetry Packets acquisition

<u>Source</u>	<u>DFE</u>
Destination	CCS
Rate	As soon as a valid packet is available
LAN	SCOE/DFE LAN

[IFRQT-0500]

[Analysis]

DFE shall send all TM source packet received to CCS using the following format

PIPE structure	Field Description	Size	Values	TYPE
<u>Header</u>	<u>Refer to Table 3 page 26 with :</u> <u>Message ID = Refer to Table 11 page 33</u> <u>VCID = VCID number of the corresponding frame</u> <u>Request ID = Forced to 0x0000 0000</u>			
Body	TM Source Packet	variable	variable	

[IFRQT-0510]

[Analysis]

DFE shall transmit TM Packet as soon as a valid TM packet is available.

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4.5 MONITORING FLOW - Telemetry Packets Distribution

Source	CCS
Destination	SCOE/DFE/IS
Rate	As soon as a valid packet is available
LAN	SCOE/DFE LAN
	IS LAN

[IFRQT-0520]

[Analysis]

The CCS shall be able to distribute all incoming Packets to the proper destination on the basis of their APID.

The TM distribution is based on a table define inside the HPSDB.

PIPE structure	Field Description	Size	Values	TYPE
<u>Header</u>	Refer to Table 3 page 26 with : Message ID = Refer to Table 11 page 33 VCID = VCID number of the corresponding frame <u>Request ID = Forced to 0x0000 0000</u>			
Body	TM Source Packet	variable	variable	

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4.6 MONITORING FLOW – Remote Message Packets

[IFRQT-0525]

[Analysis]

Two kinds of Remote Message shall be foreseen :

1. Periodic RM packets containing vital data measured/acquired by each SCOE/DFE/IS
2. Asynchronous RM packets containing special events /errors/warning notification

[IFRQT-0540] Deleted

[Analysis]

[IFRQT-0550]

[Analysis]

Source data shall contain all the necessary information concerning the SCOE/DFE/IS (status, current, voltage, temperature, alarm, etc...)

The content of these fields is describe for each SCOE/DFE/IS in the following paragraphs.

The list of parameters contained in **Source Data** field is non exhaustive; It shall be filled by the Sub-Contractor of each SCOE/DFE/IS.

[IFRQT-0560]

[Analysis]

Each RM Packet source shall be identified by its APID defined in HPSDB (as for TM packets.)

Refer to [Table 15](#) page [84](#).

RM Packet structure shall be identify by the combination of APID, Packet type and Packet subtype.

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4.6.1 PERIODIC RM Message

Source	SCOE/DFE/IS
Destination	CCS
Rate	1 packet/second for POWER SCOE and PLM SCOE 1 packet/10 seconds for all other SCOE/DFE/IS
LAN	SCOE/DFE LAN IS LAN

[IFRQT-0562] (Was IFRQT-0530)

[Analysis]

Each SCOE/DFE/IS shall send its own (and unique) Remote Message (RM) Packets to the CCS using the following format.

The period of these RM Message shall be available in each SCOE/DFE/IS configuration file and shall be modifiable.

PIPE structure	Field Description	Size	Values	TYPE
Header	Refer to Table 3 page 26 with : Message ID = Refer to Table 11 page 33 VCID = 0x00			
Body	Source Packet Header	Refer to Table 5 page 28		
	Data field header	Refer to Table 6 page 28with : Packet Type = 0x03 Packet sub-type = 0x19		
	Source data	<u>variable</u>	<u>Parameter list</u>	<u>variable</u>
	Packet error control	2 bytes	Not Used	integer

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[IFRQT-0562-
1]

[Information]

All SCOE/DFE/IS shall have a common set of mandatory Periodic Remote Monitoring parameters

Source Data Field				
Operational mnemonic	Operational description		Length (byte)	Type
TBD	SCOE mode	0 Local mode 1 Remote mode	1	Integer
TBD	Software activity :	0 idle 1 loading 2 running 3 simulation 4 Self Test 5 TBD	1	Integer
TBD	SCOE Configuration :	0 TBD 1	1	Integer
TBD	SCOE On-line/Off-line status	0 Off-line 1 On-line	1	Integer
TBD	Self-test status	0 Unknown (during software start-up) 1 Passed (if all tests went OK) 2 Failed (if some tests failed) 3 Override (if the operator indicate that the failed tests are not severe and test sequence execution shall be allowed)	1	Integer
TBD	SCOE set	4 set #1 (AVM) 5 set #2 (Herschel) 6 set #3 (Planck)	1	Integer

Table 13 : Common Periodic Remote Monitoring Parameters

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4.6.2 ASYNCHRONOUS RM Message (Event Report)

Source	SCOE/DFE/IS
Destination	CCS
Rate	Asynchronous
LAN	SCOE/DFE LAN
	IS LAN

[IFRQT-0563] (Was IFRQT-0535)

[Analysis]

When a special event happen (error, warning, ...), each SCOE/DFE shall send an Event Report to the CCS using the following format

<u>PIPE structure</u>	<u>Field Description</u>			
<u>Header</u>	Refer to Table 3 page 26 with : Message ID = Refer to Table 11 page 33 VCID = 0x00			
<u>Body</u>	<u>Source Packet Header</u>	Refer to Table 5 page 28		
	<u>Data field header</u>	Refer to Table 6 page 28 with : Packet Type = 0x05 Packet sub-type = 0x01		
	<u>Source data</u>	<u>variable</u>	<u>Parameter list</u>	<u>variable</u>
	Packet error control	2 bytes	Not Used	integer

[IFRQT-0563-1]

[Information]

All SCOE/DFE/IS shall have a common set of mandatory Asynchronous Remote Monitoring parameter :

<u>Source Data Field</u>				
<u>Operational mnemonic</u>	<u>Operational description</u>		<u>Length (byte)</u>	<u>Type</u>
<u>TBD</u>	<u>Event ID</u>	<u>0</u> TBD <u>1</u>	<u>1</u>	<u>Integer</u>
<u>TBD</u>	<u>Local disk capacity</u>	<u>0</u> Not OK (full) <u>1</u> OK (not full)	<u>1</u>	<u>Integer</u>

Table 14 : Common Asynchronous Remote Monitoring Parameters

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4.6.3 COMMUNICATION VIA SCOE/DFE LAN

4.6.3.1 RM CDMU SCOE Definition

[IFRQT-0565] To Be Completed

[Test]

Periodic RM (3,25)

Source Data Field			
Operational mnemonic	Operational description		Type
	Common RM parameter (refer to Table 13 page 24)		<u>4</u> <u>Integer</u>
<u>TBD</u>	<u>1553 Bus status</u>	0 <u>Nominal Bus active</u> 1 <u>Redundant Bus active</u>	<u>1</u> <u>Integer</u>
TBD	RT address simulated		4 Integer
TBD	1553 profile trapped		4 Integer

Asynchronous RM (5,1)

Source Data Field			
Operational mnemonic	Operational description		Type
	Common RM parameter (refer to Table 1 page 54)		<u>2</u> <u>Integer</u>
<u>TBD</u>	<u>1553 Bus status</u>	0 <u>Nominal Bus active</u> 1 <u>Redundant Bus active</u>	<u>1</u> <u>Integer</u>

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4.6.3.2 RM ACMS SCOE Definition

[IFRQT-0570] To Be Completed

[Test]

Periodic RM (3,25)

Source Data Field			
Operational mnemonic	Operational description		Type
	Common RM parameter (refer to Table 13 page 24)		<u>4</u> Integer
<u>TBD</u>	<u>1553 Bus status</u>	<u>0</u> Nominal Bus active <u>1</u> Redundant Bus active	<u>1</u> Integer
<u>TBD</u>	<u>Data storage status</u>	<u>0</u> started <u>1</u> stopped	<u>1</u> Integer
<u>TBD</u>	<u>Application test program status</u>	<u>0</u> Started <u>1</u> Held <u>2</u> Suspend <u>3</u> Terminated <u>4</u> Killed	<u>1</u> Integer
TBD			

Asynchronous RM (5,1)

Source Data Field			
Operational mnemonic	Operational description		Type
	Common RM parameter (refer to Table 1 page 54)		<u>2</u> Integer
<u>TBD</u>	<u>1553 Bus status</u>	<u>0</u> Nominal Bus active <u>1</u> Redundant Bus active	<u>1</u> Integer
TBD	TC request (request for a TC to be send by CCS)		1 Integer

4.6.3.2.1 Quick Load

TBD

4.6.3.2.2 Optical Stimuli

TBD

4.6.3.2.3 Stimuli Feedback

TBD

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4.6.3.3 RM TT&C SCOE Definition

[IFRQT-0580] To Be Completed

[Test]

Periodic RM (3,25)

Source Data Field			
Operational mnemonic	Operational description		Type
	Common RM parameter (refer to Table 13 page 24)		4 Integer
TBD	Antenna path	0 TBD	1 Integer
TBD	Up link signal switch status	0 S/C 1 Measurement devices	1 Integer
TBD	Down link signal switch status	0 S/C 1 Measurement devices	1 Integer
TBD	Up link frequency set-up		TBD TBD
TBD	Down link frequency set-up		TBD TBD
TBD	Up link mode	0 TBD	1 Integer
TBD	Ranging tone		TBD TBD
TBD	Modulation Index	0 TBD	1 Integer
TBD	Attenuation Set-up		TBD TBD
TBD	Up link Carrier Acquisition Threshold		TBD TBD
TBD	Up link Command Acquisition Threshold		TBD TBD
TBD	Up link RF Power Measurement		TBD TBD
TBD	Down link RF Power Measurement		TBD TBD
TBD	Phase noise measurement		TBD TBD
TBD	Modulation index measurement		TBD TBD
TBD	Ranging Group Delay Measurement		TBD TBD
TBD	Ranging Amplitude Response		TBD TBD
TBD	Frequency Stability Measurement		TBD TBD
TBD			

Asynchronous RM (5,1)

Source Data Field			
Operational mnemonic	Operational description		Type
	Common RM parameter (refer to Table 1 page 54)		2 Integer

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4.6.3.4 RM TM/TC DFE Definition

[IFRQT-0590] To Be Completed

[Test]

Periodic RM (3,25)

Source Data Field				
Operational mnemonic	Operational description		Length (byte)	Type
	Common RM parameter (refer to Table 13 page 24)		<u>4</u>	<u>Integer</u>
TBD	TM Link	0 Bypass 1 RF	<u>1</u>	<u>Integer</u>
<u>TBD</u>	<u>TM Selection</u>	0 Nominal 1 Redundant	<u>1</u>	<u>Integer</u>
<u>TBD</u>	<u>TC Link</u>	0 Bypass 1 RF	<u>1</u>	<u>Integer</u>
<u>TBD</u>	<u>TC Selection (decoder selected)</u>	0 Nominal 1 Redundant	<u>1</u>	<u>Integer</u>
<u>TBD</u>	<u>Current Active Services</u>	0 AD mode 1 BD mode 2 BC mode	<u>1</u>	<u>Integer</u>
<u>TBD</u>	<u>MAP-ID Selection (Processor Module selected)</u>	0 Nominal 1 Redundant	<u>1</u>	<u>Integer</u>
<u>TBD</u>	<u>Squelch TC Selection</u>	0 Nominal 1 Redundant	<u>1</u>	<u>Integer</u>
<u>TBD</u>	<u>Squelch TC Status</u>	0 Disabled 1 Enabled	<u>1</u>	<u>Integer</u>
<u>TBD</u>	<u>TC provider</u>	0 CCS 1 NDIU	<u>1</u>	<u>Integer</u>
<u>TBD</u>	<u>TM to NDIU switch status</u>	0 ON 1 OFF	<u>1</u>	<u>Integer</u>
<u>TBD</u>	<u>TM frame Archiving status</u>	0 started 1 stopped	<u>1</u>	<u>Integer</u>
<u>TBD</u>	<u>TC CLTU Archiving status</u>	0 started 1 stopped	<u>1</u>	<u>Integer</u>
<u>TBD</u>	<u>TM Source Packet Archiving status</u>	0 started 1 stopped	<u>1</u>	<u>Integer</u>
<u>TBD</u>	<u>TC Source Packet Archiving status</u>	0 started 1 stopped	<u>1</u>	<u>Integer</u>
<u>TBD</u>	<u>COP-1 status</u>	0 Disabled 1 Enabled	<u>1</u>	<u>Integer</u>
<u>TBD</u>	<u>CLCW – Virtual Channel ID</u>	0 Nominal 1 Redundant	<u>6 bits</u>	<u>Binary</u>
<u>TBD</u>	<u>CLCW – “No RF Available” flag</u>	0 RF physical connection is available 1 RF physical connection is NOT available	<u>1 bit</u>	<u>Binary</u>
<u>TBD</u>	<u>CLCW – “No Bit Lock” flag</u>	0 At least one of the S/C demodulation units has achieved bit lock 1 None of the S/C demodulation units has achieved bit lock	<u>1 bit</u>	<u>Binary</u>
<u>TBD</u>	<u>CLCW –</u>	0 FARM-1 is in Lockout state	<u>1 bit</u>	<u>Binary</u>

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Source Data Field				
Operational mnemonic	Operational description		Length (byte)	Type
	"Lockout" flag	<u>1</u> FARM-1 is not in Lockout state		
<u>TBD</u>	CLCW – "Wait" flag	<u>0</u> FARM-1 is in Wait state <u>1</u> FARM-1 is not in Wait state	<u>1</u> bit	<u>Binary</u>
<u>TBD</u>	CLCW – "Retransmit" flag	<u>0</u> FARM-1 does not request retransmission of all type AD transfer frame <u>1</u> FARM-1 requests retransmission of type AD transfer frame	<u>1</u> bit	<u>Binary</u>
TBD	CLCW – FARM B counter		2 bits	Binary
TBD	CLCW – CR Value = V(R)		1	Integer
TBD	Frame Information – S/C ID		10 bits	Integer
TBD	Frame Information – Virtual Channel ID VC0 Real Time HK Telemetry VC1 Real Time Science Telemetry VC2 Dump Spacecraft and Science HK Telemetry VC3 Dump Science Telemetry VC4 Not Required VC5 Not Required VC6 Not Required VC7 Idle Frames		3 bits	Binary
TBD	Frame Information – Master Channel Frame Count		1	Integer
TBD	Frame Information – Virtual Channel Frame Count		1	Integer
TBD	Idle frame rate		1	Integer
<u>TBD</u>	<u>TC input queue free slots counter</u>		<u>TBD</u>	<u>TBD</u>
TBD				

Asynchronous RM (5,1)

Source Data Field				
Operational mnemonic	Operational description		Length (byte)	Type
	<u>Common RM parameter (refer to Table 1 page 54)</u>		<u>2</u>	<u>Integer</u>
TBD	TC buffer	0 OK (not full) 1 Not OK (full)	1	Integer
TBD	Reed Salomon Error number		1	Integer
TBD				

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4.6.3.5 RM Umbilical I/F Module Definition

[IFRQT-0600] To Be Completed

[Test]

Periodic RM (3,25)

Source Data Field			
Operational mnemonic	Operational description		Type
	Common RM parameter (refer to Table 13 page 24)		4 Integer
TBD	On-line relay status	0 Off-line 1 On-line	1 Integer
TBD	Main Bus Voltage		4 Integer
TBD	Main Bus Current		4 Integer
TBD	Over-voltage set-up		4 Integer
TBD	Over-current set-up		4 Integer
TBD	Battery voltage		4 Integer
TBD	Battery current		4 Integer
TBD	Battery temperature 1		4 Integer
TBD	Battery temperature 2		4 Integer
TBD	Separation switch 1 status		1 Integer
TBD	Separation switch 2 status		1 Integer
TBD	Reconfiguration module switch status		1 Integer
TBD	Thermistor 1 monitoring		4 Integer
TBD	Thermistor 2 monitoring		4 Integer

Asynchronous RM (5,1)

Source Data Field			
Operational mnemonic	Operational description		Type
	Common RM parameter (refer to Table 1 page 54)		2 Integer
TBD	Safety Loop Status	0 Disable 1 Enable	1 Integer

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4.6.3.6 RM BATSIM SCOE Definition

[IFRQT-0610] To Be Completed

[Test]

Periodic RM (3,25)

Source Data Field			
Operational mnemonic	Operational description	Length (byte)	Type
	Common RM parameter (refer to Table 13 page 24)	<u>4</u>	<u>Integer</u>
TBD	Battery simulation mode 0 nominal mode (sun presence) 1 discharge mode (eclipse) 2 charge mode (sun presence after eclipse) 3 Taper charge	1	Integer
TBD	Battery simulator voltage	4	Integer
TBD	Battery simulator current	4	Integer
TBD	Battery temperature 1	4	Integer
TBD	Battery temperature 2	4	Integer
TBD	Over-voltage set-up	4	Integer
TBD	Over-current set-up	4	Integer
TBD	Dynamic load voltage value	4	Integer
TBD	Dynamic load current value	4	Integer

Asynchronous RM (5,1)

Source Data Field			
Operational mnemonic	Operational description		Type
	Common RM parameter (refer to Table 1 page 54)		<u>2</u> <u>Integer</u>
<u>TBD</u>	<u>Safety Loop Status</u>	0 <u>Disable</u> 1 <u>Enable</u>	<u>1</u> <u>Integer</u>

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4.6.3.7 RM SAS SCOE Definition

[IFRQT-0620] To Be Completed

[Test]

Periodic RM (3,25)

Source Data Field			
Operational mnemonic	Operational description		Type
	Common RM parameter (refer to Table 13 page 24)		4 Integer
TBD	Battery simulation mode 0 nominal mode (sun presence) 1 discharge mode (eclipse) 2 charge mode (sun presence after eclipse) 3 Taper charge		1 Integer
TBD	Power supply 1 status	0 Off-line 1 On-line	1 Integer
TBD	Power supplies 2 to 29 status		Integer
TBD	Power supply 30 status	0 Off-line 1 On-line	1 Integer
TBD	Output Voltage of power supply 1		4 Integer
TBD	Output Voltage of power supplies 2 to 29		Integer
TBD	Output Voltage of power supply 30		4 Integer
TBD	Output Current of power supply 1		4 Integer
TBD	Output Current of power supplies 2 to 29		Integer
TBD	Output Current of power supply 30		4 Integer
TBD	Over-voltage set-up		4 Integer
TBD	Over-current set-up		4 Integer

Asynchronous RM (5,1)

Source Data Field			
Operational mnemonic	Operational description		Type
	Common RM parameter (refer to Table 1 page 54)		2 Integer
TBD	Safety Loop Status	0 Disable 1 Enable	1 Integer

4.6.3.8 RM BCE SCOE Definition

[IFRQT-0630] N/A (no interface with CCS)

[Test]

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4.6.3.9 RM LAUNCH POWER SUPPLY Definition

[IFRQT-0640] To Be Completed

[Test]

Periodic RM (3,25)

Source Data Field			
Operational mnemonic	Operational description		Type
	Common RM parameter (refer to Table 13 page 24)		4 Integer
TBD	On-line relay status	0 Off-line 1 On-line	1 Integer
TBD	Main Bus Voltage		4 Integer
TBD	Main Bus Current		4 Integer
TBD	Over-voltage set-up		4 Integer
TBD	Over-current set-up		4 Integer
TBD	Battery voltage		4 Integer
TBD	Battery current		4 Integer
TBD	Battery temperature 1		4 Integer
TBD	Battery temperature 2		4 Integer
TBD	Reconfiguration module switch status		1 Integer
TBD	Thermistor 1 monitoring		4 Integer
TBD	Thermistor 2 monitoring		4 Integer
TBD	Battery charger voltage		4 Integer
TBD	Battery charger current		4 Integer
TBD	Battery charger temperature 1		4 Integer
TBD	Battery charger temperature 2		4 Integer
TBD	Over-voltage set-up		4 Integer
TBD	Over-current set-up		4 Integer
TBD	Dynamic load voltage value		4 Integer
TBD	Dynamic load current value		4 Integer

Asynchronous RM (5,1)

Source Data Field			
Operational mnemonic	Operational description		Type
	Common RM parameter (refer to Table 1 page 54)		2 Integer

4.6.3.10 RM SIS SCOE Definition

[IFRQT-0650]

[Test]

Deleted

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4.6.3.11 RM PLM SCOE Definition

[IFRQT-0660] To Be Completed

[Test]

Periodic RM (3,25)

Source Data Field			
Operational mnemonic	Operational description		Type
	Common RM parameter (refer to Table 13 page 24)		4 Integer
TBD	On-line relay status	0 Off-line 1 On-line	1 Integer
TBD	Main Bus Voltage		4 Integer
TBD	Main Bus Current		4 Integer
TBD	Over-voltage set-up		4 Integer
TBD	Over-current set-up		4 Integer
TBD	LCL 1 Current set-up		4 Integer
TBD	Status Line LCL 1 (ON/OFF/TRIP)		4 Integer
TBD	LCL 2 Current set-up		4 Integer
TBD	Status Line LCL 2 (ON/OFF/TRIP)		4 Integer
TBD	LCL 3 Current set-up		4 Integer
TBD	Status Line LCL 3 (ON/OFF/TRIP)		4 Integer
TBD	LCL 4 Current set-up		4 Integer
TBD	Status Line LCL 4 (ON/OFF/TRIP)		4 Integer
TBD	OVP Threshold		4 Integer
TBD	Nominal/Redundant line status		4 Integer

Asynchronous RM (5,1)

Source Data Field			
Operational mnemonic	Operational description		Type
	Common RM parameter (refer to Table 1 page 54)		2 Integer

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4.6.3.12 RM Herschel Cryo SCOE Definition

[IFRQT-0670] To Be Completed

[Test]

Periodic RM (3,25)

Source Data Field			
Operational mnemonic	Operational description	Length (byte)	Type
	Common RM parameter (refer to Table 13 page 24)	<u>4</u>	<u>Integer</u>
TBD	Main Bus Voltage	4	Integer
TBD	Main Bus Current	4	Integer
TBD	Over-voltage set-up	4	Integer
TBD	Over-current set-up	4	Integer
TBD	Temperature 1 C100 monitoring	4	Integer
TBD	Temperature 2 C100 monitoring	4	Integer
TBD	Temperature 1 Pt1000 monitoring	4	Integer
TBD	Temperature 2 Pt1000 monitoring	4	Integer
TBD	Pressure monitoring	4	Integer
TBD	Liquid level 1 monitoring	4	Integer
TBD	Liquid level 2 monitoring	4	Integer
TBD	Valve 1 status monitoring	4	Integer
TBD	Valve 2 status monitoring	4	Integer
TBD	Valve 3 status monitoring	4	Integer
TBD	Valve 4 status monitoring	4	Integer
TBD	Heater status monitoring	4	Integer
TBD	CVSE 1 Monitoring	4	Integer
TBD	CVSE 2 to 11 Monitoring		Integer
TBD	CVSE 12 Monitoring	4	Integer
	...		

Asynchronous RM (5,1)

Source Data Field			
Operational mnemonic	Operational description	Length (byte)	Type
	Common RM parameter (refer to Table 1 page 54)	<u>2</u>	<u>Integer</u>

4.6.3.13 RM Planck PLM SCOE Definition

[IFRQT-0680] Deleted

[Test]

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4.6.3.14 RM Planck Sorption SCOE Definition

[IFRQT-0690] Deleted [Test]

4.6.3.15 RM CDMU DFE Definition

[IFRQT-0700] To Be Completed [Test]

Periodic RM (3,25)

Source Data Field			
Operational mnemonic	Operational description		Type
	Common RM parameter (refer to Table 13 page 24)		<u>4</u> Integer
TBD	1553 Bus status	0 Nominal Bus active 1 Redundant Bus active	<u>1</u> Integer
TBD	RT address simulated		4 Integer
TBD	1553 profile trapped		4 Integer
TBD	Analogue input lines monitoring		4 Integer
	...		
TBD	Thermistors input lines monitoring		4 Integer
	...		
TBD	Cryo temperature input lines monitoring		4 Integer
	...		
TBD	Digital relay status		4 Integer
	...		
TBD	Digital Bi-level status		4 Integer
	...		
TBD	Status Line acquisition		4 Integer
	...		
TBD	Digital serial acquisition		4 Integer
	...		

Asynchronous RM (5,1)

Source Data Field			
Operational mnemonic	Operational description		Type
	Common RM parameter (refer to Table 1 page 54)		<u>2</u> Integer
TBD	1553 Bus status	0 Nominal Bus active 1 Redundant Bus active	<u>1</u> Integer

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4.6.3.16 RM 1553 Bus Probe Definition

[IFRQT-0710]

[Test]

Definition integrated in CDMU DFE and CDMU SCOE RM definition

4.6.3.17 RM Quick Load I/F Definition

[IFRQT-0720] N/A

[Test]

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4.6.4 COMMUNICATION VIA IS LAN

4.6.4.1 RM Instrument Stimuli SCOE Definition

[IFRQT-0730] Deleted [Test]

4.6.4.2 RM HFI EGSE Definition

[IFRQT-0740] [Test]

Periodic RM (3,25)

Source Data Field			
<u>Operational mnemonic</u>	<u>Operational description</u>	<u>Length (byte)</u>	<u>Type</u>
	Common RM parameter (refer to Table 13 page 24) TBC	4	Integer
TBC/TBD	TBC/TBD	TBC/TBD	TBC/TBD

Asynchronous RM (5,1)

Source Data Field			
<u>Operational mnemonic</u>	<u>Operational description</u>	<u>Length (byte)</u>	<u>Type</u>
	Common RM parameter (refer to Table 1 page 54) TBC	2	Integer
TBC/TBD	TBC/TBD	TBC/TBD	TBC/TBD

4.6.4.3 RM LFI EGSE Definition

[IFRQT-0750] [Test]

Periodic RM (3,25)

Source Data Field			
<u>Operational mnemonic</u>	<u>Operational description</u>	<u>Length (byte)</u>	<u>Type</u>
	Common RM parameter (refer to Table 13 page 24) TBC	4	Integer
TBC/TBD	TBC/TBD	TBC/TBD	TBC/TBD

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Asynchronous RM (5,1)

<u>Source Data Field</u>			
<u>Operational mnemonic</u>	<u>Operational description</u>	<u>Length (byte)</u>	<u>Type</u>
	Common RM parameter (refer to Table 1 page 54) TBC	2	Integer
<u>TBC/TBD</u>	<u>TBC/TBD</u>	<u>TBC/TBD</u>	<u>TBC/TBD</u>

4.6.4.4 RM HCSS SCOE Definition

[IFRQT-0760] Deleted

[Test]

4.6.4.5 RM HIFI EGSE Definition

[IFRQT-0770]

[Test]

Periodic RM (3,25)

<u>Source Data Field</u>			
<u>Operational mnemonic</u>	<u>Operational description</u>	<u>Length (byte)</u>	<u>Type</u>
	Common RM parameter (refer to Table 13 page 24) TBC	4	Integer
<u>TBC/TBD</u>	<u>TBC/TBD</u>	<u>TBC/TBD</u>	<u>TBC/TBD</u>

Asynchronous RM (5,1)

<u>Source Data Field</u>			
<u>Operational mnemonic</u>	<u>Operational description</u>	<u>Length (byte)</u>	<u>Type</u>
	Common RM parameter (refer to Table 1 page 54) TBC	2	Integer
<u>TBC/TBD</u>	<u>TBC/TBD</u>	<u>TBC/TBD</u>	<u>TBC/TBD</u>

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4.6.4.6 RM PACS EGSE Definition

[IFRQT-0780]

[Test]

Periodic RM (3,25)

Source Data Field			
<u>Operational mnemonic</u>	<u>Operational description</u>	<u>Length (byte)</u>	<u>Type</u>
	Common RM parameter (refer to Table 13 page 24) TBC	4	Integer
<u>TBC/TBD</u>	<u>TBC/TBD</u>	<u>TBC/TBD</u>	<u>TBC/TBD</u>

Asynchronous RM (5,1)

Source Data Field			
<u>Operational mnemonic</u>	<u>Operational description</u>	<u>Length (byte)</u>	<u>Type</u>
	Common RM parameter (refer to Table 1 page 54) TBC	2	Integer
<u>TBC/TBD</u>	<u>TBC/TBD</u>	<u>TBC/TBD</u>	<u>TBC/TBD</u>

4.6.4.7 RM SPIRE EGSE Definition

[IFRQT-0790]

[Test]

Periodic RM (3,25)

Source Data Field			
<u>Operational mnemonic</u>	<u>Operational description</u>	<u>Length (byte)</u>	<u>Type</u>
	Common RM parameter (refer to Table 13 page 24) TBC	4	Integer
<u>TBC/TBD</u>	<u>TBC/TBD</u>	<u>TBC/TBD</u>	<u>TBC/TBD</u>

Asynchronous RM (5,1)

Source Data Field			
<u>Operational mnemonic</u>	<u>Operational description</u>	<u>Length (byte)</u>	<u>Type</u>
	Common RM parameter (refer to Table 1 page 54) TBC	2	Integer
<u>TBC/TBD</u>	<u>TBC/TBD</u>	<u>TBC/TBD</u>	<u>TBC/TBD</u>

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4.6.5 COMMUNICATION VIA www LAN

4.6.5.1 RM www.Server Definition

[IFRQT-0800] Deleted

[Test]

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4.7 MONITORING FLOW – Acknowledge Message Packets (ACKRC)

Source	SCOE/DFE
Destination	CCS
Rate	Non periodic
LAN	SCOE/DFE LAN

[IFRQT-0801]

[Analysis]

Each SCOE/DFE shall send back to CCS an Acknowledgement message each time the SCOE/DFE received a Remote Command

[IFRQT-0802]

[Analysis]

Once the complete PIPE Message is accepted, SCOE application software shall check the coherency of the RC Packet embedded inside PIPE Body .

[IFRQT-0802-1]

[Analysis]

The validation for acceptance of RC packets depends on RC packet content and on SCOE/DFE configuration

[IFRQT-0802-2]

[Analysis]

The verification of RC packets contents shall follow the hierarchy define hereafter :

1. Check Packet Length value coherency
2. Verify consistency of APID

[IFRQT-0802-3]

[Analysis]

The verification of SCOE/DFE configuration shall follow the hierarchy define hereafter :

1. Check SCOE/DFE state (**On-line**/Off-line)
2. Check SCOE/DFE mode (**Remote**/local)

[IFRQT-0802-4]

[Analysis]

If all the previous verification are positive, the acceptance message is return as Successful.

If at least one of the previous verification is negative, the acceptance message is return as Failure

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4.7.1 Remote Command Acceptance report – Success (1,1)

[IFRQT-0803]

[Analysis]

For all RC received by a SCOE/DFE, a Command Acceptance Report shall be generated immediately with the following format in case of acceptance :

PIPE structure	Field Description	Size	Values	TYPE
<u>Header</u>	<u>Refer to Table 3 page 26 with :</u> <u>Message ID = Refer to Table 11 page 33</u> <u>VCID = 0x00</u> <u>Request ID = Same as the original RC initiated by CCS</u> <u>Remaining length = 0x0016</u>			
<u>Body</u>	<u>Source Packet Header</u>		<u>Refer to Table 5 page 28 with :</u> <u>Packet length = 0x0B</u>	
	<u>Data field header</u>		<u>Refer to Table 6 page 28 with :</u> <u>Packet Type = 0x01</u> <u>Packet sub-type = 0x01</u>	
	<u>Source data</u>		None	
	<u>RC Packet Identifier</u>	<u>2 bytes</u>	<u>Original RC Packet ID</u>	<u>integer</u>
	<u>RC Packet Sequence Control</u>	<u>2 bytes</u>	<u>Original RC Sequence Control</u>	<u>integer</u>
	Packet error control	2 bytes	Not Used	integer

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4.7.2 Remote Command Acceptance report – Failure (1,2)

[IFRQT-0804]

[Analysis]

For all RC received by a SCOE/DFE, a Command Acceptance Report shall be generated immediately with the following format in case of rejection :

PIPE structure	Field Description	Size	Values	TYPE
Header	<u>Refer to Table 3 page 26 with :</u> <u>Message ID = Refer to Table 11 page 33</u> <u>VCID = 0x00</u> <u>Request ID = Same as the original RC initiated by CCS</u>			
Body	<u>Source Packet Header</u>	<u>Refer to Table 5 page 28</u>		
	<u>Data field header</u>	<u>Refer to Table 6 page 28 with :</u> <u>Packet Type = 0x01</u> <u>Packet sub-type = 0x02</u>		
	Source data			
	<u>RC Packet Identifier</u>	<u>2 bytes</u>	<u>Original RC Packet ID</u>	<u>integer</u>
	<u>RC Packet Sequence Control</u>	<u>2 bytes</u>	<u>Original RC Sequence Control</u>	<u>integer</u>
	<u>Failure code *</u>	<u>2 bytes</u>	<u>Reason for failure of acceptance</u>	<u>integer</u>
	<u>Packet error control</u>	<u>2 bytes</u>	<u>Not Used</u>	<u>integer</u>

*

Failure code	Signification
<u>0</u>	<u>RC not authorised – local mode</u>
<u>1</u>	<u>RC not authorised– Off-line</u>
<u>2</u>	<u>TC input buffer full</u>
<u>3</u>	<u>Illegal APID</u>
<u>4</u>	<u>Illegal Data Field Header</u>
<u>5</u>	<u>Illegal packet length</u>
<u>6</u>	<u>Timeout reception</u>
<u>7</u>	<u>Port disconnection while message reading</u>

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4.7.3 Remote Command Execution Report - Started (1, 3)

[IFRQT-0805]

[Analysis]

Deleted

4.7.4 Remote Command Execution report – Progress (1,5)

[IFRQT-0806]

[Analysis]

Deleted

4.7.5 Remote Command Execution Report - Completed (1, 7)

[IFRQT-0807]

[Analysis]

Deleted

4.7.6 Remote Command Execution report – Failure (1,8)

[IFRQT-0808]

[Analysis]

Deleted

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4.8 MONITORING FLOW – Acknowledge Message for TC (ACKTC)

Source	DFE
Destination	CCS
Rate	Non periodic
LAN	SCOE/DFE LAN

[IFRQT-0808-1]

[Analysis]

DFE shall send back to CCS an Acknowledgement message each time the DFE received a TC

[IFRQT-0808-1.1]

[Analysis]

Once the complete PIPE Message is accepted, DFE application software shall check the coherency of the TC Packet embedded inside PIPE Body .

[IFRQT-0808-1.2]

[Analysis]

The validation for acceptance of TC packets depends on TC packet content and on DFE configuration

[IFRQT-0808-1.3]

[Analysis]

The verification of TC packets contents shall follow the hierarchy define hereafter :

1. Check Packet Length value coherency
2. Verify CRC field value

[IFRQT-0808-1.4]

[Analysis]

The verification of DFE configuration shall follow the hierarchy define hereafter :

1. Check DFE state (**On-line**/Off-line)
2. Check DFE mode (**Remote**/local)
3. Verify TC against dangerous list
4. Verify buffer state (**Not full**/Full)
5. Verify if NDIU is not used

[IFRQT-0808-1.5]

[Analysis]

If all the previous verification are positive, the acceptance message is return as Successful.
If at least one of the previous verification is negative, the acceptance message is return as Failure

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4.8.1 Telecommand Acceptance report – Success (1,1)

[IFRQT-0808-
2]

[Analysis]

For all TC received by a DFE, a Command Acceptance Report shall be generated immediately with the following format in case of acceptance (TC packet being queued):

PIPE structure	Field Description	Size	Values	TYPE
<u>Header</u>	Refer to Table 3 page 26 with : Message ID = Refer to Table 11 page 33 VCID = 0x00 Request ID = Same as the original TC initiated by CCS Remaining length = 0x0016			
<u>Body</u>	<u>Source Packet Header</u>	Refer to Table 5 page 28 with : Packet length = 0x0B		
	<u>Data field header</u>	Refer to Table 6 page 28with : Packet Type = 0x01 Packet sub-type = 0x01		
	<u>Source data</u>			
	<u>TC Packet Identifier</u>	2 bytes	<u>Original TC Packet ID</u>	<u>integer</u>
	<u>TC Packet Sequence Control</u>	2 bytes	<u>Original TC Sequence Control</u>	<u>integer</u>
	Packet error control	2 bytes	Not Used	integer

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4.8.2 Telecommand Acceptance report – Failure (1,2)

[IFRQT-0808-
3]

[Analysis]

For all TC received by DFE, a Command Acceptance Report shall be generated immediately with the following format in case of rejection :

PIPE structure	Field Description	Size	Values	TYPE
Header	Refer to Table 3 page 26 with : Message ID = Refer to Table 11 page 33 VCID = 0x00 Request ID = Same as the original TC initiated by CCS			
Body	Source Packet Header	Refer to Table 5 page 28		
	Data field header	Refer to Table 6 page 28 with : Packet Type = 0x01 Packet sub-type = 0x02		
	Source data			
	TC Packet Identifier	2 bytes	Original TC Packet ID	integer
	TC Packet Sequence Control	2 bytes	Original TC Sequence Control	integer
	Failure code *	2 bytes	Reason for failure of acceptance	integer
	Packet error control	2 bytes	Not Used	integer

*

Failure code	Signification
0	TC not authorised – local mode
1	TC not authorised – NDIU in charge
2	TC not authorised – Off-line
3	TC not authorised – TC contained in the dangerous list
4	TC input buffer full
5	Illegal or inconsistent packet length
6	Timeout reception
7	Port disconnection while message reading
8	Incorrect checksum
9	TC Encoder not ready

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4.9 MONITORING FLOW – TC Echo

Source ↓ <u>Destination</u>	DFE ↓ <u>CCS</u>	CCS ↓ <u>IS station</u>
Rate	Non periodic	Non periodic
LAN	SCOE/DFE LAN	IS LAN

[IFRQT-0809]

[Analysis]

Upon reception of a Telecommand request issued by the CCS itself and when the TC request remotely come from the NDIU. DFE shall deliver the TC Echo packet with the following format :

PIPE structure	Field Description	Size	Values	TYPE
<u>Header</u>	<u>Refer to Table 3 page 26 with :</u> <u>Message ID = Refer to Table 11 page 33</u> <u>VCID = 0x00</u> <u>Request ID = Forced to 0x00</u>			
Body	TC Packet	variable	variable	

Note: the same TC Echo will be sent from 0 to n times depending on TC execution.

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4.10 MONITORING FLOW – TC Report

Source	DFE
<u>Destination</u>	<u>CCS</u>
Rate	Non periodic
LAN	SCOE/DFE LAN

[IFRQT-0809-
1]

[Analysis]

Upon reception of a Telecommand request issued by the CCS itself and when the TC request remotely come from the NDIU, TM/TC DFE shall deliver the TC Report packet according to its current mode :

1. If TM/TC DFE in AD mode : TC Report shall be sent after CLCW check. (this means On-board TC acceptance)
2. If TM/TC DFE in BD mode, TC Report shall be sent after TC Acceptance Report (ACKTC) →this means DFE acceptance

Note: TC Report is generated asynchronously from any TC Echo

PIPE structure	Field Description	Size	Values	TYPE
<u>Header</u>	<u>Refer to Table 3 page 26 with :</u> <u>Message ID = Refer to Table 11 page 33</u> <u>VCID = 0x00</u> <u>Request ID = Same as the original TC initiated by CCS</u>			
<u>Body</u>	<u>Source Packet Header</u>	<u>Refer to Table 5 page 28'</u>		
	<u>Data field header</u>	<u>Refer to Table 6 page 28 with :</u> <u>Packet Type/ sub-type = [5,1] for success</u> <u>Packet Type / sub-type = [5,4] for transmission failure</u>		
	<u>Source data</u>			
	<u>Event ID</u>	<u>2 bytes</u>	<u>DFE supplier specific event code</u>	
	<u>Request ID</u>	<u>4 bytes</u>	<u>Same as the original TC</u>	
	<u>Result code</u>	<u>1 bytes</u>	<u>Rejected/Failed/Succeeded</u>	
	<u>Priority</u>	<u>1 bytes</u>	<u>Normal/High</u>	
	<u>Protocol</u>	<u>1 bytes</u>	<u>AD/BD service mode used for this TC</u>	
	<u>VCID</u>	<u>1 Bytes</u>	<u>Virtual Channel used</u>	
	<u>MAPID</u>	<u>1 Bytes</u>	<u>MAP ID used</u>	
	<u>Retransmits</u>	<u>1 bytes</u>	<u>0..255 (for AD mode)</u>	
	<u>Time stamp</u>	<u>8 bytes</u>	<u>CUC time code for final confirmation</u>	
	<u>TC-ID</u>	<u>6 bytes</u>	<u>Copy of original TC packet header</u>	
	Packet error control	2 bytes	Not Used	integer

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4.11 MONITORING FLOW – RM Alive Packet

Source	SCOE/DFE/IS
Destination	CCS
Rate	<u>1 packet every 60 seconds for all SCOE/DFE/IS</u>
LAN	SCOE/DFE LAN
	<u>IS LAN</u>

[IFRQT-0809-
2]

[Analysis]

Each SCOE/DFE/IS shall send to the CCS at least one SCOE HK status packet or an RM “Alive Packet” every 60 seconds with the following format:

PIPE structure	Field Description	Size	Values	TYPE
<u>Header</u>	<u>Refer to Table 3 page 26 with :</u> <u>Message ID = Refer to Table 11 page 33</u> <u>VCID = 0x00</u> <u>Request ID = 0x0000 0000</u> <u>Remaining length = 0x0016</u>			
<u>Body</u>	<u>Source Packet Header</u>		<u>Refer to Table 5 page 28 with :</u> <u>Packet length = 0x0B</u>	
	<u>Data field header</u>		<u>Refer to Table 6 page 28 with :</u> <u>Packet Type = 0x00</u> <u>Packet sub-type = 0x00</u>	
	<u>Source data</u>		<u>None</u>	
	Packet error control	2 bytes	Not Used	integer

The RM Alive Packet shall not be archived by CCS. It is just used in order to check if a SCOE (server) is still capable of correctly operating the PIPE Protocol.

The information contained as part of the data field within this message is not used for any further processing.

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4.12 INTERFACES REQUIREMENTS

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4.12.1 GENERIC INTERFACE NAME

EGSE	Item	APID		Host Name	Main EGSE LAN 192.168.200.xxx	SCOE/DFE LAN 192.168.201.xxx	IS LAN 192.168.202.xxx	NDIU LAN TBD.TBD.TBD.xxx	AIT Facility LLAN TBD.TBD.TBD.xxx
		Dec	Hex						
CCSy	Master Test Processor	2016	7E0	HPy-S	TBD	TBD	TBD		
	Data Server			HPy-D	TBD				
	Work Station 1			HPWSy1	TBD				
	...			...	TBD				
	Work Station 8			HPWSy8	TBD				
	B&W Printer			HPBWy1	TBD				
	B&W Printer			HPBWy2	TBD				
	Color Printer			HPCLy1	TBD				
	www server			HPNWPCy	TBD				TBD
<u>CDMU SCOE</u>	<u>Work Station</u>	<u>2017</u>	<u>7E1</u>	<u>TBD</u>		<u>TBD</u>			
<u>ACMS SCOE</u>	<u>Work Station</u>	<u>2018</u>	<u>7E2</u>	<u>TBD</u>		<u>TBD</u>			
<u>TT&C SCOE</u>	<u>Work Station</u>	<u>2019</u>	<u>7E3</u>	<u>TBD</u>		<u>TBD</u>			
TM/TC DFE	Work Station	2020	7E4	TBD		TBD		TBD	
<u>Umbilical IF module</u>	<u>Work Station</u>	<u>2021</u>	<u>7E5</u>	<u>TBD</u>		<u>TBD</u>			
SAS	Work Station	2022	7E6	TBD		TBD			
<u>BATSIM</u>	<u>Work Station</u>	<u>2023</u>	<u>7E7</u>	<u>TBD</u>		<u>TBD</u>			
LPS	Work Station	2024	7E8	TBD		TBD			
<u>PLM SCOE</u>	<u>Work Station</u>	<u>2025</u>	<u>7E9</u>	<u>TBD</u>		<u>TBD</u>			
<u>H CRYO SCOE</u>	<u>Work Station</u>	<u>2026</u>	<u>7EA</u>	<u>TBD</u>		<u>TBD</u>			
<u>CDMU DFE</u>	<u>Work Station</u>	<u>2028</u>	<u>7EC</u>	<u>TBD</u>		<u>TBD</u>			
<u>Quick Load</u>	<u>Quick Load</u>			<u>TBD</u>		<u>TBD</u>			
NDIU	NDIU			TBD				TBD	
<u>HFI EGSE</u>	<u>HFI EGSE</u>	<u>2040</u>	<u>7F8</u>				<u>TBD</u>		
<u>LFI EGSE</u>	<u>LFI EGSE</u>	<u>2041</u>	<u>7F9</u>				<u>TBD</u>		
<u>HIFI EGSE</u>	<u>HIFI EGSE</u>	<u>2042</u>	<u>7FA</u>				<u>TBD</u>		
<u>PACS EGSE</u>	<u>PACS EGSE</u>	<u>2043</u>	<u>7FB</u>				<u>TBD</u>		
<u>SPIRE EGSE</u>	<u>SPIRE EGSE</u>	<u>2044</u>	<u>7FC</u>				<u>TBD</u>		

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Table 15 : Generic Interface Name

4.12.2 DATABASE

[IFRQT-0810] **[Analysis]**

The sub-contractor responsible of each SCOE/DFE shall be in charge to provide all the information needed to define inside HPSDB all parameters constituting RM packets and RC Packets.

[IFRQT-0820] **[Analysis]**

The files that will be used to populate the HPSDB with SCOE/DFE parameters shall have the following format (TBD) and shall be compatible with HPSDB [AD2]
(They will be used to update HPSDB)

4.12.3 DATE/TIME

[IFRQT-0830] **[Analysis]**

The date/time synchronisation between all EGSE's item shall be done by using standard service providing by NTP (Network Time Protocol)

[IFRQT-0840] **[Test]**

CCS defined as server and is requested to provide the time to which the SCOE/DFE/IS synchronises.

4.12.4 Quick loading function

[IFRQT-0850] **[Analysis]**

TBW

4.12.5 Interface TM/TC DFE ↔ NDIU

[IFRQT-0860] **[Analysis]**

Two interfaces shall be provided compatible with the ESA provided Network Data Interconnect Unit (NDIU) for TM (frame) and TC (CLTU) interface between the satellites and the Mission Operation Centre (MOC).
Refer to [AD4]

4.12.6 Interface Instrument Stimuli SCOE ↔ Herschel Satellite

[IFRQT-0870] **[Analysis]**

TBD

4.12.7 *Interface Instrument Stimuli SCOE ↔ Planck Satellite*

[IFRQT-0880] Deleted **[Analysis]**

4.12.8 *Performance*

[IFRQT-0882] **[Analysis]**

The interface for the Telemetry packets delivery from the TM/TC DFE to the CCS shall support the maximum data rate of 150 Kbps (TBC) plus overhead for message header/trailer.

[IFRQT-0884] **[Analysis]**

The interface for the Telecommand packets delivery from the CCS to the TM/TC DFE shall support the maximum data rate of 4Kbps plus overhead for message header/trailer.

[IFRQT-0886] **[Analysis]**

The interface for the Telemetry packets delivery from the CCS to the Instrument Stations shall support the maximum data rate of up to 150 Kbps for each connected Instrument Station plus overhead for message header/trailer.

4.12.9 *File transfer*

[IFRQT-0887] **[Analysis]**

All SCOE/DFE having a controller shall support NFS (Network File System) and/or FTP (File Transfer Protocol) to allow direct access from the CCS into the hard disk of the controller for file transfer purposes.

4.12.10 *Naming Convention Rules for EGSE items*

The aim of this paragraph is to fix the naming rules of all commands and parameters necessary to fulfil the communication between EGSE items

[IFRQT-0888]

[Analysis]

TBD

4.12.11 *OBSM Files*

[IFRQT-0889]

[Analysis]

OBSM Files Format is define in [RD13] document (SCOS-2000 OBSM External Interfaces Control Document)

5 EGSE EXTERNAL INTERFACE REQUIREMENTS → TBW

This chapter will define all electrical Harness Interfaces between EGSE and SVM / PLM / S/C, and between all EGSE's item in all the different configurations.

[IFRQT-0890]

[Analysis]

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Table below resumes all the H/P EGSE interfaces :

EGSE		Internal Interface (communication protocol)					External Interface (Hardware)			
		NDIU Lite NDIU LAN	CCS SCOPE/DFE LAN			IS LAN	EGSE		S/C	
			WWW LAN	CCS → SCOPE (RC)	SCOPE → CCS (RM)		TM/TC DFE	NDIU	Herschel	Planck
Planck IS	HFI IS EGSE									
	LFI IS EGSE									
Herschel IS	HCSS IS EGSE					4.6.4.4 (RM)				
	HIFI IS EGSE					4.6.4.5 (RM)				
	PACS IS EGSE					4.6.4.6 (RM)				
	SPIRE IS EGSE					4.6.4.7 (RM)				
Instr Stim SCOPE	Instr Stim					4.6.4.1 (RM)			5.1.10	
TT&C * same unit	TM/TC DFE*	AD 4		4.3.1.5 4.2 (TC)	4.6.3.4 4.4 (TM)			5.1.4		
	TT&C SCOPE RF			4.3.1.4	4.6.3.3		5.1.4		5.1.3	5.1.3
	TM/TC DFE*			4.3.1.5 4.2 (TC)	4.6.3.4 4.4 (TM)					
CDMU SCOPE	CDMU SCOPE			4.3.1.2	4.6.3.1				5.1.1	5.1.1
	CDMU Quick Load			4.3.1.18	4.6.3.17				5.1.1.1	5.1.1.1
ACMS SCOPE	ACMS SCOPE			4.3.1.3	4.6.3.2				5.1.2	5.1.2
	Optical Stim			4.3.1.3.2	4.6.3.2.2				5.1.2.1	5.1.2.1
	Stim Feedbk			4.3.1.3.3	4.6.3.2.3				5.1.2.2	5.1.2.2
Power SCOPE	Umbilical I/F			4.3.1.6	4.6.3.5		5.1.4		5.1.5	5.1.5
	Battery Sim			4.3.1.7	4.6.3.6				5.1.6	5.1.6
	SA Sim			4.3.1.8	4.6.3.7				5.1.7	5.1.7
	BCE SCOPE			4.3.1.9	4.6.3.8				5.1.8	5.1.8

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EGSE		Internal Interface (communication protocol)					External Interface (Hardware)			
		NDIU Lite NDIU LAN	www LAN	CCS SCOE/DFE LAN		IS LAN	EGSE		S/C	
				CCS → SCOE (RC)	SCOE → CCS (RM)		TM/TC DFE	NDIU	Herschel	Planck
	LPS			4.3.1.10	4.6.3.9		5.1.4		5.1.9	5.1.9
PLM	PLM SCOE								5.1.10	5.1.10
Herschel	H-Cryo SCOE			4.3.1.13	4.6.3.12				5.1.11	
MIL 1553B	CDMU DFE			4.3.1.16	4.6.3.15				5.1.12	5.1.12
	1553 Bus prob			4.3.1.17	4.6.3.16				5.1.13	5.1.13

Table 16 : H/P EGSE Interfaces

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5.1 EGSE to S/C INTERFACES

5.1.1 CDMU SCOE

5.1.1.1 Quick SW Loading I/F

[IFRQT-0900] [Analysis]

CDMU SCOE shall interface with SVM for quick loading of the EEPROM of both CDMU Processor Modules with the electrical characteristics according to **TBD**

5.1.1.2 MIL-STD-1553B I/F

[IFRQT-0910] [Analysis]

Refer to [AD7] §6.8.3

5.1.1.3 Time pulse

[IFRQT-0915] [Analysis]

Refer to [AD7] §6.8.1.4

5.1.2 ACMS SCOE

5.1.2.1 Optical Stimuli Commands

[IFRQT-0920] [Analysis]

TBD

5.1.2.2 Stimuli Feedback Commands

[IFRQT-0930] [Analysis]

TBD

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5.1.3 TT&C SCOE RF

[IFRQT-0940]

[Analysis]

TT&C SCOE shall interface with SVM with the electrical characteristics according to **TBD**

5.1.4 POWER SCOE

[IFRQT-0950]

[Analysis]

Power SCOE (Umbilical I/F part) shall interface with the SVM for :

5.1.4.1 Power System I/F

Refer to [AD7] §6.7

5.1.4.2 PCDU I/F

Parameter	Herschel/Planck Limit(at SVM interface)
Battery support eclipse	- 0 to 28 Volts - 0 to 25 Amps - PCDU to provide protection from external s/c or supply reversal
Power bus Support in Sunlight Mode	- 0 to 31 Volts - 0 to 60 Amps - PCDU to provide protection from external s/c or supply reversal
Battery monitor lines	- 2 voltage monitor lines 0 to 28 volts and 2 returns - 100kΩ line protection resistors in series with the positive lines.
Bus monitor lines	- 2 voltage monitor lines 0 to 28 volts and 2 returns - 100kΩ line protection resistors in series with the positive lines.

5.1.4.3 Telecommand I/F

[IFRQT-0960]

[Analysis]

2 TC interfaces shall be provided with the electrical characteristics according to [AD7] §6.8.1.4

[IFRQT-0970]

[Analysis]

Each TC Interface shall comprise the following signals :

- TC Clock : Telecommand Clock signal input
- TC Data : Telecommand Data signal input
- TC Active : Telecommand Quality signal input

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5.1.4.4 Telemetry I/F

[IFRQT-0980]

[Analysis]

2 TM interfaces shall be provided with the electrical characteristics according to [AD7]
§6.8.1.4

[IFRQT-0990]

[Analysis]

Each TM Interface shall comprise the following signals :

- TM Clock : Telemetry Clock signal output
- TM Data : Telemetry Data signal output

5.1.5 BATSIM SCOE

[IFRQT-1000]

[Analysis]

BATSIM SCOE shall interface with the SVM with the following electrical characteristics :

Parameter	Herschel/Planck Limit
Minimum EOD voltage Veodmin	15 (V)
Nominal EOD voltage Veod	18 (V)
Nominal EOC voltage Veoc	25.2 (V)
Maximum EOC voltage Veocmax	27.7 (V) (tbc)
Maximum harness voltage drop outside the PCDU, based on GDIR 1% requirement applied at EOD	0.15
Maximum harness voltage drop, based on discharge criteria and a charge rate of 6 Amps	0.06 (V)
The maximum allowable transient current drawn by the PCDU, under any conditions, shall not exceed	120(A) (1 ms max) 35 (A) (1 minute max)

5.1.6 SAS SCOE

[IFRQT-1010]

[Analysis]

SAS SCOE shall interface with the SVM with the following electrical characteristics :

Positive array connection	- 0 to 60 Volts (section open circuit voltage) - 0 to 3 A D.C. Max. BOL, 2A Max. EOL. (for analysis purpose a nominal section current in sunlight can be assumed to be 2 to 3A). - Redundant connector pins to guard against open circuit failure.
Negative array connection	- 0 volts (reference ground is the power bus capacitor). - Redundant connector pins to guard against open circuit failure.
Section Capacitance Cp (mF) max	5 (tbc)

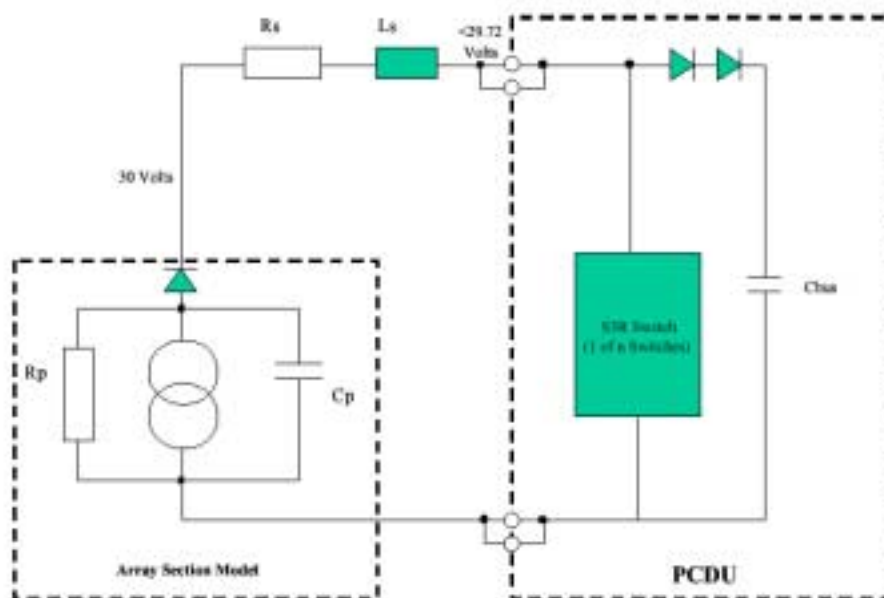
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Section Inductance L_s (mH) max	10
Section Inductance L_s (mH) min	1
Effective Series Resistance R_s (W)	0.09 (tbc)
Effective Parallel Resistance R_p (W)	203 (tbc)



Equivalent Circuit (tbc):

5.1.7 BCE SCOE

[IFRQT-1020]

[Analysis]

BCE SCOE shall interface with the SVM with the following electrical characteristics :

Parameter	Herschel/Planck Limit
Minimum EOD voltage V_{eodmin}	15 (V)
Nominal EOD voltage V_{eod}	18 (V)
Nominal EOC voltage V_{eoc}	25.2 (V)
Maximum EOC voltage V_{eocmax}	27.7 (V) (tbc)
Maximum harness voltage drop outside the PCDU, based on GDIR 1% requirement applied at EOD	0.15
Maximum harness voltage drop, based on discharge criteria and a charge rate of 6 Amps	0.06 (V)
The maximum allowable transient current drawn by the PCDU, under any conditions, shall not exceed	120(A) (1 ms max) 35 (A) (1 minute max)

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5.1.8 COTE (Launch configuration)

[IFRQT-1030]

[Analysis]

COTE SCOE shall interface with the SVM with the following electrical characteristics :

5.1.8.1 Power System I/F

Refer to [AD7] §6.7

5.1.8.2 PCDU I/F

Parameter	Herschel/Planck Limit(at SVM interface)
Battery support eclipse	- 0 to 28 Volts - 0 to 25 Amps - PCDU to provide protection from external s/c or supply reversal
Power bus Support in Sunlight Mode	- 0 to 31 Volts - 0 to 60 Amps - PCDU to provide protection from external s/c or supply reversal
Battery monitor lines	- 2 voltage monitor lines 0 to 28 volts and 2 returns - 100kΩ line protection resistors in series with the positive lines.
Bus monitor lines	- 2 voltage monitor lines 0 to 28 volts and 2 returns - 100kΩ line protection resistors in series with the positive lines.

5.1.8.3 Telecommand I/F

[IFRQT-1040]

[Analysis]

2 TC interfaces shall be provided with the electrical characteristics according to [AD7] §6.8.1.4

[IFRQT-1050]

[Analysis]

Each TC Interface shall comprise the following signals :

- TC Clock : Telecommand Clock signal input
- TC Data : Telecommand Data signal input
- TC Active : Telecommand Quality signal input

5.1.8.4 Telemetry I/F

[IFRQT-1060]

[Analysis]

2 TM interfaces shall be provided with the electrical characteristics according to [AD7] §6.8.1.4

[IFRQT-1070]

[Analysis]

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Each TM Interface shall comprise the following signals :

- TM Clock : Telemetry Clock signal output
- TM Data : Telemetry Data signal output

5.1.9 HERSCHEL Stimuli Instrument SCOE

[IFRQT-1080] [Analysis]

TBD

5.1.10 PLM SCOE

[IFRQT-1090] [Analysis]

TBD

5.1.11 Herschel Cryo SCOE

[IFRQT-1100] [Analysis]

TBD

5.1.12 CDMU DFE

5.1.12.1 Internal Commands I/F

[IFRQT-1130] [Analysis]

Refer to [AD7] §6.8.1

5.1.12.2 Internal Telemetry I/F

[IFRQT-1140] [Analysis]

Refer to [AD7] §6.8.2

5.1.13 1553 Bus Probe

[IFRQT-1150] [Analysis]

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5.2 EGSE to EGSE INTERFACES

5.2.1 TM/TC Interface

[IFRQT-1160] [Analysis]

TM/TC DFE shall interface with Power SCOE (Umbilical I/F part) with the electrical characteristics according to [AD7] § 6.8.1.4

[IFRQT-1170] [Analysis]

TM/TC DFE shall interface with TT&C SCOE RF with the electrical characteristics according to [AD7] § 6.8.1.4

[IFRQT-1180] [Analysis]

TM/TC DFE shall interface with NDIU with the electrical characteristics according to [AD7] § 6.8.1.4

5.2.2 Launch Power Supply Interface

[IFRQT-1160] [Analysis]

LPS (Umbilical I/F part) shall interface with CRYO SCOE with the electrical characteristics according to [RD12] § 4.4.2.2

5.2.3 SAFETY LOOP

[IFRQT-1190]

[Analysis]

Safety Loop signal shall link together Power SCOE (Umbilical part), SAS SCOE and BATSIM SCOE with the electrical characteristics according to [AD5]

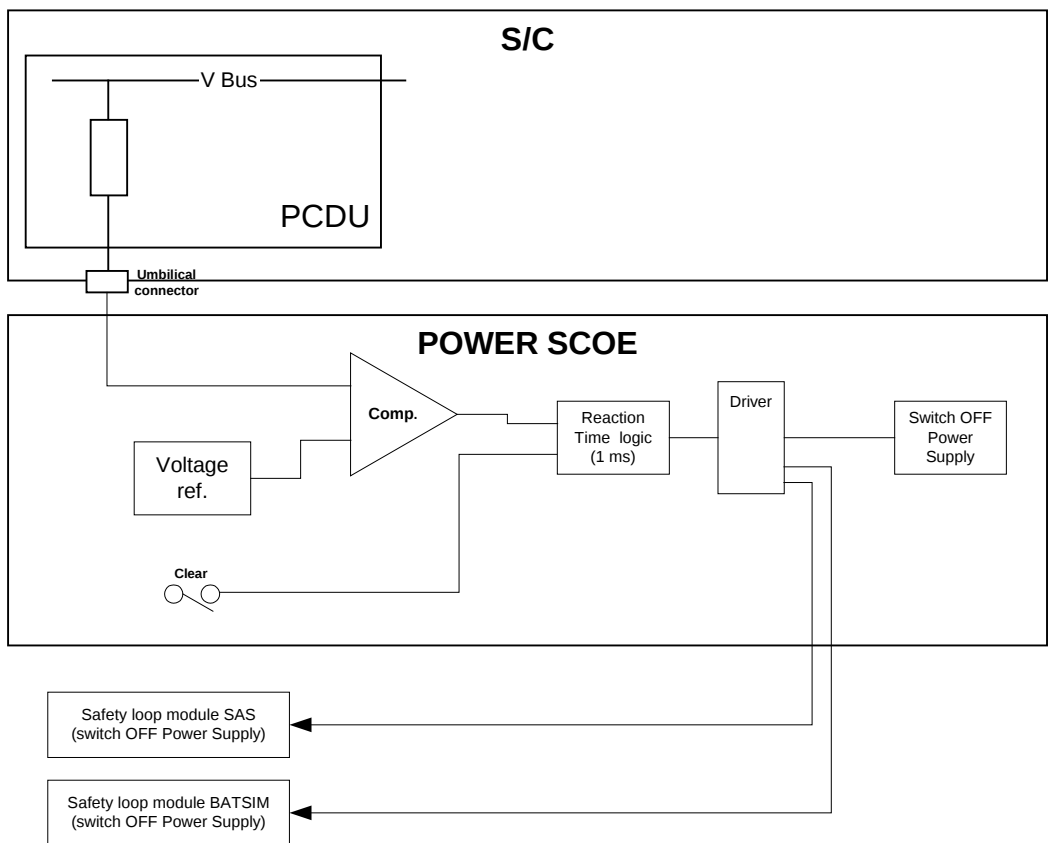


Figure 10 : SAFETY LOOP overview

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6 VERIFICATION MATRIX

6.1 GENERAL REQUIREMENTS

The acceptance tests of the EGSE shall be distributed in 3 acceptance test levels:

- Level 1 acceptance test at equipment level.
- Level 2 acceptance test of system EGSE level.
- Level 3 acceptance test of H/P EGSE.

Requirement	Test level 1	Test level 2	Test level 3
IFRQT-0010		X	X
IFRQT-0020		X	X
IFRQT-0030		X	X
IFRQT-0040		X	X
IFRQT-0042		X	X
IFRQT-0045		X	X
IFRQT-0050		X	X
IFRQT-0060			
IFRQT-0070		X	X
IFRQT-0080		X	X
IFRQT-0090			
IFRQT-0100		X	X
IFRQT-0102		X	X
IFRQT-0103		X	X
IFRQT-0104		X	X
IFRQT-0110		X	X
IFRQT-0120		X	X
IFRQT-0130		X	X
IFRQT-0140		X	X
IFRQT-0150		X	X
IFRQT-0160		X	X
IFRQT-0170		X	X
IFRQT-0180		X	X
IFRQT-0190		X	X
IFRQT-0200		X	X
IFRQT-0210		X	X
IFRQT-0220		X	X
IFRQT-0230		X	X
IFRQT-0240		X	X
IFRQT-0245		X	X
IFRQT-0250		X	X
IFRQT-0260		X	X
IFRQT-0270		X	X
IFRQT-0280		X	X
IFRQT-0290		X	X

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IFRQT-0300		X	X
IFRQT-0310		X	X
IFRQT-0320		X	X
IFRQT-0330			
IFRQT-0340		X	X
IFRQT-0350			
IFRQT-0360		X	X
IFRQT-0370		X	X
IFRQT-0380			
IFRQT-0390			
IFRQT-0400		X	X
IFRQT-0405			
IFRQT-0410		X	X
IFRQT-0411		X	X
IFRQT-0420			
IFRQT-0430			
IFRQT-0440			
IFRQT-0450			
IFRQT-0460			
IFRQT-0470			
IFRQT-0480			
IFRQT-0490			
IFRQT-0500		X	X
IFRQT-0510		X	X
IFRQT-0520		X	X
IFRQT-0525		X	X
IFRQT-0530		X	X
IFRQT-0535		X	X
IFRQT-0540		X	X
IFRQT-0550		X	X
IFRQT-0560		X	X
IFRQT-0565		X	X
IFRQT-0570		X	X
IFRQT-0580		X	X
IFRQT-0590		X	X
IFRQT-0600		X	X
IFRQT-0610		X	X
IFRQT-0620		X	X
IFRQT-0630			
IFRQT-0640		X	X
IFRQT-0650			
IFRQT-0660		X	X
IFRQT-0670		X	X
IFRQT-0680			
IFRQT-0690			
IFRQT-0700		X	X
IFRQT-0710		X	X
IFRQT-0720		X	X
IFRQT-0730			
IFRQT-0740			
IFRQT-0750			
IFRQT-0760		X	X

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IFRQT-0770		X	X
IFRQT-0780		X	X
IFRQT-0790		X	X
IFRQT-0800			
IFRQT-0801		X	X
IFRQT-0802		X	X
IFRQT-0803		X	X
IFRQT-0804		X	X
IFRQT-0805		X	X
IFRQT-0806		X	X
IFRQT-0807		X	X
IFRQT-0808		X	X
IFRQT-0808-1		X	X
IFRQT-0808-2		X	X
IFRQT-0808-3		X	X
IFRQT-0809		X	X
IFRQT-0809-1		X	X
IFRQT-0809-2		X	X
IFRQT-0810		X	X
IFRQT-0820		X	X
IFRQT-0830		X	X
IFRQT-0840		X	X
IFRQT-0850		X	X
IFRQT-0860		X	X
IFRQT-0870		X	X
IFRQT-0880			
IFRQT-0882		X	X
IFRQT-0884		X	X
IFRQT-0886		X	X
IFRQT-0887		X	X
IFRQT-0888		X	X
IFRQT-0889		X	X
IFRQT-0890		X	X
IFRQT-0900		X	X
IFRQT-0910		X	X
IFRQT-0915		X	X
IFRQT-0920		X	X
IFRQT-0930		X	X
IFRQT-0940		X	X
IFRQT-0950		X	X
IFRQT-0960		X	X
IFRQT-0970		X	X
IFRQT-0980		X	X
IFRQT-0990		X	X
IFRQT-1000		X	X
IFRQT-1010		X	X
IFRQT-1020		X	X
IFRQT-1030		X	X
IFRQT-1040		X	X
IFRQT-1050		X	X
IFRQT-1060		X	X
IFRQT-1070		X	X

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IFRQT-1080		X	X
IFRQT-1090		X	X
IFRQT-1100		X	X
IFRQT-1110		X	X
IFRQT-1120		X	X
IFRQT-1130		X	X
IFRQT-1140		X	X
IFRQT-1150		X	X
IFRQT-1160		X	X
IFRQT-1170		X	X
IFRQT-1180		X	X
IFRQT-1190		X	X

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