ALCATEL SPACE

HERSCHEL / PLANCK

EGSE INTERFACE Requirements Specification
H-P-1-ASPI-IS-0121

Product Code: 00000

		Date	Signature
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ENREGISTREMENT DES EVOLUTIONS / *CHANGE RECORDS*

ISSUE	DATE	§ : DESCRIPTION DES EVOLUTIONS *§ : CHANGE RECORD*	REDACTEUR *AUTHOR*
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	18/June/02	H-P-ASPI-CR-0259 H-P-ASPI-CR-0260	B.DUBOIS
4.0	10/April/03	Updated version according to :	B.DUBOIS
		Minute Of Meeting Fax H-P-ASP-LT-2727 :	
		[IFRQT-0042] → Req deleted	
		[IFRQT-0043] → Req deleted	
		[IFRQT-0102] → 5 sec Timeout is applicable to Write and read processes.	
		[IFRQT-0110] →Modified : "*As soon as the connection between the CCS and a SCOE/DFE/IS is established, the SCOE/DFE/IS (whatever its mode is (Local or Remote)) shall send to the CCS RM Keep-Alive Packet (0x11) or at least one Remote Message packet (RM) every 60 seconds (0x10)*"	
		[IFRQT-0141] →Precision on Time Field : TAI Epoch is 1958-January-1st	
		[IFRQT-0200] reworded taking into account new type and Sub-type of RC Commands	
		[IFRQT-0246] Command (*Stop the running …*) in table 12 deleted	
		[IFRQT-0247] → New Req : "*Each SCOE Sub-contractor is free to define and to add all the commands needed for SCOE application in the tables defined hereafter*"	
		[IFRQT-0562] → Precision on the use of SID field for RM packet Type/Subtype = (3,25). SCOE could send more than one RM Packet to CCS.	
		[IFRQT-0562-2] & [IFRQT-0562-3] → New Req on the use of SID field.	
		[IFRQT-0803] → - Remaining length is 0x1C instead of 0x16 - Packet length field of Source Packet Header is 0x0F instead of 0x0B - RC_ID is type 'enumerated 8 bits'	
		Minute Of Meeting Fax H-P-ASP-LT-2736 :	
		[IFRQT-0562-1] → Bullet correction for SCOE Set numbering	
		[IFRQT-0804] → One new code will be added : *Failure Code 8, "RC Unknown"*	

Minute Of Meeting HP-AI-MI-0198 action #56 :
[IFRQT-0240] → Table in Database links SCOE Name with SCOE host Name and SCOE Port Number.
§ 4.6.3.18 → New Par : "*RM 1553 Bus Monitor Definition*"
Table 15 → Column *'Port Number'* added
Table 15 → Line '*1553 Bus Monitor Definition*' added
ACMS SCOE PDR RID-AIV-004 :
[IFRQT-0201] → Req deleted
§ 4.5.1 → Remaining Message length = Body Message length + 6 bytes. Unit is "number of bytes".
[IFRQT-0562-1] → Precision : *in Off-line mode, Satellite power lines are completely isolated from the SCOE (all relay OFF, …)*
[IFRQT-0562-1] → New req . *'SCOE will use Event Packet to send Log Messages to CCS'*
SCOEs design updated :
§ 3.1 → All figures updated
[IFRQT-0120] → PIPE Header is 10 bytes (not 8) → Body Length is <1024 bytes
§ 4.1.5 → PIPE Header is 10 bytes (not 8)
§ 5.2.1 → IF TMTC / LPS
§ 5.2.2 → IF LPS / CRYO
§ 4.12.10 → paragraph updated wrt Naming Convention Document
[IFRQT-0300] → Req deleted (Umbilical Interface is included in LPS (IFRQT-0340)
[IFRQT-0320] → Req deleted (SAS is included is LPS (IFRQT-0340)
[IFRQT-0600] → Req deleted (Umbilical Interface is included in LPS (IFRQT-0640)
[IFRQT-0960 to 0990] → Deleted (No TM and TC interface between LPS and S/C)
[IFRQT-1010] → TBC value updated
[IFRQT-1020] → TBC value updated
[IFRQT-1040 to 1070] → Deleted (No TM and TC interface between COTE and S/C)
[IFRQT-1090] → TBC value updated
[IFRQT-1100] → TBC value updated
[IFRQT-1160] → Req deleted (no interface between TM/TC DFE and LPS)
§ 5.1.15 → New Paragraph " Interface between TM/TC DFE and S/C"
[IFRQT-1182] → New Requirement for electrical characteristics between TM/TC DFE and TM/TC Amplifier.
§ 5.2.2 [IFRQT-1185] → LPS interface with CRYO COTE
IFRQT-1185] → Interface characteristics
Table 15 → Line *'SAS'* deleted (SAS is included in LPS)
Table 20 → Line *'Umbilical I/F Module'* deleted (Umbilical

Interface is included in LPS)
Table 20 → Line *'SAS'* deleted (SAS is included in LPS)
Figure 10 → Safety loop is between LPS/SAS and BATSIM (SAS is included in LPS)

TABLE OF CONTENTS

LISTE OF FIGURES

LISTE OF TABLES

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.

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

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 RO-ESC-RS-5002	NDIU3 for ROSETTA SVT's Design Report (NDIU full) NDIU3 for ROSETTA SVT's User Manual (NDIU full) I/F ROSETTA Gateway – TM/TC FEE (NDIU lite)
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

2.4 Acronyms

Abbreviation	Signification
AIT	**A**ssembly, **I**ntegration and **T**est
BCE	**B**attery **C**harge **E**quipment
BER	**B**it **E**rror **R**ate
BHC	**B**loc **H**ouse **C**onsole
BOB	**B**reak **O**ut **B**ox
BPSK	**B**i **P**hase **S**hift **K**eying
CCS	**C**entral **C**heckout **S**ystem
CCSDS	**C**onsultative **C**ommittee for **S**pace **D**ata **S**ystems
CLCW	**C**ommand **L**ink **C**ontrol **W**ord
CLTU	**C**ommand **L**ink **T**ransmission **U**nit
COTE	**C**heck **O**ut **T**erminal **E**quipment
CUC	**C**CSDS **U**nsegmented time **C**ode
EGSE	**E**lectrical **G**round **S**upport **E**quipment
EMC	**E**lectro**M**agnetic **C**ompatibility
FEE	**F**ront **E**nd **E**quipment
HK	**H**ouse **K**eeping
HPSDB	**H**erschel/**P**lanck **S**ystem **D**ata**B**ase
IF or I/F	**I**nter**F**aces
JU	**J**unction **U**nit
LAN	**L**ocal **A**rea **N**etwork
MMI	**M**an **M**achine **I**nterface
MTBF	**M**ean **T**ime **B**etween **F**ailure[1]
MTTR	**M**ean **T**ime **T**o **R**epare[2]
MOC	**M**ission **O**peration **C**enter
NA	**N**on **A**pplicable
NDIU	**N**etwork **D**ata **I**nterface **U**nit
NRZ-L	**N**on **R**eturn to **Z**ero-**L**evel
NRZ-M	**N**on **R**eturn to **Z**ero-**M**ark
OBCP	**O**n-**b**oard **C**ontrol **P**rocedures
OBSW	**O**n **B**oard **S**oft**W**are
PIPE	**P**acket **I**nterface **P**rotocol for **E**GSE
RF	**R**adio **F**requency
SAS	**S**olar **A**rray **S**imulator
SCOE	**S**pecific **C**heck **O**ut **E**quipment
TAI	**T**emps **A**tomique **I**nternational
TBC	**T**o **B**e **C**onfirmed
TBD	**T**o **B**e **D**efined
TM/TC	**Tele**m**e**try & **Tele**c**o**mmand
UTC	**U**niversal **T**ime **C**oordinated
UUT	**U**nit **U**nder **T**est
VC	**V**irtual **C**hannels

[1] Average time between two breakdown of the system
[2] Average time before complete repair of the system

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

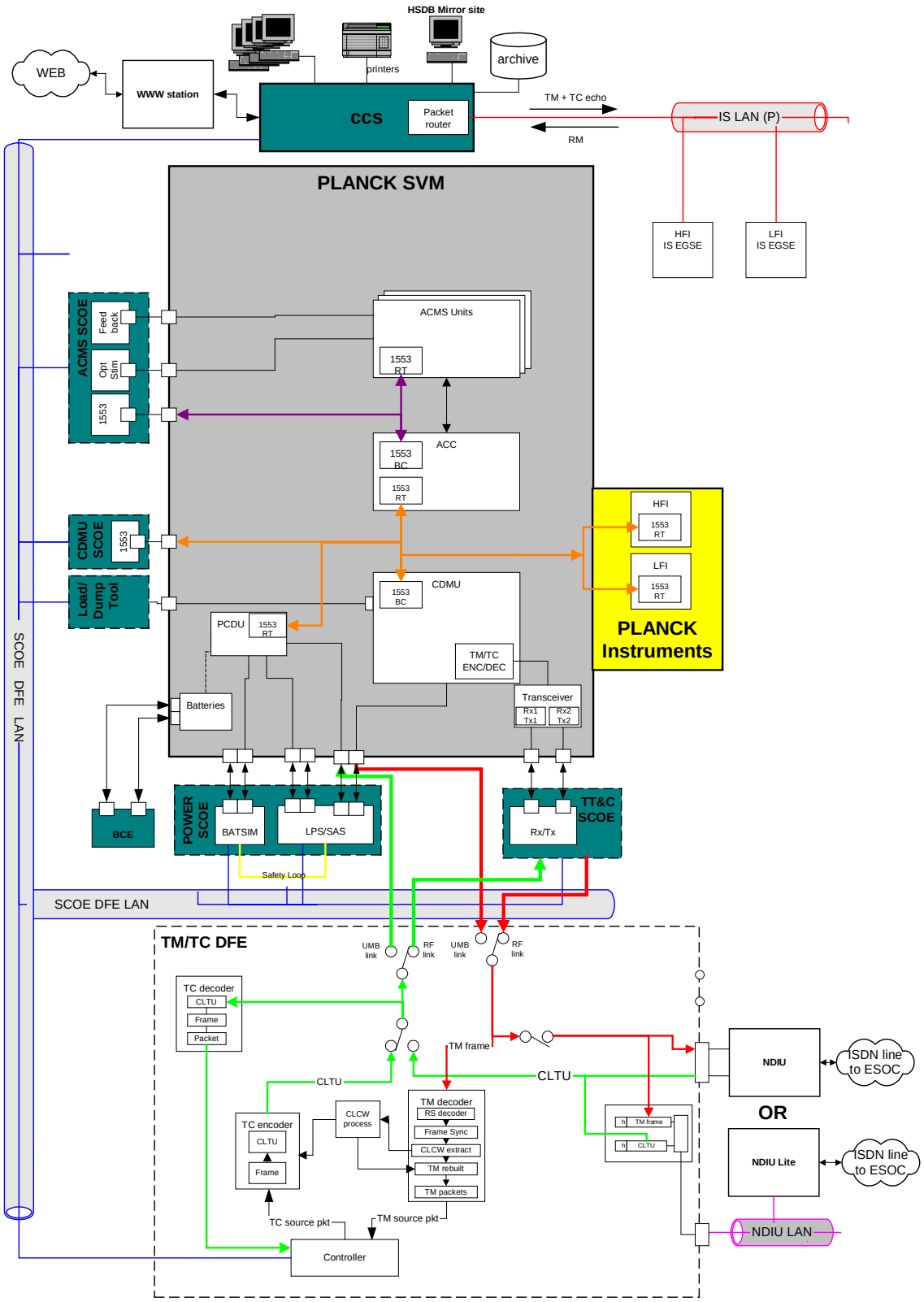


Figure 1 : Overview of the PLANCK EGSE architecture

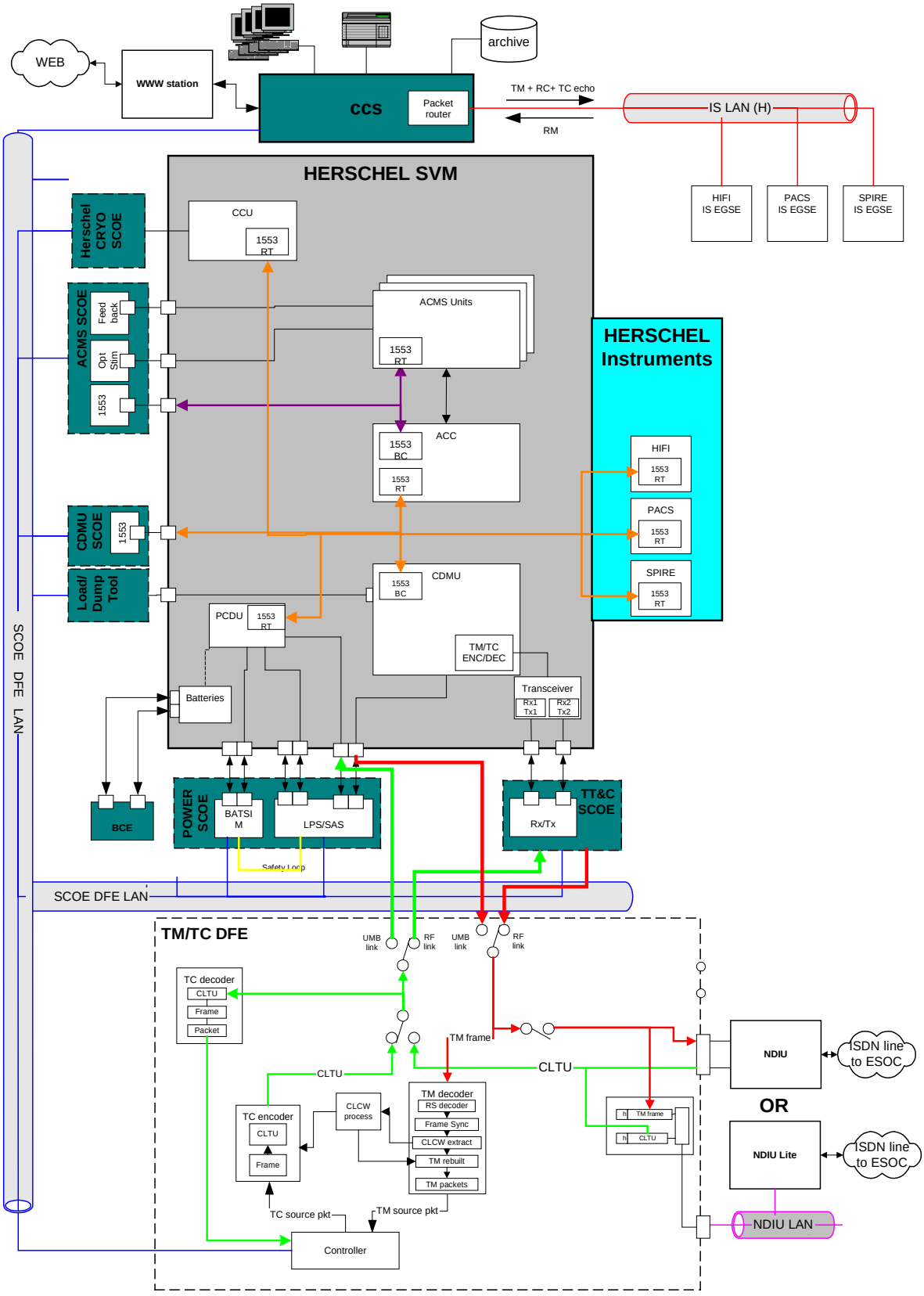


Figure 2 : Overview of the HERSCHEL EGSE architecture

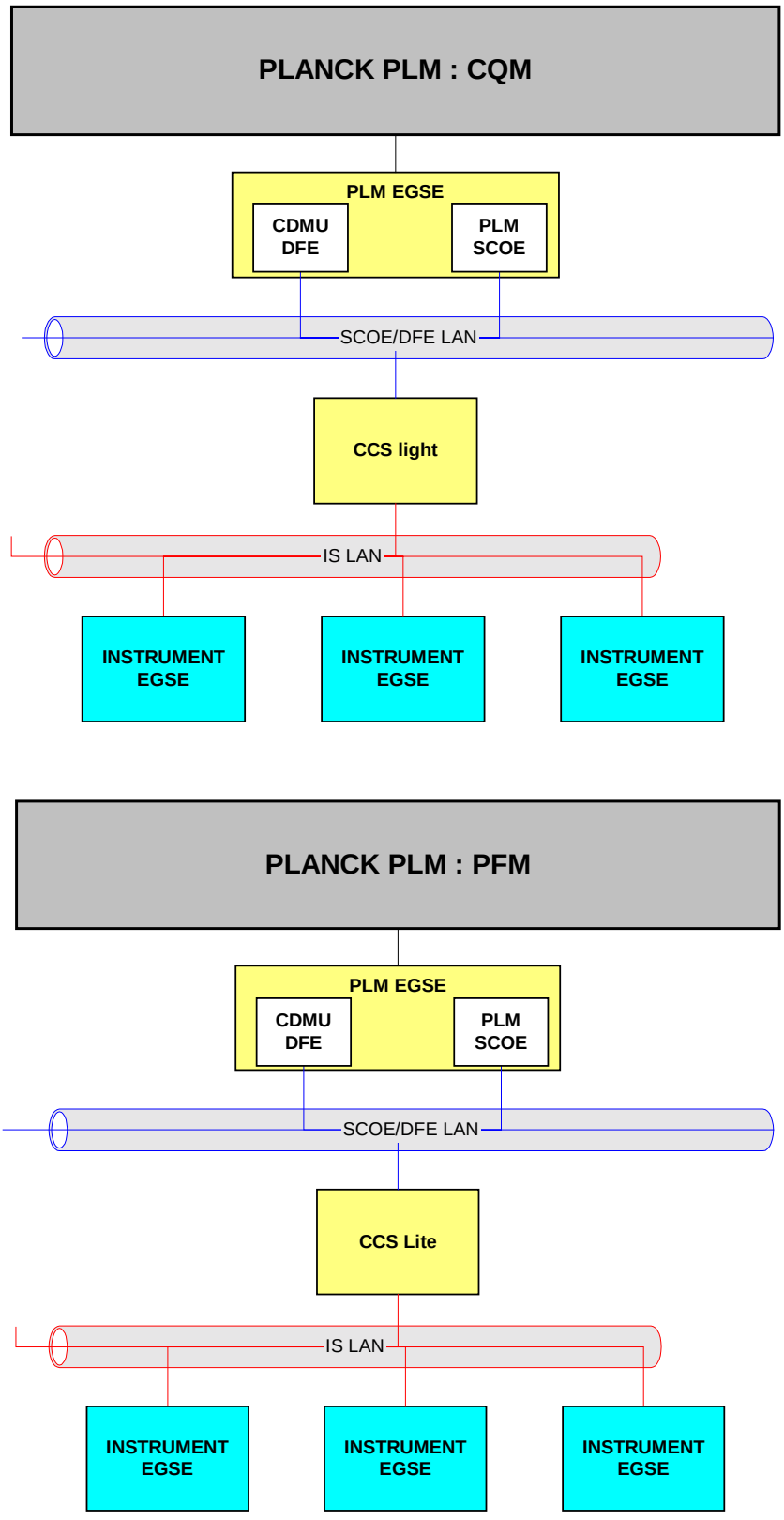


Figure 3 : EGSE PLANCK PLM Configuration

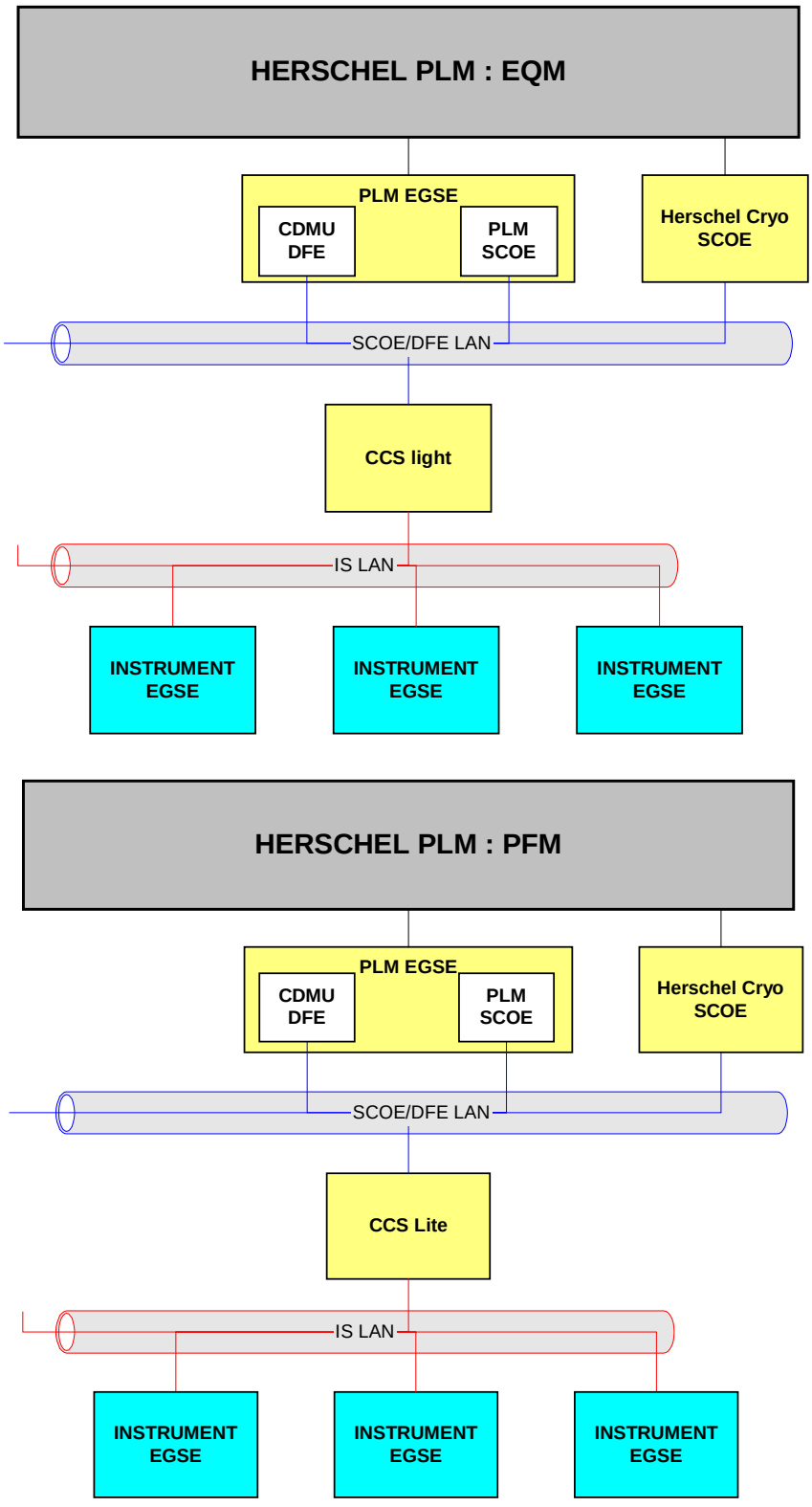


Figure 4 : EGSE HERSCHEL PLM Configuration

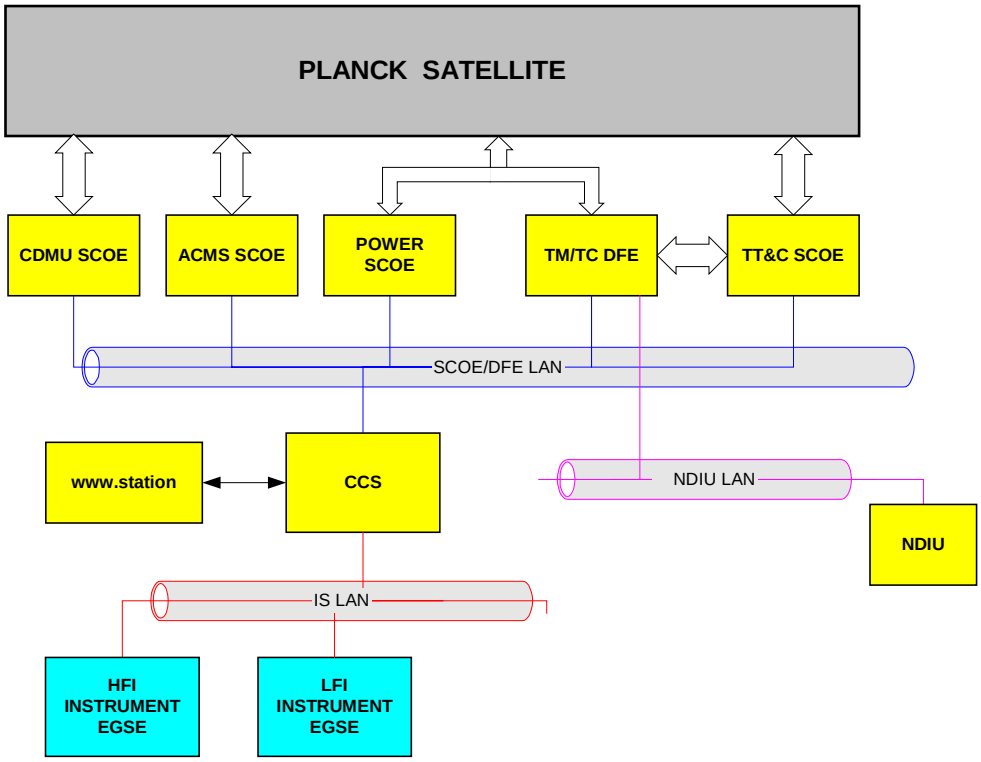


Figure 5 : EGSE PLANCK S/C Configuration

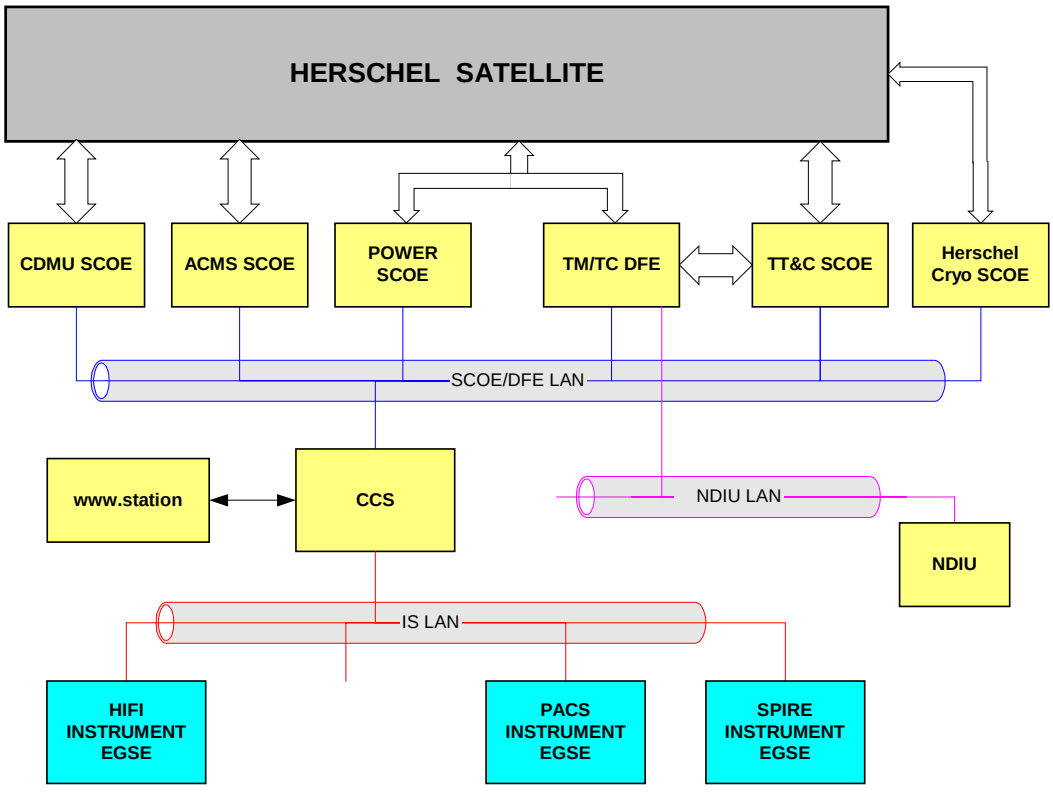


Figure 6 : EGSE HERSCHEL S/C Configuration

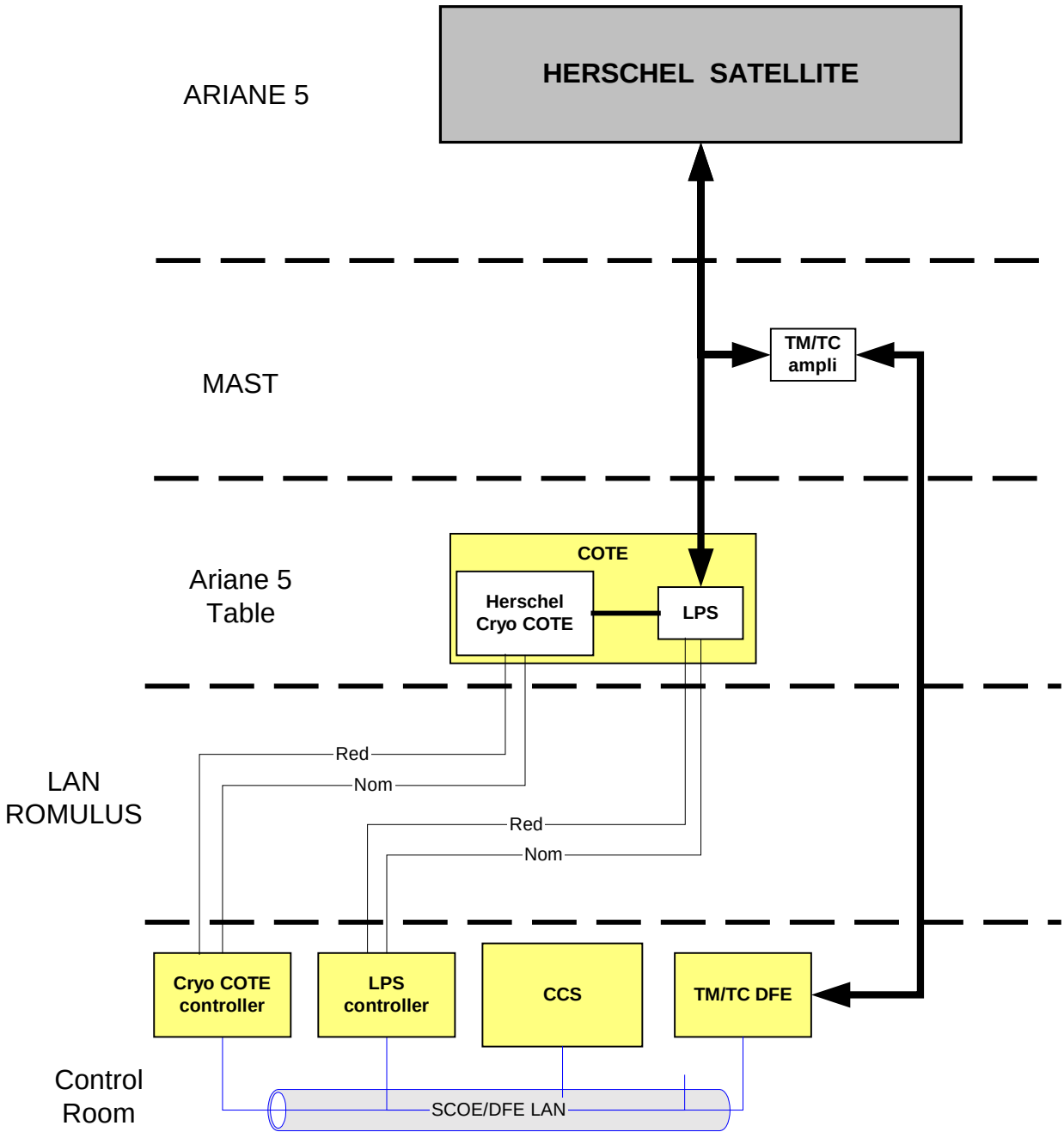


Figure 7 : HERSCHEL EGSE Launch Configuration

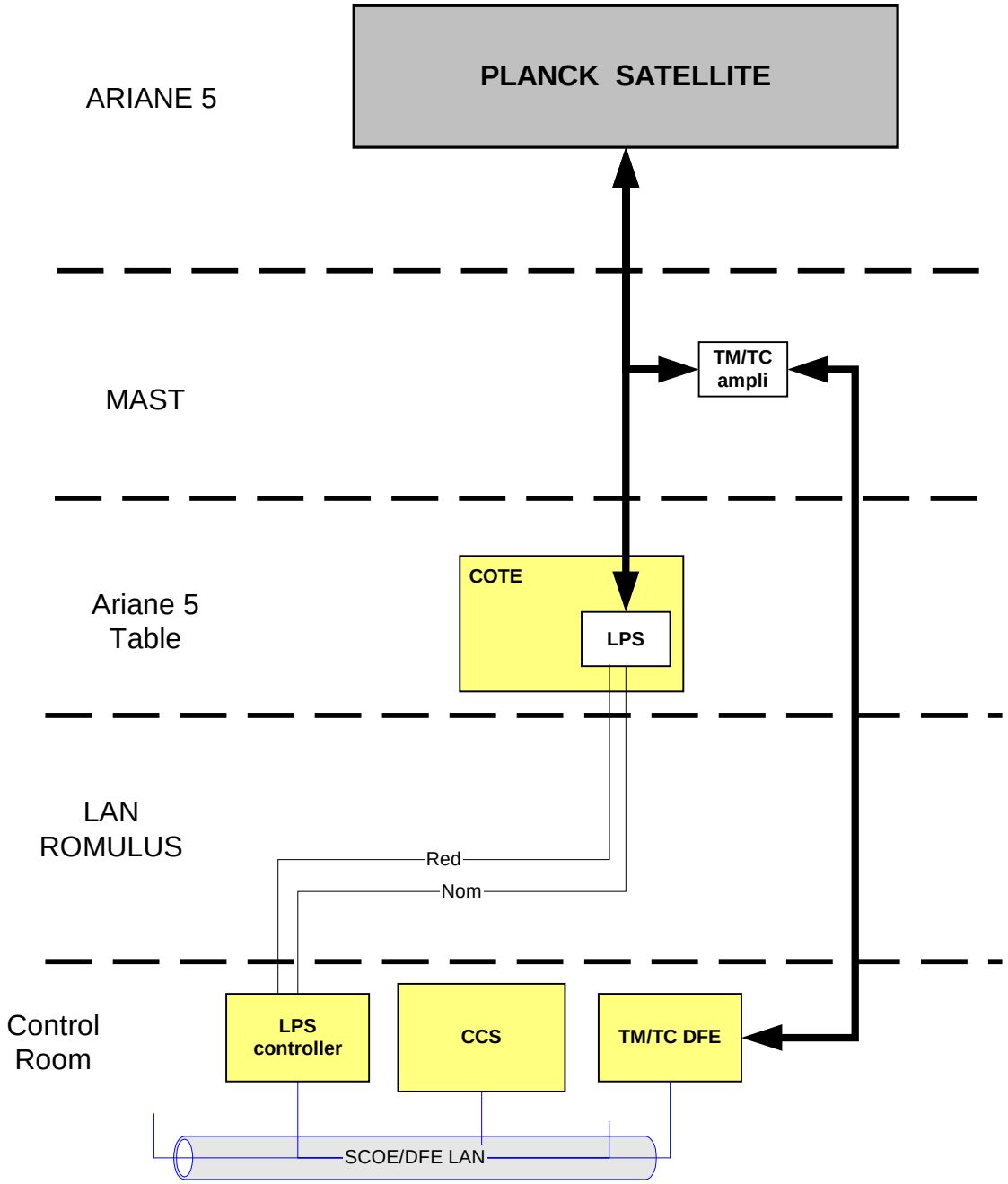
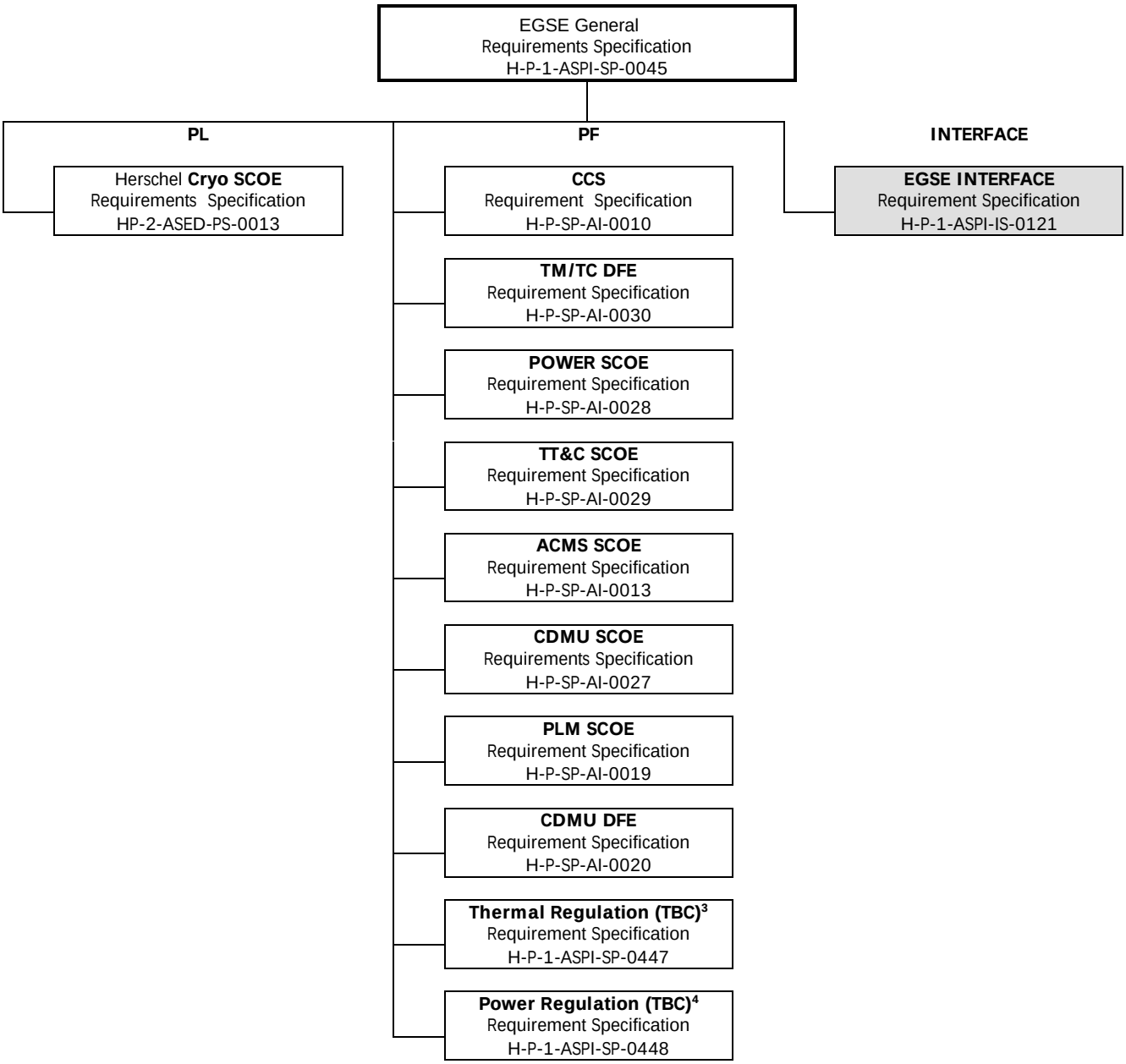


Figure 8 : PLANCK EGSE Launch Configuration

EGSE Specification Tree



[3] SCOE neither specify, procure and use by Alenia
[4] SCOE neither specify, procure and use by Alenia

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

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).

[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:

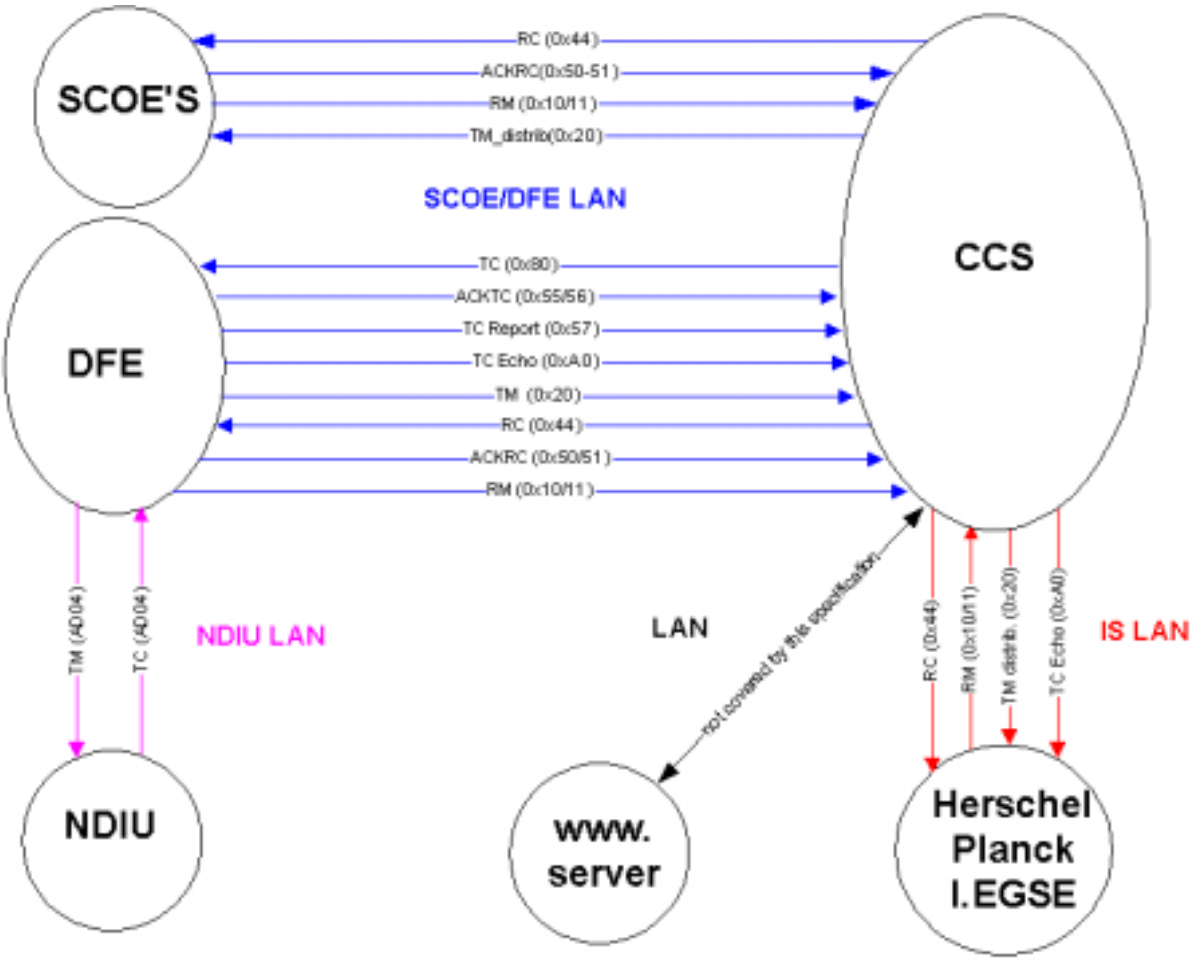
- On-board Telemetry Packets (TM)
- EGSE Remote Message Packets (RM) → *(Packet generated by each SCOE (one packet per SCOE identified by APID) sent to CCS containing its internal data like status, logging message, error report, data acquisition...):*
  - Periodic packets containing vital data acquired/measured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

[IFRQT-0043] Deleted [Test]


SCOE'S
DFE
CCS
RC (0x44)
ACKRC(0x50-51)
RM (0x10/11)
TM_distrib(0x20)
SCOE/DFE LAN
TC (0x80)
ACKTC (0x55/56)
TC Report (0x57)
TC Echo (0xA0)
TM (0x20)
RC (0x44)
ACKRC (0x50/51)
RM (0x10/11)
TM (4004)
TC (4004)
NDIU LAN
LAN
not covered by this specification
RC (0x44)
RM (0x10/11)
TM distrib. (0x20)
TC Echo (0xA0)
IS LAN
NDIU
www. server
Herschel Planck I.EGSE

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 as soon as the connection is open.

It is not mutual i.e. no keep-alive message will be transmitted by CCS towards the SCOE's.

[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 - inconstistent Length
- PIPE Header Error – inconstistent Synchro Word
- Whole PIPE message writing and 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
- Unexpected RC (RC received before sending ACKRC)

[IFRQT-0104] [Test]

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

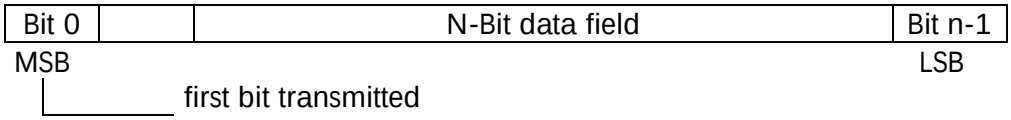
[IFRQT-0110] [Test]

As soon as the connection between the CCS and a SCOE/DFE/IS is established, the SCOE/DFE/IS (whatever its mode is (Local or Remote)) shall send to the CCS RM Keep-Alive Packet (0x11) or at least one Remote Message packet (RM) every 60 seconds (0x10)
(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
10 bytes	User defined (14 bytes< <1024)

Table 1 : PIPE message lay-out

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
Request ID	4	TC/RC identification	integer
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.
Remaining Message length = Body Message length + 6 bytes.
Unit is "number of bytes".

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 0x**FADE**

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 0x**FADE**	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 0x**00**	integer
	Remaining length	2 bytes	Variable	integer
	Request ID	4 bytes	Variable	integer
	Synchronisation Word	2 bytes	Forced to 0x**FADE**	integer

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

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)

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 90)	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 0x**00**	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.

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]

- 48 bits of time field are split into 4 bytes for Coarse time (seconds) and 2 bytes for Fine time (subseconds).
- TAI Epoch is 1958-January-1st.

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**

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	Seq Count
(3 bits)	(11 bits)

CCSDS Secondary Header flag	TC Source Packet PUS Version Nbr	Acknowledge	Packet Type	Packet Sub-Type	Spare
(1 bit)	(3 bits)	(4 bits)	(8 bits)	(8 bits)	(8 bits)

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 *page90)*	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 0x**00**	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

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 counte**r.

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 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): **mandator**y, 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**

4.1.7 Message ID List

Message ID	TYPE	Description	(Type, SubType)	Source	Dest.	[IFRQT-]
0x**80**	TC	S/C TELECOMMAND Packets		CCS	DFE	0170
0x**44**	RC	SCOE Command Packets	(8,4)	CCS	SCOE/DFE/IS	0200
0x**20**	TM	On-Board Telemetry Packets acquisition		DFE	CCS	0500
0x**20**	TM	Telemetry Packets Distribution		CCS	SCOE/DFE/IS	0520
0x**10**	RM	SCOE Periodic Telemetry	(3,25)	SCOE/DFE/IS	CCS	0562
0x**10**	RM	SCOE Asynch. Telemetry	(5,1)	SCOE/DFE/IS	CCS	0563
0x**11**	RM	SCOE Idle Packet (Alive Packet)		SCOE/DFE/IS	CCS	0809-2
0x**50**	ACKRC	RC Acceptance report – Success	(1,1)	SCOE/DFE	CCS	0803
0x**51**	ACKRC	RC Acceptance report – Failure	(1,2)	SCOE/DFE	CCS	0804
0x**55**	ACKTC	TC Acceptance report – Success	(1,1)	DFE	CCS	0808-2
0x**56**	ACKTC	TC Acceptance report – Failure	(1,2)	DFE	CCS	0808-3
0x**A0**	TC Echo	TC Echo		DFE CCS	CCS IS station	0809
0x**57**	TC Report	TC Report – Success	(5,1)	DFE	CCS	0809-1
		TC Report – transmission failure	(5,4)			

Table 11 : Message ID

4.1.8 Message Control Flow description

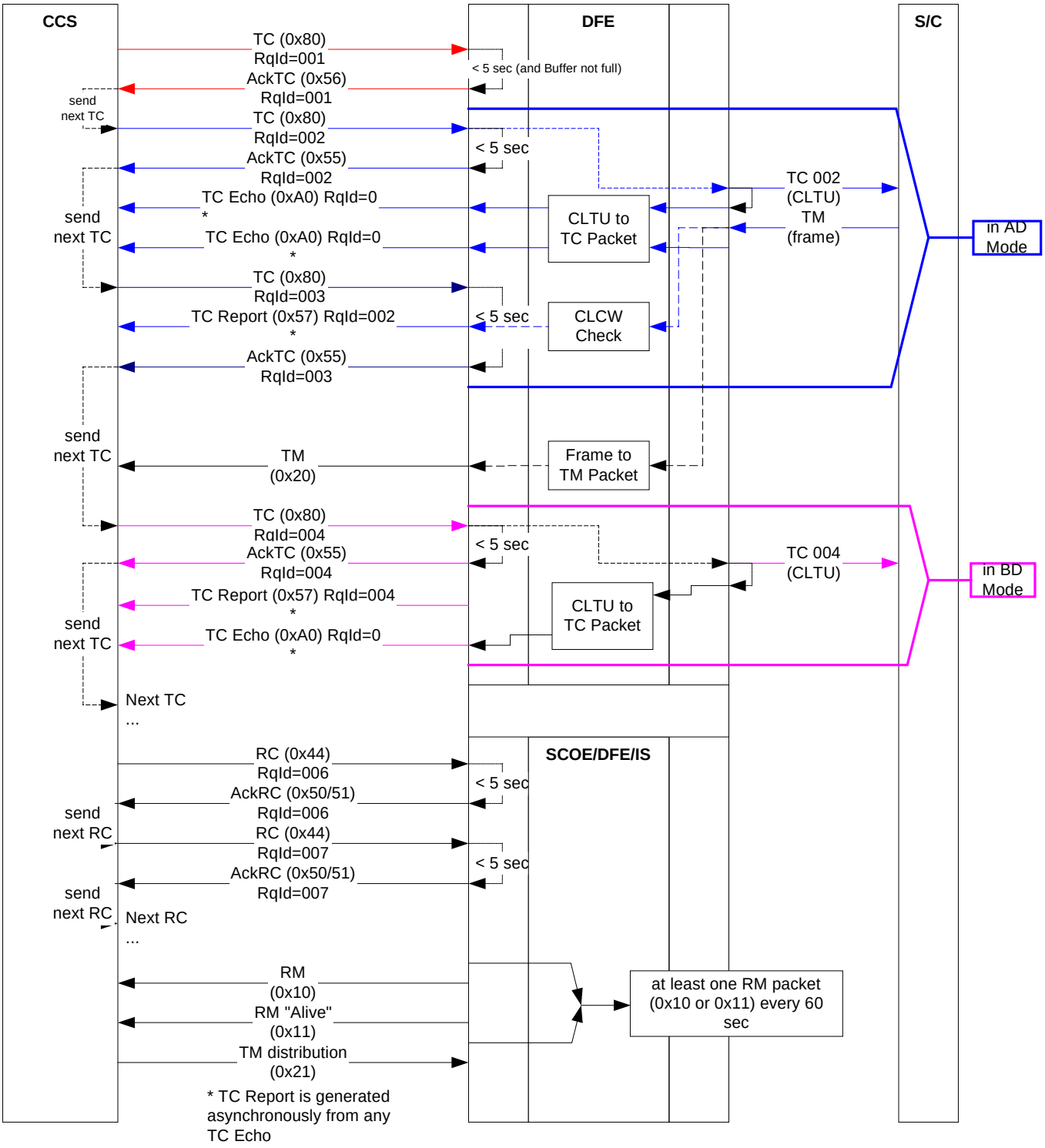


Figure 9 : Control Flow message description

[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).

4.2 CONTROL FLOW – TELECOMMAND Packets

[IFRQT-0170] [Test]

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

Source	CCS
Destination	DFE
Rate	4 kb/s
LAN	SCOE/DFE LAN

PIPE structure	Field Description	Size	Values	TYPE
Header	Refer to Table 4 page 29 with : Message ID = Refer to Table 11 page 36 Request ID = Variable (initiated by CCS)			
Body	**TC Packet**	**variable**	**variable**	variable

[IFRQT-0180] Deleted [Analysis]

[IFRQT-0190] Deleted [Analysis]

4.3 CONTROL FLOW – CCS REMOTE Commanding Packets

Source	CCS
Destination	SCOE/DFE/IS
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 29 with : Message ID = Refer to Table 11 page 36			
Body	Source Packet Header	Refer to Table 8 page 34		
	Data field header	Refer to Table 9 page 34 with : Packet Type = 0x**08** Packet sub-type = 0x**04**		
	Application data	*Length*	*Parameter list*	*Type*
	Function ID	1 byte	RC identifier (**Mandatory**)	Enum
	Activity ID	1 byte	Activity of function (**Mandatory**)	Enum
	SID	2 bytes	Structure of parameter field (**Mandatory**)	Enum
	Parameter 1	variable	Optional	Any
	Parameter …	variable	Optional	Any
	Parameter n	variable	Optional	Any
	Packet error control	2 bytes	Not Used	integer

[IFRQT-0201] Deleted [Analysis]

[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 :
- '*Function ID*' field will contain the RC identifier (which identify uniquely the RC)
- *'Activity ID'* field could be used freely by SCOE contractor (if needed, else to be set to zero).
- *'SID'* field will indicate the presence of RC parameter(s). (zero =no parameters are sent)
- parameters fields (optional)

[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/port and name:

RC Mnemo → RC_ID → SCOE IF Name → APID
IP name → IP address
SCOE Port

Parameter → Transfer function
PIPE message length
RC Packet length
Packet type
Packet sub type

[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	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

Table 12 : Common Remote Commands

[IFRQT-0247] [Information]

Each SCOE Sub-contractor is free to define and to add all the commands needed for SCOE application in the tables defined hereafter

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	RC_ID	Operational description
See Table 16		Common RC (refer to Table 12 page 41)
		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	RC_ID	Operational description
See Table 16		Common RC (refer to Table 12 page 41)
		Start/hold/suspend/terminate/kill an Application Test Program

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	RC_ID	Operational description
See Table 16		Common RC (refer to Table 12 page 41)
		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

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	RC_ID	Operational description
See Table 16		Common RC (refer to Table 12 page 41)
		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

4.3.1.6 CCS → Umbilical I/F Module Commands

[IFRQT-0300] Deleted [Test]

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	RC_ID	Operational description
See Table 16		Common RC (refer to Table 12 page 41)
		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
		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] Deleted [Test]

4.3.1.9 CCS → BCE SCOE Commands

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

4.3.1.10 CCS → LPS/SAS Commands

[IFRQT-0340] To Be Completed [Test]

RC mnemonic	RC_ID	Operational description
See Table 16		Common RC (refer to Table 12 page 41)
		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
		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
		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

RC mnemonic	RC_ID	Operational description
		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*

4.3.1.11 CCS → SIS SCOE Commands

[IFRQT-0350] [Test]

Deleted

4.3.1.12 CCS → PLM SCOE Commands

[IFRQT-0360] To Be Completed [Test]

RC mnemonic	Operational description
See Table 16	Common RC (refer to Table 12 page 41)
	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

4.3.1.13 CCS → Herschel Cryo SCOE/CRYO COTE Commands

[IFRQT-0370] To Be Completed [Test]

RC mnemonic	RC_ID	Operational description
See Table 16		Common RC (refer to Table 12 page 41)
		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]

RC mnemonic	RC_ID	Operational description
See Table 16		Common RC (refer to Table 12 page 41)
		Start/hold/suspend/terminate/kill an Application Test Program
		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.

RC mnemonic	RC_ID	Operational description
		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 (list of TC time tagged)
		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 *val*
		Send Low Level Command number *val*
		Send Memory Load Command number *val*

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

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] [Test]
TBD/TBC

4.3.2.3 CCS → LFI EGSE Commands

[IFRQT-0440] [Test]
TBD/TBC

4.3.2.4 CCS → HCSS SCOE Commands

[IFRQT-0450] Deleted [Test]

4.3.2.5 CCS → HIFI EGSE Commands

[IFRQT-0460] To Be Completed [Test]

RC mnemonic	RC_ID	Operational description
See Table 16	TBD	TBD
…	…	…
TBD	TBD	TBD

4.3.2.6 CCS → PACS EGSE Commands

[IFRQT-0470] To Be Completed

RC mnemonic	RC_ID	Operational description
See Table 16	TBD	TBD
…	…	…
TBD	TBD	TBD

4.3.2.7 CCS → SPIRE EGSE Commands

[IFRQT-0480] To Be Completed

RC mnemonic	RC_ID	Operational description
See Table 16	TBD	TBD
…	…	…
TBD	TBD	TBD

4.3.3 COMMUNICATION VIA www LAN

4.3.3.1 CCS → www.Server Commands

[IFRQT-0490] Deleted [Test]

4.4 MONITORING FLOW - On-Board Telemetry Packets acquisition

Source	DFE
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
Header	Refer to Table 3 page 29 with : Message ID = Refer to Table 11 page 36 VCID = VCID number of the corresponding frame Request ID = Forced to 0x**0000 0000**			
Body	**TM Source Packet**	**variable**	**variable**	

[IFRQT-0510] [Analysis]

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

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 SPID (APID + Type + Subtype + SID)
The TM distribution is based on a table define inside the HPSDB.

PIPE structure	Field Description	Size	Values	TYPE
Header	Refer to Table 3 page 29 with : Message ID = Refer to Table 11 page 36 VCID = VCID number of the corresponding frame Request ID = Forced to 0x**0000 0000**			
Body	**TM Source Packet**	**variable**	**variable**	

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 90.

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

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 -0530) [Analysis]

Each SCOE/DFE/IS shall send **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 29 with : Message ID = Refer to Table 11 page 36 VCID = 0x**00**			
Body	Source Packet Header	Refer to Table 5 page 31		
	Data field header	Refer to Table 6 page 31with : Packet Type = 0x**03** Packet sub-type = 0x**19**		
	Source data	*Length*	*Parameter list*	*Type*
	SID	2 bytes	Structure of parameter field (**Mandatory**)	**Enumerated 2 octets**
	Parameter 1	variable	Mandatory	Any
	Parameter …	variable	Optional	Any
	Parameter n	variable	Optional	Any
	Packet error control	2 bytes	Not Used	integer

SID: free used by sub-co

The SID, together with the Application Process ID and the nature of the packet (packet type / subtype) implicitly identifies the structure of the parameter field.

The combination of APID/Type/Sub-type/SID fields solely identify the parameters of the packet.

Parameters:

This field consists of a sequence of values of housekeeping or diagnostic parameters that are sampled nominally once per packet generation interval.

[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**
See Table 19	**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**	0 set #1 (AVM) 1 set #2 (Herschel) 2 set #3 (Planck)	1	Integer

* in Off-line mode, Satellite power lines are completely isolated from the SCOE (all relay OFF, …)

Table 13 : Common Periodic Remote Monitoring Parameters

[IFRQT-0562-2] [Information]

Each SCOE Sub-contractor is free to define and to add all the parameters needed for SCOE application in the tables defined hereafter

[IFRQT-0562-3] [Information]

If needed, SCOE/DFE/IS could send several different RM Packet (3,25) by using SID mandatory field.
It is up to Sub-contractor to define the meaning of each different RM Packet.

It is possible to make each packet with a logical split; e.g. one packet for acquisition sensors, one for heater status, one for current/voltage, etc
Note : some RM packet (3,25) could be not periodic, but this shall be rare.

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 -0535) [Analysis]

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

PIPE structure	Field Description			
Header	Refer to Table 3 page 29 with : Message ID = Refer to Table 11 page 36 VCID = 0x**00**			
Body	Source Packet Header	Refer to Table 5 page 31		
	Data field header	Refer to Table 6 page 31with : Packet Type = 0x**05** Packet sub-type = 0x**01**		
	Source data	variable	*Parameter list*	variable
	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 :

Source Data Field				
Operational mnemonic	**Operational description**		**Length (byte)**	**Type**
See Table 19	**Event ID**	0 TBD 1	1	Integer
TBD	**Local disk capacity**	0 Not OK (full) 1 OK (not full)	1	Integer

Table 14 : Common Asynchronous Remote Monitoring Parameters

[IFRQT-0563-2] [Information]

SCOE will use Event Packet to send Log Messages to CCS. In this case, ASCII string parameters will be 'fixed length' type.

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) - SID = 1

Source Data Field				
Operational mnemonic	**Operational description**		**Length (byte)**	**Type**
	Common RM parameter (refer to Table 13 page 27)		4	Integer
See Table 19	**1553 Bus status**	0 Nominal Bus active 1 Redundant Bus active	1	Integer
TBD	**RT address simulated**		4	Integer
TBD	**1553 profile trapped**		4	Integer

Periodic RM (3,25) - SID = 2→ TBC/TBD

Source Data Field			
Operational mnemonic	**Operational description**	**Length (byte)**	**Type**
See Table 19			

Asynchronous RM (5,1)

Source Data Field				
Operational mnemonic	**Operational description**		**Length (byte)**	**Type**
	Common RM parameter (refer to Table 14 page 57)		2	Integer
See Table 19	**1553 Bus status**	0 Nominal Bus active 1 Redundant Bus active	1	Integer

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**		**Length (byte)**	**Type**
	Common RM parameter (refer to Table 13 page 27)		4	Integer
See Table 19	**1553 Bus status**	0 Nominal Bus active 1 Redundant Bus active	1	Integer
TBD	**Data storage status**	0 started 1 stopped	1	Integer
TBD	**Application test program status**	0 Started 1 Held 2 Suspend 3 Terminated 4 Killed	1	Integer
TBD				

Periodic RM (3,25) - SID = 2→ TBC/TBD

Source Data Field			
Operational mnemonic	**Operational description**	**Length (byte)**	**Type**
See Table 19			

Asynchronous RM (5,1)

Source Data Field				
Operational mnemonic	**Operational description**		**Length (byte)**	**Type**
	Common RM parameter (refer to Table 14 page 57)		2	Integer
See Table 19	**1553 Bus status**	0 Nominal Bus active 1 Redundant Bus active	1	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

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**		**Length (byte)**	**Type**
	Common RM parameter (refer to Table 13 page 27)		4	Integer
See Table 19	**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
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				

Periodic RM (3,25) - SID = 2→ TBC/TBD

Source Data Field			
Operational mnemonic	**Operational description**	**Length (byte)**	**Type**
See Table 19			

Asynchronous RM (5,1)

Source Data Field			
Operational mnemonic	**Operational description**	**Length (byte)**	**Type**
	Common RM parameter (refer to Table 14 page 57)	2	Integer
See Table 19			

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 27)		4	Integer
See Table 19	**TM Link**	0 Bypass 1 RF	1	Integer
TBD	**TM Selection**	0 Nominal 1 Redundant	1	Integer
TBD	**TC Link**	0 Bypass 1 RF	1	Integer
TBD	**TC Selection (decoder selected)**	0 Nominal 1 Redundant	1	Integer
TBD	**Current Active Services**	0 AD mode 1 BD mode 2 BC mode	1	Integer
TBD	**MAP-ID Selection (Processor Module selected)**	0 Nominal 1 Redundant	1	Integer
TBD	**Squelch TC Selection**	0 Nominal 1 Redundant	1	Integer
TBD	**Squelch TC Status**	0 Disabled 1 Enabled	1	Integer
TBD	**TC provider**	0 CCS 1 NDIU	1	Integer
TBD	**TM to NDIU switch status**	0 ON 1 OFF	1	Integer
TBD	**TM frame Archiving status**	0 started 1 stopped	1	Integer
TBD	**TC CLTU Archiving status**	0 started 1 stopped	1	Integer
TBD	**TM Source Packet Archiving status**	0 started 1 stopped	1	Integer
TBD	**TC Source Packet Archiving status**	0 started 1 stopped	1	Integer
TBD	**COP-1 status**	0 Disabled 1 Enabled	1	Integer
TBD	**CLCW – Virtual Channel ID**	0 Nominal 1 Redundant	6 bits	Binary
TBD	**CLCW – "No RF Available" flag**	0 RF physical connection is available 1 RF physical connection is NOT available	1 bit	Binary
TBD	**CLCW – "No Bit Lock" flag**	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	1 bit	Binary
TBD	**CLCW –**	0 FARM-1 is in Lockout state	1 bit	Binary

Source Data Field				
Operational mnemonic	**Operational description**		**Length (byte)**	**Type**
	"Lockout" flag	1 FARM-1 is not in Lockout state		
TBD	**CLCW – "Wait" flag**	0 FARM-1 is in Wait state 1 FARM-1 is not in Wait state	1 bit	Binary
TBD	**CLCW – "Retransmit" flag**	0 FARM-1 does not request retransmission of all type AD transfer frame 1 FARM-1 requests retransmission of type AD transfer frame	1 bit	Binary
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
TBD	TC input queue free slots counter		TBD	TBD
TBD				

Periodic RM (3,25) - SID = 2→ TBC/TBD

Source Data Field			
Operational mnemonic	**Operational description**	**Length (byte)**	**Type**
See Table 19			

Asynchronous RM (5,1)

Source Data Field				
Operational mnemonic	**Operational description**		**Length (byte)**	**Type**
	Common RM parameter (refer to Table 14 page 57)		2	Integer
See Table 19	**TC buffer**	0 OK (not full) 1 Not OK (full)	1	Integer
TBD	**Reed Salomon Error number**		1	Integer
TBD				

4.6.3.5 RM Umbilical I/F Definition

[IFRQT-0600] Deleted [Test]

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 27)	4	Integer
See Table 19	**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

Periodic RM (3,25) - SID = 2→ TBC/TBD

Source Data Field			
Operational mnemonic	**Operational description**	**Length (byte)**	**Type**
See Table 19			

Asynchronous RM (5,1)

Source Data Field			
Operational mnemonic	**Operational description**	**Length (byte)**	**Type**
	Common RM parameter (refer to Table 14 page 57)	2	Integer
See Table 19	**Safety Loop Status** 0 Disable 1 Enable	1	Integer

4.6.3.7 RM SAS SCOE Definition

[IFRQT-0620] Deleted [Test]

4.6.3.8 RM BCE SCOE Definition

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

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**	**Length (byte)**	**Type**
	Common RM parameter (refer to Table 13 page 27)	4	Integer
See Table 19	**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
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

Periodic RM (3,25) - SID = 2→ e.g. SAS RM Packet (TBC/TBD)

Source Data Field				
Operational mnemonic	**Operational description**		**Length (byte)**	**Type**
See Table 19	**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**		**Length (byte)**	**Type**
	Common RM parameter (refer to Table 14 page 57)		2	Integer
See Table 19	**Safety Loop Status**	0 Disable 1 Enable	1	Integer

4.6.3.10 RM SIS SCOE Definition

[IFRQT-0650] [Test]

Deleted

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**	**Length (byte)**	**Type**

	Common RM parameter (refer to Table 13 page 27)	4	Integer
See Table 19	**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

Periodic RM (3,25) - SID = 2→ TBC/TBD

Source Data Field			
Operational mnemonic	**Operational description**	**Length (byte)**	**Type**
See Table 19			

Asynchronous RM (5,1)

Source Data Field			
Operational mnemonic	**Operational description**	**Length (byte)**	**Type**
	Common RM parameter (refer to Table 14 page 57)	2	Integer
See Table 19			

4.6.3.12 RM Herschel Cryo SCOE/CRYO COTE 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 27)	4	Integer
See Table 19	**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
	…		

Periodic RM (3,25) - SID = 2→ TBC/TBD

Source Data Field			
Operational mnemonic	**Operational description**	**Length (byte)**	**Type**
See Table 19			

Periodic RM (3,25) - SID =3→ TBC/TBD

Source Data Field			
Operational mnemonic	**Operational description**	**Length (byte)**	**Type**
See Table 19			

Periodic RM (3,25) - SID =4→ TBC/TBD

Source Data Field			
Operational mnemonic	**Operational description**	**Length (byte)**	**Type**
See Table 19			

Asynchronous RM (5,1)

Source Data Field			
Operational mnemonic	**Operational description**	**Length (byte)**	**Type**
	Common RM parameter (refer to Table 14 page 57)	2	Integer
See Table 19			

4.6.3.13 RM Planck PLM SCOE Definition

[IFRQT-0680] Deleted [Test]

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**		**Length (byte)**	**Type**
	Common RM parameter (refer to Table 13 page 27)		4	Integer
See Table 19	**1553 Bus status**	0 Nominal Bus active 1 Redundant Bus active	1	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
	...		

Periodic RM (3,25) - SID = 2→ TBC/TBD

Source Data Field			
Operational mnemonic	**Operational description**	**Length (byte)**	**Type**
See Table 19			

Asynchronous RM (5,1)

Source Data Field				
Operational mnemonic	**Operational description**		**Length (byte)**	**Type**
	Common RM parameter (refer to Table 14 page 57)		2	Integer
TBD	**1553 Bus status**	0 Nominal Bus active 1 Redundant Bus active	1	Integer
See Table 19				

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]

4.6.3.18 RM 1553 Bus Monitor Definition

[IFRQT-0700] 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 27)		4	Integer
See Table 19	**TBD**	TBD	1	Integer
TBD	**TBD**		4	Integer

Periodic RM (3,25) - SID = 2→ TBC/TBD

Source Data Field			
Operational mnemonic	**Operational description**	**Length (byte)**	**Type**
See Table 19			

Asynchronous RM (5,1)

Source Data Field				
Operational mnemonic	**Operational description**		**Length (byte)**	**Type**
	Common RM parameter (refer to Table 14 page 57)		2	Integer
See Table 19	**1553 Bus status**	0 Nominal Bus active 1 Redundant Bus active	1	Integer

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			
Operational mnemonic	**Operational description**	**Length (byte)**	**Type**
	Common RM parameter (refer to Table 13 page 27) TBC	4	Integer
See Table 19	TBC/TBD	TBC/TBD	TBC/TBD

Periodic RM (3,25) - SID = 2→ TBC/TBD

Source Data Field			
Operational mnemonic	**Operational description**	**Length (byte)**	**Type**
See Table 19			

Asynchronous RM (5,1)

Source Data Field			
Operational mnemonic	**Operational description**	**Length (byte)**	**Type**
	Common RM parameter (refer to Table 1 page 57) TBC	2	Integer
See Table 19	TBC/TBD	TBC/TBD	TBC/TBD

4.6.4.3 RM LFI EGSE Definition

[IFRQT-0750] [Test]

Periodic RM (3,25)

Source Data Field			
Operational mnemonic	**Operational description**	**Length (byte)**	**Type**
	Common RM parameter (refer to Table 13 page 27) TBC	4	Integer
See Table 19	TBC/TBD	TBC/TBD	TBC/TBD

Periodic RM (3,25) - SID = 2→ TBC/TBD

Source Data Field			
Operational mnemonic	**Operational description**	**Length (byte)**	**Type**
See Table 19			

Asynchronous RM (5,1)

Source Data Field			
Operational mnemonic	**Operational description**	**Length (byte)**	**Type**
	Common RM parameter (refer to Table 14 page 57)	2	Integer
See Table 19	TBC/TBD	TBC/TBD	TBC/TBD

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)

Source Data Field			
Operational mnemonic	**Operational description**	**Length (byte)**	**Type**
	Common RM parameter (refer to Table 13 page 27) TBC	4	Integer
See Table 19	TBC/TBD	TBC/TBD	TBC/TBD

Periodic RM (3,25) - SID = 2→ TBC/TBD

Source Data Field			
Operational mnemonic	**Operational description**	**Length (byte)**	**Type**
See Table 19			

Asynchronous RM (5,1)

Source Data Field			
Operational mnemonic	**Operational description**	**Length (byte)**	**Type**
	Common RM parameter (refer to Table 14 page 57)	2	Integer
See Table 19	TBC/TBD	TBC/TBD	TBC/TBD

4.6.4.6 RM PACS EGSE Definition

[IFRQT-0780] [Test]

Periodic RM (3,25)

Source Data Field			
Operational mnemonic	**Operational description**	**Length (byte)**	**Type**
	Common RM parameter (refer to Table 13 page 27) TBC	4	Integer
See Table 19	TBC/TBD	TBC/TBD	TBC/TBD

Periodic RM (3,25) - SID = 2→ TBC/TBD

Source Data Field			
Operational mnemonic	**Operational description**	**Length (byte)**	**Type**
See Table 19			

Asynchronous RM (5,1)

Source Data Field			
Operational mnemonic	**Operational description**	**Length (byte)**	**Type**
	Common RM parameter (refer to Table 14 page 57)	2	Integer
See Table 19	TBC/TBD	TBC/TBD	TBC/TBD

4.6.4.7 RM SPIRE EGSE Definition

[IFRQT-0790] [Test]

Periodic RM (3,25)

Source Data Field			
Operational mnemonic	**Operational description**	**Length (byte)**	**Type**
	Common RM parameter (refer to Table 13 page 27) TBC	4	Integer
See Table 19	TBC/TBD	TBC/TBD	TBC/TBD

Periodic RM (3,25) - SID = 2→ TBC/TBD

Source Data Field			
Operational mnemonic	**Operational description**	**Length (byte)**	**Type**
See Table 19			

Asynchronous RM (5,1)

Source Data Field			
Operational mnemonic	**Operational description**	**Length (byte)**	**Type**
	Common RM parameter (refer to Table 14 page 57)	2	Integer
See Table 19	TBC/TBD	TBC/TBD	TBC/TBD

4.6.5 COMMUNICATION VIA www LAN

4.6.5.1 RM www.Server Definition

[IFRQT-0800] Deleted [Test]

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

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
Header	Refer to Table 3 page 29 with : Message ID = Refer to Table 11 page 36 VCID = 0x**00** Request ID = Same as the original RC initiated by CCS Remaining length = 0x**001C**			
Body	Source Packet Header	Refer to Table 5 page 31 with : Packet length = 0x**0F**		
	Data field header	Refer to Table 6 page 31with : Packet Type = 0x**01** Packet sub-type = 0x**01**		
	Source data	*Length*	*Parameter list*	*Type*
	RC Packet Identifier	1 byte	Original RC Packet ID	Enum
	RC Packet Sequence Control	2 bytes	Original RC Sequence Control	integer
	Packet error control	2 bytes	Not Used	integer

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	Refer to Table 3 page 29 with : Message ID = Refer to Table 11 page 36 VCID = 0x**00** Request ID = Same as the original RC initiated by CCS			
Body	Source Packet Header	Refer to Table 5 page 31		
	Data field header	Refer to Table 6 page 31with : Packet Type = 0x**01** Packet sub-type = 0x**02**		
	Source data			
	RC Packet Identifier	2 bytes	Original RC Packet ID	integer
	RC Packet Sequence Control	2 bytes	Original RC 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	RC not authorised – local mode
1	RC not authorised– Off-line
2	TC input buffer full
3	Illegal APID
4	Illegal Data Field Header
5	Illegal packet length
6	Timeout reception
7	Port disconnection while message reading
8	RC unknown

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

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

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
Header	Refer to Table 3 page 29 with : Message ID = Refer to Table 11 page 36 VCID = 0x**00** Request ID = Same as the original TC initiated by CCS Remaining length = 0x**0016**			
Body	Source Packet Header	Refer to Table 5 page 31 with : Packet length = 0x**0B**		
	Data field header	Refer to Table 6 page 31with : Packet Type = 0x**01** Packet sub-type = 0x**01**		
	Source data			
	TC Packet Identifier	2 bytes	Original TC Packet ID	integer
	TC Packet Sequence Control	2 bytes	Original TC Sequence Control	integer
	Packet error control	2 bytes	Not Used	integer

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 29 with : Message ID = Refer to Table 11 page 36 VCID = 0x**00** Request ID = Same as the original TC initiated by CCS			
Body	Source Packet Header	Refer to Table 5 page 31		
	Data field header	Refer to Table 6 page 31with : Packet Type = 0x**01** Packet sub-type = 0x**02**		
	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

4.9 MONITORING FLOW – TC Echo

Source ↓ Destination	DFE ↓ CCS	CCS ↓ IS station
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
Header	Refer to Table 3 page 29 with : Message ID = Refer to Table 11 page 36 VCID = 0x**00** Request ID = Forced to 0x**00**			
Body	**TC Packet**	**variable**	**variable**	

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

4.10 MONITORING FLOW – TC Report

Source	DFE
Destination	CCS
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
Header	Refer to Table 3 page 29 with : Message ID = Refer to Table 11 page 36 VCID = 0x**00** Request ID = Same as the original TC initiated by CCS			
Body	Source Packet Header	Refer to Table 5 page 31'		
	Data field header	Refer to Table 6 page 31 with : Packet Type/ sub-type = [5,1] for success Packet Type / sub-type = [5,4] for transmission failure		
	Source data			
	Event ID	2 bytes	DFE supplier specific event code	
	Request ID	4 bytes	Same as the original TC	
	Result code	1 bytes	Rejected/Failed/Succeeded	
	Priority	1 bytes	Normal/High	
	Protocol	1 bytes	AD/BD service mode used for this TC	
	VCID	1 Bytes	Virtual Channel used	
	MAPID	1 Bytes	MAP ID used	
	Retransmits	1 bytes	0..255 (for AD mode)	
	Time stamp	8 bytes	CUC time code for final confirmation	
	TC-ID	6 bytes	Copy of original TC packet header	
	Packet error control	2 bytes	Not Used	integer

4.11 MONITORING FLOW – RM Alive Packet

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

[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
Header	Refer to Table 3 page 29 with : Message ID = Refer to Table 11 page 36 VCID = 0x**00** Request ID = 0x**0000 0000** Remaining length = 0x**0018**			
Body	Source Packet Header	Refer to Table 5 page 31 with : Packet length = 0x**0B**		
	Data field header	Refer to Table 6 page 31 with : Packet Type = 0x**00** Packet sub-type = 0x**00**		
	Source data	None		
	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.

4.12 INTERFACES REQUIREMENTS

4.12.1 GENERIC INTERFACE NAME

EGSE	Item	APID		Host Name	Port number	*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 LAN* TBD.TBD.TBD.xxx
		Dec	Hex							
CCSy	Master Test Processor	2016	7E0	HPy-S	TBD	TBD	TBD	TBD		
y=1 for CCS #1	Data Server			HPy-D	TBD	TBD				
y=2 for CCS #2	Work Station 1			HPWSy1	TBD	TBD				
y=3 for CCS #3	…			…	TBD	TBD				
y=4 for CCS Lite1	Work Station 8			HPWSy8	TBD	TBD				
y=5 for CCS Lite 2	B&W Printer			HPBWy1	TBD	TBD				
	B&W Printer			HPBWy2	TBD	TBD				
	Color Printer			HPCLy1	TBD	TBD				
	www server			HPNWPCy	TBD	TBD				TBD
CDMU SCOE	Work Station	2017	7E1	TBD	TBD		TBD			
ACMS SCOE	Work Station	2018	7E2	TBD	TBD		TBD			
TT&C SCOE	Work Station	2019	7E3	TBD	TBD		TBD			
TM/TC DFE	Work Station	2020	7E4	TBD	TBD		TBD		TBD	
BATSIM	Work Station	2023	7E7	TBD	TBD		TBD			
LPS/SAS	Work Station	2024	7E8	TBD	TBD		TBD			
PLM SCOE	Work Station	2025	7E9	TBD	TBD		TBD			
H CRYO SCOE / CRYO COTE	Work Station	2026	7EA	TBD TBD	TBD		TBD TBD			
CDMU DFE	Work Station	2028	7EC	TBD	TBD		TBD			
1553 Bus monitor	Work Station	2029	7ED	TBD	TBD		TBD			
Quick Load	Quick Load			TBD	TBD		TBD			
NDIU	NDIU			TBD	TBD				TBD	
HFI EGSE	HFI EGSE	2040	7F8	TBD	TBD			TBD		
LFI EGSE	LFI EGSE	2041	7F9	TBD	TBD			TBD		
HIFI EGSE	HIFI EGSE	2042	7FA	TBD	TBD			TBD		
PACS EGSE	PACS EGSE	2043	7FB	TBD	TBD			TBD		
SPIRE EGSE	SPIRE EGSE	2044	7FC	TBD	TBD			TBD		

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 (RC) and parameters necessary to fulfil the communication between EGSE items
For more information, refer to [AD06].

[IFRQT-0888-1] [Analysis]

The allocation for EGSE Subsystem Identifier shall be "**Y**" (refer to AD[06] req. NMCVT-7500-C)

[IFRQT-0888-2] [Analysis]

The allocation for EGSE Subsystem Identifier shall be "**25**" (for RM packet (Y is 25th alphabetic letter))

[IFRQT-0888-3] [Analysis]

The allocation for EGSE item shall be as follows (Refer to AD[06] req. NMCVT-7520-C) :

EGSE Item	Position allocation
ACMS SCOE	[900-920]
CCS	[940-941]
PLM SCOE	[942-943]
CDMU DFE	[944-945]
TM/TC DFE	[946-947]
CDMU SCOE	[948-949]
TT&C SCOE	[950-951]
LPS	[952-953]
SAS	[954-955]
BATSIM	[956-957]
CRYO SCOE	[958-959]
CRYO COTE	[960-961]
HIFI	[962-963]
PACS	[964-965]
SPIRE	[966-967]
HFI	[968-969]
LFI	[970-971]

[IFRQT-0888-4] [Analysis]

The authorised character string should be one of the following:
[0-9] (decimal digits),
[A-H] (characters from "A" to "H", but only upper case),
[J-N] (characters from "J" to "N", but only upper case),
[P] (character "P", but only upper case),
[R-Z] (characters from "R" to "Z", but only upper case),
[_] (underscore).

This applies only for identifiers.

[IFRQT-0888-5] [Analysis]

RC Definition shall be as follows (Refer to AD[06] req. NMCVT-4540-C and NMCVT-4580-C):
e.g.

EGSE Item	RC mnemo						Short descrip	Long descript	RC_ID	
	Sub-System	ID Subtype	Function (3 char)			Position allocation				
PLM SCOE	Y	C	R	E	M	942	Set Remote	Set PLM SCOE in Remote Mode	TBD	
PLM SCOE	Y	C	L	O	C	942	Set Local	Set PLM SCOE in Local Mode	TBD	
SAS	Y	C	O	N	L	954	Set On-line	Set SAS in On-line	TBD	
SAS	Y	C	O	F	L	954	Set Off-line	Set SAS in Off -line	TBD	
CDMU SCOE	Y	C	E	A	R	948	Enable Archive	Enable Archiving on CDMU SCOE	TBD	
CDMU SCOE	Y	C	D	A	R	948	Disable Archive	Disable Archive on CDMU SCOE	TBD	
...										

Note : Greyed columns are fixed

Table 16 : RC mnemonic definition

[IFRQT-0888-6] [Analysis]

The three characters of 'RC mnemo function' field shall be of authorised characters.
SCOE Subcontractor is free to define its own RC mnemo with respect to Table 16.
However, the combination of the three characters shall be, as far as possible, easily understandable.

[IFRQT-0888-7] [Analysis]

If needed RC Parameter shall be as follows (Refer to AD[06] req. NMCVT-5110-C and NMCVT-5150-C) :

e.g.

EGSE Item	RC Parameter Name						Textual Description
	Sub-System	ID Subtype	Function (3 char)			Position allocation	
SAS	Y	P	S	E	C	954	SAS section
SAS	Y	P	S	E	V	954	Voltage characteristic for SAS section
SAS	Y	P	S	E	I	954	Current characteristic for SAS section
LPS	Y	P	P	W	V	952	Power supply Voltage
LPS	Y	P	P	W	I	952	Power supply current
…							

Note : Greyed columns are fixed

Table 17 : RC parameters definition

[IFRQT-0888-8] [Analysis]

The three characters of 'RC param name function' field shall be of authorised characters.
SCOE Subcontractor is free to define its own RC parameter name with respect to Table 17.
However, the combination of the three characters shall be, as far as possible, easily understandable.

[IFRQT-0888-9] [Analysis]

RM Packet Definition shall be as follows (Refer to AD[06] req. NMCVT-4392-C):
e.g.

EGSE Item	RM mnemo						Textual Description	Pkt Type	Pkt SubType	Pkt SID
	Sub-System Number	Element RM pkt (4 dec)				Position allocation				
PLM SCOE	**25**	**9**	**4**	**2**	**0**	**942**	RM Acquisition relay	3	25	0
PLM SCOE	**25**	**9**	**4**	**2**	**1**	**942**	RM acquisition voltage	3	25	1
PLM SCOE	**25**	**9**	**4**	**2**	**2**	**942**	RM TBD	3	25	2
PLM SCOE	**25**	**9**	**4**	**2**	**3**	**942**	Asynchronous RM Message (event)	5	1	

Note : Greyed columns are fixed

Table 18 : RM Packet definition

[IFRQT-0888-10] [Analysis]

The four characters of 'element RM pkt' field shall be of 'decimal digit string' type [0-9]
SCOE Subcontractor is free to define its own RM packet name with respect to Table 18.

[IFRQT-0888-11] [Analysis]

First three characters shall be the same as the 'position allocation' field.

[IFRQT-0888-12] [Analysis]

Fourth character shall uniquely identify the RM Packet Name.

[IFRQT-0888-14] [Analysis]

If needed RM Parameter shall be as follows (Refer to AD[06] req. NMCVT-5110-C and NMCVT-5150-C) :

e.g.

EGSE Item	Parameter Name						Textual Description	PTC	PFC
	Sub-System	ID Subtype	Function (3 char)			Position allocation			
SAS	Y	M	0	5	V	954	Voltage acquisition for SAS section 05	TBD	TBD
SAS	Y	M	1	2	I	954	Current acquisition for SAS section 12	TBD	TBD
PLM SCOE	Y	M				942			

Note : Greyed columns are fixed

Table 19 : RM Parameter definition

[IFRQT-0888-15] [Analysis]

The three characters of 'RC param name function' field shall be of authorised characters.
SCOE Subcontractor is free to define its own RM parameter name with respect to Table 19.
However, the combination of the three characters shall be, as far as possible, easily understandable.

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

This chapter defines 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]

Table below resumes all the H/P EGSE interfaces :

EGSE		Internal Interface (communication protocol)					External Interface (Hardware)					
		NDIU Lite	CCS				EGSE			S/C		
		NDIU LAN	www LAN	SCOE/DFE LAN: CCS → SCOE (RC)	SCOE/DFE LAN: SCOE → CCS (RM)	IS LAN	TM/TC DFE	NDIU	LPS/SAS	Herschel	Planck	
Planck IS	HFI IS EGSE					4.5-4.9-4.11						
	LFI IS EGSE					4.5-4.9-4.11						
Herschel IS	HCSS IS EGSE					4.5-4.9-4.11 4.6.4.4 (RM) 4.3.2.4 (RC)						
	HIFI IS EGSE					4.5-4.9-4.11 4.6.4.5 (RM) 4.3.2.5 (RC)						
	PACS IS EGSE					4.5-4.9-4.11 4.6.4.6 (RM) 4.3.2.6 (RC)						
	SPIRE IS EGSE					4.5-4.9-4.11 4.6.4.7 (RM) 4.3.2.7 (RC)						
TT&C	TM/TC DFE	AD 4		4.3.1.5 (RC) 4.2 (TC)	4.6.3.4 (RM) 4.4 (TM)			5.2.1		5.1.15	5.1.15	
	TT&C SCOE RF			4.3.1.4	4.6.3.3		5.2.1			5.1.3	5.1.3	
ACMS SCOE	ACMS SCOE Optical Stim			4.3.1.3 4.3.1.3.2	4.6.3.2 4.6.3.2.2					5.1.2 5.1.2.1	5.1.2 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 SCOE	Battery Sim			4.3.1.7	4.6.3.6					5.1.6	5.1.6	
	BCE SCOE									5.1.8	5.1.8	
	LPS/SAS			4.3.1.10	4.6.3.9					5.1.9	5.1.9	
PLM	PLM SCOE			4.3.1.11	4.6.3.12					5.1.10	5.1.10	

EGSE		Internal Interface (communication protocol)					External Interface (Hardware)					
		NDIU Lite	CCS				EGSE			S/C		
		NDIU LAN	www LAN	SCOE/DFE LAN		IS LAN	TM/TC DFE	NDIU	LPS/SAS	Herschel	Planck	
				CCS → SCOE (RC)	SCOE → CCS (RM)							
Herschel	H-Cryo SCOE			4.3.1.13	4.6.3.12					5.1.11		
	H-Cryo COTE			4.3.1.1	4.6.3.1				5.2.2			
MIL 1553B	CDMU SCOE			4.3.1.2	4.6.3.1					5.1.1	5.1.1	
	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	
OBSW Load/Dump Tool										5.1.14	5.1.14	

Table 20 : H/P EGSE Interfaces

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

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 Launch POWER SCOE

[IFRQT-0950] [Analysis]

Launch Power SCOE 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)
S/C Powering	- 6 current sections from 0 to 3A each.
Bus monitor lines	- 2 voltage monitor lines 0 to 28 volts and 2 returns - 100κΩ line protection resistors in series with the positive lines.
Charge Array disable link	- 2 straps to short-circuit the current sections

5.1.4.3 Telecommand I/F

[IFRQT-0960] Deleted [Analysis]

[IFRQT-0970] Deleted [Analysis]

5.1.4.4 Telemetry I/F

[IFRQT-0980] Deleted [Analysis]

[IFRQT-0990] Deleted [Analysis]

5.1.5 BATSIM SCOE

[IFRQT-1000] [Analysis]

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

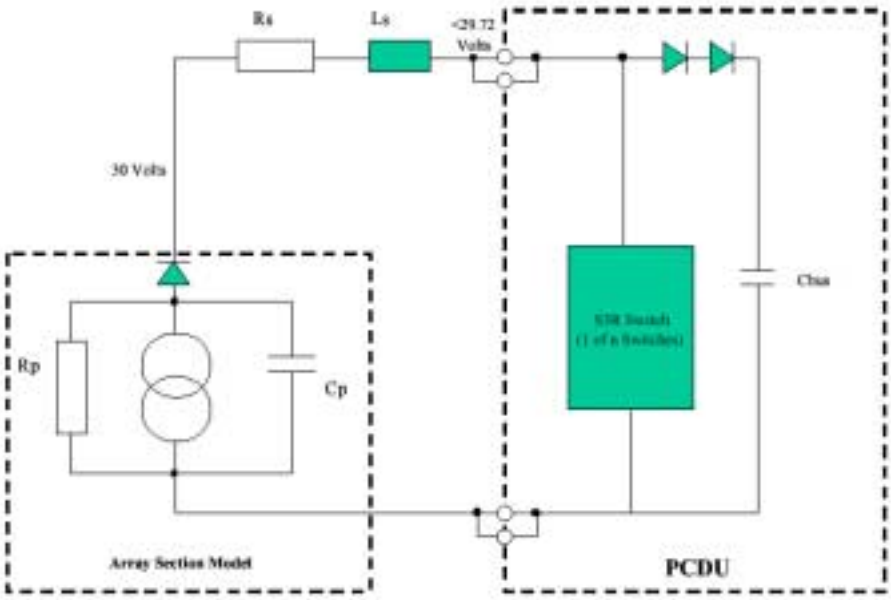
Parameter	Herschel/Planck Limit
Minimum EOD voltage Veodmin	15 (V)
Nominal EOD voltage Veod	18 (V)
Nominal EOC voltage Veoc	25.2 (V)
Maximum EOC voltage Veocmax	27.7 (V) (tbc)
Maximum harness voltage drop outside the PCDU, based on GDIR 1% requirement applied at EOD	0.15
Maximum harness voltage drop, 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 part of LPS

[IFRQT-1010] [Analysis]

SAS part of LPS 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 (µF) max	0,5µF
Section Inductance Ls (mH) max	7,5 mH
Effective Series Resistance Rs	2,5 Ω



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 Veodmin	15 (V)
Nominal EOD voltage Veod	18 (V)
Nominal EOC voltage Veoc	25.2 (V)
Maximum EOC voltage Veocmax	27.7 (V)
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)

5.1.8 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)
S/C Powering	- 6 current sections from 0 to 3A each.
Bus monitor lines	- 2 voltage monitor lines 0 to 28 volts and 2 returns - 100κΩ line protection resistors in series with the positive lines.
Charge Array disable link	- 2 straps to short-circuit the current sections

5.1.8.3 Telecommand I/F

[IFRQT-1040] Deleted [Analysis]

[IFRQT-1050] Deleted [Analysis]

•

5.1.8.4 Telemetry I/F

[IFRQT-1060] Deleted [Analysis]

[IFRQT-1070] Deleted [Analysis]

•

5.1.9 HERSCHEL Stimuli Instrument SCOE

[IFRQT-1080] [Analysis]

TBD

5.1.10 PLM SCOE

[IFRQT-1090] [Analysis]

PLM SCOE shall simulate the PCDU functionality. It shall power the Satellite with a voltage Bus between 26 and 29 V.

5.1.11 Herschel Cryo SCOE

[IFRQT-1100] [Analysis]

Herschel CRYO SCOE shall interface the H-PLM for :
- Heaters powering
- Launch valve command
- Thermal sensor acquisition

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 CDMU SCOE - 1553 Bus Probe

[IFRQT-1150] [Analysis]

Refer to [AD7] §6.8.2

5.1.14 OBSW Load/Dump tool

[IFRQT-1155] [Analysis]

OBSW Load/Dump Tool shall interface with SVM for quick loading of the EEPROM of both CDMU Processor Modules with the electrical characteristics according to TBD

5.1.15 TM/TC DFE

5.1.15.1 Telecommand I/F

[IFRQT-1156] [Analysis]

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

[IFRQT-1157] [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

5.1.15.2 Telemetry I/F

[IFRQT-1158] [Analysis]

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

[IFRQT-1159] [Analysis]

Each TM Interface shall comprise the following signals :

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

5.2 EGSE to EGSE INTERFACES

5.2.1 TM/TC Interface

[IFRQT-1160] Deleted [Analysis]

[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

[IFRQT-1182] [Analysis]

TM/TC DFE shall interface with TM/TC Amplifier with the electrical characteristics according to TBC

5.2.2 Launch Power Supply Interface

[IFRQT-1185] [Analysis]

LPS shall interface with CRYO COTE with the electrical characteristics according to [RD12] § 4.4.2.2

- 650 W heater powering : 4 lines
- 10 W heater powering : 2 lines
- Level sensor powering : 2 lines
- Level sensor signal : 2 lines
- Latch Valve command : 3 lines
- Thermal sensors : 2 lines

5.2.3 SAFETY LOOP

[IFRQT-1190] [Analysis]

Safety Loop signal shall link together LPS/ SAS and BATSIM SCOE with the electrical characteristics according to [AD5]

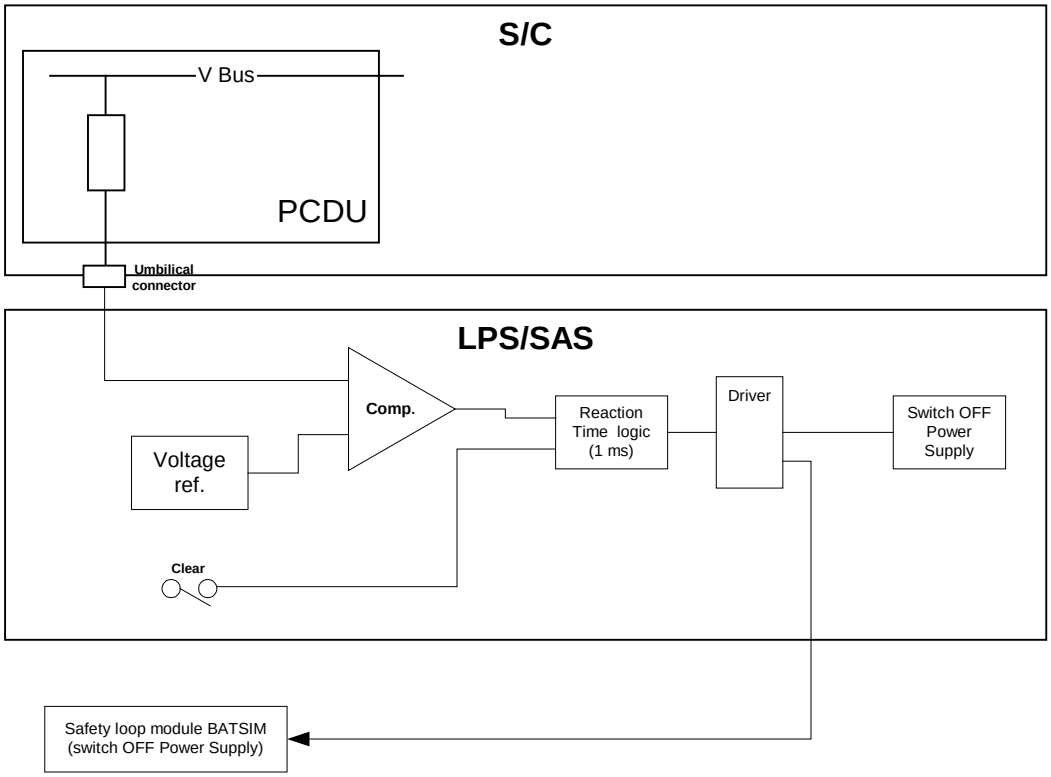


Figure 10 : SAFETY LOOP overview

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	Status (Applicable (if empty), Deleted, N/A)	Req. Verification	Test level 2	Test level 3
[IFRQT-0010]		Analysis	X	X
[IFRQT-0020]		Analysis	X	X
[IFRQT-0030]		Analysis	X	X
[IFRQT-0040]		Analysis	X	X
[IFRQT-0042]	Deleted			
[IFRQT-0043]	Deleted			
[IFRQT-0045]		Test	X	X
[IFRQT-0050]		Test	X	X
[IFRQT-0070]		Test	X	X
[IFRQT-0080]		Test	X	X
[IFRQT-0100]		Test	X	X
[IFRQT-0102]		Test	X	X
[IFRQT-0103]		Test	X	X
[IFRQT-0104]		Test	X	X
[IFRQT-0105]		Test	X	X
[IFRQT-0110]		Test	X	X
[IFRQT-0120]		Analysis	X	X
[IFRQT-0130]		Analysis	X	X
[IFRQT-0140]		Analysis	X	X
[IFRQT-0150]		Analysis	X	X
[IFRQT-0160]		Analysis	X	X
[IFRQT-0161]		Test	X	X
[IFRQT-0162]		Test	X	X
[IFRQT-0163]		Test	X	X
[IFRQT-0164]		Test	X	X
[IFRQT-0165]		Test	X	X
[IFRQT-0166]		Test	X	X
[IFRQT-0170]		Test	X	X
[IFRQT-0180]	Deleted			

Requirement	Status (Applicable (if empty), Deleted, N/A)	Req. Verification	Test level 2	Test level 3
[IFRQT-0190]	Deleted			
[IFRQT-0200]		Analysis	X	X
[IFRQT-0201]	Deleted			
[IFRQT-0210]	Deleted			
[IFRQT-0220]		Analysis	X	X
[IFRQT-0230]		Analysis	X	X
[IFRQT-0240]		Analysis	X	X
[IFRQT-0245]		Information	X	X
[IFRQT-0246]		Information	X	X
[IFRQT-0247]		Information	X	X
[IFRQT-0250]	N/A			
[IFRQT-0260]		Test	X	X
[IFRQT-0270]		Test	X	X
[IFRQT-0280]		Test	X	X
[IFRQT-0290]		Test	X	X
[IFRQT-0300]	Deleted			
[IFRQT-0310]		Test	X	X
[IFRQT-0320]	Deleted			
[IFRQT-0330]	N/A (no interface with CCS)			
[IFRQT-0340]		Test	X	X
[IFRQT-0350]		Test	X	X
[IFRQT-0360]		Test	X	X
[IFRQT-0370]		Test	X	X
[IFRQT-0380]	Deleted			
[IFRQT-0390]	Deleted			
[IFRQT-0400]		Test	X	X
[IFRQT-0405]	N/A			
[IFRQT-0410]		Test	X	X
[IFRQT-0420]	Deleted			
[IFRQT-0430]		Test	X	X
[IFRQT-0440]		Test	X	X
[IFRQT-0450]	Deleted			
[IFRQT-0460]		Test	X	X
[IFRQT-0470]		Test	X	X
[IFRQT-0480]		Test	X	X
[IFRQT-0490]	Deleted			
[IFRQT-0500]		Analysis	X	X
[IFRQT-0510]		Analysis	X	X
[IFRQT-0520]		Analysis	X	X
[IFRQT-0525]		Analysis	X	X
[IFRQT-0540]	Deleted			
[IFRQT-0550]		Analysis	X	X
[IFRQT-0560]		Analysis	X	X

Requirement	Status (Applicable (if empty), Deleted, N/A)	Req. Verification	Test level 2	Test level 3
[IFRQT-0562]	(Was -0530)	Analysis	X	X
[IFRQT-0562-1]		Information	X	X
[IFRQT-0562-2]		Information	X	X
[IFRQT-0562-3]		Information	X	X
[IFRQT-0563]	(Was -0535)	Analysis	X	X
[IFRQT-0563-1]		Information	X	X
[IFRQT-0563-2]		Information	X	X
[IFRQT-0565]		Test	X	X
[IFRQT-0570]		Test	X	X
[IFRQT-0580]		Test	X	X
[IFRQT-0590]		Test	X	X
[IFRQT-0600]	Deleted			
[IFRQT-0610]		Test	X	X
[IFRQT-0620]	Deleted			
[IFRQT-0630]	N/A			
[IFRQT-0640]		Test	X	X
[IFRQT-0650]		Test	X	X
[IFRQT-0660]		Test	X	X
[IFRQT-0670]		Test	X	X
[IFRQT-0680]	Deleted			
[IFRQT-0690]	Deleted			
[IFRQT-0700]		Test	X	X
[IFRQT-0710]		Test	X	X
[IFRQT-0720]	N/A			
[IFRQT-0700]		Test	X	X
[IFRQT-0730]	Deleted			
[IFRQT-0740]		Test	X	X
[IFRQT-0750]		Test	X	X
[IFRQT-0760]	Deleted			
[IFRQT-0770]		Test	X	X
[IFRQT-0780]		Test	X	X
[IFRQT-0790]		Test	X	X
[IFRQT-0800]	Deleted			
[IFRQT-0801]		Analysis	X	X
[IFRQT-0802]		Analysis	X	X
[IFRQT-0802-1]		Analysis	X	X
[IFRQT-0802-2]		Analysis	X	X
[IFRQT-0802-3]		Analysis	X	X
[IFRQT-0802-4]		Analysis	X	X
[IFRQT-0803]		Analysis	X	X
[IFRQT-0804]		Analysis	X	X
[IFRQT-0805]		Analysis	X	X
[IFRQT-0806]		Analysis	X	X
[IFRQT-0807]		Analysis	X	X

Requirement	Status (Applicable (if empty), Deleted, N/A)	Req. Verification	Test level 2	Test level 3
[IFRQT-0808]		Analysis	X	X
[IFRQT-0808-1]		Analysis	X	X
[IFRQT-0808-1.1]		Analysis	X	X
[IFRQT-0808-1.2]		Analysis	X	X
[IFRQT-0808-1.3]		Analysis	X	X
[IFRQT-0808-1.4]		Analysis	X	X
[IFRQT-0808-1.5]		Analysis	X	X
[IFRQT-0808-2]		Analysis	X	X
[IFRQT-0808-3]		Analysis	X	X
[IFRQT-0809]		Analysis	X	X
[IFRQT-0809-1]		Analysis	X	X
[IFRQT-0809-2]		Analysis	X	X
[IFRQT-0810]		Analysis	X	X
[IFRQT-0820]		Analysis	X	X
[IFRQT-0830]		Analysis	X	X
[IFRQT-0840]		Test	X	X
[IFRQT-0850]		Analysis	X	X
[IFRQT-0860]		Analysis	X	X
[IFRQT-0870]		Analysis	X	X
[IFRQT-0880]	Deleted			
[IFRQT-0882]		Analysis	X	X
[IFRQT-0884]		Analysis	X	X
[IFRQT-0886]		Analysis	X	X
[IFRQT-0887]		Analysis	X	X
[IFRQT-0888-1]		Analysis	X	X
[IFRQT-0888-2]		Analysis	X	X
[IFRQT-0888-3]		Analysis	X	X
[IFRQT-0888-4]		Analysis	X	X
[IFRQT-0888-5]		Analysis	X	X
[IFRQT-0888-6]		Analysis	X	X
[IFRQT-0888-7]		Analysis	X	X
[IFRQT-0888-8]		Analysis	X	X
[IFRQT-0888-9]		Analysis	X	X
[IFRQT-0888-10]		Analysis	X	X
[IFRQT-0888-11]		Analysis	X	X
[IFRQT-0888-12]		Analysis	X	X
[IFRQT-0888-14]		Analysis	X	X
[IFRQT-0888-15]		Analysis	X	X
[IFRQT-0889]		Analysis	X	X
[IFRQT-0890]		Analysis	X	X
[IFRQT-0900]		Analysis	X	X
[IFRQT-0910]		Analysis	X	X
[IFRQT-0915]		Analysis	X	X
[IFRQT-0920]		Analysis	X	X

Requirement	Status (Applicable (if empty), Deleted, N/A)	Req. Verification	Test level 2	Test level 3
[IFRQT-0930]		Analysis	X	X
[IFRQT-0940]		Analysis	X	X
[IFRQT-0950]		Analysis	X	X
[IFRQT-0960]	Deleted			
[IFRQT-0970]	Deleted			
[IFRQT-0980]	Deleted			
[IFRQT-0990]	Deleted			
[IFRQT-1000]		Analysis	X	X
[IFRQT-1010]		Analysis	X	X
[IFRQT-1020]		Analysis	X	X
[IFRQT-1030]		Analysis	X	X
[IFRQT-1040]	Deleted			
[IFRQT-1050]	Deleted			
[IFRQT-1060]	Deleted			
[IFRQT-1070]	Deleted			
[IFRQT-1080]		Analysis	X	X
[IFRQT-1090]		Analysis	X	X
[IFRQT-1100]		Analysis	X	X
[IFRQT-1130]		Analysis	X	X
[IFRQT-1140]		Analysis	X	X
[IFRQT-1150]		Analysis	X	X
[IFRQT-1155]		Analysis	X	X
[IFRQT-1156]		Analysis	X	X
[IFRQT-1157]		Analysis	X	X
[IFRQT-1158]		Analysis	X	X
[IFRQT-1159]		Analysis	X	X
[IFRQT-1160]	Deleted			
[IFRQT-1170]		Analysis	X	X
[IFRQT-1180]		Analysis	X	X
[IFRQT-1182]		Analysis	X	X
[IFRQT-1185]		Analysis	X	X
[IFRQT-1190]		Analysis	X	X

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