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ENREGISTREMENT DES EVOLUTIONS / CHANGE RECORDS

ISSUE	DATE	§ : DESCRIPTION DES EVOLUTIONS § : CHANGE RECORD	REDACTEUR AUTHOR
01	20/03/2006	Initial revision	
02 Draft	15/02/2007	Update according to new instruments specifications	NL
02	11/07/2007	Increase Time-out of all OBCPs, update the specifications of HFI_OFF OBCP and replace all the “TBD” by the current value and a “TBC” mark	NL

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1. INTRODUCTION

1.1 Purpose

This documents aims at specifying the On-Board Control Procedures (OBCP) that are necessary to support the Herschel/Planck Payload Management functionality being implemented in the CDMS OBSW.
In addition, it identifies the Payload event reports that shall trigger the execution of some of these OBCP. Entries in the Event/Action Table (EAT) supported by the CDMS ASW are defined to create the link between event report and action (nominal or recovery) to be performed by the CDMS OBSW.

1.2 Limitations

OBCP that Ground may need for nominal operations of the Payloads are not covered by this document as they are not under AAS-F responsibility.

2. DOCUMENTATION AND TERMINOLOGY

2.1 Applicable documents

Following documents must be applied when using this document, with the extend specified in the text.
The documents quoted in this section are referenced throughout the document by [ADi] as in the list below. If not specified, the latest available version is used.

Title		Reference	Issue	Date
[AD1]	Packet Structure Interface Control Document	SCI-PT-ICD-7527	5.0	20/07/2004
[AD2]	SPIRE Data ICD	SPIRE-RAL-PRJ-001078	2.0	15/11/2004
[AD3]	PACS DPUOBS User Manual	ACS-CR-UM-024	1.7	15/09/2004
[AD4]	HIFI TC Packet ICD	SRON-U/HIFI/SP/2001-001	1.5	05/10/2005
[AD5]	HIFI TM Packet ICD	SRON-U/HIFI/SP/2001-002	1.6	05/10/2005
[AD6]	HIFI HK Packet ICD	SRON-U/HIFI/SP/2001-003	1.8	05/10/2005
[AD7]	HFI OBSW TCTM List	LI-PHBC-300081-LAL	2.1	19/11/2004
[AD8]	LFI User Manual Document	PL-LFI-PST-MA-001	2.2	30/06/2007
[AD9]	SCE TC and TM Structures	TS-PSCBC-100010-LPSC	7.2	19/10/2005
[AD10]	CDMU Software ICD for the BSW	P-HPL-NOT-00076-SE	12	05/04/2006
[AD11]	CDMU ASW ICD	H-P-4-SSF-IC-0001	4.1	26/06/2007

Table 2.1-1 : Applicable documents

2.2 Reference documents

Following documents have been taken into account when writing this document or are mentioned in the text as complementary information.

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The documents quoted in this section are referenced throughout the document by [RDi] as in the list below. If not specified, the latest available version is used.

Title		Reference	Issue	Date
[RD1]	List of Acronyms	H-P-1-ASPI-LI-0077	-	
[RD2]	System Operations & FDIR Requirements	H-P-1-ASPI-SP-0209	-	
[RD3]	SPIRE FDIR	SPIRE-RAL-PRJ-001978	1.0	13/07/2004
[RD4]	PACS FDIR	PACS-ME-GP-002	1.1	23/01/2007
[RD5]	HIFI FDIR Specification	SRON-U/HIFI/SP/2004-002	1.2	09/06/2006
[RD6]	HFI Instrument Main Electronics OBSW ICD A	IC-PHBC-200031-LAL	3.1	16/03/2005
[RD7]	Planck LFI – FDIR description	PL-LFI-PST-AN-002	1.0	18/05/2005
[RD8]	Planck Sorption Cooler Electronics FMECA	PA-PSCB-100006-ISN	1.15	01/03/2005
[RD9]	CDMU ASW Requirements Specification	H-P-SP-AI-0031	-	
[RD10]	Intended Operational Usage of Sub-Schedules	PT-CMOC-OPS-TN-6605-OPS-OGH	Draft[1]	31/03/2004
[RD11]	Data Management Working Group Meeting #21	H-P-ASP-MN-5558	-	20/10/2004

Table 2.2-1 : Reference documents

2.3 Glossary of terms and acronyms

If not defined below, terms and acronyms used are listed and defined in [RD1].

AFO	Autonomous Fail Operational
AFS	Autonomous Fail Safe
ASW	Application SoftWare
BSW	Basic SoftWare
CDMS	Command and Data Management Subsystem
CDMU	Central Data Management Unit
EAT	Event/Action Table
HPSDB	Herschel-Planck System Data-Base
ICD	Interface Control Document
OBCP	On-Board Control Procedure
OBSW	On-Board SoftWare
PCDU	Power Conditioning Distribution Unit
RT	Remote Terminal
RTU	Remote Terminal Unit
TBD	To Be Defined
SVM	SerVice Module

[1] No official release delivered to AAS-F. Intention to handle Sub-schedule as defined in this document shall be confirmed.

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3. PAYLOAD MANAGEMENT OVERVIEW

3.1 FDIR

3.1.1 Payload internal FDIR

For some specific cases, Instruments need the support of the CDMS OBSW to start their recovery procedures via OBCP.
Instruments detect some internal failures and inform the CDMS OBSW by sending dedicated Event Reports. On receipt of these reports, the CDMS OBSW start an OBCP execution according to the related entries in the EAT definition.

Note that each entry related to Instrument internal FDIR will be configured as follows:

- Action Handling ID = 01_b i.e. the action is Disabled in AFS[2] and Enabled in AFO
- Parameter Passing Status = 1_b (Enabled) when Parameter A field of the event report has to be passed to the TC starting the action. In most cases, this field is set to 0_b (Disabled) as action to be executed does not depend on the content of the related event report (event ID being sufficient).
- Action Status = 1_b i.e. the action is Enabled by default

Note also that when one APID is allocated to each side of one instrument (nominal/redundant) for its telemetry including event reports, two entries in the EAT need to be defined.

3.1.2 S/C FDIR

Some S/C FDIR detected by the SVM OBSW may impact the Instruments for which a new configuration is requested.
This new configuration is reached by executing an OBCP by the CDMS OBSW.

The FDIR related to CDMS/ACMS Level 3/4 is not treated in this section as covered by the S/C Mode Transition in section 3.2.

Consequently, the remaining S/C FDIR impacting the Instruments are:

- S/C 1553B Bus FDIR
- Science Data Monitoring
- Class B Heater Loop FDIR

3.1.2.1 S/C 1553B Bus FDIR

Start OBCP is executed as part of CDMU OBSW actions to perform the S/C 1553B Bus FDIR recovery as specified in [RD2]. The specification of the OBCP to start is given through the Event/Action Table (EAT)

[2] TBC: this has to be discussed with Instruments: the default FDIR status being AFS after a S/C mode transition, this would mean that the Payload Internal FDIR would be disabled. This sounds particularly of concern for Planck where Instrument request to do nothing during these transitions.

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definition and as such is HPSDB and flight configurable. The triggering Event Reports and related OBCP to start are specific to each FDIR (DLL, TFL TC or TFL TM) and instrument.

Note that these events reports are generated by the CDMU BSW which supports the S/C 1553B Bus FDIR.

Note that each entry related to S/C 1553B Bus FDIR will be configured as follows:

- Action Handling ID = 11_b i.e. the action is Enabled in AFS and AFO
- Parameter Passing Status = 1_b (Enabled) when Parameter A field of the event report has to be passed to the TC starting the action. In most cases, this field is set to 0_b (Disabled) as action to be executed does not depend on the content of the related event report (event ID being sufficient).
- Action Status = 1_b i.e. the action is Enabled by default

3.1.2.2 Science Data Monitoring

In addition to the TFL TM FDIR on the S/C 1553B Bus (supported by the CDMU BSW), a functionality is in place in the CDMU ASW that allows to count the number of TM generated by each Instrument and monitor this number according to specified thresholds. This has been designed using the capability of the Monitoring Table (MOT) that supports the Service 12 specified in the [AD1].
If necessary, this would offer more flexibility than the TFL TM FDIR. Indeed, the TFL TM FDIR is “hard coded” and can not be modified in flight except by patching the OBSW. Its configuration is performed via inputs parameters coming from the HPSDB, namely SDB_FDIR_TFL_TM_PERIOD_<Instrument>_VALUE and SDB_FDIR_TFL_TM_MIN_<Instrument>_VALUE. At time being, the value of these parameters are set to:

- SDB_FDIR_TFL_TM_PERIOD_<Instrument>_VALUE = 90 seconds for each instrument
- SDB_FDIR_TFL_TM_MIN_<Instrument>_VALUE = 1 for each instrument

This means that the TFL TM FDIR triggers when the CDMU OBSW does not receive more than 1 TM from an Instrument during the last 90 seconds.

On the other hand, the Science Data Monitoring functionality implemented by the CDMU ASW allows to modify in-flight the minimum thresholds. Though the counting period of the TM packets is also “hard coded” and coming from the HPSDB, the MOT allows to act on the monitoring period and repetition number before triggering an event in case of values below the thresholds.

TBC: Need to use the Science Data Monitoring functionality instead of the TLF TM FDIR has to be assessed with Instruments. In case, events coming from related MOT entries would replace the ones associated with the TFL TM FDIR in the EAT entries triggering the relevant P/L OBCP. Slight adaptation of these OBCP would be needed.

3.1.2.3 Class B Heater Loop FDIR

As described in [RD9], the CDMU OBSW (ASW) monitors the temperature computed by each Class B control loop in order to detect any potential failure of the associated heaters.
In case such a failure in detected (i.e. temperature is over specific thresholds), an event report (TM(5,4,114,5)) is generated and a recovery procedure is started by the CDMS OBSW that consists in switching to the redundant heaters.
A place holder was foreseen at the beginning of this recovery procedure in order to start the execution of a Payload OBCP that would execute some actions needed by the Instruments.

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However, as detailed in the Instruments specific sections of this document, only HIFI is thermally controlled with Class B control loops and in case of failure, HIFI do not request any action to be done other than generated an event to be informed of this failure case that may impact the accuracy of their measurements. This need is already covered by the generation of the TM(5,4,114,5).

Consequently, it is suggested to remove from [RD9] the execution of a specific payload OBCP as part of the recovery procedure of the class B heater loops. (TBC)

3.2 S/C Mode Transition

There are five S/C modes, namely:

- Launch Mode
- Sun Acquisition Mode (SAM)
- Earth Acquisition Mode (EAM)
- Nominal Mode (NOM)
- Survival Mode (SM)

S/C Mode transition can be commanded:

- By Ground via TC sent directly or via MTL or most unlikely via OBCP
- Autonomously by the CDMS OBSW:
  - On separation detection
  - For FDIR purpose, i.e. to recover from a level 3 or 4 alarm from the CDMS or ACMS.

All the possible S/C mode transitions are described in [RD2] and [RD9], and are recalled in the following figure.

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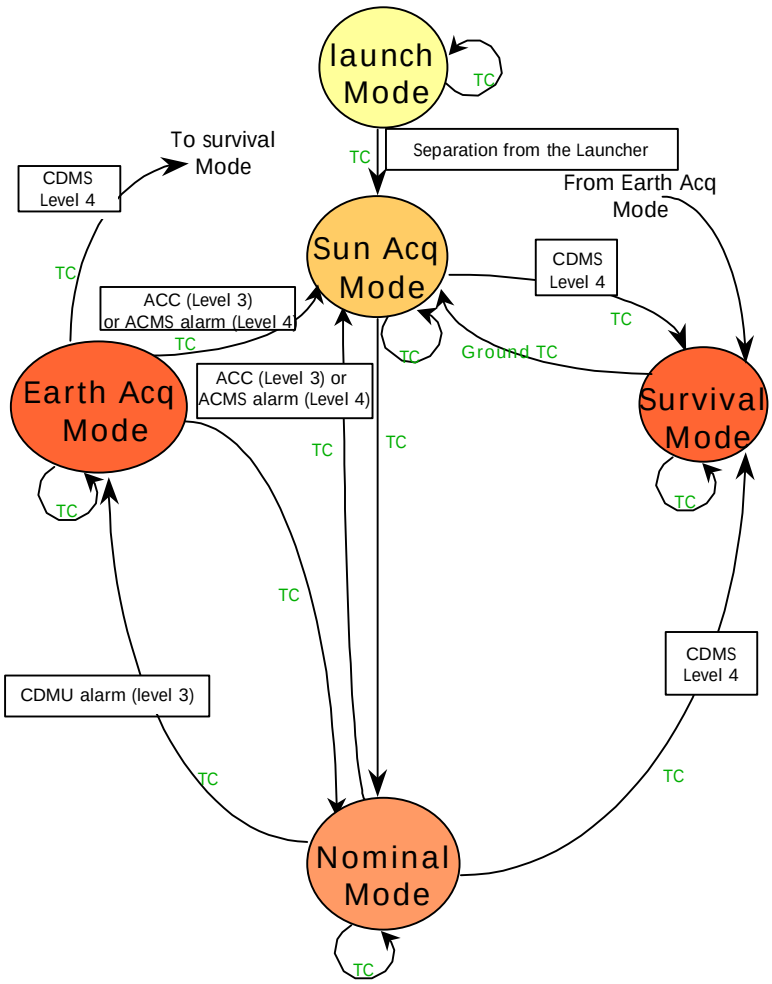

Figure 3.1.2-1 : S/C Mode Transition Logic

Whenever a transition to a non nominal mode is possible, an OBCP is executed as part of the sequence of actions to be performed by the CDMS OBSW in order to put the instruments in a “standby” mode according to the new reached S/C configuration.

As only one OBCP is started by the CDMS OBSW during the mode transition sequence, a “mother” Payload OBCP is needed to call each OBCP related a specific instrument.

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The following table identified the OBCP that are executed by the CMDS OBSW during the S/C Mode transitions as specified in [RD9].

To / From	Launch		S/C SAM		S/C NOM		S/C EAM		S/C SM	
	Trigger by	OBCP	Trigger by	OBCP	Trigger by	OBCP	Trigger by	OBCP	Trigger by	OBCP
Launch	TC CDMS Level 3b	None (Instruments are OFF at Launch)	TC Separation detected	None (Instruments are OFF at Launch)	Illegal	N/A	Illegal	N/A	Illegal	N/A
S/C SAM	Illegal	N/A	CDMS Level 3a	DB_LEVEL_3a_INSTRUMENTS	TC	None (Never autonomous)	Illegal	N/A	TC	DB_LEVEL_4_INSTRUMENTS
			TC CDMS Level 3b	DB_LEVEL_3b_INSTRUMENTS						
			ACMS Level 3/4 (AIR)	??						
S/C NOM	Illegal	N/A	TC	DB_NOM_TO_SAM_INSTRUMENTS	TC	None (Never autonomous)	CDMS Level 3a	DB_LEVEL_3a_INSTRUMENTS		
							TC CDMS Level 3b	DB_LEVEL_3b_INSTRUMENTS		
			ACMS Level 3/4 (AIR)	DB_ACMS_LEVEL_4_INSTRUMENTS						
S/C EAM	Illegal	N/A	TC	DB_EAM_TO_SAM_INSTRUMENTS	TC	None (Never autonomous)	CDMS Level 3a	DB_LEVEL_3a_INSTRUMENTS		
			ACMS Level 3/4 (AIR)	DB_ACMS_LEVEL_4_INSTRUMENTS			TC CDMS Level 3b	DB_LEVEL_3b_INSTRUMENTS	CDMS Level 4	
S/C SM	Illegal	N/A	TC	DB_SURV_TO_SAM_INSTRUMENTS	Illegal	N/A	Illegal	N/A	TC	

Table 3.1.2-1 : OBCP vs. S/C Mode transition

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As far as the Instruments are concerned, only two general cases are relevant:

- Transition from any mode to SAM or EAM
  - This transition can occur either
    - Autonomously
      - after a CDMS Level 3a or 3b alarm for both SAM and EAM
      - after an ACMS level 3 or 4 (AIR) alarm for SAM
    - By TC

- Transition from any mode to SM
  - This transition can occur either
    - Autonomously
      - After a CDMS Level 4 alarm
      - No action is requested from the Instruments as they are switched OFF by the CDMS RM after a Level 4 Alarm
    - By TC
      - As the CDMS RM sequence is not executed in this case, it is under Ground responsibility to ensure that instruments are switched OFF before entering SM

However, as:
- Only one S/C mode transition can occur at a time,
- Instruments request is identical for transition to EAM and SAM,
- Instruments request is identical for each cause of the transition (TC, 3a/3b, AIR) to SAM or EAM,

only two OBCPs for each S/C are needed (DB_H/P_PL_SC_MODE_OBCP, DB_H/P_PL_SC_SM_OBCP) and the following simplification applies.

Note that DB_H/P_PL_SC_SM_OBCP stays as a placeholder, as nothing is requested from instruments as when autonomously entering in SM, the instruments are switched OFF by the RM and the complete MTL is stopped. Again, if the SM mode is entered on TC, it is Ground responsibility to properly set the Instruments accordingly.

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To / From	Launch		S/C SAM		S/C NOM		S/C EAM		S/C SM	
	Trigger by	OBCP	Trigger by	OBCP	Trigger by	OBCP	Trigger by	OBCP	Trigger by	OBCP
Launch	TC CDMS Level 3b	None (Instruments are OFF at Launch)	TC Separation detected	None (Instruments are OFF at Launch)	Illegal	N/A	Illegal	N/A	Illegal	N/A
S/C SAM	Illegal	N/A	CDMS Level 3a	DB_H/P_PL_SC_MODE_OBCP	TC	None (Never autonomous)	Illegal	N/A	TC	DB_H/P_PL_SC_MODE_OBCP
			TC CDMS Level 3b	DB_H/P_PL_SC_MODE_OBCP						
			ACMS Level 3/4 (AIR)	??						
S/C NOM	Illegal	N/A	TC	DB_H/P_PL_SC_MODE_OBCP	TC	None (Never autonomous)	CDMS Level 3a	DB_H/P_PL_SC_MODE_OBCP		
							TC CDMS Level 3b	DB_H/P_PL_SC_MODE_OBCP		
			ACMS Level 3/4 (AIR)	DB_H/P_PL_SC_MODE_OBCP						
S/C EAM	Illegal	N/A	TC	DB_H/P_PL_SC_MODE_OBCP	TC	None (Never autonomous)	CDMS Level 3a	DB_H/P_PL_SC_MODE_OBCP		
			ACMS Level 3/4 (AIR)	DB_H/P_PL_SC_MODE_OBCP			TC CDMS Level 3b	DB_H/P_PL_SC_MODE_OBCP	CDMS Level 4	
S/C SM	Illegal	N/A	TC	DB_H/P_PL_SC_MODE_OBCP	Illegal	N/A	Illegal	N/A	TC	

Table 3.1.2-2 : OBCP vs. S/C Mode transition - Simplified

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4. HERSCHEL

4.1 SPIRE

4.1.1 SPIRE FDIR

4.1.1.1 SPIRE internal FDIR

According to [RD3], SPIRE generates the following Event Reports when it needs a support from the CDMS OBSW to complete a recovery activity.
Identification of the OBCP to implement the requested sequence of actions is then provided as additional information.

FDIR	Event Report		P/L request	OBCP
	ST,SST	ID		
DRCU Power Anomaly	5,2	0xC000	Switch Off the DRCU	DB_OBCP_H_SPIRE_DRCU_OFF
DRCU Temperature Anomaly				
DPU Power Anomaly	5,2	0xC010	Switch Off SPIRE immediately	DB_OBCP_H_SPIRE_OFF
Operations Anomaly	5,2	0xC100	Disable TC to SPIRE until further notice	DB_OBCP_H_SPIRE_OPE_STOP
Operations Resume	5,2	0xC110	Re-enable TC to SPIRE at the start of the next Subschedule	DB_OBCP_H_SPIRE_OPE_RESUME

Table 4.1.1-1 : SPIRE internal FDIR Event Reports

From the previous table, one can define the following EAT entries to support SPIRE Internal FDIR.
Note that SPIRE Event Reports can have two different APID as specified in [AD1], i.e.:

- 0x0500 for SPIRE Prime
- 0x0501 for SPIRE Redundant.

This induces that for each failure case, two entries have to be defined in the EAT.

APID	Event ID	Telecommand Packet	Action Handling ID	Parameter Passing Status	Action Status
0x0500 (SPIRE Prime)	0xC000 (DRCU Anom)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_H_SPIRE_DRCU_OFF N1=0	01_b (Disabled in AFS & Enabled in AFO)	0 (Disabled)	1 (Enabled)

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APID	Event ID	Telecommand Packet	Action Handling ID	Parameter Passing Status	Action Status
0x0501 (SPIRE Red.)	0xC000 (DRCU Anom)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_H_SPIRE_DRCU_OFF N1=0	01_b (Disabled in AFS & Enabled in AFO)	0 (Disabled)	1 (Enabled)
0x0500 (SPIRE Prime)	0xC010 (DPU Power)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_H_SPIRE_OFF N1=2 (SPIRE_SUBS_ID_CMD, SPIRE_SUBS_ID_META)	01_b (Disabled in AFS & Enabled in AFO)	0 (Disabled)	1 (Enabled)
0x0501 (SPIRE Red.)	0xC010 (DPU Power)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_H_SPIRE_OFF N1=2 (SPIRE_SUBS_ID_CMD, SPIRE_SUBS_ID_META)	01_b (Disabled in AFS & Enabled in AFO)	0 (Disabled)	1 (Enabled)
0x0500 (SPIRE Prime)	0xC100 (Operations Anom)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_H_SPIRE_OPE_STOP N1=2 (SPIRE_SUBS_ID_CMD, SPIRE_SUBS_ID_META)	01_b (Disabled in AFS & Enabled in AFO)	0 (Disabled)	1 (Enabled)
0x0501 (SPIRE Red.)	0xC100 (Operations Anom)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_H_SPIRE_OPE_STOP N1=2 (SPIRE_SUBS_ID_CMD, SPIRE_SUBS_ID_META)	01_b (Disabled in AFS & Enabled in AFO)	0 (Disabled)	1 (Enabled)
0x0500 (SPIRE Prime)	0xC110 (Operations Resume)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_H_SPIRE_OPE_RESUME N1=1 (SPIRE_SUBS_ID_META)	01_b (Disabled in AFS & Enabled in AFO)	0 (Disabled)	1 (Enabled)
0x0501 (SPIRE Red.)	0xC110 (Operations Resume)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_H_SPIRE_OPE_RESUME N1=1 (SPIRE_SUBS_ID_META)	01_b (Disabled in AFS & Enabled in AFO)	0 (Disabled)	1 (Enabled)

Table 4.1.1-2 : EAT for SPIRE Internal FDIR

4.1.1.2 SPIRE S/C FDIR

4.1.1.2.1 SPIRE S/C 1553B Bus FDIR

The following table summarises what SPIRE requests to be done by the CDMS OBSW in case an S/C 1553B Bus FDIR related to the communication with SPIRE triggers.
Identification of the OBCP to implement the requested sequence of actions is then provided as additional information.

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FDIR	Event Report		P/L request	OBCP
	ST,SST	ID		
DLL FDIR	5,x	152	Switch Off SPIRE immediately	DB_OBCP_H_SPIRE_OFF
TFL TC FDIR	5,x	171	Switch Off SPIRE immediately	DB_OBCP_H_SPIRE_OFF
TFL TM FDIR	5,x	185	Switch Off SPIRE in a controlled manner	DB_OBCP_H_SPIRE_OFF_CTRL

Table 4.1.1-3 : SPIRE S/C 1553B Bus FDIR

From the previous table, one can define the following EAT entries to support SPIRE S/C 1553B Bus FDIR.

APID	Event ID	Telecommand Packet	Action Handling ID	Parameter Passing Status	Action Status
0x0010 (CDMS)	152 (DLL FDIR)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_H_SPIRE_OFF N1=2 (SPIRE_SUBS_ID_CMD, SPIRE_SUBS_ID_META)	11_b (Enabled in both AFS & AFO)	0 (Disabled)	1 (Enabled)
0x0010 (CDMS)	171 (TFL TC FDIR)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_H_SPIRE_OFF N1=2 (SPIRE_SUBS_ID_CMD, SPIRE_SUBS_ID_META)	11_b (Enabled in both AFS & AFO)	0 (Disabled)	1 (Enabled)
0x0010 (CDMS)	185 (TFL TM FDIR)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_H_SPIRE_OFF_CTRL N1=2 (SPIRE_SUBS_ID_CMD, SPIRE_SUBS_ID_META)	11_b (Enabled in both AFS & AFO)	0 (Disabled)	1 (Enabled)

Table 4.1.1-4 : EAT for SPIRE S/C 1553B Bus FDIR

4.1.1.2.2 SPIRE Science Data Monitoring

No instrument request beyond what is requested within the 1553B FDIR.

4.1.1.2.3 SPIRE Class B Heater Loop FDIR

No Class B Thermal Control Loop is applicable to SPIRE.

4.1.2 SPIRE S/C Mode Transition

As specified in section 3.2, during a S/C transition from any S/C mode to S/C EAM or SAM, SPIRE will be put in a “standby” mode by the CDMS OBSW via the execution of one dedicated OBCP.
This OBCP will be called by the “mother” S/C Mode Transition OBCP, as summarised in the following table.

S/C Transition	P/L request	OBCP

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			Called by...
From any mode to SAM or EAM	Put SPIRE in Standby Mode	DB_OBCP_H_SPIRE_STANDBY	DB_H_PL_SC_MODE_OBCP
From any mode to SM	Do nothing	None	DB_H_PL_SC_MODE_OBCP

Table 4.1.2-1 : SPIRE OBCP vs. S/C Mode transition

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4.1.3 SPIRE OBCP

4.1.3.1 List of SPIRE OBCP

According to sections 4.1.1and 4.1.2, the following OBCP are needed to support SPIRE activity from the CDMS OBSW:

OBCP	Payload Internal FDIR	S/C 1553B Bus FDIR	Science Data Monitoring	Class B Heater Loop FDIR	S/C Mode Transition	Triggered by			
						Event Report			"Mother" OBCP
						APID	ST,SST	ID	
DB_OBCP_H_SPIRE_DRCU_OFF	X					0x0500 (SPIRE Prime)	5,2	0xC000	
	X					0x0501 (SPIRE Red.)	5,2	0xC000	
DB_OBCP_H_SPIRE_OFF	X					0x0500 (SPIRE Prime)	5,2	0xC010	
	X					0x0501 (SPIRE Red.)	5,2	0xC010	
		X				0x0010 (CDMS)	5,x	0x0098 152 (DLL)	
		X				0x0010 (CDMS)	5,x	0x00AB 171 (TFL TC)	
DB_OBCP_H_SPIRE_OFF_CTRL		X				0x0010 (CDMS)	5,x	0x00B9 185 (TFL TM)	
DB_OBCP_H_SPIRE_STANDBY					X				DB_H_PL_SC_MODE_OBCP
DB_OBCP_H_SPIRE_OPE_STOP	X					0x0500 (SPIRE Prime)	5,2	0xC100	
	X					0x0501 (SPIRE Red.)	5,2	0xC100	

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OBCP	Payload Internal FDIR	S/C 1553B Bus FDIR	Science Data Monitoring	Class B Heater Loop FDIR	S/C Mode Transition	Triggered by			
						Event Report			"Mother" OBCP
						APID	ST,SST	ID	
DB_OBCP_H_SPIRE_OPE_RESUME	X					0x0500 (SPIRE Prime)	5,2	0xC110	
	X					0x0501 (SPIRE Red.)	5,2	0xC110	

Table 4.1.3-1 : List of SPIRE OBCP

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4.1.3.2 SPIRE OBCP Specification

4.1.3.2.1 DB_OBCP_H_SPIRE_DRCU_OFF

OBCP DB_OBCP_H_SPIRE_DRCU_OFF		
ID	DB_OBCP_H_SPIRE_DRCU_OFF	0x1102
Triggered by	Event 0xC000 from SPIRE Nom or Red	SPIRE Internal FDIR: - DRCU Power Anomaly - DRCU Temperature Anomaly
Type		Normal TB
Time-Out		600 seconds (TBC)
OBCP Parameters	None	
ACTIONS		
Instrument request	CDMS OBSW Action	Implementation
	Disable all EAT entries associated with SPIRE related events that could contradict or interfere with current OBCP execution, i.e. : - 0xC000 from SPIRE Nom & Red. as they trigger the current OBCP	Send TC(19,5) "Disable Actions" with the following parameters: - N = 0x0002 - APID / Event ID = 0x0500 / 0xC000 (SPIRE Nom.) - APID / Event ID = 0x0501 / 0xC000 (SPIRE Red.)
	Stop execution of all running SPIRE OBCP that could contradict or interfere with current OBCP execution: - None	
Command PDSU to remove power from SPIRE DRCU	OPEN LCL related to both nominal and redundant SPIRE HSFCU	Send TC(8,4,112,3) "Switch PCDU Unit OFF" with the following parameters: - PCDU Unit Code = 0x0033 (LCL 51 = SPIRE HSFCU Nom.) Send TC(8,4,112,3) "Switch PCDU Unit OFF", with the following parameters: - PCDU Unit Code = 0x0034 (LCL 52 = SPIRE HSFCU Red.)
Issue TM(5,4) , EventID=0x1000 "SPIRE DRCU Switched OFF" Event Packet	Issue a TM(5,4) indicating "SPIRE DRCU Switched OFF"	Issue a TM(5,4) with the following parameters: - Event ID = <SPIRE_DRCU_OFF_EID> (0x1000) - SID = 0x0000 - Parameters A = 0x0000_0000_0000_0000 - Event Sequence Counter = Generated autonomously by the CDMU OBSW - Parameters B = None
	Enable EAT entries that triggered the current OBCP[3]: - 0xC000 from SPIRE (Nom and Red)	Send TC(19,4) "Enable Actions" with the following parameters: - N = 0x0002 - APID / Event ID = 0x0500 / 0xC000 (SPIRE Nom.) - APID / Event ID = 0x0501 / 0xC000 (SPIRE Red.)

[3] TBC: This could be useful in case the current recovery did not succeed

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4.1.3.2.2 DB_OBCP_H_SPIRE_OFF

OBCP DB_OBCP_H_SPIRE_OFF		
ID	DB_OBCP_H_SPIRE_OFF	0x1103
Triggered by	Event 0xC010 from SPIRE Nom or Red.	SPIRE Internal FDIR - DPU Power Anomaly
	Event 0x0098 from CDMS	DLL FDIR
	Event 0x00AB from CDMS	TFL TC FDIR
Type		Normal TB
Time-Out		600 seconds (TBC)
OBCP Parameters	SPIRE_SUBS_ID_CMD	Default value = 370
	SPIRE_SUBS_ID_META	Default value = 100

ACTIONS		
Instrument request	CDMS OBSW Action	Implementation
	Disable all EAT entries associated with SPIRE related events that could contradict or interfere with current OBCP execution, i.e. : - 0xC010 from SPIRE Nom & Red. as they trigger the current OBCP - 0x0098/0x00AB from the CDMS as they trigger the current OBCP - 0xC110 from SPIRE Nom & Red. as they would re-enable the SPIRE sub-schedules.	Send TC(19,5) "Disable Actions" with the following parameters: - N = 0x0006 - APID / Event ID = 0x0500 / 0xC010 (SPIRE Nom.) - APID / Event ID = 0x0501 / 0xC010 (SPIRE Red.) - APID / Event ID = 0x0010 / 0x0098 (CDMS DLL FDIR) - APID / Event ID = 0x0010 / 0x00AB (CDMS TFL TC FDIR) - APID / Event ID = 0x0500 / 0xC110 (SPIRE Nom.) - APID / Event ID = 0x0501 / 0xC110 (SPIRE Red.)
	Stop execution of all running SPIRE OBCP that could contradict or interfere with current OBCP execution: - DB_OBCP_H_SPIRE_OPE_RESUME as it would re-enable the SPIRE sub-schedules.	Send TC(18,4) "Stopping a procedure", with the following parameters: - Procedure-ID = DB_OBCP_H_SPIRE_OPE_RESUME (0x1107)
Disable all the telecommands from the MTL for SPIRE		Send TC(11,2) "Disable Release of Telecommands" with the following parameters:[4] - N = 2 (Two sub-schedules) - SUBSCHEDULE-ID = <SPIRE_SUBS_ID_CMD> (SPIRE command sub-schedule) - SUBSCHEDULE-ID = <SPIRE_SUBS_ID_META> (SPIRE meta subschedule) - M = 0 (All APID)
	Declare both SPIRE RT as OFF[5]	Send TC(8,4,10,1) "Configure SDB FDIR " with the following parameters: - RTA = <SDB_RTA_SPIRE_A_VALUE> - F0 / M0 = 0_b / 1_b (RTA OFF) - F1 / M1 = 0_b / 0_b (Flag ignored) - F2 / M2 = 0_b / 0_b (Flag ignored) - F3 / M3 = 0_b / 0_b (Flag ignored) - F4 / M4 = 0_b / 0_b (Flag ignored) - F5 / M5 = 0_b / 0_b (Flag ignored) - F6 / M6 = 0_b / 0_b (Flag ignored)

[4] According to [RD10]
[5] This will avoid to trigger any S/C 1553B bus FDIR related to SPIRE when it is OFF

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		- F7 / M7 = 0_b / 0_b (Flag ignored) - F8 / M8 = 0_b / 0_b (Flag ignored) - F9 / M9 = 0_b / 0_b (Flag ignored) - F10 / M10 = 0_b / 0_b (Flag ignored) - F11 / M11 = 0_b / 0_b (Flag ignored) - CNT / M_C = 01_b / 0_b (Flag ignored) Send TC(8,4,10,1) with the following parameters: - RTA = <SDB_RTA_SPIRE_B_VALUE> - F0 / M0 = 0_b / 1_b (RTA OFF) - F1 / M1 = 0_b / 0_b (Flag ignored) - F2 / M2 = 0_b / 0_b (Flag ignored) - F3 / M3 = 0_b / 0_b (Flag ignored) - F4 / M4 = 0_b / 0_b (Flag ignored) - F5 / M5 = 0_b / 0_b (Flag ignored) - F6 / M6 = 0_b / 0_b (Flag ignored) - F7 / M7 = 0_b / 0_b (Flag ignored) - F8 / M8 = 0_b / 0_b (Flag ignored) - F9 / M9 = 0_b / 0_b (Flag ignored) - F10 / M10 = 0_b / 0_b (Flag ignored) - F11 / M11 = 0_b / 0_b (Flag ignored) - CNT / M_C = 01_b / 0_b (Flag ignored)
Command PDSU to remove power from SPIRE DRCU	OPEN LCL related to both nominal and redundant SPIRE HSFCU	Send TC(8,4,112,3) “Switch PCDU Unit OFF” with the following parameters: - PCDU Unit Code = 0x0033 (LCL 51 = SPIRE HSFCU Nom.) Send TC(8,4,112,3) “Switch PCDU Unit OFF”, with the following parameters: - PCDU Unit Code = 0x0034 (LCL 52 = SPIRE HSFCU Red.)
Wait 2 (TBC) seconds		Wait 2 (TBC) seconds
Command PDSU to remove power from SPIRE DPU	OPEN LCL related to both nominal and redundant SPIRE HSDPU	Send TC(8,4,112,3) “Switch PCDU Unit OFF” with the following parameters: - PCDU Unit Code = 0x000B (LCL 11 = SPIRE HSDPU Nom.) Send TC(8,4,112,3) “Switch PCDU Unit OFF”, with the following parameters: - PCDU Unit Code = 0x000C (LCL 12 = SPIRE HSDPU Red.)
	(TBC)[6] Mark SPIRE Unit as OFF in order to inform the Thermal Control Management function that SPIRE OFF thresholds have to be used.	(TBC) Send TC(8,4,116,25) “Mark Unit OFF” with the following parameters: - Status Unit ID = 0x0308 (SPIRE)
Issue TM(5,4) , Event_ID = 0x1001 “SPIRE Switched OFF” Event Packet		Issue a TM(5,4) with the following parameters: - Event ID = <SPIRE_OFF_EID> (0x1001) - SID = 0x0000 - Parameters A = 0x0000_0000_0000_0000 - Event Sequence Counter = Generated autonomously by the CDMU OBSW - Parameters B = None
	Enable EAT entries that triggered the current OBCP[7]: - 0xC010 from SPIRE Nom & Red. - 0x0098/0x00AB from the CDMS	Send TC(19,4) “Enable Actions” with the following parameters: - N = 0x0004 - APID / Event ID = 0x0500 / 0xC010 (SPIRE Nom.) - APID / Event ID = 0x0501 / 0xC010 (SPIRE Red.) - APID / Event ID = 0x0010 / 0x0098 (CDMS DLL

[6] TBC: This should not be done as the SPIRE panel is thermally controlled a with the CCU that are still ON.
[7] TBC: This could be useful in case the current recovery did not succeed

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		FDIR) - APID / Event ID = 0x0010 / 0x00AB (CDMS TFL TC FDIR)

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4.1.3.2.3 DB_OBCP_H_SPIRE_OFF_CTRL

OBCP DB_OBCP_H_SPIRE_OFF_CTRL		
ID	DB_OBCP_H_SPIRE_OFF_CTRL	0x1104
Triggered by	Event 0x00B9 from CDMS	TFL TM FDIR[8]
Type		Normal
Time-Out		600 seconds (TBC)
OBCP Parameters	SPIRE_SUBS_ID_CMD	Default value = 370
	SPIRE_SUBS_ID_META	Default value = 100
ACTIONS		
Instrument request	CDMS OBSW Action	Implementation
	Disable all EAT entries associated with SPIRE related events that could contradict or interfere with current OBCP execution, i.e. : - 0x00B9 from the CDMS as it triggers the current OBCP - 0xC110 from SPIRE Nom & Red. as they would re-enable the SPIRE sub-schedules.	Send TC(19,5) "Disable Actions" with the following parameters: - N = 0x0003 - APID / Event ID = 0x0010 / 0x00B9 (CDMS TFL TM FDIR) - APID / Event ID = 0x0500 / 0xC110 (SPIRE Nom.) - APID / Event ID = 0x0501 / 0xC110 (SPIRE Red.)
	Stop execution of all running SPIRE OBCP that could contradict or interfere with current OBCP execution: - DB_OBCP_H_SPIRE_OPE_RESUME as it would re-enable the SPIRE sub-schedules.	Send TC(18,4) "Stopping a procedure", with the following parameters: - Procedure-ID = DB_OBCP_H_SPIRE_OPE_RESUME (0x1107)
Disable all the telecommands from the MTL for SPIRE		Send TC(11,2) "Disable Release of Telecommands" with the following parameters:[9] - N = 2 (Two sub-schedules) - SUBSCHEDULE-ID = <SPIRE_SUBS_ID_CMD> (SPIRE command sub-schedule) - SUBSCHEDULE-ID = <SPIRE_SUBS_ID_META> (SPIRE meta subschedule) - M = 0 (All APID)
Stop current VMs (send 4 TCs to instrument)		Send TC(8,4, 2, 3) "HALT_VM " to SPIRE Send TC(8,4, 3, 3) "HALT_VM1 " to SPIRE Send TC(8,4, 4, 3) "HALT_VM2 " to SPIRE Send TC(8,4, 5, 3) "HALT_VM3 " to SPIRE
Wait 2 (TBC) seconds		Wait 2 (TBC) seconds
Send TC to instrument to run		Send TC(8,4,2,2) "RUN_VM" to SPIRE with the following

[8] TBC: Note that SPIRE RT is declared as Sick_TM by the CDMU OBSW. This means that no TM transfer from SPIRE is performed during this recovery. Is this acceptable?
[9] According to [RD10]

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VM to switch DRCU to SAFE mode		parameters: - TABLEID = 60 - INDEX = 0 - N = 0 - DATA = 0
Wait 5 (TBC) seconds		Wait 5 (TBC) seconds
	Declare the two SPIRE RT as OFF[10]	Send TC(8,4,10,1) "Configure SDB FDIR " with the following parameters: - RTA = <SDB_RTA_SPIRE_A_VALUE> - F0 / M0 = 0_b / 1_b (RTA OFF) - F1 / M1 = 0_b / 0_b (Flag ignored) - F2 / M2 = 0_b / 0_b (Flag ignored) - F3 / M3 = 0_b / 0_b (Flag ignored) - F4 / M4 = 0_b / 0_b (Flag ignored) - F5 / M5 = 0_b / 0_b (Flag ignored) - F6 / M6 = 0_b / 0_b (Flag ignored) - F7 / M7 = 0_b / 0_b (Flag ignored) - F8 / M8 = 0_b / 0_b (Flag ignored) - F9 / M9 = 0_b / 0_b (Flag ignored) - F10 / M10 = 0_b / 0_b (Flag ignored) - F11 / M11 = 0_b / 0_b (Flag ignored) - CNT / M_C = 01_b / 0_b (Flag ignored) Send TC(8,4,10,1) with the following parameters: - RTA = <SDB_RTA_SPIRE_B_VALUE> - F0 / M0 = 0_b / 1_b (RTA OFF) - F1 / M1 = 0_b / 0_b (Flag ignored) - F2 / M2 = 0_b / 0_b (Flag ignored) - F3 / M3 = 0_b / 0_b (Flag ignored) - F4 / M4 = 0_b / 0_b (Flag ignored) - F5 / M5 = 0_b / 0_b (Flag ignored) - F6 / M6 = 0_b / 0_b (Flag ignored) - F7 / M7 = 0_b / 0_b (Flag ignored) - F8 / M8 = 0_b / 0_b (Flag ignored) - F9 / M9 = 0_b / 0_b (Flag ignored) - F10 / M10 = 0_b / 0_b (Flag ignored) - F11 / M11 = 0_b / 0_b (Flag ignored) - CNT / M_C = 01_b / 0_b (Flag ignored)
Command PDSU to remove power from SPIRE DRCU	OPEN LCL related to both nominal and redundant SPIRE HSFCU	Send TC(8,4,112,3) "Switch PCDU Unit OFF" with the following parameters: - PCDU Unit Code = 0x0033 (LCL 51 = SPIRE HSFCU Nom.) Send TC(8,4,112,3) "Switch PCDU Unit OFF", with the following parameters: - PCDU Unit Code = 0x0034 (LCL 52 = SPIRE HSFCU Red.)
Wait 2 (TBC) seconds		Wait 2 (TBC) seconds
Command PDSU to remove power from SPIRE DPU	OPEN LCL related to both nominal and redundant SPIRE HSDPU	Send TC(8,4,112,3) "Switch PCDU Unit OFF" with the following parameters: - PCDU Unit Code = 0x000B (LCL 11 = SPIRE HSDPU Nom.) Send TC(8,4,112,3) "Switch PCDU Unit OFF", with the following parameters: - PCDU Unit Code = 0x000C (LCL 12 = SPIRE HSDPU Red.)
	(TBC)[11] Mark SPIRE Unit as OFF in order to	(TBC) Send TC(8,4,116,25) "Mark Unit OFF" with the following

[10] This will avoid to trigger any S/C 1553B bus FDIR related to SPIRE when it is OFF

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	inform the Thermal Control Management function that SPIRE OFF thresholds have to be used.	parameters: - Status Unit ID = 0x0308 (SPIRE)
Issue TM(5,4) , EventID = 0x1002 "SPIRE Shutdown" Event Packet		Issue a TM(5,4) with the following parameters: - Event ID = <SPIRE_SHUTDOWN_EID> (0x1002) - SID = 0x0000 - Parameters A = 0x0000_0000_0000_0000 - Event Sequence Counter = Generated autonomously by the CDMU OBSW - Parameters B = None
	Enable EAT entries that triggered the current OBCP[12]: - 0x00B9 from the CDMS	Send TC(19,4) "Enable Actions" with the following parameters: - N = 0x0001 - APID / Event ID = 0x0010 / 0x00B9 (CDMS TFL TM FDIR)

TBC: Common parts between DB_OBCP_H_SPIRE_OFF_CTRL and DB_OBCP_H_SPIRE_OFF could be mplemented in a sub OBCP to ease the maintenance of them. In this case, one parameter would have to be passed to this sub OBCP to distinguish between SPIRE OFF request in a control manner or not.

[11] TBC: This should not be done as the SPIRE panel is thermally controlled a with the CCU that are still ON.
[12] TBC: This could be useful in case the current recovery did not succeed

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4.1.3.2.4 DB_OBCP_H_SPIRE_STANDBY

OBCP DB_OBCP_H_SPIRE_STANDBY		
ID	DB_OBCP_H_SPIRE_STANDBY	0x1105
Triggered by	DB_H_PL_SC_MODE_OBCP	S/C mode transition OBCP
Type		Normal
Time-Out		600 seconds (TBC)
OBCP Parameters	SPIRE_SUBS_ID_CMD	Default value = 370
	SPIRE_SUBS_ID_META	Default value = 100

ACTIONS		
Instrument request	CDMS OBSW Action	Implementation
	Disable all EAT entries associated with SPIRE related events that could contradict or interfere with current OBCP execution, i.e. : 0xC110 from SPIRE Nom & Red. as they would re-enable the SPIRE sub-schedules.	Send TC(19,5) "Disable Actions" with the following parameters: - N = 0x0002 - APID / Event ID = 0x0500 / 0xC110 (SPIRE Nom.) - APID / Event ID = 0x0501 / 0xC110 (SPIRE Red.)
	Stop execution of all running SPIRE OBCP that could contradict or interfere with current OBCP execution: - DB_OBCP_H_SPIRE_OPE_RESUME as it would re-enable the SPIRE sub-schedules.	Send TC(18,4) "Stopping a procedure", with the following parameters: - Procedure-ID = DB_OBCP_H_SPIRE_OPE_RESUME (0x1107)
	Disable all the telecommands from the MTL for SPIRE[13]	Send TC(11,2) "Disable Release of Telecommands" with the following parameters:[14] - N = 2 (Two sub-schedules) - SUBSCHEDULE-ID = <SPIRE_SUBS_ID_CMD> (SPIRE command sub-schedule) - SUBSCHEDULE-ID = <SPIRE_SUBS_ID_META> (SPIRE meta subschedule) - M = 0 (All APID)
Send TC to SPIRE to put the instrument into Standby Mode		Send TC(8,4,2,2) "RUN_VM" to SPIRE with the following parameters: - TABLEID = 61 - INDEX = 0 - N = 0 - DATA = 0
	Enable EAT entries that triggered the current OBCP[15]: None	

[13] TBC: Not specified by Instrument but it is assumed this is needed
[14] According to [RD10]
[15] TBC: This could be useful in case the current recovery did not succeed

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4.1.3.2.5 DB_OBCP_H_SPIRE_OPE_STOP

OBCP DB_OBCP_H_SPIRE_OPE_STOP		
ID	DB_OBCP_H_SPIRE_OPE_STOP	0x1106
Triggered by	Event 0xC100 from SPIRE Nom. or Red.	SPIRE Internal FDIR - Operations Anomaly
Type		Normal
Time-Out		600 seconds (TBC)
OBCP Parameters	SPIRE_SUBS_ID_CMD	Default value = 370
	SPIRE_SUBS_ID_META	Default value = 100

ACTIONS		
Instrument request	CDMS OBSW Action	Implementation
	Disable all EAT entries associated with SPIRE related events that could contradict or interfere with current OBCP execution, i.e. : - 0xC100 from SPIRE Nom & Red. as they trigger the current OBCP.	Send TC(19,5) "Disable Actions" with the following parameters: - N = 0x0002 - APID / Event ID = 0x0500 / 0xC100 (SPIRE Nom.) - APID / Event ID = 0x0501 / 0xC100 (SPIRE Red.)
	Stop execution of all running SPIRE OBCP that could contradict or interfere with current OBCP execution: None[16]	
Disable all the telecommands from the MTL for SPIRE		Send TC(11,2) "Disable Release of Telecommands" with the following parameters:[17] - N = 2 (Two sub-schedules) - SUBSCHEDULE-ID = <SPIRE_SUBS_ID_CMD> (SPIRE command sub-schedule) - SUBSCHEDULE-ID = <SPIRE_SUBS_ID_META> (SPIRE meta subschedule) - M = 0 (All APID)
Issue TM(5,4) , EventID=0x1003 "SPIRE Operations Stopped" Event Packet		Issue a TM(5,4) with the following parameters: - Event ID = <SPIRE_OPE_STOP_EID> (0x1003) - SID = 0x0000 - Parameters A = 0x0000_0000_0000_0000 - Event Sequence Counter = Generated autonomously by the CDMU OBSW - Parameters B = None
	Enable EAT entries that triggered the current OBCP[18]: - 0xC100 from SPIRE (Nom and Red)	Send TC(19,4) "Enable Actions" with the following parameters: - N = 0x0002 - APID / Event ID = 0x0500 / 0xC100 (SPIRE Nom.) - APID / Event ID = 0x0501 / 0xC100 (SPIRE Red.)

[16] It is assumed there is enough time to allow executing the stop procedure before a resume request is sent.
[17] According to [RD10]
[18] TBC: This could be useful in case the current recovery did not succeed

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4.1.3.2.6 DB_OBCP_H_SPIRE_OPE_RESUME

OBCP DB_OBCP_H_SPIRE_OPE_RESUME		
ID	DB_OBCP_H_SPIRE_OPE_STOP	0x1107
Triggered by	Event 0xC110 from SPIRE Nom. or Red.	SPIRE Internal FDIR - Operations Resume
Type		Normal
Time-Out		600 seconds (TBC)
OBCP Parameters	SPIRE_SUBS_ID_META	Default value = 370
ACTIONS		
Instrument request	CDMS OBSW Action	Implementation
	Disable all EAT entries associated with SPIRE related events that could contradict or interfere with current OBCP execution, i.e. : 0xC110 from SPIRE Nom & Red. as they trigger the current OBCP.	Send TC(19,5) "Disable Actions" with the following parameters: - N = 0x0002 - APID / Event ID = 0x0500 / 0xC110 (SPIRE Nom.) - APID / Event ID = 0x0501 / 0xC110 (SPIRE Red.)
	Stop execution of all running SPIRE OBCP that could contradict or interfere with current OBCP execution: None[19]	
Re-enable telecommands from the MTL to the instrument at the start of the next subschedule		Send TC(11,1) "Enable Release of Telecommands" with the following parameters:[20] - N = 1 (One sub-schedules) - SUBSCHEDULE-ID = <SPIRE_SUBS_ID_META> (SPIRE meta subschedule) - M = 0 (All APID)
Issue TM(5,4) , EventID=0x1004 "SPIRE Operations Resumed" Event Packet		Issue a TM(5,4) with the following parameters: - Event ID = <SPIRE_OPE_RESUME_EID> (0x1004) - SID = 0x0000 - Parameters A = 0x0000_0000_0000_0000 - Event Sequence Counter = Generated autonomously by the CDMU OBSW - Parameters B = None
	Enable EAT entries that triggered the current OBCP[21]: 0xC110 from SPIRE (Nom and Red)	Send TC(19,4) "Enable Actions" with the following parameters: - N = 0x0002 - APID / Event ID = 0x0500 / 0xC110 (SPIRE Nom.) - APID / Event ID = 0x0501 / 0xC110 (SPIRE Red.)

[19] It is assumed there is enough time to allow executing the resume procedure before a stop request is sent.
[20] According to [RD10]
[21] TBC: This could be useful in case the current recovery did not succeed

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4.2 PACS

4.2.1 PACS FDIR

4.2.1.1 PACS internal FDIR

According to [RD4], PACS generates the following Event Reports when it needs a support from the CDMS OBSW to complete a recovery activity.
Identification of the OBCP to implement the requested sequence of actions is then provided as additional information.

FDIR	Event Report		P/L request	OBCP
	ST,SST	ID		
GO SAFE	5,2	4	Put PACS in SAFE mode	DB_OBCP_H_PACS_SAFE
BOLC OFF	5,2	5	Switch OFF the BOLC	DB_OBCP_H_PACS_BOLC_OFF
POWER CYCLE	5,2	6	Power cycle PACS	DB_OBCP_H_PACS_POWER_CYCLE
IMMEDIATE OFF	5,2	13	Switch OFF PACS immediately	DB_OBCP_H_PACS_IMMEDIATE_OFF
NORMAL OFF	5,2	25	Switch OFF PACS in a controlled way	DB_OBCP_H_PACS_NORMAL_OFF

Table 4.2.1-1 : PACS internal FDIR Event Reports

From the previous table, one can define the following EAT entries to support PACS Internal FDIR.
Note that PACS Event Reports can have two different APID as specified in [AD1], i.e.:

- 0x0480 for PACS Prime
- 0x0481 for PACS Redundant.

This induces that for each failure case, two entries have to be defined in the EAT.

APID	Event ID	Telecommand Packet	Action Handling ID	Parameter Passing Status	Action Status
0x0480 (PACS Prime)	4 (GO SAFE)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_H_PACS_SAFE N1=1 (PACS_SUBS_ID_CMD)	01_b (Disabled in AFS & Enable in AFO)	0 (Disabled)	1 (Enabled)
0x0481 (PACS Red.)	4 (GO SAFE)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_H_PACS_SAFE N1=1 (PACS_SUBS_ID_CMD)	01_b (Disabled in AFS & Enable in AFO)	0 (Disabled)	1 (Enabled)
0x0480 (PACS Prime)	5 (BOLC OFF)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_H_PACS_BOLC_OFF N1=1 (PACS_SUBS_ID_CMD)	01_b (Disabled in AFS & Enable in AFO)	0 (Disabled)	1 (Enabled)
0x0481 (PACS Red.)	5 (BOLC OFF)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_H_PACS_BOLC_OFF N1=1 (PACS_SUBS_ID_CMD)	01_b (Disabled in AFS & Enable in AFO)	0 (Disabled)	1 (Enabled)

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APID	Event ID	Telecommand Packet	Action Handling ID	Parameter Passing Status	Action Status
0x0480 (PACS Prime)	6 (POWER CYCLE)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_H_PACS_POWER_CYCLE N1=2 (PACS_SUBS_ID_CMD, PL_SIDE)	01_b (Disabled in AFS & Enable in AFO)	0 (Disabled)	1 (Enabled)
0x0481 (PACS Red.)	6 (POWER CYCLE)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_H_PACS_POWER_CYCLE N1=2 (PACS_SUBS_ID_CMD, PL_SIDE)	01_b (Disabled in AFS & Enable in AFO)	0 (Disabled)	1 (Enabled)
0x0480 (PACS Prime)	13 (IMMEDIATE OFF)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_H_PACS_IMMEDIATE_OFF N1=1 (PACS_SUBS_ID_CMD)	01_b (Disabled in AFS & Enable in AFO)	0 (Disabled)	1 (Enabled)
0x0481 (PACS Red.)	13 (IMMEDIATE OFF)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_H_PACS_IMMEDIATE_OFF N1=1 (PACS_SUBS_ID_CMD)	01_b (Disabled in AFS & Enable in AFO)	0 (Disabled)	1 (Enabled)
0x0480 (PACS Prime)	25 (NORMAL OFF)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_H_PACS_NORMAL_OFF N1=1 (PACS_SUBS_ID_CMD)	01_b (Disabled in AFS & Enable in AFO)	0 (Disabled)	1 (Enabled)
0x0481 (PACS Red.)	25 (NORMAL OFF)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_H_PACS_NORMAL_OFF N1=1 (PACS_SUBS_ID_CMD)	01_b (Disabled in AFS & Enable in AFO)	0 (Disabled)	1 (Enabled)

Table 4.2.1-2 : EAT for PACS Internal FDIR

4.2.1.2 PACS S/C FDIR

4.2.1.2.1 PACS S/C 1553B Bus FDIR

The following table summarises what PACS requests to be done by the CDMS OBSW in case a S/C 1553B Bus FDIR related to the communication with PACS triggers.
Identification of the OBCP to implement the requested sequence of actions is then provided as additional information.

FDIR	Event Report		P/L request	OBCP
	ST,SST	ID		
DLL FDIR	5,x	153	Switch Off PACS immediately	DB_OBCP_H_PACS_IMMEDIATE_OFF
TFL TC FDIR	5,x	172	Switch Off PACS immediately	DB_OBCP_H_PACS_IMMEDIATE_OFF
TFL TM FDIR	5,x	186	Switch Off PACS immediately	DB_OBCP_H_PACS_IMMEDIATE_OFF

Table 4.2.1-3 : PACS S/C 1553B Bus FDIR

From the previous table, one can define the following EAT entries to support PACS S/C 1553B Bus FDIR.

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APID	Event ID	Telecommand Packet	Action Handling ID	Parameter Passing Status	Action Status
0x0010 (CDMS)	153 (DLL FDIR)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_H_PACS_IMMEDIATE_OFF N1=1 (PACS_SUBS_ID_CMD)	11_b (Enabled in both AFS & AFO)	0 (Disabled)	1 (Enabled)
0x0010 (CDMS)	172 (TFL TC FDIR)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_H_PACS_IMMEDIATE_OFF N1=1 (PACS_SUBS_ID_CMD)	11_b (Enabled in both AFS & AFO)	0 (Disabled)	1 (Enabled)
0x0010 (CDMS)	186 (TFL TM FDIR)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_H_PACS_IMMEDIATE_OFF N1=1 (PACS_SUBS_ID_CMD)	11_b (Enabled in both AFS & AFO)	0 (Disabled)	1 (Enabled)

Table 4.2.1-4 : EAT for PACS S/C 1553B Bus FDIR

4.2.1.2.2 PACS Science Data Monitoring

No instrument request beyond what is requested within the 1553B FDIR.

4.2.1.2.3 PACS Class B Heater Loop FDIR

No Class B Thermal Control Loop is applicable to PACS.

4.2.2 PACS S/C Mode Transition

As specified in section 3.2, during a S/C transition from any S/C mode to S/C EAM or SAM, PACS will be put in a “standby” mode by the CDMS OBSW via the execution of one dedicated OBCP.
This OBCP will be called by the “mother” S/C Mode Transition OBCP, as summarised in the following table.

S/C Transition	P/L request	OBCP	
			Called by...
From any mode to SAM or EAM	Put PACS in SAFE Mode	DB_OBCP_H_PACS_SAFE	DB_H_PL_SC_MODE_OBCP
From any mode to SM	Do nothing	None	DB_H_PL_SC_MODE_OBCP

Table 4.2.2-1 : PACS OBCP vs. S/C Mode transition

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4.2.3 PACS OBCP

4.2.3.1 List of PACS OBCP

According to sections 4.2.1and 4.2.2, the following OBCP are needed to support PACS activity from the CDMS OBSW:

OBCP	Payload Internal FDIR	S/C 1553B Bus FDIR	Science Data Monitoring	Class B Heater Loop FDIR	S/C Mode Transition	Triggered by			
						Event Report			"Mother" OBCP
						APID	ST,SST	ID	
DB_OBCP_H_PACS_SAFE	X					0x0480 (PACS Prime)	5,2	0x00044	
	X					0x0481 (PACS Red.)	5,2	0x00044	
					X				DB_H_PL_SC_MODE_OBCP
DB_OBCP_H_PACS_BOLC_OFF	X					0x0480 (PACS Prime)	5,2	0x00055	
	X					0x0481 (PACS Red.)	5,2	0x00055	
DB_OBCP_H_PACS_POWER_CYCLE	X					0x0480 (PACS Prime)	5,2	0x00066	
	X					0x0481 (PACS Red.)	5,2	0x00066	
DB_OBCP_H_PACS_IMMEDIATE_OFF	X					0x0480 (PACS Prime)	5,2	0x000D13	
	X					0x0481 (PACS Red.)	5,2	0x000D13	
		X				0x0010 (CDMS)	5,x	0x0099153 (DLL)	

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OBCP	Payload Internal FDIR	S/C 1553B Bus FDIR	Science Data Monitoring	Class B Heater Loop FDIR	S/C Mode Transition	Triggered by			
						Event Report			"Mother" OBCP
						APID	ST,SST	ID	
		X				0x0010 (CDMS)	5,x	0x00AC 172 (TFL TC)	
		X				0x0010 (CDMS)	5,x	0x00BA 186 (TFL TM)	
DB_OBCP_H_PACS_NORMAL_OFF	X					0x0480 (PACS Prime)	5,2	0x0019 25	
	X					0x0481 (PACS Red.)	5,2	0x0019 25	

Table 4.2.3-1 : List of PACS OBCP

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4.2.3.2 PACS OBCP Specification

4.2.3.2.1 DB_OBCP_H_PACS_SAFE

OBCP DB_OBCP_H_PACS_SAFE		
ID	DB_OBCP_H_PACS_SAFE	0x1208
Triggered by	Event 0x0004 from PACS Nom. or Red.	Internal FDIR - GO SAFE
	DB_H_PL_SC_MODE_OBCP	S/C mode transition OBCP
Type		Normal
Time-Out		600 seconds (TBC)
OBCP Parameters	- PACS_SUBS_ID_CMD	Default value = 90
ACTIONS		
Instrument request	CDMS OBSW Action	Implementation
	Disable all EAT entries associated with PACS related events that could contradict or interfere with current OBCP execution, i.e. : - 0x0004 from PACS Nom & Red. as they trigger the current OBCP	Send TC(19,5) "Disable Actions" with the following parameters: - N = 0x0002 - APID / Event ID = 0x0480 / 0x0004 (PACS Nom.)) - APID / Event ID = 0x0481 / 0x0004 (PACS Red.)
	Stop execution of all running PACS OBCP that could contradict or interfere with current OBCP execution: - None[22]	
Disable all commanding of PACS from the MTL Stop all commanding from ground[23]		Send TC(11,2) "Disable Release of Telecommands" with the following parameters:[24] - N = 1 (One sub-schedule) - SUBSCHEDULE-ID = <PACS_SUBS_ID_CMD> (PACS command sub-schedule) - M = 0 (All APID) (TBC) Send TC(8,4,10,5) "Enable/disable TC Routing" with the following parameters: - TC_APID = 0x0480 (PACS) - TC_SRC = 100_b (Ground, low priority) - EOD = 0_b (Routing Disabled)
Send the TC to PACS which triggers the transition into PACS SAFE mode.		Send TC(18, 3) "Start Procedure" to PACS, with the following parameters: - Procedure-ID = 24 (Enter SAFE mode) - N1 = 0 (No parameter)
	Wait 10 (TBC) seconds (execution time of PACS SAFE mode TC)	Wait 10 (TBC) seconds

[22] TBC: it is assumed that even if a power cycling is in progress it is preferable to let it complete
[23] TBC: is this really necessary and in case should it be applied to all instruments?
[24] According to [RD10]

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	Enable EAT entries that triggered the current OBCP[25]: - 0x0004 from PACS (both Nom. and Red.)	Send TC(19,4) "Enable Actions" with the following parameters: - N = 0x0002 - APID / Event ID = 0x0480 / 0x0004 (PACS Nom.) - APID / Event ID = 0x0481 / 0x0004 (PACS Red.)

[25] TBC: This could be useful in case the current recovery did not succeed

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4.2.3.2.2 DB_OBCP_H_PACS_BOLC_OFF

OBCP DB_OBCP_H_PACS_BOLC_OFF		
ID	DB_OBCP_H_PACS_BOLC_OFF	0x1209
Triggered by	Event 0x0005 from PACS Nom. or Red.	Internal FDIR - BOLC OFF
Type		Normal
Time-Out		600 seconds (TBC)
OBCP Parameters	PACS_SUBS_ID_CMD	Default value = 90
ACTIONS		
Instrument request	CDMS OBSW Action	Implementation
	Disable all EAT entries associated with PACS related events that could contradict or interfere with current OBCP execution, i.e. : - 0x0005 from PACS Nom & Red. as they trigger the current OBCP	Send TC(19,5) "Disable Actions" with the following parameters: - N = 0x0002 - APID / Event ID = 0x0480 / 0x0005 (PACS Nom.)) - APID / Event ID = 0x0481 / 0x0005 (PACS Red.)
	Stop execution of all running PACS OBCP that could contradict or interfere with current OBCP execution: - None[26]	
Disable all commanding of PACS from the MTL Stop all commanding from ground[27]		Send TC(11,2) "Disable Release of Telecommands" with the following parameters:[28] - N = 1 (One sub-schedule) - SUBSCHEDULE-ID = <PACS_SUBS_ID_CMD> (PACS command sub-schedule) M = 0 (All APID) (TBC) Send TC(8,4,10,5) "Enable/disable TC Routing" with the following parameters: - TC_APID = 0x0480 (PACS) - TC_SRC = 100_b (Ground, low priority) - EOD = 0_b (Routing Disabled)
Send the TC to PACS which triggers the transition into PACS SAFE mode.		Send TC(18, 3) "Start Procedure" to PACS, with the following parameters: - Procedure-ID = 24 (Enter SAFE mode) - N1 = 0 (No parameter)
	Wait 10 (TBC) seconds (execution time of PACS SAFE mode TC)	Wait 10 (TBC) seconds
Switch OFF the 28V power for	OPEN LCL related to both nominal and	Send TC(8,4,112,3) "Switch PCDU Unit OFF" with the following

[26] TBC: it is assumed that even if a power cycling is in progress it is preferable to let it complete
[27] TBC: is this really necessary and in case should it be applied to all instruments?
[28] According to [RD10]
[29] According to [RD10]

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the BOLC	redundant PACS BOLC	parameters: - PCDU Unit Code = 0x001B (LCL 27 = PACS BOLC Nom.) Send TC(8,4,112,3) “Switch PCDU Unit OFF”, with the following parameters: - PCDU Unit Code = 0x001C (LCL 28 = PACS BOLC Red.)
	Mark PACS BOLC Unit as OFF in order to inform the Thermal Control Management function that OFF thresholds have to be used.	Send TC(8,4,116,25) “Mark Unit OFF” with the following parameters: - Status Unit ID = 0x0309 (PACS BOLC)
	Enable EAT entries that triggered the current OBCP[30]: - 0x0005 from PACS (both Nom. and Red.)	Send TC(19,4) “Enable Actions” with the following parameters: - N = 0x0002 - APID / Event ID = 0x0480 / 0x0005 (PACS Nom.) - APID / Event ID = 0x0481 / 0x0005 (PACS Red.)

[30] TBC: This could be useful in case the current recovery did not succeed

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4.2.3.2.3 DB_OBCP_H_PACS_POWER_CYCLE

OBCP DB_OBCP_H_PACS_POWER_CYCLE		
ID	DB_OBCP_H_PACS_POWER_CYCLE	0x120A
Triggered by	Event 0x0006 from PACS Nom. or Red.	Internal FDIR - POWER CYCLE
Type		Normal
Time-Out		1500 seconds (TBC)
OBCP Parameters	PACS_SUBS_ID_CMD	Default value = 90
	PL_Side	Default value = 0 (NOMINAL)
ACTIONS		
Instrument request	CDMS OBSW Action	Implementation
	Disable all EAT entries associated with PACS related events that could contradict or interfere with current OBCP execution, i.e. : - 0x0006 from PACS Nom & Red. as they trigger the current OBCP	Send TC(19,5) "Disable Actions" with the following parameters: - N = 0x0002 (2 entries) - APID / Event ID = 0x0480 / 0x0006 (PACS Nom.) - APID / Event ID = 0x0481 / 0x0006 (PACS Red.)
	Stop execution of all running PACS OBCP that could contradict or interfere with current OBCP execution: - None	
Disable all commanding of PACS from the MTL Stop all commanding from ground[31]		Send TC(11,2) "Disable Release of Telecommands" with the following parameters:[32] - N = 1 (One sub-schedule) - SUBSCHEDULE-ID = <PACS_SUBS_ID_CMD> (PACS command sub-schedule) - M = 0 (All APID) (TBC) Send TC(8,4,10,5) "Enable/disable TC Routing" with the following parameters: - TC_APID = 0x0480 (PACS) - TC_SRC = 100_b (Ground, low priority) - EOD = 0_b (Routing Disabled)
Execute procedure "PACS Switch-OFF in a safe way"		/* See DB_OBCP_H_PACS_NORMAL_OFF */[34]
Wait 4 minutes after the last PACS Power		Wait 240 seconds

[31] TBC: is this really necessary and in case should it be applied to all instruments?
[32] According to [RD10]
[33] According to [RD10]
[34] TBC: A sub OBCP could be defined and called by both DB_OBCP_H_PACS_NORMAL_OFF & DB_OBCP_H_PACS_POWER_CYCLE

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Execute procedure "PACS Switch-ON":		

	Declare the PACS RT as ON[35] according to PL_SIDE and disable SDB FDIR till the RT is effectively ON	Send TC(8,4,10,1) with the following parameters:
		If (PL_SIDE == NOM) then
		RTA = <SDB_RTA_PACS_A_VALUE>
		Else /* Redundant side */
		RTA = <SDB_RTA_PACS_A_VALUE>
		End if
		- F0 / M0 = 1_b / 1_b (RTA ON)
		- F1 / M1 = 0_b / 0_b (Flag ignored)
		- F2 / M2 = 0_b / 0_b (Flag ignored)
		- F3 / M3 = 0_b / 0_b (Flag ignored)
		- F4 / M4 = 0_b / 0_b (Flag ignored)
		- F5 / M5 = 0_b / 0_b (Flag ignored)
		- F6 / M6 = 0_b / 0_b (Flag ignored)
		- F7 / M7 = 0_b / 0_b (Flag ignored)
		- F8 / M8 = 0_b / 0_b (Flag ignored)
		- F9 / M9 = 0_b / 0_b (Flag ignored)
		- F10 / M10 = 0_b / 0_b (Flag ignored)
		- F11 / M11 = 0_b / 1_b (Disable SDB FDIR)
		- CNT / M_C = 01_b / 0_b (Flag ignored)

		If (PL_Side == NOM) then
		{
		LCL_SPU = 35;
		LCL_BOLC = 27;
		LCL_DEC_MEC = 65;
		LCL_DPU = 41;
		}
		Else /* Redundant side */
		{
		LCL_SPU = 36;
		LCL_BOLC = 28;
		LCL_DEC_MEC = 69;
		LCL_DPU = 42;
		}

Switch ON power supply for DPU	CLOSE LCL related to PACS DPU in use	Send TC(8,4,112,5) "Switch PCDU Unit ON" with the following parameters: - PCDU Unit Code = 0xXXXX = LCL_DPU ;
Wait 12 seconds		Wait 12 seconds
Wait 3 seconds (TEI jitter)		Wait 3 seconds
Force Boot DPU		Send TC(8, 4) "Perform Activity of Function" to PACS, with the following parameters: - Function-ID = 0x70 (112 = TBC) - Activity-ID = 0x03 (3 = TBC) - SID = 0x0000
Wait 3 seconds		Wait 3 seconds
	Re-enable the SDB FDIR	Send TC(8,4,10,1) with the following parameters:

[35] In order to be able to send TC to PACS as it was declare as OFF by the Switch OFF procedure.

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		- F0 / M0 = 0_b / 0_b (Flag ignored) - F1 / M1 = 0_b / 0_b (Flag ignored) - F2 / M2 = 0_b / 0_b (Flag ignored) - F3 / M3 = 0_b / 0_b (Flag ignored) - F4 / M4 = 0_b / 0_b (Flag ignored) - F5 / M5 = 0_b / 0_b (Flag ignored) - F6 / M6 = 0_b / 0_b (Flag ignored) - F7 / M7 = 0_b / 0_b (Flag ignored) - F8 / M8 = 0_b / 0_b (Flag ignored) - F9 / M9 = 0_b / 0_b (Flag ignored) - F10 / M10 = 0_b / 0_b (Flag ignored) - F11 / M11 = 1_b / 1_b (Enable SDB FDIR) - CNT / M_C = 01_b / 0_b (Flag ignored)
Self-check DPU OBSW version		Send TC(6,9) "Memory Check" to PACS with the following parameters : - Memory ID = 0x0100 - Start Address = 0x4000 - N = 0x1513 Send TC(6,9) "Memory Check" to PACS with the following parameters : - Memory ID = 0x0100 - Start Address = 0x5551 - N = 0xB63D
Switch ON power supply for DMC	CLOSE LCL related to PACS DEC-MEC in use	Send TC(8,4,112,5) "Switch PCDU Unit ON" with the following parameters: - PCDU Unit Code = LCL_DEC _MEC;
Wait 15 seconds		Wait 15 seconds
Wait 3 seconds (TEI jitter)		Wait 3 seconds
DPU reset of 1355		Send TC(8, 4) "Perform Activity of Function" to PACS, with the following parameters: - Function-ID = 0x64 (100 = TBC) - Activity-ID = 0x0B (11 = TBC) - SID = 0x0000
Establish DPU à DMC connection (DPU as master)		Send TC(18,3) "Start Procedure" to PACS with the following parameters: - Procedure ID = 0x0013 (19 = TBC) - N1 = 0x0002 (2 parameters) - OBCP-PID /Value = 0x0001 / 0x0000_0000 - OBCP-PID /Value = 0x0002 / 0x0000_0001
Wait 4 seconds		Wait 4 seconds
Execute Memory Self-Test check		Send TC(6,5) "Memory Dump" to PACS with the following parameters : - Memory ID = 0x3100 - Start Address = 0x0000 - N = 0x0011
Wait 1 second		Wait 1 second
Copy DMC SW from EEPROM		Send TC(8, 4) "Perform Activity of Function" to PACS, with the

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to RAM		following parameters: - Function-ID = 0x67 (103 = TBC) - Activity-ID = 0x65 (101 = TBC) - SID = 0x0005 - DMC_EEPROM_MEMORY_ID = 0x0000_0003 - DMC_EEPROM_START_ADDR = 0x0000_0000 - DMC_RAM_MEMORY_ID= 0x0000_0001 - DMC_RAM_START_ADDR = 0x0006_EE00 - DMC_DATA_LENGTH_HLSW = 0x0000_4000 Wait 2 seconds Send TC(8, 4) “Perform Activity of Function“ to PACS, with the following parameters: - Function-ID = 0x67 (103 = TBC) - Activity-ID = 0x65 (101 = TBC) - SID = 0x0005 - DMC_EEPROM_MEMORY_ID = 0x0000_0003 - DMC_EEPROM_START_ADDR = 0x0000_8000 - DMC_RAM_MEMORY_ID= 0x0000_0001 - DMC_RAM_START_ADDR = 0x0000_8000 - DMC_DATA_LENGTH_HLSW = 0x0000_8000
Wait 2 seconds		Wait 2 seconds
Wait 4 seconds		Wait 4 seconds
Start DMC HLSW		Send TC(18,3) “Start Procedure” to PACS with the following parameters: - Procedure ID = 0x0015 (21 = TBC) - N1 = 0x0003 (3 parameters) - OBCP-PID /Value = 0x0001 / 0x0000_0000 - OBCP-PID /Value = 0x0002 / 0x0000_0001 - OBCP-PID /Value = 0x0003 / 0x0000_8032
Wait 10 seconds		Wait 10 seconds
Establish DPU à DMC (DPU as slave)		Send TC(18,3) “Start Procedure” to PACS with the following parameters: - Procedure ID = 0x0013 (19 = TBC) - N1 = 0x0002 (2 parameters) - OBCP-PID /Value = 0x0001 / 0x0000_0000 - OBCP-PID /Value = 0x0002 / 0x0000_0002
Wait 3 seconds		Wait 3 seconds
Switch ON power supply for BOLC	CLOSE LCL related to PACS BOLC in use	Send TC(8,4,112,5) “Switch PCDU Unit ON” with the following parameters: - PCDU Unit Code = LCL_BOLC;
Wait 10 seconds		Wait 10 seconds
Wait 3 seconds (TEI jitter)		Wait 3 seconds
DMC_RESET_SMCS_CHIP_2		Send TC(8, 4) “Perform Activity of Function“ to PACS, with the following parameters: - Function-ID = 0x67 (103 = TBC) - Activity-ID = 0x59 (89 = TBC)

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		- SID = 0x0000
Wait 4 seconds		Wait 4 seconds
Reset all temperature Sensors		Send TC(8, 4) "Perform Activity of Function" to PACS, with the following parameters: - Function-ID = 0x67 (103 = DEC sub-system) - Activity-ID = 0x21 (33 = DMC_SEND_COMMAND_TO_BOLC) - SID = 0x0001 - COMMAND = 0x0700_00FF
Wait 6 seconds		Wait 6 seconds
Switch on power supply for SPU	CLOSE LCL related to PACS SPU in use	Send TC(8,4,112,5) "Switch PCDU Unit ON" with the following parameters: - PCDU Unit Code = LCL_SPU;
Wait 15 seconds		Wait 15 seconds
Wait 3 seconds (TEI jitter)		Wait 3 seconds
DPU reset of 1355		Send TC(8, 4) "Perform Activity of Function" to PACS, with the following parameters: - Function-ID = 0x64 (100 = TBC) - Activity-ID = 0x0B (11 = TBC) - SID = 0x0000
Wait 4 seconds		Wait 4 seconds
Establish DPU à DMC (DPU as slave)		Send TC(18,3) "Start Procedure" to PACS with the following parameters: - Procedure ID = 0x0013 (19 = TBC) - N1 = 0x0002 (2 parameters) - OBCP-PID /Value = 0x0001 / 0x0000_0000 - OBCP-PID /Value = 0x0002 / 0x0000_0002
Wait 10 seconds		Wait 10 seconds
Establish DPU à blue SPU links (DPU as master)		Send TC(18,3) "Start Procedure" to PACS with the following parameters: - Procedure ID = 0x0013 (19 = TBC) - N1 = 0x0002 (2 parameters) - OBCP-PID /Value = 0x0001 / 0x0000_0001 - OBCP-PID /Value = 0x0002 / 0x0000_0001
Wait 4 seconds		Wait 4 seconds
Establish DPU à red SPU links (DPU as master)		Send TC(18,3) "Start Procedure" to PACS with the following parameters: - Procedure ID = 0x0013 (19 = TBC) - N1 = 0x0002 (2 parameters) - OBCP-PID /Value = 0x0001 / 0x0000_0002 - OBCP-PID /Value = 0x0002 / 0x0000_0001

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Wait 4 seconds		Wait 4 seconds
LOAD SPU RED HLSW FROM EEPROM TO RAM first chunk		Send TC(8, 4) “Perform Activity of Function“ to PACS, with the following parameters: - Function-ID = 0x66 (102 = TBC) - Activity-ID = 0x65 (101 = TBC) - SID = 0x0005 - SPUL_EEPROM_MEMORY_ID = 0x0000_0003 - SPUL_EEPROM_START_ADDR = 0x0000_0100 - SPUL_RAM_MEMORY_ID = 0x0000_0001 - SPUL_RAM_START_ADDR = 0x0000_0100 - SPUL_DATA_LENGTH_HLSW = 0x0000_01E0
Wait 2 seconds		Wait 2 seconds
LOAD SPU RED HLSW FROM EEPROM TO RAM second chunk		Send TC(8, 4) “Perform Activity of Function“ to PACS, with the following parameters: - Function-ID = 0x66 (102 = TBC) - Activity-ID = 0x65 (101 = TBC) - SID = 0x0005 - SPUL_EEPROM_MEMORY_ID = 0x0000_0003 - SPUL_EEPROM_START_ADDR = 0x0000_0300 - SPUL_RAM_MEMORY_ID = 0x0000_0001 - SPUL_RAM_START_ADDR = 0x0000_0300 - SPUL_DATA_LENGTH_HLSW = 0x0000_0700
Wait 2 seconds		Wait 2 seconds
LOAD SPU RED HLSW FROM EEPROM TO RAM third chunk		Send TC(8, 4) “Perform Activity of Function“ to PACS, with the following parameters: - Function-ID = 0x66 (102 = TBC) - Activity-ID = 0x65 (101 = TBC) - SID = 0x0005 - SPUL_EEPROM_MEMORY_ID = 0x0000_0003 - SPUL_EEPROM_START_ADDR = 0x0000_0A00 - SPUL_RAM_MEMORY_ID = 0x0000_0001 - SPUL_RAM_START_ADDR = 0x0000_0A00 - SPUL_DATA_LENGTH_HLSW = 0x0000_A600
Wait 2 seconds		Wait 2 seconds
LOAD SPU BLUE HLSW FROM EEPROM TO RAM first chunk		Send TC(8, 4) “Perform Activity of Function“ to PACS, with the following parameters: - Function-ID = 0x65 (101 = TBC) - Activity-ID = 0x65 (101 = TBC) - SID = 0x0005 - SPUS_EEPROM_MEMORY_ID = 0x0000_0003 - SPUS_EEPROM_START_ADDR = 0x0000_0100 - SPUS_RAM_MEMORY_ID = 0x0000_0001 - SPUS_RAM_START_ADDR = 0x0000_0100 - SPUS_DATA_LENGTH_HLSW = 0x0000_01E0
Wait 2 seconds		Wait 2 seconds
LOAD SPU BLUE HLSW FROM EEPROM TO RAM second chunk		Send TC(8, 4) “Perform Activity of Function“ to PACS, with the following parameters: - Function-ID = 0x65 (101 = TBC) - Activity-ID = 0x65 (101 = TBC)

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		- SID = 0x0005 - SPUS_EEPROM_MEMORY_ID = 0x0000_0003 - SPUS_EEPROM_START_ADDR = 0x0000_0300 - SPUS_RAM_MEMORY_ID = 0x0000_0001 - SPUS_RAM_START_ADDR = 0x0000_0300 - SPUS_DATA_LENGTH_HLSW = 0x0000_0700
Wait 2 seconds		Wait 2 seconds
LOAD SPU BLUE HLSW FROM EEPROM TO RAM third chunk		Send TC(8, 4) “Perform Activity of Function“ to PACS, with the following parameters: - Function-ID = 0x65 (101 = TBC) - Activity-ID = 0x65 (101 = TBC) - SID = 0x0005 - SPUS_EEPROM_MEMORY_ID = 0x0000_0003 - SPUS_EEPROM_START_ADDR = 0x0000_0A00 - SPUS_RAM_MEMORY_ID = 0x0000_0001 - SPUS_RAM_START_ADDR = 0x0000_0A00 - SPUS_DATA_LENGTH_HLSW = 0x0000_A600
Wait 4 seconds		Wait 4 seconds
Start SPUS HLSW		Send TC(18,3) “Start Procedure” to PACS with the following parameters: - Procedure ID = 0x0015 (21 = TBC) - N1 = 0x0003 (3 parameters) - OBCP-PID /Value = 0x0001 / 0x0000_0001 - OBCP-PID /Value = 0x0002 / 0x0000_0001 - OBCP-PID /Value = 0x0003 / 0x0000_0A02
Wait 3 seconds		Wait 3 seconds
Establish DPU à blue SPU links (DPU as slave)		Send TC(18,3) “Start Procedure” to PACS with the following parameters: - Procedure ID = 0x0013 (19 = TBC) - N1 = 0x0002 (2 parameters) - OBCP-PID /Value = 0x0001 / 0x0000_0001 - OBCP-PID /Value = 0x0002 / 0x0000_0002
Wait 4 seconds		Wait 4 seconds
Start SPUL HLSW		Send TC(18,3) “Start Procedure” to PACS with the following parameters: - Procedure ID = 0x0015 (21 = TBC) - N1 = 0x0003 (3 parameters) - OBCP-PID /Value = 0x0001 / 0x0000_0002 - OBCP-PID /Value = 0x0002 / 0x0000_0001 - OBCP-PID /Value = 0x0003 / 0x0000_0A02
Wait 3 seconds		Wait 3 seconds
Establish DPU à red SPU links (DPU as slave)		Send TC(18,3) “Start Procedure” to PACS with the following parameters: - Procedure ID = 0x0013 (19 = TBC) - N1 = 0x0002 (2 parameters) - OBCP-PID /Value = 0x0001 / 0x0000_0002 - OBCP-PID /Value = 0x0002 / 0x0000_0002

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Wait 5 seconds		Wait 5 seconds
Establish connection SPUL-DMC, DMC as master		Send TC(8, 4) "Perform Activity of Function" to PACS, with the following parameters: - Function-ID = 0x66 (102 = TBC) - Activity-ID = 0x10 (16 = TBC) - SID = 0x0001 - SPUL_MASTER_OR_SLAVE = 0x0000_0022
Wait 1 second		Wait 1 second
Establish connection SPUS-DMC, DMC as master		Send TC(8, 4) "Perform Activity of Function" to PACS, with the following parameters: - Function-ID = 0x65 (101 = TBC) - Activity-ID = 0x10 (16 = TBC) - SID = 0x0001 - SPUS_MASTER_OR_SLAVE = 0x0000_0022
Wait 2 seconds		Wait 2 seconds
Establish connection DMC-SPURS DMC Master		Send TC(8, 4) "Perform Activity of Function" to PACS, with the following parameters: - Function-ID = 0x67 (103 = TBC) - Activity-ID = 0x57 (87 = TBC) - SID = 0x0001 - DMC_MASTER_OR_SLAVE = 0x0000_0001
Wait 1 second		Wait 1 second
Establish connection DMC-SPURL DMC Master		Send TC(8, 4) "Perform Activity of Function" to PACS, with the following parameters: - Function-ID = 0x67 (103 = TBC) - Activity-ID = 0x56 (86 = TBC) - SID = 0x0001 - DMC_MASTER_OR_SLAVE = 0x0000_0001
Wait 2 seconds		Wait 2 seconds
DMC_SWON_TEMP_SENSORS		Send TC(8, 4) "Perform Activity of Function" to PACS, with the following parameters: - Function-ID = 0x67 (103 = TBC) - Activity-ID = 0x5F (95 = TBC) - SID = 0x0000
Wait 1 second		Wait 1 second
putlog "FPU T-sensors are activated"		Issue a TM(5,[redacted]) with the following parameters: - Event ID = <PACS_FPU_TSENSORS_ON_EID> (0x2002 [redacted]) - SID = 0x0000 - Parameters A = 0x0000_0000_0000_0000[36] - Event Sequence Counter = Generated autonomously by the CDMU OBSW - Parameters B = None

[36] TBC: There could be 2 different values depending on Pl_Side

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Start all required autonomy functions	Function 1 : Monitor SPU Temperatures and Voltages	Send TC(8,4,100,6) “Set Function” with the following parameters : - Function ID = 0x64 (100) - Activity ID = 0x06 (6) - SID = 0x0002 - Internal Function ID = 1 - Status = 1 (ENABLE)
	Function 2 : Monitor DMC temperatures	Send TC(8,4,100,6) “Set Function” with the following parameters : - Function ID = 0x64 (100) - Activity ID = 0x06 (6) - SID = 0x0002 - Internal Function ID = 2 - Status = 1 (ENABLE)
	Function 3 : Monitor DMC counters on Last_Err and Memory	Send TC(8,4,100,6) “Set Function” with the following parameters : - Function ID = 0x64 (100) - Activity ID = 0x06 (6) - SID = 0x0002 - Internal Function ID = 3 - Status = 1 (ENABLE)
	Function 6 : Monitor BOL_REC_PAC to check DMC-BOLC communication	Send TC(8,4,100,6) “Set Function” with the following parameters : - Function ID = 0x64 (100) - Activity ID = 0x06 (6) - SID = 0x0002 - Internal Function ID = 6 - Status = 1 (ENABLE)
	Function 7 : Monitor SPU-S alive counter CIB	Send TC(8,4,100,6) “Set Function” with the following parameters : - Function ID = 0x64 (100) - Activity ID = 0x06 (6) - SID = 0x0002 - Internal Function ID = 7 - Status = 1 (ENABLE)
	Function 8 : Monitor SPU-S memory counter	Send TC(8,4,100,6) “Set Function” with the following parameters : - Function ID = 0x64 (100) - Activity ID = 0x06 (6) - SID = 0x0002 - Internal Function ID = 8 - Status = 1 (ENABLE)
	Function 9 : Monitor SPU-L alive counter CIR	Send TC(8,4,100,6) “Set Function” with the following parameters : - Function ID = 0x64 (100) - Activity ID = 0x06 (6) - SID = 0x0002 - Internal Function ID = 9 - Status = 1 (ENABLE)
	Function 10 : Monitor SPU-L memory counter	Send TC(8,4,100,6) “Set Function” with the following parameters : - Function ID = 0x64 (100)

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		- Activity ID = 0x06 (6) - SID = 0x0002 - Internal Function ID = 10 - Status = 1 (ENABLE)
	Function 11 : Monitor DPU HK	Send TC(8,4,100,6) "Set Function" with the following parameters : - Function ID = 0x64 (100) - Activity ID = 0x06 (6) - SID = 0x0002 - Internal Function ID = 11 - Status = 1 (ENABLE)
	Function 13 : monitor BOLC WE temperatures	Send TC(8,4,100,6) "Set Function" with the following parameters : - Function ID = 0x64 (100) - Activity ID = 0x06 (6) - SID = 0x0002 - Internal Function ID = 13 - Status = 1 (ENABLE)
	Function 16 : Monitor cooler heat switch temperatures	Send TC(8,4,100,6) "Set Function" with the following parameters : - Function ID = 0x64 (100) - Activity ID = 0x06 (6) - SID = 0x0002 - Internal Function ID = 16 - Status = 1 (ENABLE)
	Function 19 : Monitor BOL FPU heater	Send TC(8,4,100,6) "Set Function" with the following parameters : - Function ID = 0x64 (100) - Activity ID = 0x06 (6) - SID = 0x0002 - Internal Function ID = 19 - Status = 1 (ENABLE)
	Mark PACS Units as ON in order to inform the Thermal Control Management function that ON thresholds have to be used.	Send TC(8,4,116,26) "Mark Unit ON" with the following parameters: - Status Unit ID = 0x0309 (PACS BOLC) Send TC(8,4,116,26) "Mark Unit ON" with the following parameters: - Status Unit ID = 0x030A (PACS DEC-MEC) Send TC(8,4,116,26) "Mark Unit ON" with the following parameters: - Status Unit ID = 0x030B (PACS DPU/SPU)
End of procedure "PACS Switch-ON"		
	Enable EAT entries that triggered the current OBCP: - 0x0006 from PACS Nom & Red.	Send TC(19,4) "Enable Actions" with the following parameters: - N = 0x0002 (5 entries) - APID / Event ID = 0x0480 / 0x0006 (PACS Nom.) - APID / Event ID = 0x0481 / 0x0006 (PACS Red.)

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4.2.3.2.4 DB_OBCP_H_PACS_IMMEDIATE_OFF

OBCP DB_OBCP_H_PACS_IMMEDIATE_OFF		
ID	DB_OBCP_H_PACS_IMMEDIATE_OFF	0x120B
Triggered by	Event 0x000D from PACS Nom. or Red.	Internal FDIR - NORMAL OFF
	Event 0x0099 from CDMS	DLL FDIR
	Event 0x00AC from CDMS	TFL TC FDIR
	Event 0x00BA from CDMS	TFL TM FDIR
Type		Normal
Time-Out		600 seconds (TBC)
OBCP Parameters	PACS_SUBS_ID_CMD	Default value = 90
ACTIONS		
Instrument request	CDMS OBSW Action	Implementation
	Disable all EAT entries associated with PACS related events that could contradict or interfere with current OBCP execution, i.e. : - 0x000D from PACS Nom & Red. as they trigger the current OBCP - 0x0099, 0x00AC, 0x00BA from CDMS as they trigger the current OBCP - 0x0006 from PACS Nom & Red. As they would switched ON PACS.	Send TC(19,5) "Disable Actions" with the following parameters: - N = 0x0007 (7 entries) - APID / Event ID = 0x0480 / 0x000D (PACS Nom.) - APID / Event ID = 0x0481 / 0x000D (PACS Red.) - APID / Event ID = 0x0010 / 0x0099 (CDMS DLL FDIR) - APID / Event ID = 0x0010 / 0x00AC (CDMS TFL TC FDIR) - APID / Event ID = 0x0010 / 0x00BA (CDMS TFL TM FDIR) - APID / Event ID = 0x0480 / 0x0006 (PACS Nom.) - APID / Event ID = 0x0481 / 0x0006 (PACS Red.) -
	Stop execution of all running PACS OBCP that could contradict or interfere with current OBCP execution: - DB_OBCP_H_PACS_POWER_CYCLE as it would switched ON PACS	Send TC(18,4) "Stopping a procedure", with the following parameters: - Procedure-ID = DB_OBCP_H_PACS_POWER_CYCLE
Disable all commanding of PACS from the MTL Stop all PACS commanding from ground[37]		Send TC(11,2) "Disable Release of Telecommands" with the following parameters:[38] - N = 1 (One sub-schedule) - SUBSCHEDULE-ID = <PACS_SUBS_ID_CMD> (PACS command sub-schedule) - M = 0 (All APID) (TBC) Send TC(8,4,10,5) "Enable/disable TC Routing" with the following parameters: - TC_APID = 0x0480 (PACS) - TC_SRC = 100_b (Ground, low priority) - EOD = 0_b (Routing Disabled)
	Declare the two PACS RT as OFF[39]	Send TC(8,4,10,1) "Configure SDB FDIR " with the following

[37] TBC: is this really necessary and in case should it be applied to all instruments?
[38] According to [RD10]
[39] This will avoid to trigger any S/C 1553B bus FDIR related to PACS when it is OFF

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		parameters: - RTA = <SDB_RTA_PACS_A_VALUE> - F0 / M0 = 0_b / 1_b (RTA OFF) - F1 / M1 = 0_b / 0_b (Flag ignored) - F2 / M2 = 0_b / 0_b (Flag ignored) - F3 / M3 = 0_b / 0_b (Flag ignored) - F4 / M4 = 0_b / 0_b (Flag ignored) - F5 / M5 = 0_b / 0_b (Flag ignored) - F6 / M6 = 0_b / 0_b (Flag ignored) - F7 / M7 = 0_b / 0_b (Flag ignored) - F8 / M8 = 0_b / 0_b (Flag ignored) - F9 / M9 = 0_b / 0_b (Flag ignored) - F10 / M10 = 0_b / 0_b (Flag ignored) - F11 / M11 = 0_b / 0_b (Flag ignored) - CNT / M_C = 01_b / 0_b (Flag ignored) Send TC(8,4,10,1) with the following parameters: - RTA = <SDB_RTA_PACS_B_VALUE> - F0 / M0 = 0_b / 1_b (RTA OFF) - F1 / M1 = 0_b / 0_b (Flag ignored) - F2 / M2 = 0_b / 0_b (Flag ignored) - F3 / M3 = 0_b / 0_b (Flag ignored) - F4 / M4 = 0_b / 0_b (Flag ignored) - F5 / M5 = 0_b / 0_b (Flag ignored) - F6 / M6 = 0_b / 0_b (Flag ignored) - F7 / M7 = 0_b / 0_b (Flag ignored) - F8 / M8 = 0_b / 0_b (Flag ignored) - F9 / M9 = 0_b / 0_b (Flag ignored) - F10 / M10 = 0_b / 0_b (Flag ignored) - F11 / M11 = 0_b / 0_b (Flag ignored) - CNT / M_C = 01_b / 0_b (Flag ignored)
Switch OFF the 28V power for the FPSPU	OPEN LCL related to both nominal and redundant PACS SPU	Send TC(8,4,112,3) “Switch PCDU Unit OFF” with the following parameters: - PCDU Unit Code = 0x0023 (LCL 35 = PACS SPU Nom.) Send TC(8,4,112,3) “Switch PCDU Unit OFF”, with the following parameters: - PCDU Unit Code = 0x0024 (LCL 36 = PACS SPU Red.)
Switch OFF the 28V power for the FPBOLC	OPEN LCL related to both nominal and redundant PACS BOLC	Send TC(8,4,112,3) “Switch PCDU Unit OFF” with the following parameters: - PCDU Unit Code = 0x001B (LCL 27 = PACS BOLC Nom.) Send TC(8,4,112,3) “Switch PCDU Unit OFF”, with the following parameters: - PCDU Unit Code = 0x001C (LCL 28 = PACS BOLC Red.)
Switch OFF the 28V power for the FPDMC	OPEN LCL related to both nominal and redundant PACS DEC-MEC	Send TC(8,4,112,3) “Switch PCDU Unit OFF” with the following parameters: - PCDU Unit Code = 0x0041 (LCL 65 = PACS DEC-MEC 1) Send TC(8,4,112,3) “Switch PCDU Unit OFF”, with the following parameters: - PCDU Unit Code = 0x0045 (LCL 69 = PACS DEC-MEC 2)
Switch OFF the 28V power for the FPDPU	OPEN LCL related to both nominal and redundant PACS DPU	Send TC(8,4,112,3) “Switch PCDU Unit OFF” with the following parameters: - PCDU Unit Code = 0x0029 (LCL 41 = PACS DPU

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		Nom.) Send TC(8,4,112,3) "Switch PCDU Unit OFF", with the following parameters: - PCDU Unit Code = 0x002A (LCL 42 = PACS DPU Red.)
	Mark PACS Units as OFF in order to inform the Thermal Control Management function that OFF thresholds have to be used.	Send TC(8,4,116,25) "Mark Unit OFF" with the following parameters: - Status Unit ID = 0x0309 (PACS BOLC) Send TC(8,4,116,25) "Mark Unit OFF" with the following parameters: - Status Unit ID = 0x030A (PACS DEC-MEC) Send TC(8,4,116,25) "Mark Unit OFF" with the following parameters: - Status Unit ID = 0x030B (PACS DPU/SPU)
	Enable EAT entries that triggered the current OBCP[40]: - 0x000D from PACS Nom & Red. - 0x0099, 0x00AC, 0x00BA from CDMS	Send TC(19,4) "Enable Actions" with the following parameters: - N = 0x0005 (5 entries) - APID / Event ID = 0x0480 / 0x000D (PACS Nom.) - APID / Event ID = 0x0481 / 0x000D (PACS Red.) - APID / Event ID = 0x0010 / 0x0099 (CDMS DLL FDIR) - APID / Event ID = 0x0010 / 0x00AC (CDMS TFL TC FDIR) - APID / Event ID = 0x0010 / 0x00BA (CDMS TFL TM FDIR)

[40] TBC: This could be useful in case the current recovery did not succeed

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4.2.3.2.5 DB_OBCP_H_PACS_NORMAL_OFF

OBCP DB_OBCP_H_PACS_NORMAL_OFF		
ID	DB_OBCP_H_PACS_NORMAL_OFF	0x120C
Triggered by	Event 0x0019 from PACS Nom. or Red.	Internal FDIR - NORMAL OFF
Type		Normal
Time-Out		600 seconds (TBC)
OBCP Parameters	PACS_SUBS_ID_CMD	Default value = 90
ACTIONS		
Instrument request	CDMS OBSW Action	Implementation
	Disable all EAT entries associated with PACS related events that could contradict or interfere with current OBCP execution, i.e. : - 0x0019 from PACS Nom & Red. as they trigger the current OBCP - 0x0006 from PACS Nom & Red. As they would switched ON PACS.	Send TC(19,5) "Disable Actions" with the following parameters: - N = 0x0004 (4 entries) - APID / Event ID = 0x0480 / 0x0019 (PACS Nom.) - APID / Event ID = 0x0481 / 0x0019 (PACS Red.) - APID / Event ID = 0x0480 / 0x0006 (PACS Nom.) - APID / Event ID = 0x0481 / 0x0006 (PACS Red.) -
	Stop execution of all running PACS OBCP that could contradict or interfere with current OBCP execution: - DB_OBCP_H_PACS_POWER_CYCLE as it would switched ON PACS	Send TC(18,4) "Stopping a procedure", with the following parameters: - Procedure-ID = DB_OBCP_H_PACS_POWER_CYCLE
Disable all commanding of PACS from the MTL Stop all commanding from ground[41]		Send TC(11,2) "Disable Release of Telecommands" with the following parameters:[42] - N = 1 (One sub-schedule) - SUBSCHEDULE-ID = <PACS_SUBS_ID_CMD> (PACS command sub-schedule) - M = 0 (All APID) (TBC) Send TC(8,4,10,5) "Enable/disable TC Routing" with the following parameters: - TC_APID = 0x0480 (PACS) - TC_SRC = 100_b (Ground, low priority) - EOD = 0_b (Routing Disabled)
Execute procedure "PACS Switch-OFF in a safe way":		
Send the TC to PACS which triggers the transition into PACS SAFE mode.		Send TC(18, 3) "Start Procedure" to PACS, with the following parameters: - Procedure-ID = 24 (Enter SAFE mode) - N1 = 0 (No parameter)
- Set all groups bol		Send TC(8, 4) "Perform Activity of Function" to PACS, with the

[41] TBC: is this really necessary and in case should it be applied to all instruments?
[42] According to [RD10]

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bias 02 (VL) to 0.000 volt		following parameters: - Function-ID = 0x67 (103 = DEC sub-system) - Activity-ID = 0x21 (33 = DMC_SEND_COMMAND_TO_BOLC) - SID = 0x0001 - COMMAND = 0x00020000
- Set all groups bol bias 05 (VCH) to 0.000 volt		Send TC(8, 4) “Perform Activity of Function“ to PACS, with the following parameters: - Function-ID = 0x67 (103 = DEC sub-system) - Activity-ID = 0x21 (33 = DMC_SEND_COMMAND_TO_BOLC) - SID = 0x0001 - COMMAND = 0x00050000
- Set all groups bol bias 01 (VH) to 0.000 volt		Send TC(8, 4) “Perform Activity of Function“ to PACS, with the following parameters: - Function-ID = 0x67 (103 = DEC sub-system) - Activity-ID = 0x21 (33 = DMC_SEND_COMMAND_TO_BOLC) - SID = 0x0001 - COMMAND = 0x00010000
- Set all groups bol bias 03 (VRL) to 0.000 volt		Send TC(8, 4) “Perform Activity of Function“ to PACS, with the following parameters: - Function-ID = 0x67 (103 = DEC sub-system) - Activity-ID = 0x21 (33 = DMC_SEND_COMMAND_TO_BOLC) - SID = 0x0001 - COMMAND = 0x00030000
- Set all groups bol bias 04 (VINJ) to 0.000 volt		Send TC(8, 4) “Perform Activity of Function“ to PACS, with the following parameters: - Function-ID = 0x67 (103 = DEC sub-system) - Activity-ID = 0x21 (33 = DMC_SEND_COMMAND_TO_BOLC) - SID = 0x0001 - COMMAND = 0x00040000
- Set all groups bol bias 06 (VDL) to 0.000 volt		Send TC(8, 4) “Perform Activity of Function“ to PACS, with the following parameters: - Function-ID = 0x67 (103 = DEC sub-system) - Activity-ID = 0x21 (33 = DMC_SEND_COMMAND_TO_BOLC) - SID = 0x0001 - COMMAND = 0x00060000
- Set all groups bol bias 08 (VGL) to 0.000 volt		Send TC(8, 4) “Perform Activity of Function“ to PACS, with the following parameters: - Function-ID = 0x67 (103 = DEC sub-system) - Activity-ID = 0x21 (33 = DMC_SEND_COMMAND_TO_BOLC) - SID = 0x0001 - COMMAND = 0x00080000
- Set all groups bol bias 07 (VSS) to 0.000 volt		Send TC(8, 4) “Perform Activity of Function“ to PACS, with the following parameters: - Function-ID = 0x67 (103 = DEC sub-system) - Activity-ID = 0x21 (33 = DMC_SEND_COMMAND_TO_BOLC) - SID = 0x0001 - COMMAND = 0x00070000

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- Set all groups bol bias 16 (VDD) to 0.000 volt		Send TC(8, 4) “Perform Activity of Function“ to PACS, with the following parameters: - Function-ID = 0x67 (103 = DEC sub-system) - Activity-ID = 0x21 (33 = DMC_SEND_COMMAND_TO_BOLC) - SID = 0x0001 - COMMAND = 0x00100000
- Set all groups bol bias 15 (VGG) to 0.000 volt		Send TC(8, 4) “Perform Activity of Function“ to PACS, with the following parameters: - Function-ID = 0x67 (103 = DEC sub-system) - Activity-ID = 0x21 (33 = DMC_SEND_COMMAND_TO_BOLC) - SID = 0x0001 - COMMAND = 0x000F0000
- Set all groups bol bias 09 (CKRLH) to 0.000 volt		Send TC(8, 4) “Perform Activity of Function“ to PACS, with the following parameters: - Function-ID = 0x67 (103 = DEC sub-system) - Activity-ID = 0x21 (33 = DMC_SEND_COMMAND_TO_BOLC) - SID = 0x0001 - COMMAND = 0x00090000
- Set all groups bol bias 10 (CKRLL) to 0.000 volt		Send TC(8, 4) “Perform Activity of Function“ to PACS, with the following parameters: - Function-ID = 0x67 (103 = DEC sub-system) - Activity-ID = 0x21 (33 = DMC_SEND_COMMAND_TO_BOLC) - SID = 0x0001 - COMMAND = 0x000A0000
- Set all groups bol bias 11 (VDECX-H) to 0.000 volt		Send TC(8, 4) “Perform Activity of Function“ to PACS, with the following parameters: - Function-ID = 0x67 (103 = DEC sub-system) - Activity-ID = 0x21 (33 = DMC_SEND_COMMAND_TO_BOLC) - SID = 0x0001 - COMMAND = 0x000B0000
- Set all groups bol bias 12 (VDECX-L) to 0.000 volt		Send TC(8, 4) “Perform Activity of Function“ to PACS, with the following parameters: - Function-ID = 0x67 (103 = DEC sub-system) - Activity-ID = 0x21 (33 = DMC_SEND_COMMAND_TO_BOLC) - SID = 0x0001 - COMMAND = 0x000C0000
- Set all groups bol bias 13 (VSMS-H) to 0.000 volt		Send TC(8, 4) “Perform Activity of Function“ to PACS, with the following parameters: - Function-ID = 0x67 (103 = DEC sub-system) - Activity-ID = 0x21 (33 = DMC_SEND_COMMAND_TO_BOLC) - SID = 0x0001 - COMMAND = 0x000D0000
- Set all groups bol bias 14 (VSMS-L) to 0.000 volt		Send TC(8, 4) “Perform Activity of Function“ to PACS, with the following parameters: - Function-ID = 0x67 (103 = DEC sub-system) - Activity-ID = 0x21 (33 =

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		DMC_SEND_COMMAND_TO_BOLC) - SID = 0x0001 - COMMAND = 0x000E0000
- Set all groups bol bias 18 (VDL-BU) to 0.000 volt		Send TC(8, 4) “Perform Activity of Function“ to PACS, with the following parameters: - Function-ID = 0x67 (103 = DEC sub-system) - Activity-ID = 0x21 (33 = DMC_SEND_COMMAND_TO_BOLC) - SID = 0x0001 - COMMAND = 0x00120000
- Set all groups bol bias 20 (VH-BLIND) to 0.000 volt		Send TC(8, 4) “Perform Activity of Function“ to PACS, with the following parameters: - Function-ID = 0x67 (103 = DEC sub-system) - Activity-ID = 0x21 (33 = DMC_SEND_COMMAND_TO_BOLC) - SID = 0x0001 - COMMAND = 0x00140000
- Set all groups bol bias 19 (VGL-BU) to 0.000 volt		Send TC(8, 4) “Perform Activity of Function“ to PACS, with the following parameters: - Function-ID = 0x67 (103 = DEC sub-system) - Activity-ID = 0x21 (33 = DMC_SEND_COMMAND_TO_BOLC) - SID = 0x0001 - COMMAND = 0x00130000
- Set all groups bol bias 17 (VSS-BU) to 0.000 volt		Send TC(8, 4) “Perform Activity of Function“ to PACS, with the following parameters: - Function-ID = 0x67 (103 = DEC sub-system) - Activity-ID = 0x21 (33 = DMC_SEND_COMMAND_TO_BOLC) - SID = 0x0001 - COMMAND = 0x00110000
- Wait 1 second		Wait 1 second
- Set all groups bol bias 21 (VDD-PROT-CL) OFF		Send TC(8, 4) “Perform Activity of Function“ to PACS, with the following parameters: - Function-ID = 0x67 (103 = DEC sub-system) - Activity-ID = 0x21 (33 = DMC_SEND_COMMAND_TO_BOLC) - SID = 0x0001 - COMMAND = 0x00150000
- Set all groups bol bias 22 (VDD-PROT-BU) OFF		Send TC(8, 4) “Perform Activity of Function“ to PACS, with the following parameters: - Function-ID = 0x67 (103 = DEC sub-system) - Activity-ID = 0x21 (33 = DMC_SEND_COMMAND_TO_BOLC) - SID = 0x0001 - COMMAND = 0x00160000
- Set all groups bol bias 23 (GND-BU) OFF		Send TC(8, 4) “Perform Activity of Function“ to PACS, with the following parameters: - Function-ID = 0x67 (103 = DEC sub-system) - Activity-ID = 0x21 (33 = DMC_SEND_COMMAND_TO_BOLC) - SID = 0x0001 - COMMAND = 0x00170000

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- Putlog « BOL biases are set to 0 » - Set temperature probes OFF - Set all groups to OFF - Wait 2 seconds		Issue a TM(5,[illegible]) [illegible] with the following parameters: - Event ID = <PACS_BOL_BIAS_RESET_EID> (0x2001 TB[illegible]) - SID = 0x0000 - Parameters A = 0x0000_0000_0000_0000 - Event Sequence Counter = Generated autonomously by the CDMU OBSW - Parameters B = None Send TC(8, 4) "Perform Activity of Function" to PACS, with the following parameters: - Function-ID = 0x67 (103 = DEC sub-system) - Activity-ID = 0x21 (33 = DMC_SEND_COMMAND_TO_BOLC) - SID = 0x0001 - COMMAND = 0x07000000 Send TC(8, 4) "Perform Activity of Function" to PACS, with the following parameters: - Function-ID = 0x67 (103 = DEC sub-system) - Activity-ID = 0x21 (33 = DMC_SEND_COMMAND_TO_BOLC) - SID = 0x0001 - COMMAND = 0x0A000000 Wait 2 seconds
	Declare the two PACS RT as OFF[43]	Send TC(8,4,10,1) "Configure SDB FDIR " with the following parameters: - RTA = <SDB_RTA_PACS_A_VALUE> - F0 / M0 = 0_b / 1_b (RTA OFF) - F1 / M1 = 0_b / 0_b (Flag ignored) - F2 / M2 = 0_b / 0_b (Flag ignored) - F3 / M3 = 0_b / 0_b (Flag ignored) - F4 / M4 = 0_b / 0_b (Flag ignored) - F5 / M5 = 0_b / 0_b (Flag ignored) - F6 / M6 = 0_b / 0_b (Flag ignored) - F7 / M7 = 0_b / 0_b (Flag ignored) - F8 / M8 = 0_b / 0_b (Flag ignored) - F9 / M9 = 0_b / 0_b (Flag ignored) - F10 / M10 = 0_b / 0_b (Flag ignored) - F11 / M11 = 0_b / 0_b (Flag ignored) - CNT / M_C = 01_b / 0_b (Flag ignored) Send TC(8,4,10,1) with the following parameters: - RTA = <SDB_RTA_PACS_B_VALUE> - F0 / M0 = 0_b / 1_b (RTA OFF) - F1 / M1 = 0_b / 0_b (Flag ignored) - F2 / M2 = 0_b / 0_b (Flag ignored) - F3 / M3 = 0_b / 0_b (Flag ignored) - F4 / M4 = 0_b / 0_b (Flag ignored) - F5 / M5 = 0_b / 0_b (Flag ignored) - F6 / M6 = 0_b / 0_b (Flag ignored) - F7 / M7 = 0_b / 0_b (Flag ignored) - F8 / M8 = 0_b / 0_b (Flag ignored) - F9 / M9 = 0_b / 0_b (Flag ignored) - F10 / M10 = 0_b / 0_b (Flag ignored) - F11 / M11 = 0_b / 0_b (Flag ignored) - CNT / M_C = 01_b / 0_b (Flag ignored)
Switch OFF the 28V power for the FPSPU	OPEN LCL related to both nominal and redundant PACS SPU	Send TC(8,4,112,3) "Switch PCDU Unit OFF" with the following parameters:

[43] This will avoid to trigger any S/C 1553B bus FDIR related to PACS when it is OFF

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		- PCDU Unit Code = 0x0023 (LCL 35 = PACS SPU Nom.) Send TC(8,4,112,3) "Switch PCDU Unit OFF", with the following parameters: - PCDU Unit Code = 0x0024 (LCL 36 = PACS SPU Red.)
Switch OFF the 28V power for the FPBOLC	OPEN LCL related to both nominal and redundant PACS BOLC	Send TC(8,4,112,3) "Switch PCDU Unit OFF" with the following parameters: - PCDU Unit Code = 0x001B (LCL 27 = PACS BOLC Nom.) Send TC(8,4,112,3) "Switch PCDU Unit OFF", with the following parameters: - PCDU Unit Code = 0x001C (LCL 28 = PACS BOLC Red.)
Switch OFF the 28V power for the FPDMC	OPEN LCL related to both nominal and redundant PACS DEC-MEC	Send TC(8,4,112,3) "Switch PCDU Unit OFF" with the following parameters: - PCDU Unit Code = 0x0041 (LCL 65 = PACS DEC-MEC 1) Send TC(8,4,112,3) "Switch PCDU Unit OFF", with the following parameters: - PCDU Unit Code = 0x0045 (LCL 69 = PACS DEC-MEC 2)
Switch OFF the 28V power for the FPDPU	OPEN LCL related to both nominal and redundant PACS DPU	Send TC(8,4,112,3) "Switch PCDU Unit OFF" with the following parameters: - PCDU Unit Code = 0x0029 (LCL 41 = PACS DPU Nom.) Send TC(8,4,112,3) "Switch PCDU Unit OFF", with the following parameters: - PCDU Unit Code = 0x002A (LCL 42 = PACS DPU Red.)
	Mark PACS Units as OFF in order to inform the Thermal Control Management function that OFF thresholds have to be used.	Send TC(8,4,116,25) "Mark Unit OFF" with the following parameters: - Status Unit ID = 0x0309 (PACS BOLC) Send TC(8,4,116,25) "Mark Unit OFF" with the following parameters: - Status Unit ID = 0x030A (PACS DEC-MEC) Send TC(8,4,116,25) "Mark Unit OFF" with the following parameters: - Status Unit ID = 0x030B (PACS DPU/SPU)
Putlog « PACS is OFF »		Issue a TM(5,[redacted]) [redacted] with the following parameters: - Event ID = <PACS_OFF_EID> (0x2000 TB[redacted]) - SID = 0x0000 - Parameters A = 0x0000_0000_0000_0000 - Event Sequence Counter = Generated autonomously by the CDMU OBSW - Parameters B = None
End of procedure "PACS Switch-OFF in a safe way"		

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	Enable EAT entries that triggered the current OBCP[44]: - 0x0019 from PACS Nom & Red. -	Send TC(19,4) “Enable Actions” with the following parameters: - N = 0x0002 (2 entries) - APID / Event ID = 0x0480 / 0x0019 (PACS Nom.) - APID / Event ID = 0x0481 / 0x0019 (PACS Red.)

[44] TBC: This could be useful in case the current recovery did not succeed

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4.3 HIFI

4.3.1 HIFI FDIR

4.3.1.1 HIFI internal FDIR

According to [RD5], HIFI requests no support from the CDMS OBSW to complete a recovery activity related to any internal failure.

4.3.1.2 HIFI S/C FDIR

4.3.1.2.1 HIFI S/C 1553B Bus FDIR

The following table summarises what HIFI requests to be done by the CDMS OBSW in case a S/C 1553B Bus FDIR related to the communication with HIFI triggers.
Identification of the OBCP to implement the requested sequence of actions is then provided as additional information.

FDIR	Event Report		P/L request	OBCP
	ST,SST	ID		
DLL FDIR	5,x	151	Reset HIFI	DB_OBCP_H_HIFI_RESET
TFL TC FDIR	5,x	170	Reset HIFI	DB_OBCP_H_HIFI_RESET
TFL TM FDIR	5,x	184	Reset HIFI	DB_OBCP_H_HIFI_RESET

Table 4.3.1-1 : HIFI S/C 1553B Bus FDIR

From the previous table, one can define the following EAT entries to support PACS S/C 1553B Bus FDIR.

APID	Event ID	Telecommand Packet	Action Handling ID	Parameter Passing Status	Action Status
0x0010 (CDMS)	151 (DLL FDIR)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_H_HIFI_RESET N1=2 (HIFI_SUBS_ID_CMD, HIFI_PL_SIDE)	11_b (Enabled in both AFS & AFO)	0 (Disabled)	1 (Enabled)
0x0010 (CDMS)	170 (TFL TC FDIR)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_H_HIFI_RESET N1=2 (HIFI_SUBS_ID_CMD, HIFI_PL_SIDE)	11_b (Enabled in both AFS & AFO)	0 (Disabled)	1 (Enabled)
0x0010 (CDMS)	184 (TFL TM FDIR)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_H_HIFI_RESET N1=2 (HIFI_SUBS_ID_CMD, HIFI_PL_SIDE)	11_b (Enabled in both AFS & AFO)	0 (Disabled)	1 (Enabled)

Table 4.3.1-2 : EAT for HIFI S/C 1553B Bus FDIR

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4.3.1.2.2 HIFI Science Data Monitoring

No instrument request beyond what is requested within the 1553B FDIR.

4.3.1.2.3 HIFI Class B Heater Loop FDIR

HIFI is thermally controlled with Class B control loops.

However, in case of failure, HIFI do not request any action to be done other than generated an event to be informed of this failure case that may impact the accuracy of their measurements. This need is already covered by the generation of the TM(5,4,114,5).

Consequently, no additional OBCP is needed (see 3.1.2.3).

4.3.2 HIFI S/C Mode Transition

As specified in section 3.2, during a S/C transition from any S/C mode to S/C EAM or SAM, HIFI will be put in a "standby" mode by the CDMS OBSW via the execution of one dedicated OBCP.
This OBCP will be called by the "mother" S/C Mode Transition OBCP, as summarised in the following table.

S/C Transition	P/L request	OBCP	
			Called by...
From any mode to SAM or EAM	Put HIFI in STANDBY Mode	DB_OBCP_H_HIFI_STANDBY	DB_H_PL_SC_MODE_OBCP
From any mode to SM	Do Nothing	None	DB_H_PL_SC_MODE_OBCP

Table 4.3.2-1 : HIFI OBCP vs. S/C Mode transition

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4.3.3 HIFI OBCP

4.3.3.1 List of HIFI OBCP

According to sections 4.3.1and 4.3.2, the following OBCP are needed to support HIFI activity from the CDMS OBSW:

OBCP	Payload Internal FDIR	S/C 1553B Bus FDIR	Science Data Monitoring	Class B Heater Loop FDIR	S/C Mode Transition	Triggered by			
						Event Report			"Mother" OBCP
						APID	ST,SST	ID	
DB_OBCP_H_HIFI_RESET		X				0x0010 (CDMS)	5,x	0x0097 151 (DLL)	
		X				0x0010 (CDMS)	5,x	0x00AA 170 (TFL TC)	
		X				0x0010 (CDMS)	5,x	0x00B8 184 (TFL TM)	
DB_OBCP_H_HIFI_STANDBY					X				DB_H_PL_SC_MODE_OBCP

Table 4.3.3-1 : List of HIFI OBCP

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4.3.3.2 HIFI OBCP Specification

4.3.3.2.1 DB_OBCP_H_HIFI_RESET

OBCP DB_OBCP_H_HIFI_RESET		
ID	DB_OBCP_H_HIFI_RESET	0x130D
Triggered by	Event 0x0097 from CDMS	DLL FDIR
	Event 0x00AA from CDMS	TFL TC FDIR
	Event 0x00B8 from CDMS	TFL TM FDIR
Type		Normal
Time-Out		600 seconds (TBC)
OBCP Parameters	HIFI_SUBS_ID_CMD	Default value = 70
	HIFI_PL_SIDE	Default value = 0 (NOMINAL)

ACTIONS		
Instrument request	CDMS OBSW Action	Implementation
	Disable all EAT entries associated with HIFI related events that could contradict or interfere with current OBCP execution, i.e. : - 0x0097, 0x00AA, 0x00B8 from CDMS as they trigger the current OBCP	Send TC(19,5) "Disable Actions" with the following parameters: - N = 0x0003 (3 entries) - APID / Event ID = 0x0010 / 0x0097 (CDMS DLL FDIR) - APID / Event ID = 0x0010 / 0x00AA (CDMS TFL TC FDIR) - APID / Event ID = 0x0010 / 0x00B8 (CDMS TFL TM FDIR)
	Stop execution of all running HIFI OBCP that could contradict or interfere with current OBCP execution: - None[45]	
Disable timeline		Send TC(11,2) "Disable Release of Telecommands" with the following parameters:[46] - N = 1 (One sub-schedule) - SUBSCHEDULE-ID = <HIFI_SUBS_ID_CMD> (HIFI command sub-schedule) - M = 0 (All APID)
	Declare HIFI RT (Nom. and Red.) as Well_TM, Well_TC and Valid in order to be able to send TC and receive TM, and to check later on if anomaly is still present	Send TC(8,4,10,1) "Configure SDB FDIR " with the following parameters: - RTA = <SDB_RTA_HIFI_A_VALUE> - F0 / M0 = 0_b / 0_b (Flag ignored) - F1 / M1 = 0_b / 0_b (Flag ignored) - F2 / M2 = 1_b / 1_b (RTA Well_TC) - F3 / M3 = 1_b / 1_b (RTA Well_TM) - F4 / M4 = 1_b / 1_b (RTA Valid) - F5 / M5 = 0_b / 0_b (Flag ignored) - F6 / M6 = 0_b / 0_b (Flag ignored) - F7 / M7 = 0_b / 0_b (Flag ignored) - F8 / M8 = 0_b / 0_b (Flag ignored) - F9 / M9 = 0_b / 0_b (Flag ignored) - F10 / M10 = 0_b / 0_b (Flag ignored) - F11 / M11 = 0_b / 0_b (Flag ignored)

[45] TBC: it is assumed that a request to go to standby mode would not interfere with the reset procedure.
[46] According to [RD10]

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		- CNT / M_C = 01_b / 0_b (Flag ignored) Send TC(8,4,10,1) with the following parameters: - RTA = <SDB_RTA_HIFI_B_VALUE> - F0 / M0 = 0_b / 0_b (Flag ignored) - F1 / M1 = 0_b / 0_b (Flag ignored) - F2 / M2 = 1_b / 1_b (RTA Well_TC) - F3 / M3 = 1_b / 1_b (RTA Well_TM) - F4 / M4 = 1_b / 1_b (RTA Valid) - F5 / M5 = 0_b / 0_b (Flag ignored) - F6 / M6 = 0_b / 0_b (Flag ignored) - F7 / M7 = 0_b / 0_b (Flag ignored) - F8 / M8 = 0_b / 0_b (Flag ignored) - F9 / M9 = 0_b / 0_b (Flag ignored) - F10 / M10 = 0_b / 0_b (Flag ignored) - F11 / M11 = 0_b / 0_b (Flag ignored) - CNT / M_C = 01_b / 0_b (Flag ignored)
Send the HIFI_goto_safe telecommand (which will or will not arrive)		Send TC(8, 4) "Perform Activity of Function" to HIFI, with the following parameters: - Function-ID = 0x11 (17 = HIFI_Goto_Safe) - Activity-ID = 0x00 - SID = 0x0000
Send the HIFI_reset telecommand (which will or will not arrive)		Send TC(8, 4) "Perform Activity of Function" to HIFI, with the following parameters: - Function-ID = 0x11 (17 = HIFI_Reset) - Activity-ID = 0x03 - SID = 0x0000
Issue an appropriate event		Issue a TM(5,4) with the following parameters: - Event ID = <HIFI_SOFT_RESET_EID> (0x3001 TB) - SID = 0x0000 - Parameters A = 0x0000_0000_0000_0000 - Event Sequence Counter = Generated autonomously by the CDMU OBSW - Parameters B = None
Check if the anomaly is still there		Wait 2 (TB seconds If HIFI RT is declared Sick_TC or Sick_TM or Invalid[49] then anomaly is still there.

In case of no anomaly : enable timeline at the next observation		If there is no anomaly (i.e. HIFI RT Well_TC & Well_TM & Valid) then
		{
		/* Enable EAT entries that triggered the current OBCP */
		Send TC(19,4) "Enable Actions" with the following parameters:
		- N = 0x0003 (3 entries)
		- APID / Event ID = 0x0010 / 0x0097 (CDMS DLL FDIR)
		- APID / Event ID = 0x0010 / 0x00AA (CDMS TFL TC FDIR)
		- APID / Event ID = 0x0010 / 0x00B8 (CDMS TFL TM FDIR)
		
		/* Re-enable telecommands from the MTL to the instrument at the start of the next subschedule */

[47] TBC: [AD4] does not specify any SID though it is mandatory according to [AD1]
[48] TBC: [AD4] does not specify any FID/AID/SID associated with HIFI_reset TC
[49] The information can be extracted from DID_BSW_SDB_RTA_CFG_HIFI_A and DID_BSW_SDB_RTA_CFG_HIFI_B

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		Send TC(11,1) "Enable Release of Telecommands" with the following parameters: - N = 1 (One sub-schedules) - SUBSCHEDULE-ID = <HIFI_SUBS_ID_CMD> (HIFI command subschedule) - M = 0 (All APID) }
In case of anomaly proceed as follows:		Else /* 1 */ {
Issue an appropriate event		Issue a TM(5,4) with the following parameters: - Event ID = <HIFI_HARD_RESET_EID> (0x3002 TB) - SID = 0x0000 - Parameters A = 0x0000_0000_0000_0000 - Event Sequence Counter = Generated autonomously by the CDMU OBSW - Parameters B = None
Power off ICU	OPEN LCL related to both nominal and redundant HIFI ICU	Send TC(8,4,112,3) "Switch PCDU Unit OFF" with the following parameters: - PCDU Unit Code = 0x0040 (LCL 64 = HIFI ICU Nom.) Send TC(8,4,112,3) "Switch PCDU Unit OFF", with the following parameters: - PCDU Unit Code = 0x0044 (LCL 68 = HIFI ICU Red.)
Wait 1 second		Wait 1 second

Power on ICU	CLOSE LCL related to HIFI ICU in-use	If HIFI_ICU_In_Use[50] = NOM then
		HIFI_ICU_LCL = 64;
		Else
		HIFI_ICU_LCL = 68;
		
		Send TC(8,4,112,5) "Switch PCDU Unit ON" with the following parameters:
		- PCDU Unit Code = HIFI_ICU_LCL

	Declare HIFI RT (Nom. and Red.) as Well_TM, Well_TC and Valid in order to be able to send TC and receive TM, and to check later on if anomaly is still present	Send TC(8,4,10,1) "Configure SDB FDIR " with the following parameters: - RTA = <SDB_RTA_HIFI_A_VALUE> - F0 / M0 = 0_b / 0_b (Flag ignored) - F1 / M1 = 0_b / 0_b (Flag ignored) - F2 / M2 = 1_b / 1_b (RTA Well_TC) - F3 / M3 = 1_b / 1_b (RTA Well_TM) - F4 / M4 = 1_b / 1_b (RTA Valid) - F5 / M5 = 0_b / 0_b (Flag ignored) - F6 / M6 = 0_b / 0_b (Flag ignored) - F7 / M7 = 0_b / 0_b (Flag ignored) - F8 / M8 = 0_b / 0_b (Flag ignored) - F9 / M9 = 0_b / 0_b (Flag ignored) - F10 / M10 = 0_b / 0_b (Flag ignored)

[50] HIFI_ICU_In_Use can be determined either:
- by inspecting the Parameter_A field of the event report that triggered the OBCP (in case parameter passing has to be activated)
- by reading which LCL is CLOSED before switching OFF the ICU
- by passing the information in the EAT

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		- F11 / M11 = 0_b / 0_b (Flag ignored) - CNT / M_C = 01_b / 0_b (Flag ignored) Send TC(8,4,10,1) with the following parameters: - RTA = <SDB_RTA_HIFI_B_VALUE> - F0 / M0 = 0_b / 0_b (Flag ignored) - F1 / M1 = 0_b / 0_b (Flag ignored) - F2 / M2 = 1_b / 1_b (RTA Well_TC) - F3 / M3 = 1_b / 1_b (RTA Well_TM) - F4 / M4 = 1_b / 1_b (RTA Valid) - F5 / M5 = 0_b / 0_b (Flag ignored) - F6 / M6 = 0_b / 0_b (Flag ignored) - F7 / M7 = 0_b / 0_b (Flag ignored) - F8 / M8 = 0_b / 0_b (Flag ignored) - F9 / M9 = 0_b / 0_b (Flag ignored) - F10 / M10 = 0_b / 0_b (Flag ignored) - F11 / M11 = 0_b / 0_b (Flag ignored) - CNT / M_C = 01_b / 0_b (Flag ignored)
Assume that it boots automatically or issue force-boot command[51]		TBC
Check if the anomaly is still there		Wait 2 (TB) seconds[52] If HIFI RT is declared Sick_TC or Sick_TM or Invalid[53] then anomaly is still there.

In case of no anomaly : enable timeline at the next observation		If there is no anomaly (i.e. HIFI RT Well_TC & Well_TM & Valid) then
		{
		
		/* Enable EAT entries that triggered the current OBCP */
		Send TC(19,4) “Enable Actions” with the following parameters:
		- N = 0x0003 (3 entries)
		- APID / Event ID = 0x0010 / 0x0097 (CDMS DLL FDIR)
		- APID / Event ID = 0x0010 / 0x00AA (CDMS TFL TC FDIR)
		- APID / Event ID = 0x0010 / 0x00B8 (CDMS TFL TM FDIR)
		
		/* Re-enable telecommands from the MTL to the instrument at the start of the next subschedule */
		Send TC(11,1) “Enable Release of Telecommands” with the following parameters:
		- N = 1 (One sub-schedules)
		- SUBSCHEDULE-ID = <HIFI_SUBS_ID_CMD> (HIFI command subschedule)
		- M = 0 (All APID)
		
		}

In case of anomaly proceed as follows:		Else /* 2 */ {
	Declare the two HIFI RT as OFF[54]	Send TC(8,4,10,1) “Configure SDB FDIR “ with the

[51] TBC: HIFI shall clarify if force-boot command has to be sent.
[52] TBC: In case no force boot command is sent, one dummy command as to be sent to HIFI to check that communication is OK
[53] The information can be extracted from DID_BSW_SDB_RTA_CFG_HIFI_A and DID_BSW_SDB_RTA_CFG_HIFI_B
[54] This will avoid to trigger any S/C 1553B bus FDIR related to HIFI when it is OFF

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		following parameters: - RTA = <SDB_RTA_HIFI_A_VALUE> - F0 / M0 = 0_b / 1_b (RTA OFF) - F1 / M1 = 0_b / 0_b (Flag ignored) - F2 / M2 = 0_b / 0_b (Flag ignored) - F3 / M3 = 0_b / 0_b (Flag ignored) - F4 / M4 = 0_b / 0_b (Flag ignored) - F5 / M5 = 0_b / 0_b (Flag ignored) - F6 / M6 = 0_b / 0_b (Flag ignored) - F7 / M7 = 0_b / 0_b (Flag ignored) - F8 / M8 = 0_b / 0_b (Flag ignored) - F9 / M9 = 0_b / 0_b (Flag ignored) - F10 / M10 = 0_b / 0_b (Flag ignored) - F11 / M11 = 0_b / 0_b (Flag ignored) - CNT / M_C = 01_b / 0_b (Flag ignored) Send TC(8,4,10,1) with the following parameters: - RTA = <SDB_RTA_HIFI_B_VALUE> - F0 / M0 = 0_b / 1_b (RTA OFF) - F1 / M1 = 0_b / 0_b (Flag ignored) - F2 / M2 = 0_b / 0_b (Flag ignored) - F3 / M3 = 0_b / 0_b (Flag ignored) - F4 / M4 = 0_b / 0_b (Flag ignored) - F5 / M5 = 0_b / 0_b (Flag ignored) - F6 / M6 = 0_b / 0_b (Flag ignored) - F7 / M7 = 0_b / 0_b (Flag ignored) - F8 / M8 = 0_b / 0_b (Flag ignored) - F9 / M9 = 0_b / 0_b (Flag ignored) - F10 / M10 = 0_b / 0_b (Flag ignored) - F11 / M11 = 0_b / 0_b (Flag ignored) - CNT / M_C = 01_b / 0_b (Flag ignored)
Issue an appropriate event		Issue a TM(5,4) with the following parameters: - Event ID = <HIFI_OFF_EID> (0x3000 TBC) - SID = 0x0000 - Parameters A = 0x0000_0000_0000_0000 - Event Sequence Counter = Generated autonomously by the CDMU OBSW - Parameters B = None
Switch off WBS-H, WBS-V	OPEN LCL related to HIFI WEH & WEV	Send TC(8,4,112,3) “Switch PCDU Unit OFF” with the following parameters: - PCDU Unit Code = 0x002B (LCL 43 = HIFI WEH) Send TC(8,4,112,3) “Switch PCDU Unit OFF”, with the following parameters: - PCDU Unit Code = 0x002C (LCL 44 = HIFI WEV)
Switch off HRS-H, HRS-V	OPEN LCL related to HIFI HRH & HRV	Send TC(8,4,112,3) “Switch PCDU Unit OFF” with the following parameters: - PCDU Unit Code = 0x003F (LCL 63 = HIFI HRH) Send TC(8,4,112,3) “Switch PCDU Unit OFF”, with the following parameters: - PCDU Unit Code = 0x0043 (LCL 67 = HIFI HRV)
Switch off LCU	OPEN LCL related to both nominal and redundant HIFI LCU	Send TC(8,4,112,3) “Switch PCDU Unit OFF” with the following parameters: - PCDU Unit Code = 0x0035 (LCL 53 = HIFI LCU Nom.) Send TC(8,4,112,3) “Switch PCDU Unit OFF”, with the following parameters: - PCDU Unit Code = 0x0036 (LCL 54 = HIFI LCU Red.)

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Switch off ICU	OPEN LCL related to both nominal and redundant HIFI ICU	Send TC(8,4,112,3) “Switch PCDU Unit OFF” with the following parameters: - PCDU Unit Code = 0x0040 (LCL 64 = HIFI ICU Nom.) Send TC(8,4,112,3) “Switch PCDU Unit OFF”, with the following parameters: - PCDU Unit Code = 0x0044 (LCL 68 = HIFI ICU Red.)
	Mark HIFI Units as OFF in order to inform the Thermal Control Management function that OFF thresholds have to be used.[55]	Send TC(8,4,116,25) “Mark Unit OFF” with the following parameters: - Status Unit ID = 0x030C (HIFI WOV) Send TC(8,4,116,25) “Mark Unit OFF” with the following parameters: - Status Unit ID = 0x030D (HIFI HRV) Send TC(8,4,116,25) “Mark Unit OFF” with the following parameters: - Status Unit ID = 0x030E (HIFI WEV) Send TC(8,4,116,25) “Mark Unit OFF” with the following parameters: - Status Unit ID = 0x030F (HIFI WOH) Send TC(8,4,116,25) “Mark Unit OFF” with the following parameters: - Status Unit ID = 0x0310 (HIFI WEH) Send TC(8,4,116,25) “Mark Unit OFF” with the following parameters: - Status Unit ID = 0x0311 (HIFI HRH) Send TC(8,4,116,25) “Mark Unit OFF” with the following parameters: - Status Unit ID = 0x0312 (HIFI LCU) Send TC(8,4,116,25) “Mark Unit OFF” with the following parameters: - Status Unit ID = 0x0313 (HIFI IFV) Send TC(8,4,116,25) “Mark Unit OFF” with the following parameters: - Status Unit ID = 0x0314 (HIFI LSU) Send TC(8,4,116,25) “Mark Unit OFF” with the following parameters: - Status Unit ID = 0x0315 (HIFI FCU)
	Enable EAT entries that triggered the current OBCP[56]: - 0x000D from PACS Nom & Red. - 0x0099, 0x00AC, 0x00BA from CDMS	Send TC(19,4) “Enable Actions” with the following parameters: - N = 0x0003 (3 entries) - APID / Event ID = 0x0010 / 0x0097 (CDMS DLL FDIR) - APID / Event ID = 0x0010 / 0x00AA (CDMS TFL TC FDIR) - APID / Event ID = 0x0010 / 0x00B8 (CDMS TFL TM FDIR)
		} /* End Else 2 */

[55] TBC: some of these units might be passive or still powered and in this case shall not be marked as OFF. This has to be clarified.

[56] TBC: This could be useful in case the current recovery did not succeed.

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		} /* End Else 1 */

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4.3.3.2.2 DB_OBCP_H_HIFI_STANDBY

OBCP DB_OBCP_H_HIFI_STANDBY		
ID	DB_OBCP_H_HIFI_STANDBY	0x130E
Triggered by	DB_H_PL_SC_MODE_OBCP	S/C mode transition OBCP
Type		Normal
Time-Out		600 seconds (TBC)
OBCP Parameters	HIFI_SUBS_ID_CMD	Default value = 70
ACTIONS		
Instrument request	CDMS OBSW Action	Implementation
	Disable all EAT entries associated with HIFI related events that could contradict or interfere with current OBCP execution, i.e. : - None	
	Stop execution of all running HIFI OBCP that could contradict or interfere with current OBCP execution: - None[57]	
	(TBC) Disable all commanding of HIFI from the MTL	Send TC(11,2) "Disable Release of Telecommands" with the following parameters:[58] - N = 1 (One sub-schedule) - SUBSCHEDULE-ID = <HIFI_SUBS_ID_CMD> (HIFI command sub-schedule) - M = 0 (All APID)
Send the TC to HIFI which triggers the transition into HIFI STANDBY mode.		Send TC(8, 4) "Perform Activity of Function" to HIFI, with the following parameters: - Function-ID = 0x0C (12 = Configure sub-system) - Activity-ID = 0x1A (26 = HIFI_ HL_STANDBY) - SID = 0x0000 - Building Block-ID = 0x00000000 (TB) - LS-CMD = 0xF00FF0FF (HL_STANDBY)
	Enable EAT entries that triggered the current OBCP[59]: - None	

[57] TBC: it is assumed that a request to reset should execute even if HIFI is requested to go to standby.
[58] According to [RD10]
[59] TBC: This could be useful in case the current recovery did not succeed.

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4.4 Common HERSCHEL OBCP

4.4.1 DB_H_PL_SC_MODE_OBCP

OBCP DB_H_PL_SC_MODE_OBCP		
ID	DB_H_PL_SC_MODE_OBCP	0x0001
Triggered by	S/C mode transition to EAM or SAM or SM	
Type		Normal
Time-Out		30 seconds (TBC)
OBCP Parameters	None	
ACTIONS		
Instrument request	CDMS OBSW Action	Implementation

Test Destination Mode		If (S/C_MODE == SM) then
		{
		/* Do Nothing */
		} else {

SPIRE : Put SPIRE in STANDBY Mode	Start OBCP DB_OBCP_H_SPIRE_STANDBY	Send TC(18,3) “Start Procedure” with the following parameters : - Procedure ID = DB_OBCP_H_SPIRE_STANDBY - N1 = 0 (No 32bits parameter) (Use default values) - N2 = 0 (No 64bits parameter)
PACS: Put PACS in SAFE Mode	Start OBCP DB_OBCP_H_PACS_SAFE	Send TC(18,3) “Start Procedure” with the following parameters: - Procedure ID = DB_OBCP_H_PACS_SAFE - N1 = 0 (No 32bits parameter) (Use default values) - N2 = 0 (No 64bits parameter)
HIFI: Put HIFI in STANDBY Mode	Start OBCP DB_OBCP_H_HIFI_STANDBY	Send TC(18,3) “Start Procedure” with the following parameters: - Procedure ID = DB_OBCP_H_HIFI_STANDBY - N1 = 0 (No 32bits parameter) (Use default values) - N2 = 0 (No 64bits parameter) -
		} /* End if */

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5. PLANCK

5.1 HFI

5.1.1 HFI FDIR

5.1.1.1 HFI internal FDIR

According to [RD6], HFI generates the following Event Reports when it needs a support from the CDMS OBSW to complete a recovery activity.
Identification of the OBCP to implement the requested sequence of actions is then provided as additional information.

FDIR	Event Report		P/L request	OBCP
	ST,SST	ID		
FDIR5-0 (REU FPGA synchronisation failure)	5,2	128 (EVENT_ REU_FPGA_ERR OR_ON)	Do nothing autonomously	
FDIR5-2 (Loss of DPU-REU communication)	5,2	130 (EVENT_ NEED_REU_RE START _ON)	Do nothing autonomously	
FDIR5-3 (Loss of DPU-4KCDE communication)	5,2	132 (EVENT_ NEED_4KCDE_ RESTART _ON)	Do nothing autonomously	
FDIR5-4 (Loss of DPU-DCE communication)	5,2	134 (EVENT_ NEED_DCE_RE START _ON)	Do nothing autonomously	

Table 5.1.1-1 : HFI internal FDIR Event Reports

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5.1.1.2 HFI S/C FDIR

5.1.1.2.1 HFI S/C 1553B Bus FDIR

The following table summarises what HFI requests to be done by the CDMS OBSW in case an S/C 1553B Bus FDIR related to the communication with HFI triggers (see FDIR2 & FDIR5-1 in [RD6]).
Identification of the OBCP to implement the requested sequence of actions is then provided as additional information.

FDIR	Event Report		P/L request	OBCP
	ST,SST	ID		
DLL FDIR	5,x	154	Switch Off ME, REU processor and REU analogue belts (FDIR2-1)[60]	DB_OBCP_P_HFI_OFF
TFL TC FDIR	5,x	173	Do nothing (FDIR2-2)	None[61]
TFL TM FDIR	5,x	187	Reset the ME (FDIR2-3 = FDIR5-1)	DB_OBCP_P_HFI_DPU_RESTART

Table 5.1.1-3 : HFI S/C 1553B Bus FDIR

From the previous table, one can define the following EAT entries to support HFI S/C 1553B Bus FDIR.

APID	Event ID	Telecommand Packet	Action Handling ID	Parameter Passing Status	Action Status
0x0010 (CDMS)	154 (DLL FDIR)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_P_HFI_OFF N1=1 (HFI_SUBS_ID_CMD)	11_b (Enabled in both AFS & AFO)	0 (Disabled)	1 (Enabled)
0x0010 (CDMS)	187 (TFL TM FDIR)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_P_HFI_DPU_RESTART N1=3 (HFI_SUBS_ID_CMD, PL_SIDE and MAX_RESTART)	11_b (Enabled in both AFS & AFO)	0 (Disabled)	1 (Enabled)

Table 5.1.1-4 : EAT for HFI S/C 1553B Bus FDIR

5.1.1.2.2 HFI Science Data Monitoring

No instrument request beyond what is requested within the 1553B FDIR.

[60] TBC: It is assumed that FDIR2-1 as defined in [RD6] is equivalent to FDIR0.
[61] TBC: Should the communication with HFI be re-enabled, i.e. in this case TC sending authorised? If confirmed then an additional OBCP is needed.
[62] TBC: this has to be refined according to decision on how to identify which side has failed.

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5.1.1.2.3 HFI Class B Heater Loop FDIR

No Class B Thermal Control Loop is applicable to HFI.

5.1.2 HFI S/C Mode Transition

As specified in section 3.2, during a S/C transition from any S/C mode to S/C EAM or SAM, HFI will be put in a "standby" mode by the CDMS OBSW via the execution of one dedicated OBCP.
This OBCP will be called by the "mother" S/C Mode Transition OBCP, as summarised in the following table.

S/C Transition	P/L request	OBCP	
			Called by...
From any mode to SAM or EAM	Do nothing (FDIR1)	None	DB_P_PL_SC_MODE_OBCP
From any mode to SM	Do nothing	None	DB_P_PL_SC_MODE_OBCP

Table 5.1.2-1 : HFI OBCP vs. S/C Mode transition

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5.1.3 HFI OBCP

5.1.3.1 List of HFI OBCP

According to sections 5.1.1and 5.1.2, the following OBCP are needed to support HFI activity from the CDMS OBSW:

OBCP	Payload Internal FDIR	S/C 1553B Bus FDIR	Science Data Monitoring	Class B Heater Loop FDIR	S/C Mode Transition	Triggered by			
						Event Report			"Mother" OBCP
						APID	ST,SST	ID	
DB_OBCP_P_HFI_OFF		X				0x0010 (CDMS)	5,x	0x009A 154 (DLL)	
DB_OBCP_P_HFI_DPU_RESTART		X				0x0010 (CDMS)	5,x	0x00BB 187 (TFL TM)	

Table 5.1.3-1 : List of HFI OBCP

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5.1.3.2 HFI OBCP Specification

5.1.3.2.1 DB_OBCP_P_HFI_REU_RESYNCH

Removed

5.1.3.2.2 DB_OBCP_P_HFI_REU_RESTART

Removed

5.1.3.2.3 DB_OBCP_P_HFI_4KCDE_RESTART

Removed

5.1.3.2.4 DB_OBCP_P_HFI_DCE_RESTART

Removed

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5.1.3.2.5 DB_OBCP_P_HFI_OFF

OBCP DB_OBCP_P_HFI_OFF		
ID	DB_OBCP_P_HFI_OFF	0x2102
Triggered by	Event 0x009A from CDMS	DLL FDIR
Type		Normal
Time-Out		600 seconds (TBC)
OBCP Parameters		
	HFI_SUBS_ID_CMD	Default value = 70

ACTIONS		
Instrument request	CDMS OBSW Action	Implementation
	Disable all EAT entries associated with HFI related events that could contradict or interfere with current OBCP execution, i.e. : - 0x009A from CDMS as it triggers the current OBCP - 0x00BB from CDMS as it would restart the DPU	Send TC(19,5) “Disable Actions” with the following parameters: - N = 0x0002 - APID / Event ID = 0x0010 / 0x009A (CDMS DLL FDIR) - APID / Event ID = 0x0010 / 0x00BB (CDMS TFL TM)
	Stop execution of all running HFI OBCP that could contradict or interfere with current OBCP execution: - DB_OBCP_P_HFI_DPU_RESTART as it would restart the DPU	Send TC(18,4) “Stopping a procedure”, with the following parameters: - Procedure-ID = DB_OBCP_P_HFI_DPU_RESTART
Disable all commanding of HFI from the MTL		Send TC(11,2) “Disable Release of Telecommands“ with the following parameters:[63] - N = 1 (One sub-schedule) - SUBSCHEDULE-ID = <HFI_SUBS_ID_CMD> (HFI command sub-schedule) - M = 0 (All APID)
Switch HFI in STANDBY Mode according to “FDIR1” defined in [RD6]		/* Inhibit all DPU autonomous functions */ Send TC(8,4,160,2) to HFI with following parameters : - SID = 0x0000 - Sig_q CTRL = 0x00 /* Put the 4KCDE and REU in BOOT, and the DPU in STARTUP */ Send TC(8,4,0,16) to HFI with following parameters : - SID = 0x0002 - Private_Length_0 = 0x0002 - Function_ID_1 = 0x40 (REU) - Activity_ID_1 = 0xAO - SID_1 = 0x0000 - Private_Length_3 = 0x0001 - Function_ID_2 = 0x80 (4KCDE) - Activity_ID_2 = 0x0F Wait 2 minutes

[63] According to [RD10]

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		/* Put the DPU and the REU in STANDBY and the 4KCDE in Freewheel mode */ Send TC(8,4,0,17) to HFI with following parameters : - SID = 0x0003 - Private_Length_0 = 0x0002 - Function_ID_1 = 0x40 (REU) - Activity_ID_1 = 0x23 - SID_1 = 0x0000 - Private_Length_3 = 0x0002 - Function_ID_2 = 0x40 (REU) - Activity_ID_2 = 0xAA - SID_2 = 0x0000 - Private_Length_5 = 0x0001 - Function_ID_3 = 0x80 (4KCDE) - Activity_ID_3 = 0x01 Wait 1 minutes /* Put the 4KCDE in STANDBY Mode */ Send TC(8,4,128,3) to HFI Wait 3 minutes
	Declare the two HFI RT as OFF	Send TC(8,4,10,1) with the following parameters: - RTA = <SDB_RTA_HFI_A_VALUE> - F0 / M0 = 0_b / 1_b (RTA OFF) - F1 / M1 = 0_b / 0_b (Flag ignored) - F2 / M2 = 0_b / 0_b (Flag ignored) - F3 / M3 = 0_b / 0_b (Flag ignored) - F4 / M4 = 0_b / 0_b (Flag ignored) - F5 / M5 = 0_b / 0_b (Flag ignored) - F6 / M6 = 0_b / 0_b (Flag ignored) - F7 / M7 = 0_b / 0_b (Flag ignored) - F8 / M8 = 0_b / 0_b (Flag ignored) - F9 / M9 = 0_b / 0_b (Flag ignored) - F10 / M10 = 0_b / 0_b (Flag ignored) - F11 / M11 = 0_b / 0_b (Flag ignored) - CNT / M_C = 01_b / 0_b (Flag ignored) Send TC(8,4,10,1) with the following parameters: - RTA = <SDB_RTA_HFI_B_VALUE> - F0 / M0 = 0_b / 1_b (RTA OFF) - F1 / M1 = 0_b / 0_b (Flag ignored) - F2 / M2 = 0_b / 0_b (Flag ignored) - F3 / M3 = 0_b / 0_b (Flag ignored) - F4 / M4 = 0_b / 0_b (Flag ignored) - F5 / M5 = 0_b / 0_b (Flag ignored) - F6 / M6 = 0_b / 0_b (Flag ignored) - F7 / M7 = 0_b / 0_b (Flag ignored) - F8 / M8 = 0_b / 0_b (Flag ignored) - F9 / M9 = 0_b / 0_b (Flag ignored) - F10 / M10 = 0_b / 0_b (Flag ignored) - F11 / M11 = 0_b / 0_b (Flag ignored) - CNT / M_C = 01_b / 0_b (Flag ignored)

Switch off HFI according to "FDIR0" defined in [RD6]		/* Switch OFF all analog belts LCL */
		For (LCL_Index = 39; LCL_Index <= 44 ; LCL_Index++)
		{
		Send TC(8,4,112,3) "Switch PCDU Unit OFF" with the following parameters:
		- PCDU Unit Code = 0xXXXX = LCL_Index
		}
		
		/* Switch OFF 4KCDE Compressors (Nominal and Redundant)*/

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		Send TC(8,4,112,3) “Switch PCDU Unit OFF” with the following parameters: - PCDU Unit Code = 0x003C (LCL 59 = HFI 4KC Drive Bus Nom 2)[64] Send TC(8,4,112,3) “Switch PCDU Unit OFF” with the following parameters: - PCDU Unit Code = 0x003E (LCL 61 = HFI 4KC Drive Bus Red 2)[65] /* Mark HFI 4KCDE Compressor as OFF in order to inform the Thermal Control Management function that OFF thresholds have to be used.*/ Send TC(8,4,116,25) “Mark Unit OFF” with the following parameters: - Status Unit ID = 0x0307 (HFI CCU/CEU) Send TC(8,4,116,25) “Mark Unit OFF” with the following parameters: - Status Unit ID = 0x0309 (HFI CRU)[66] Wait 2 TB [67] seconds /* Switch OFF 4KCDE Processors (Nominal and Redundant)*/ Send TC(8,4,112,3) “Switch PCDU Unit OFF” with the following parameters: - PCDU Unit Code = 0x0025 (LCL 37 = HFI 4KCDE Nom) Send TC(8,4,112,3) “Switch PCDU Unit OFF” with the following parameters: - PCDU Unit Code = 0x0026 (LCL 38 = HFI 4KCDE Red) /* Mark HFI CAU as OFF in order to inform the Thermal Control Management function that OFF thresholds have to be used.*/ Send TC(8,4,116,25) “Mark Unit OFF” with the following parameters: - Status Unit ID = 0x0308 (HFI CAU)[68] Wait 2 TB [69] seconds /* Switch OFF DCE */ Send TC(8,4,112,3) “Switch PCDU Unit OFF” with the following parameters: - PCDU Unit Code = 0x0024 (LCL 36 = HFI DCE) /* The DCE is not individually thermally controlled, so there is no need to mark it as OFF */ Wait 2 TB [70] seconds /* Switch OFF the DPU (Nominal and Redundant)*/ Send TC(8,4,112,3) “Switch PCDU Unit OFF” with the following

[64] The 4KCDE compressor is powered by two // OP-LCL (59-60 for Nom. & 61-62 for Red.). Selecting one of them in the Switch PCDU Unit ON/OFF TC is sufficient as it acts on all of them at the same time.
[65] The 4KCDE compressor is powered by two // OP-LCL (59-60 for Nom. & 61-62 for Red.). Selecting one of them in the Switch PCDU Unit ON/OFF TC is sufficient as it acts on all of them at the same time.
[66] TBC: The 4KCDE Compressor is powered via the HFI CRU. As the CRU is passive, it might not be necessary to mark it OFF.
[67] TBC: No wait is specified by HFI in this sequence contrary to the others.
[68] TBC: The HFI CAU is powered by the 4KCDE Processor
[69] TBC: No wait is specified by HFI in this sequence contrary to the others.
[70] TBC: No wait is specified by HFI in this sequence contrary to the others.
[71] TBC: HFI PAU is powered via the HFI REU.
[72] TBC: No wait is specified by HFI in this sequence contrary to the others.

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		parameters: - PCDU Unit Code = 0x001D (LCL 29 = HFI DPU Nom) Send TC(8,4,112,3) “Switch PCDU Unit OFF” with the following parameters: - PCDU Unit Code = 0x001E (LCL 30 = HFI DPU Red) /* Mark HFI DPU as OFF in order to inform the Thermal Control Management function that OFF thresholds have to be used.*/ Send TC(8,4,116,25) “Mark Unit OFF” with the following parameters: - Status Unit ID = 0x0304 (HFI DPU1) Send TC(8,4,116,25) “Mark Unit OFF” with the following parameters: - Status Unit ID = 0x0305 (HFI DPU2) Wait 2 [redacted] seconds /* Switch OFF REU Processors (Nominal and Redundant)*/ Send TC(8,4,112,3) “Switch PCDU Unit OFF” with the following parameters: - PCDU Unit Code = 0x000B (LCL 11 = HFI REU Proc Nom) Send TC(8,4,112,3) “Switch PCDU Unit OFF” with the following parameters: - PCDU Unit Code = 0x000C (LCL 12 = HFI REU Proc Red) /* Mark HFI REU as OFF in order to inform the Thermal Control Management function that OFF thresholds have to be used.*/ Send TC(8,4,116,25) “Mark Unit OFF” with the following parameters: - Status Unit ID = 0x0306 (HFI REU) Send TC(8,4,116,25) “Mark Unit OFF” with the following parameters: - Status Unit ID = 0x030A (HFI PAU)[74]
	Enable EAT entries that triggered the current OBCP: - 0x009A from CDMS -	Send TC(19,4) “Enable Actions” with the following parameters: - N = 0x0001 - APID / Event ID = 0x0010 / 0x009A (CDMS DLL FDIR)

[73] TBC: No wait is specified by HFI in this sequence contrary to the others.
[74] TBC: HFI PAU is powered via the HFI REU.

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5.1.3.2.6 DB_OBCP_P_HFI_DPU_RESTART

OBCP DB_OBCP_P_HFI_DPU_RESTART		
ID	DB_OBCP_P_HFI_DPU_RESTART	0x2103
Triggered by	Event 0x00BB from CDMS	TFL TM FDIR
Type		Normal
Time-Out		1200 seconds (TBC)
OBCP Parameters	HFI_SUBS_ID_CMD	70 by default
	PL_Side[75]	Default value = 0 (NOMINAL)
	Max_Nb_Restart_Attempt	Maximum number of attempts to restart the DPU Default value = 2
ACTIONS		
Instrument request	CDMS OBSW Action	Implementation
	Disable all EAT entries associated with HFI related events that could contradict or interfere with current OBCP execution, i.e. : - 0x00BB from CDMS as it triggers the current OBCP -	Send TC(19,5) "Disable Actions" with the following parameters: - N = 0x0001 - APID / Event ID = 0x0010 / 0x00BB (CDMS TFL TM FDIR)
	Stop execution of all running HFI OBCP that could contradict or interfere with current OBCP execution: - None	
Disable all commanding of HFI from the MTL		Send TC(11,2) "Disable Release of Telecommands" with the following parameters:[77] - N = 1 (One sub-schedule) - SUBSCHEDULE-ID = <HFI_SUBS_ID_CMD> (HFI command sub-schedule) - M = 0 (All APID)

Restart the REU according to procedure "Loss of S/C-DPU communication" defined in [RD6]		Restart_Index = Max_Nb_Restart_Attempt;
		
		If (PL_Side == NOM) then LCL_Index = 29;
		Else LCL_Index = 30;
		
		While (Restart_Index>0)
		{
		/* Declare the two HFI RT as OFF */
		Send TC(8,4,10,1) with the following parameters:
		- RTA = <SDB_RTA_HFI_A_VALUE>
		- F0 / M0 = 0_b / 1_b (RTA OFF)

[75] TBC: Pl_Side could either be determined from the content of the event that triggered the OBCP (in this case parameter passing has to be enabled) or given as parameter of the OBCP directly in the EAT (then it would be under ground responsibility to set the EAT accordingly when there is an instrument switch-over).
[76] TBC: Pl_Side could either be determined from the content of the event that triggered the OBCP (in this case parameter passing has to be enabled) or given as parameter of the OBCP directly in the EAT (then it would be under ground responsibility to set the EAT accordingly when there is an instrument switch-over).
[77] According to [RD10]

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		- F1 / M1 = 0_b / 0_b (Flag ignored) - F2 / M2 = 0_b / 0_b (Flag ignored) - F3 / M3 = 0_b / 0_b (Flag ignored) - F4 / M4 = 0_b / 0_b (Flag ignored) - F5 / M5 = 0_b / 0_b (Flag ignored) - F6 / M6 = 0_b / 0_b (Flag ignored) - F7 / M7 = 0_b / 0_b (Flag ignored) - F8 / M8 = 0_b / 0_b (Flag ignored) - F9 / M9 = 0_b / 0_b (Flag ignored) - F10 / M10 = 0_b / 0_b (Flag ignored) - F11 / M11 = 0_b / 0_b (Flag ignored) - CNT / M_C = 01_b / 0_b (Flag ignored) Send TC(8,4,10,1) with the following parameters: - RTA = <SDB_RTA_HFI_B_VALUE> - F0 / M0 = 0_b / 1_b (RTA OFF) - F1 / M1 = 0_b / 0_b (Flag ignored) - F2 / M2 = 0_b / 0_b (Flag ignored) - F3 / M3 = 0_b / 0_b (Flag ignored) - F4 / M4 = 0_b / 0_b (Flag ignored) - F5 / M5 = 0_b / 0_b (Flag ignored) - F6 / M6 = 0_b / 0_b (Flag ignored) - F7 / M7 = 0_b / 0_b (Flag ignored) - F8 / M8 = 0_b / 0_b (Flag ignored) - F9 / M9 = 0_b / 0_b (Flag ignored) - F10 / M10 = 0_b / 0_b (Flag ignored) - F11 / M11 = 0_b / 0_b (Flag ignored) - CNT / M_C = 01_b / 0_b (Flag ignored) /* Switch OFF DPU */ Send TC(8,4,112,3) “Switch PCDU Unit OFF” with the following parameters: - PCDU Unit Code = 0xXXXX = LCL_Index Wait 1 minute /* Declare HFI RT (Nom. or Red.) as ON and Well_TM in order to be able to receive TM, and to check later on if anomaly is still present and Disable SDB FDIR */ Send TC(8,4,10,1) “Configure SDB FDIR “ with the following parameters: - RTA = <SDB_RTA_HFI_A_VALUE> or <SDB_RTA_HFI_B_VALUE> (according to PL_Side) - F0 / M0 = 1b / 1b (RTA ON) - F1 / M1 = 0b / 0b (Flag ignored) - F2 / M2 = 0b / 0b (Flag ignored) - F3 / M3 = 1b / 1b (RTA Well_TM) - F4 / M4 = 0b / 0b (Flag ignored) - F5 / M5 = 0b / 0b (Flag ignored) - F6 / M6 = 0b / 0b (Flag ignored) - F7 / M7 = 0b / 0b (Flag ignored) - F8 / M8 = 0b / 0b (Flag ignored) - F9 / M9 = 0b / 0b (Flag ignored) - F10 / M10 = 0b / 0b (Flag ignored) - F11 / M11 = 0b / 1b (Disable SDB FDIR) - CNT / M_C = 01b / 0b (Flag ignored) /* Switch ON DPU */ Send TC(8,4,112,5) “Switch PCDU Unit ON” with the following parameters: - PCDU Unit Code = 0xXXXX = LCL_Index

[78] The information can be extracted from DID_BSW_SDB_RTA_CFG_HFI_A and DID_BSW_SDB_RTA_CFG_HFI_B
[79] TBC: It is assumed that the DPU has to be switched OFF and not the RU as specified in [RD6].
[80] TBC: It is assumed the procedure has to stop here and no REU switch OFF is needed contrary to what [RD6] specifies
[81] According to [RD10]

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Wait (TB) seconds

/* Re-Enable SDB FDIR */

Send TC(8,4,10,1) "Configure SDB FDIR " with the following parameters:

- F0 / M0 = 0b / 0b (Flag ignored)
- F1 / M1 = 0b / 0b (Flag ignored)
- F2 / M2 = 0b / 0b (Flag ignored)
- F3 / M3 = 1b / 1b (RTA Well_TM)
- F4 / M4 = 0b / 0b (Flag ignored)
- F5 / M5 = 0b / 0b (Flag ignored)
- F6 / M6 = 0b / 0b (Flag ignored)
- F7 / M7 = 0b / 0b (Flag ignored)
- F8 / M8 = 0b / 0b (Flag ignored)
- F9 / M9 = 0b / 0b (Flag ignored)
- F10 / M10 = 0b / 0b (Flag ignored)
- F11 / M11 = 1b / 1b (Enable SDB FDIR)
- CNT / M_C = 01b / 0b (Flag ignored)

If HIFI RT is declared Sick_TM or RTA OFF[78] then /* Anomaly is still there */

{

Restart_Index = Restart_Index –1;

Wait 1 minute

if (Restart_Index < = 0) then

{

/* Declare the two HFI RT as OFF */

Send TC(8,4,10,1) with the following parameters:

- RTA = <SDB_RTA_HFI_A_VALUE>
- F0 / M0 = 0_b / 1_b (RTA OFF)
- F1 / M1 = 0_b / 0_b (Flag ignored)
- F2 / M2 = 0_b / 0_b (Flag ignored)
- F3 / M3 = 0_b / 0_b (Flag ignored)
- F4 / M4 = 0_b / 0_b (Flag ignored)
- F5 / M5 = 0_b / 0_b (Flag ignored)
- F6 / M6 = 0_b / 0_b (Flag ignored)
- F7 / M7 = 0_b / 0_b (Flag ignored)
- F8 / M8 = 0_b / 0_b (Flag ignored)
- F9 / M9 = 0_b / 0_b (Flag ignored)
- F10 / M10 = 0_b / 0_b (Flag ignored)
- F11 / M11 = 0_b / 0_b (Flag ignored)
- CNT / M_C = 01_b / 0_b (Flag ignored)

Send TC(8,4,10,1) with the following parameters:

- RTA = <SDB_RTA_HFI_B_VALUE>
- F0 / M0 = 0_b / 1_b (RTA OFF)
- F1 / M1 = 0_b / 0_b (Flag ignored)
- F2 / M2 = 0_b / 0_b (Flag ignored)
- F3 / M3 = 0_b / 0_b (Flag ignored)
- F4 / M4 = 0_b / 0_b (Flag ignored)
- F5 / M5 = 0_b / 0_b (Flag ignored)
- F6 / M6 = 0_b / 0_b (Flag ignored)
- F7 / M7 = 0_b / 0_b (Flag ignored)
- F8 / M8 = 0_b / 0_b (Flag ignored)
- F9 / M9 = 0_b / 0_b (Flag ignored)
- F10 / M10 = 0_b / 0_b (Flag ignored)
- F11 / M11 = 0_b / 0_b (Flag ignored)
- CNT / M_C = 01_b / 0_b (Flag ignored)

/* Switch OFF DPU[79] */

Send TC(8,4,112,3) "Switch PCDU Unit OFF" with the following parameters:

- PCDU Unit Code = 0xXXXX = LCL_Index

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		/* Mark HFI DPU as OFF in order to inform the Thermal Control Management function that OFF thresholds have to be used.*/
		Send TC(8,4,116,25) “Mark Unit OFF” with the following parameters:
		- Status Unit ID = 0x0304 (HFI DPU1)
		Send TC(8,4,116,25) “Mark Unit OFF” with the following parameters:
		- Status Unit ID = 0x0305 (HFI DPU2)
		
		} /* Else Do Nothing */
		}
		Else /* Else recovery successful => no retry */
		{
		Restart_Index = 0[80];
		
		/* Restart HFI MTL */
		Send TC(11,1) “Enable Release of Telecommands” with the following parameters:[81]
		- N = 1 (One sub-schedules)
		- SUBSCHEDULE-ID = <HFI_SUBS_ID_CMD> (HFI command subschedule)
		- M = 0 (All APID)
		}
		}

	Enable EAT entries that triggered the current OBCP: - 0x00BB from CDMS -	Send TC(19,4) “Enable Actions” with the following parameters: - N = 0x0001 - APID / Event ID = 0x0010 / 0x00BB (CDMS TFL TM FDIR)
If recovery succeeds, restart the HFI MTL[82]		Already covered.

[82] TBC: It is assumed that MTL shall be restarted at the next sub-schedule.

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This procedure can be armed "ArmCount" times.
i is initialised to ArmCount by TC.

1 events can be generated by S/ C:
- Lost of DPU communication.

"Lost of DPU communication" event is generated after 90 seconds of no packet transmission (the internal watchdog had time to reset the DPU). This event is associated to the FDIR of FDIR2 type which is specified by HP-SOFDIR-1553-REQ-0260 with (TRT and Min_RT_TM_nb).

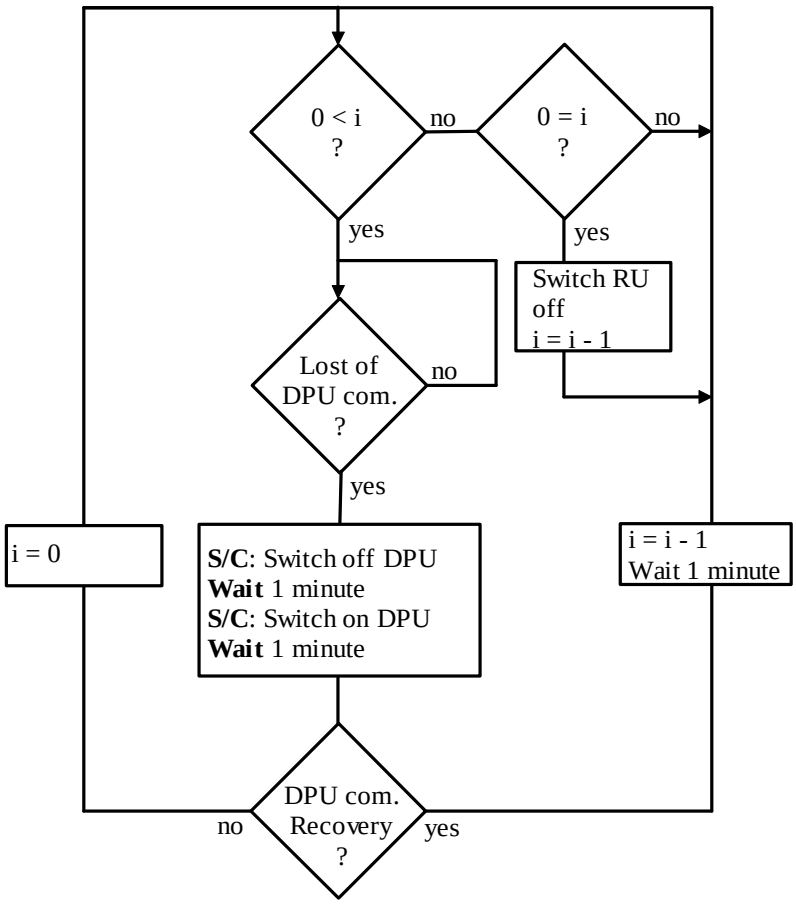

Figure 5.1.3-5 : HFI « Loss of S/C-DPU communication » procedure

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5.2 LFI

5.2.1 LFI FDIR

5.2.1.1 LFI internal FDIR

According to [RD7], LFI generates the following Event Reports when it needs a support from the CDMS OBSW to complete a recovery activity.
Identification of the OBCP to implement the requested sequence of actions is then provided as additional information.

FDIR	Event Report		P/L request	OBCP
	ST,SST	ID		
Loss of HK Data from DAE	5,2	5105	Switch OFF the RAA	DB_OBCP_P_LFI_RAA_OFF

Table 5.2.1-1 : LFI internal FDIR Event Reports

From the previous table, one can define the following EAT entries to support LFI Internal FDIR.
Note that LFI Event Reports can have only one APID as specified in [AD1], i.e.:

- 0x0600 for LFI Prime and Redundant.

This induces that for each failure case, two entries have to be defined in the EAT.

APID	Event ID	Telecommand Packet	Action Handling ID	Parameter Passing Status	Action Status
0x0600 (LFI Prime and Red.)	5105	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_P_LFI_RAA_OFF N1=2 (LFI_SUBS_ID_CMD, LFI_SUBS_ID_META) N2=0	01_b (Disabled in AFS & Enable in AFO)	0 (Disabled)	1 (Enabled)

Table 5.2.1-2 : EAT for LFI Internal FDIR

5.2.1.2 LFI S/C FDIR

5.2.1.2.1 LFI S/C 1553B Bus FDIR

[83] TBC: 5105 is said to be the SID in [RD7]. Event ID shall be specified.

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The following table summarises what LFI requests to be done by the CDMS OBSW in case an S/C 1553B Bus FDIR related to the communication with LFI triggers.
Identification of the OBCP to implement the requested sequence of actions is then provided as additional information.

FDIR	Event Report		P/L request	OBCP
	ST,SST	ID		
DLL FDIR	5,x	155	Do nothing	None[84]
TFL TC FDIR	5,x	174	Do nothing	None[85]
TFL TM FDIR	5,x	188	Check whether the REBA restarted its operations from the Startup SW execution	DB_OBCP_P_LFI_CHECK_REBA_TM

Table 5.2.1-3 : LFI S/C 1553B Bus FDIR

From the previous table, one can define the following EAT entries to support LFI S/C 1553B Bus FDIR.

APID	Event ID	Telecommand Packet	Action Handling ID	Parameter Passing Status	Action Status
0x0010 (CDMS)	188 (TFL TM FDIR)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_P_LFI_CHECK_REBA_TM N1=2 (LFI_SUBS_ID_CMD, LFI_SUBS_ID_META) N2=0	11_b (Enabled in both AFS & AFO)	0 (Disabled)	1 (Enabled)

Table 5.2.1-4 : EAT for LFI S/C 1553B Bus FDIR

5.2.1.2.2 LFI Science Data Monitoring

No instrument request beyond what is requested within the 1553B FDIR.

5.2.1.2.3 LFI Class B Heater Loop FDIR

No Class B Thermal Control Loop is applicable to LFI.

5.2.2 LFI S/C Mode Transition

[84] TBC: Should the communication with HFI be re-enabled, i.e. in this case TC sending and TM transfer authorised? If confirmed then an additional OBCP is needed.
[85] TBC: Should the communication with HFI be re-enabled, i.e. in this case TC sending authorised? If confirmed then an additional OBCP is needed.

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As specified in section 3.2, during a S/C transition from any S/C mode to S/C EAM or SAM, LFI will be put in a “standby” mode by the CDMS OBSW via the execution of one dedicated OBCP.
This OBCP will be called by the “mother” S/C Mode Transition OBCP, as summarised in the following table.

S/C Transition	P/L request	OBCP	
			Called by...
From any mode to SAM or EAM	Do nothing	None	DB_P_PL_SC_MODE_OBCP
From any mode to SM	Do nothing	None	DB_P_PL_SC_MODE_OBCP

Table 5.2.2-1 : LFI OBCP vs. S/C Mode transition

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5.2.3 LFI OBCP

5.2.3.1 List of LFI OBCP

According to sections 5.2.1and 5.2.2, the following OBCP are needed to support LFI activity from the CDMS OBSW:

OBCP	Payload Internal FDIR	S/C 1553B Bus FDIR	Science Data Monitoring	Class B Heater Loop FDIR	S/C Mode Transition	Triggered by			
						Event Report			"Mother" OBCP
						APID	ST,SST	ID	
DB_OBCP_P_LFI_RAA_OFF	X					0x0600 (LFI Prime and Red.)	5,2	5105	
DB_OBCP_P_LFI_CHECK_REBA_TM		X				0x0010 (CDMS)	5,x	0x00BC 188 (TFL TM)	

Table 5.2.3-1 : List of LFI OBCP

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5.2.3.2 LFI OBCP Specification

5.2.3.2.1 DB_OBCP_P_LFI_RAA_OFF

OBCP DB_OBCP_P_LFI_RAA_OFF		
ID	DB_OBCP_P_LFI_RAA_OFF	0x2204
Triggered by	Event 0x5105 from LFI	Internal FDIR - Loss of HK Data from DAE
Type		Normal
Time-Out		600 seconds (TBC)
OBCP Parameters	LFI_SUBS_ID_CMD	Default value = 90
	LFI_SUBS_ID_META	Default value = 80
ACTIONS		
Instrument request	CDMS OBSW Action	Implementation
	Disable all EAT entries associated with LFI related events that could contradict or interfere with current OBCP execution, i.e. : - 0x5105 from LFI as it triggers the current OBCP -	Send TC(19,5) "Disable Actions" with the following parameters: - N = 0x0001 - APID / Event ID = 0x0600 / 0x5105 (LFI Nom. or Red.)
	Stop execution of all running LFI OBCP that could contradict or interfere with current OBCP execution: - None	
Switch off RAA according to procedure "Loss of DAE HK" defined in [RD7]		/* Disable all commanding of LFI from the MTL */ Send TC(11,2) "Disable Release of Telecommands" with the following parameters:[86] - N = 2 (Two sub-schedules) - SUBSCHEDULE-ID = <LFI_SUBS_ID_CMD> (LFI command sub-schedule) - SUBSCHEDULE-ID = <LFI_SUBS_ID_META> (LFI meta subschedule) - M = 0 (All APID) /* Switch OFF the RAA [87]*/ Send TC(8,4,112,3) "Switch PCDU Unit OFF" with the following parameters: - PCDU Unit Code = 0x0033 (LCL 51 = LFI DAE Power Box Nom) Send TC(8,4,112,3) "Switch PCDU Unit OFF" with the following parameters: - PCDU Unit Code = 0x0034 (LCL 52 = LFI DAE Power Box Red) /* (TBC)There is no need to mark LFI RAA as OFF as it is not thermally controlled */

[86] According to [RD10]
[87] [RD7] requests to check if RAA is OFF or not before switching it OFF. This is assumed to be useless.

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	Enable EAT entries that triggered the current OBCP: - 0x5105 (TBC) from LFI -	Send TC(19,4) "Enable Actions" with the following parameters: - N = 0x0001 - APID / Event ID = 0x0600 / 0x5105 (TBC) (LFI Nom. or Red.)

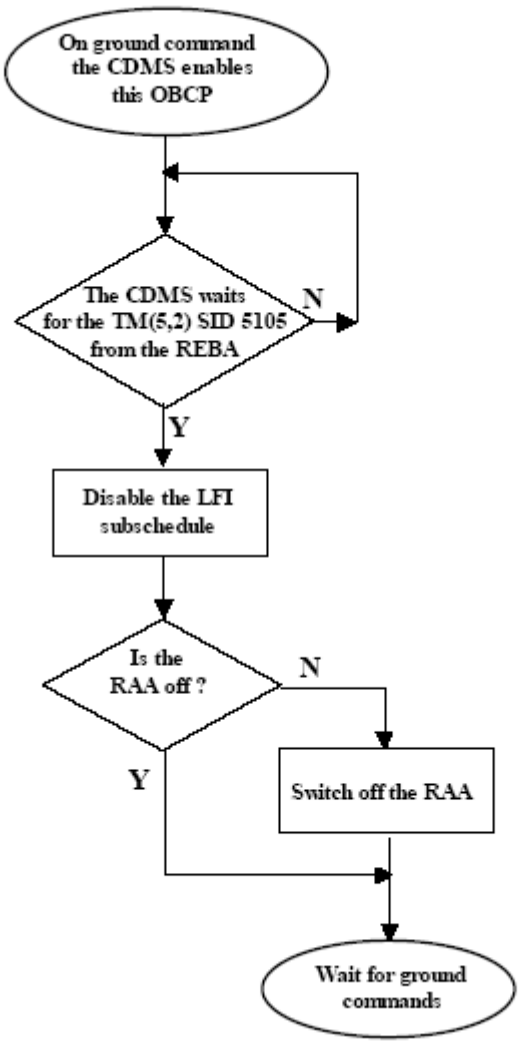

Figure 5.2.3-1 : LFI « Loss of DAE HK » procedure

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5.2.3.2.2 DB_OBCP_P_LFI_CHECK_REBA_TM

OBCP DB_OBCP_P_LFI_CHECK_REBA_TM		
ID	DB_OBCP_P_LFI_CHECK_REBA_TM	0x2205
Triggered by	Event 0x00BC from CDMS.	TFL TM FDIR
Type		Normal
Time-Out		1200 seconds (TBC)
OBCP Parameters	LFI_SUBS_ID_CMD	Default value = 90
	LFI_SUBS_ID_META	Default value = 80

ACTIONS		
Instrument request	CDMS OBSW Action	Implementation
	Disable all EAT entries associated with LFI related events that could contradict or interfere with current OBCP execution, i.e. : - 0x00BC from CDMS as it triggers the current OBCP -	Send TC(19,5) “Disable Actions” with the following parameters: - N = 0x0001 - APID / Event ID = 0x0010 / 0x00BC (CDMS TFL TM FDIR)
	Stop execution of all running LFI OBCP that could contradict or interfere with current OBCP execution: - None	

Detect whether the REBA restarted its operations from the Startup SW execution.according to procedure “Loss of TM from LFI” defined in [RD7]		/* Disable all commanding of LFI from the MTL */
		Send TC(11,2) “Disable Release of Telecommands“ with the following parameters:[88]
		- N = 2 (Two sub-schedules)
		- SUBSCHEDULE-ID = <LFI_SUBS_ID_CMD> (LFI command sub-schedule)
		- SUBSCHEDULE-ID = <LFI_SUBS_ID_META> (LFI meta subschedule)
		- M = 0 (All APID)
		
		Continue_TM_Check = 0;
		
		While (Continue_TM_Check < 10 (TBC))
		{
		/* Declare LFI RT (Nom. and Red.) as Well_TM in order to be able to receive TM */
		
		Send TC(8,4,10,1) “Configure SDB FDIR “ with the following parameters:
		- RTA = <SDB_RTA_LFI_A_VALUE>
		- F0 / M0 = 0b / 0b (Flag ignored)
		- F1 / M1 = 0b / 0b (Flag ignored)
		- F2 / M2 = 0b / 0b (Flag ignored)
		- F3 / M3 = 1b / 1b (RTA Well_TM)
		- F4 / M4 = 0b / 0b (Flag ignored)
		- F5 / M5 = 0b / 0b (Flag ignored)
		- F6 / M6 = 0b / 0b (Flag ignored)
		- F7 / M7 = 0b / 0b (Flag ignored)
		- F8 / M8 = 0b / 0b (Flag ignored)
		- F9 / M9 = 0b / 0b (Flag ignored)

[88] According to [RD10]

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		- F10 / M10 = 0b / 0b (Flag ignored)
		- F11 / M11 = 0b / 0b (Flag ignored)
		- CNT / M_C = 01b / 0b (Flag ignored)
		
		Send TC(8,4,10,1) "Configure SDB FDIR " with the following parameters:
		- RTA = <SDB_RTA_LFI_B_VALUE>
		- F0 / M0 = 0b / 0b (Flag ignored)
		- F1 / M1 = 0b / 0b (Flag ignored)
		- F2 / M2 = 0b / 0b (Flag ignored)
		- F3 / M3 = 1b / 1b (RTA Well_TM)
		- F4 / M4 = 0b / 0b (Flag ignored)
		- F5 / M5 = 0b / 0b (Flag ignored)
		- F6 / M6 = 0b / 0b (Flag ignored)
		- F7 / M7 = 0b / 0b (Flag ignored)
		- F8 / M8 = 0b / 0b (Flag ignored)
		- F9 / M9 = 0b / 0b (Flag ignored)
		- F10 / M10 = 0b / 0b (Flag ignored)
		- F11 / M11 = 0b / 0b (Flag ignored)
		- CNT / M_C = 01b / 0b (Flag ignored)
		
		Wait 58 s (TBC)
		
		/* Check if LFI produced any TM during the last 2 seconds */
		LFI_TM_Nr_1 = <DID_BSW_SDB_NOF_LFI_TM>[89]
		Wait 2 seconds
		LFI_TM_Nr_2 = <DID_BSW_SDB_NOF_LFI_TM>[90]
		
		If (LFI_TM_Nr_2 ≠ LFI_TM_Nr_1) then
		{ /* TM from LFI received */
		
		/* Check if LFI is producing Event TM */
		Wait until event from LFI is received or Time-out of 5 seconds (TB) has elapsed
		
		If /* Event received from LFI */
		{
		Continue_TM_Check = Continue_TM_Check + 1;
		
		If (Continue_TM_Check == 10 (TBC))
		{ /* TM Check completed */
		
		/* Reset the REBA writing in SA28R */
		Nothing to do TB [91]
		
		/* Send TM(5,4) signalling "LFI Standby" */
		Issue a TM(5,4) with the following parameters:
		- Event ID = <LFI_STANDBY_EID> (0xD0D0 TB)
		- SID = 0x0000
		- Parameters A = 0x0000_0000_0000_FFFF
		- Event Sequence Counter = Generated autonomously by the CDMU OBSW
		- Parameters B = None
		
		} /* End TM Check completed */
		
		} /* End Event received from LFI */

[89] DID_BSW_SDB_NOF_LFI_TM is read from the CDMU datapool. It corresponds to the number of successful TM packet transfers from LFI. Failed TM transfers are not included. It is assumed it satisfies the request from LFI (TBC).

[90] DID_BSW_SDB_NOF_LFI_TM is read from the CDMU datapool. It corresponds to the number of successful TM packet transfers from LFI. Failed TM transfers are not included. It is assumed it satisfies the request from LFI (TBC).

[91] TBC: the command to be sent has to be clearly described

[92] TBC: it is assumed that it is preferable to mark LFI as OFF in order to trigger again S/C 1553B bus FDIR. This would mean that no communication with LFI would be performed (no TM/ TC). This has to be confirmed.

[93] [RD7] requests to check if RAA is OFF or not before switching it OFF. This is assumed to be useless.

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Else /* Time-out has elapsed */
{ /* No event received from LFI */

Continue_TM_Check = 10 (TBC); /* Exit from while */

/* Send TM(5,4) signalling “LFI Standby” */
Issue a TM(5,4) with the following parameters:
- Event ID = <LFI_STANDBY_EID> (0xD0D0 TBC)
- SID = 0x0000
- Parameters A = 0x0000_0000_0000_0000
- Event Sequence Counter = Generated autonomously by the CDMU OBSW
- Parameters B = None

} /* End No event received from LFI */

} /* End TM from LFI received */

Else
{ /* No TM from LFI */

/* Declare the two LFI RT as OFF */[92]
Send TC(8,4,10,1) with the following parameters:
- RTA = <SDB_RTA_LFI_A_VALUE>
- F0 / M0 = 0_b / 1_b (RTA OFF)
- F1 / M1 = 0_b / 0_b (Flag ignored)
- F2 / M2 = 0_b / 0_b (Flag ignored)
- F3 / M3 = 0_b / 0_b (Flag ignored)
- F4 / M4 = 0_b / 0_b (Flag ignored)
- F5 / M5 = 0_b / 0_b (Flag ignored)
- F6 / M6 = 0_b / 0_b (Flag ignored)
- F7 / M7 = 0_b / 0_b (Flag ignored)
- F8 / M8 = 0_b / 0_b (Flag ignored)
- F9 / M9 = 0_b / 0_b (Flag ignored)
- F10 / M10 = 0_b / 0_b (Flag ignored)
- F11 / M11 = 0_b / 0_b (Flag ignored)
- CNT / M_C = 01_b / 0_b (Flag ignored)

Send TC(8,4,10,1) with the following parameters:
- RTA = <SDB_RTA_LFI_B_VALUE>
- F0 / M0 = 0_b / 1_b (RTA OFF)
- F1 / M1 = 0_b / 0_b (Flag ignored)
- F2 / M2 = 0_b / 0_b (Flag ignored)
- F3 / M3 = 0_b / 0_b (Flag ignored)
- F4 / M4 = 0_b / 0_b (Flag ignored)
- F5 / M5 = 0_b / 0_b (Flag ignored)
- F6 / M6 = 0_b / 0_b (Flag ignored)
- F7 / M7 = 0_b / 0_b (Flag ignored)
- F8 / M8 = 0_b / 0_b (Flag ignored)
- F9 / M9 = 0_b / 0_b (Flag ignored)
- F10 / M10 = 0_b / 0_b (Flag ignored)
- F11 / M11 = 0_b / 0_b (Flag ignored)
- CNT / M_C = 01_b / 0_b (Flag ignored)

/* Send TM(5,4) signalling “LFI off” */
Issue a TM(5,4) with the following parameters:
- Event ID = <LFI_OFF_EID> (0xDEAD TBC)
- SID = 0x0000
- Parameters A = 0x0000_0000_0000_0000
- Event Sequence Counter = Generated autonomously by the CDMU OBSW
- Parameters B = None

Continue_TM_Check = 10 (TBC); /* Exit from while */

} /* End No TM from LFI */

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		} /* End While Continue_TM_Check */ /* Switch OFF the RAA [93]*/ Send TC(8,4,112,3) "Switch PCDU Unit OFF" with the following parameters: - PCDU Unit Code = 0x0033 (LCL 51 = LFI DAE Power Box Nom) Send TC(8,4,112,3) "Switch PCDU Unit OFF" with the following parameters: - PCDU Unit Code = 0x0034 (LCL 52 = LFI DAE Power Box Red) /* There is no need to mark LFI RAA as OFF as it is not thermally controlled */
	Enable EAT entries that triggered the current OBCP: - 0x00BC from CDMS -	Send TC(19,4) "Enable Actions" with the following parameters: - N = 0x0001 - APID / Event ID = 0x0010 / 0x00BC (CDMS TFL TM FDIR)

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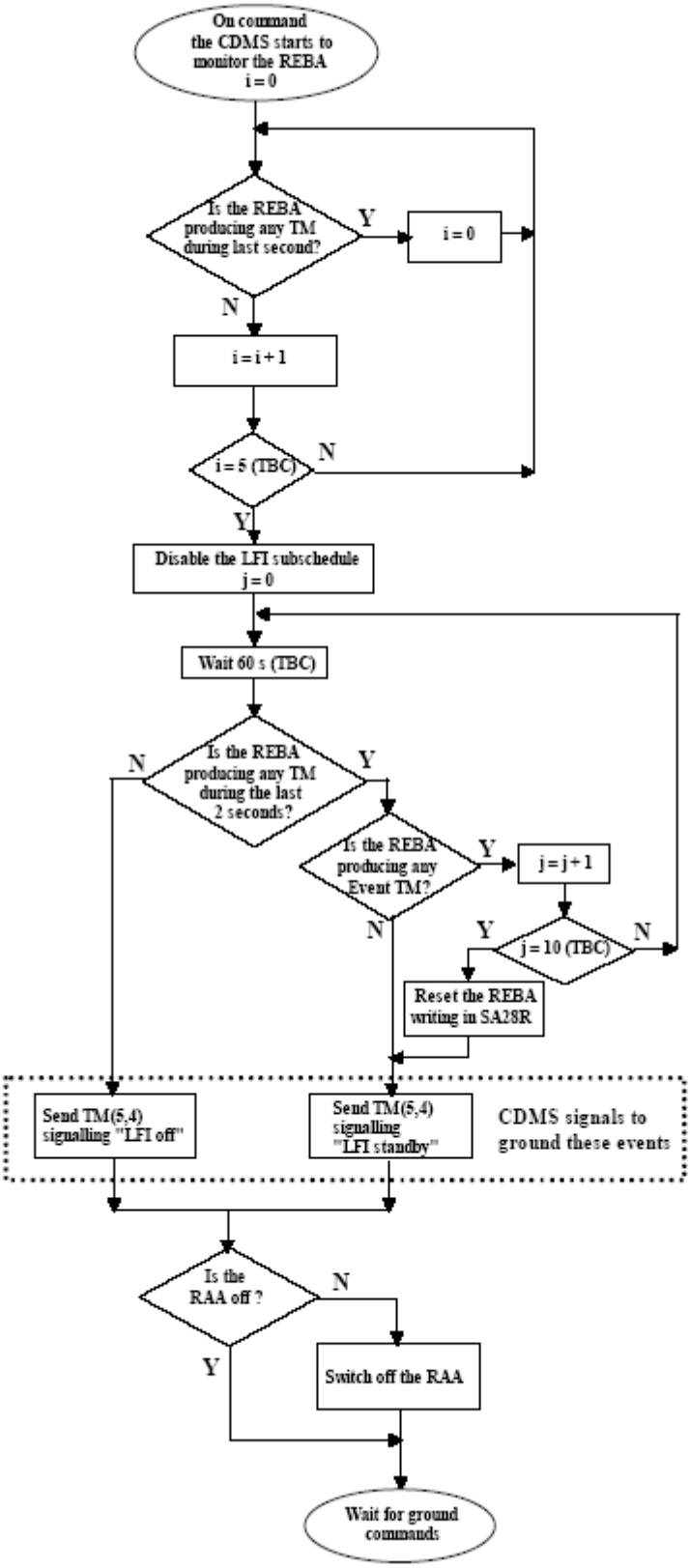

Figure 5.2.3-2 : LFI « Loss of TM from LFI » procedure

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5.3 SCE

5.3.1 SCE FDIR

5.3.1.1 SCE internal FDIR

According to [RD8], SCE generates the following Event Reports when it needs a support from the CDMS OBSW to complete a recovery activity[94].
Identification of the OBCP to implement the requested sequence of actions is then provided as additional information.

FDIR	Event Report		P/L request	OBCP
	ST,SST	ID		
Boot Mode entered	5,1	1	Switch OFF the 20A power line	DB_OBCP_P_SCE_20A_POWER_OFF
Init Mode entered	5,1	2	Switch OFF the 20A power line[95]	DB_OBCP_P_SCE_20A_POWER_OFF
Ready Mode entered	5,1	3	Switch ON the 20A power line[96]	DB_OBCP_P_SCE_20A_POWER_ON
Shutdown Mode entered	5,1	8[97]	Switch OFF the 20A power line	DB_OBCP_P_SCE_20A_POWER_OFF
Electronics over temperature	5,4	11	Switch OFF both power lines	DB_OBCP_P_SCE_OFF

Table 5.3.1-1 : SCE internal FDIR Event Reports

From the previous table, one can define the following EAT entries to support SCE Internal FDIR.
Note that SCE Event Reports can have two different APID as specified in [AD1], i.e.:

- 0x0680 for SCE Prime
- 0x0681 for SCE Redundant.

This induces that for each failure case, two entries have to be defined in the EAT.

APID	Event ID	Telecommand Packet	Action Handling ID	Parameter Passing Status	Action Status

[94] TBC: [RD8] section 6.2.3 specifies that Event ID 10 is sent to ask the CDMS for a shutdown. However, this case does not appear in sections 6.6 and 6.6.1.1 (figure 1). This shall be clarified.
[95] TBC: The need for this autonomous action shall be confirmed as Init Mode is commanded by Ground and there is no tight timing constraint to switch OFF the 20A power line such that it would required support from the CDMS OBSW.
[96] TBC: The need for this autonomous action shall be confimed as Ready Mode is commanded by Ground and there is no tight timing constraint to switch ON the 20A power line such that it would required support from the CDMS OBSW.
[97] TBC: [RD8] and previous issue of [AD9] specifies Event ID = 8 whereas last issue of [AD9] specifies Event ID = 9 though it is not traced in change record. This shall be clarified. In addition, the need for this autonomous action shall be confirmed as Shutdown is commanded by Ground and there is no tight timing constraint to switch OFF the 20A power line such that it would required support from the CDMS OBSW.

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APID	Event ID	Telecommand Packet	Action Handling ID	Parameter Passing Status	Action Status
0x0680 (SCE Prime)	1	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_P_SCE_20A_POWER_OFF N1=2 (SCE_SUBS_ID_CMD, SCE_SUBS_ID_META) N2=0	01_b (Disabled in AFS & Enable in AFO)	0 (Disabled)	1 (Enabled)
0x0681 (SCE Red.)	1	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_P_SCE_20A_POWER_OFF N1=2 (SCE_SUBS_ID_CMD, SCE_SUBS_ID_META) N2=0	01_b (Disabled in AFS & Enable in AFO)	0 (Disabled)	1 (Enabled)
0x0680 (SCE Prime)	2	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_P_SCE_20A_POWER_OFF N1=2 (SCE_SUBS_ID_CMD, SCE_SUBS_ID_META) N2=0	01_b (Disabled in AFS & Enable in AFO)	0 (Disabled)	1 (Enabled)
0x0681 (SCE Red.)	2	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_P_SCE_20A_POWER_OFF N1=2 (SCE_SUBS_ID_CMD, SCE_SUBS_ID_META) N2=0	01_b (Disabled in AFS & Enable in AFO)	0 (Disabled)	1 (Enabled)
0x0680 (SCE Prime)	3	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_P_SCE_20A_POWER_ON N1=1 (PL_SIDE)	01_b (Disabled in AFS & Enable in AFO)	0 (Disabled)	1 (Enabled)
0x0681 (SCE Red.)	3	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_P_SCE_20A_POWER_ON N1=1 (PL_SIDE)	01_b (Disabled in AFS & Enable in AFO)	0 (Disabled)	1 (Enabled)
0x0680 (SCE Prime)	8	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_P_SCE_20A_POWER_OFF N1=2 (SCE_SUBS_ID_CMD, SCE_SUBS_ID_META) N2=0	01_b (Disabled in AFS & Enable in AFO)	0 (Disabled)	1 (Enabled)
0x0681 (SCE Red.)	8	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_P_SCE_20A_POWER_OFF N1=2 (SCE_SUBS_ID_CMD, SCE_SUBS_ID_META) N2=0	01_b (Disabled in AFS & Enable in AFO)	0 (Disabled)	1 (Enabled)
0x0680 (SCE Prime)	11	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_P_SCE_OFF N1=0	01_b (Disabled in AFS & Enable in AFO)	0 (Disabled)	1 (Enabled)

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APID	Event ID	Telecommand Packet	Action Handling ID	Parameter Passing Status	Action Status
0x0681 (SCE Red.)	11	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_P_SCE_OFF N1=2 (SCE_SUBS_ID_CMD, SCE_SUBS_ID_META) N2=0	01_b (Disabled in AFS & Enable in AFO)	0 (Disabled)	1 (Enabled)

Table 5.3.1-2 : EAT for SCE Internal FDIR

5.3.1.2 SCE S/C FDIR

5.3.1.2.1 SCE S/C 1553B Bus FDIR

The following table summarises what SCE requests to be done by the CDMS OBSW in case an S/C 1553B Bus FDIR related to the communication with SCE triggers.
Identification of the OBCP to implement the requested sequence of actions is then provided as additional information.

FDIR	Event Report		P/L request	OBCP
	ST,SST	ID		
DLL FDIR	5,x	156	Switch OFF SCE[98]	DB_OBCP_P_SCE_OFF
TFL TC FDIR	5,x	175	Switch OFF SCE[99]	DB_OBCP_P_SCE_OFF
TFL TM FDIR	5,x	189	Switch OFF SCE[100]	DB_OBCP_P_SCE_OFF

Table 5.3.1-3 : SCE S/C 1553B Bus FDIR

From the previous table, one can define the following EAT entries to support HFI S/C 1553B Bus FDIR.

APID	Event ID	Telecommand Packet	Action Handling ID	Parameter Passing Status	Action Status
0x0010 (CDMS)	156 (DLL FDIR)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_P_SCE_OFF N1=2 (SCE_SUBS_ID_CMD, SCE_SUBS_ID_META) N2=0	11_b (Enabled in both AFS & AFO)	0 (Disabled)	1 (Enabled)
0x0010 (CDMS)	175 (TFL TC FDIR)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_P_SCE_OFF N1=2 (SCE_SUBS_ID_CMD,	11_b (Enabled in both AFS &	0 (Disabled)	1 (Enabled)

[98] TBC: SCE requests a switch to redundant unit after ground contact. It is assumed that SCE has to be switched OFF while waiting for ground contact.
[99] TBC: SCE requests a switch to redundant unit after ground contact. It is assumed that SCE has to be switched OFF while waiting for ground contact.
[100] TBC: SCE requests a switch to redundant unit after ground contact. It is assumed that SCE has to be switched OFF while waiting for ground contact.

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APID	Event ID	Telecommand Packet	Action Handling ID	Parameter Passing Status	Action Status
		SCE_SUBS_ID_META) N2=0	AFO)		
0x0010 (CDMS)	189 (TFL TM FDIR)	TC(18,3) [Start OBCP] Procedure ID = DB_OBCP_P_SCE_OFF N1=2 (SCE_SUBS_ID_CMD, SCE_SUBS_ID_META) N2=0	11_b (Enabled in both AFS & AFO)	0 (Disabled)	1 (Enabled)

Table 5.3.1-4 : EAT for SCE S/C 1553B Bus FDIR

5.3.1.2.2 SCE Science Data Monitoring

No instrument request beyond what is requested within the 1553B FDIR.

5.3.1.2.3 SCE Class B Heater Loop FDIR

No Class B Thermal Control Loop is applicable to SCE.

5.3.2 SCE S/C Mode Transition

As specified in section 3.2, during a S/C transition from any S/C mode to S/C EAM or SAM, SCE will be put in a "standby" mode by the CDMS OBSW via the execution of one dedicated OBCP.
This OBCP will be called by the "mother" S/C Mode Transition OBCP, as summarised in the following table.

S/C Transition	P/L request	OBCP	
			Called by...
From any mode to SAM or EAM	Do nothing[101]	None	DB_P_PL_SC_MODE_OBCP
From any mode to SM	Do nothing	None	DB_P_PL_SC_MODE_OBCP

Table 5.3.2-1 : SCE OBCP vs. S/C Mode transition

[101] TBC: It shall be confirmed that there is no need to go to Ready Mode.

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5.3.3 SCE OBCP

5.3.3.1 List of SCE OBCP

According to sections 5.3.1and 5.3.2, the following OBCP are needed to support SCE activity from the CDMS OBSW:

OBCP	Payload Internal FDIR	S/C 1553B Bus FDIR	Science Data Monitoring	Class B Heater Loop FDIR	S/C Mode Transition	Triggered by			
						Event Report			"Mother" OBCP
						APID	ST,SST	ID	
DB_OBCP_P_SCE_20A_POWER_OFF	X					0x0680 (SCE Prime)	5,1	0x00011	
	X					0x0681 (SCE Red.)	5,1	0x00011	
	X					0x0680 (SCE Prime)	5,1	0x00022	
	X					0x0681 (SCE Red.)	5,1	0x00022	
	X					0x0680 (SCE Prime)	5,1	0x00088	
	X					0x0681 (SCE Red.)	5,1	0x00088	
DB_OBCP_P_SCE_20A_POWER_ON	X					0x0680 (SCE Prime)	5,1	0x00033	
	X					0x0681 (SCE Red.)	5,1	0x00033	
DB_OBCP_P_SCE_OFF	X					0x0680 (SCE Prime)	5,4	0x000B11	
	X					0x0681 (SCE Red.)	5,4	0x000B11	
		X				0x0010 (CDMS)	5,x	0x009C156 (DLL FDIR)	

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OBCP	Payload Internal FDIR	S/C 1553B Bus FDIR	Science Data Monitoring	Class B Heater Loop FDIR	S/C Mode Transition	Triggered by			
						Event Report			"Mother" OBCP
						APID	ST,SST	ID	
		X				0x0010 (CDMS)	5,x	0x00AF 175 (TFL TC FDIR)	
		X				0x0010 (CDMS)	5,x	0x00BD 189 (TFL TM FDIR)	

Table 5.3.3-1 : List of SCE OBCP

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5.3.3.2 SCE OBCP Specification

5.3.3.2.1 DB_OBCP_P_SCE_20A_POWER_OFF

OBCP DB_OBCP_P_SCE_20A_POWER_OFF		
ID	DB_OBCP_P_SCE_20A_POWER_OFF	0x2306
Triggered by	Event 0x0001 from SCE Nom. Or Red.	Internal FDIR - Boot Mode entered
	Event 0x0002 from SCE Nom. Or Red.	Internal FDIR - Init Mode entered
	Event 0xs0008 from SCE Nom. Or Red.	Internal FDIR - Shutdown Mode entered
Type		Normal
Time-Out		600 seconds (TBC)
OBCP Parameters	SCE_SUBS_ID_CMD	Default value = 100
	SCE_SUBS_ID_META	Default value = 370
ACTIONS		
Instrument request	CDMS OBSW Action	Implementation
	Disable all EAT entries associated with SCE related events that could contradict or interfere with current OBCP execution, i.e. : - 0x0001, 0x0002, 0x0008 from SCE Nom. & Red. as they trigger the current OBCP	Send TC(19,5) “Disable Actions” with the following parameters: - N = 0x0006 (6 entries) - APID / Event ID = 0x0680 / 0x0001 (SCE Nom.) - APID / Event ID = 0x0681 / 0x0001 (SCE Red.) - APID / Event ID = 0x0680 / 0x0002 (SCE Nom.) - APID / Event ID = 0x0681 / 0x0002 (SCE Red.) - APID / Event ID = 0x0680 / 0x0008 (SCE Nom.) - APID / Event ID = 0x0681 / 0x0008 (SCE Red.) -
	Stop execution of all running SCE OBCP that could contradict or interfere with current OBCP execution: - None[102] -	
	Disable all commanding of SCE from the MTL[103]	Send TC(11,2) “Disable Release of Telecommands“ with the following parameters:[104] - N = 2 (Two sub-schedules) - SUBSCHEDULE-ID = <SCE_SUBS_ID_CMD> (SCE command sub-schedule) - SUBSCHEDULE-ID = <SCE_SUBS_ID_META> (SCE meta sub-schedule) - M = 0 (All APID)
Shutdown the 20A power line	OPEN LCL related to both nominal and redundant Sorption Cooler Compressors	/* SCC A */ Send TC(8,4,112,3) “Switch PCDU Unit OFF” with the following

[102] TBC: it is assumed Switch ON request following entering in Ready Mode can not occur while Boot, Init or Shutdown mode is entered.
[103] TBC: This is not clearly requested by SCE but is done for consistency purpose.
[104] According to [RD10]

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		parameters: - PCDU Unit Code = 0x0043 (LCL 67 = SCC A1)[105] /* SCC B */ Send TC(8,4,112,3) “Switch PCDU Unit OFF” with the following parameters: - PCDU Unit Code = 0x003F (LCL 63 = SCC B1)[106]
	Mark SCC as OFF in order to inform the Thermal Control Management function that OFF thresholds have to be used.	N/A[107]
	Enable EAT entries that triggered the current OBCP: - 0x0001, 0x0002, 0x0008 from SCE Nom. & Red.	Send TC(19,4) “Enable Actions” with the following parameters: - N = 0x0006 (6 entries) - APID / Event ID = 0x0680 / 0x0001 (SCE Nom.) - APID / Event ID = 0x0681 / 0x0001 (SCE Red.) - APID / Event ID = 0x0680 / 0x0002 (SCE Nom.) - APID / Event ID = 0x0681 / 0x0002 (SCE Red.) - APID / Event ID = 0x0680 / 0x0008 (SCE Nom.) - APID / Event ID = 0x0681 / 0x0008 (SCE Red.)

[105] The Sorption Cooler Compressor is powered by four // OP-LCL, originally LCL 63-66 for SCC A. & LCL 67-70 for SCC B. Selecting one of them in the Switch PCDU Unit ON/OFF TC is sufficient as it acts on all of them at the same time. In addition, due to a cabling swap problem, LCL 63-66 actually apply to for SCC B and LCL 67-70 apply to SCC A.
[106] The Sorption Cooler Compressor is powered by four // OP-LCL, originally LCL 63-66 for SCC A. & LCL 67-70 for SCC B. Selecting one of them in the Switch PCDU Unit ON/OFF TC is sufficient as it acts on all of them at the same time. In addition, due to a cabling swap problem, LCL 63-66 actually apply to for SCC B and LCL 67-70 apply to SCC A.
[107] The SCC is not thermally controlled so it is not possible (and not needed) to mark it OFF.

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5.3.3.2.2 DB_OBCP_P_SCE_20A_POWER_ON

OBCP DB_OBCP_P_SCE_20A_POWER_ON		
ID	DB_OBCP_P_SCE_20A_POWER_ON	0x2307
Triggered by	Event 0x0003 from SCE Nom. Or Red.	Internal FDIR - Ready Mode entered
Type		Normal
Time-Out		600 seconds (TBC)
OBCP Parameters	SCE_PL_Side	Default value = 0 (NOMINAL)
ACTIONS		
Instrument request	CDMS OBSW Action	Implementation
	Disable all EAT entries associated with SCE related events that could contradict or interfere with current OBCP execution, i.e. : - 0x0003 from SCE Nom. & Red. as they trigger the current OBCP	Send TC(19,5) "Disable Actions" with the following parameters: - N = 0x0002 (2 entries) - APID / Event ID = 0x0680 / 0x0003 (SCE Nom.) - APID / Event ID = 0x0681 / 0x0003 (SCE Red.)
	Stop execution of all running SCE OBCP that could contradict or interfere with current OBCP execution: - None	

Put ON the 20A power line	CLOSED LCL related to active Sorption Cooler Compressors	If (PL_Side[108] = = NOM) then
		{
		LCL_SCC = 0x0043 (LCL 67 = SCC A1)[109]
		}
		Else /* Redundant side */
		{
		LCL_SCC = 0x003F (LCL 63 = SCC B1)[110]
		}
		/* Switch ON SCC */
		Send TC(8,4,112,5) "Switch PCDU Unit ON" with the following parameters:
		- PCDU Unit Code = 0xXXXX = LCL_SCC ;

	Enable EAT entries that triggered the current OBCP: - 0x0003 from SCE Nom. & Red.	Send TC(19,4) "Enable Actions" with the following parameters: - N = 0x0002 (2 entries) - APID / Event ID = 0x0680 / 0x0003 (SCE Nom.)

[108] TBC: Instead of passing as a parameter the SCC to be switched ON, this could be deduced from reading which SCE is ON.
[109] The Sorption Cooler Compressor is powered by four // OP-LCL, originally LCL 63-66 for SCC A. & LCL 67-70 for SCC B. Selecting one of them in the Switch PCDU Unit ON/OFF TC is sufficient as it acts on all of them at the same time. In addition, due to a cabling swap problem, LCL 63-66 actually apply to for SCC B and LCL 67-70 apply to SCC A.
[110] The Sorption Cooler Compressor is powered by four // OP-LCL, originally LCL 63-66 for SCC A. & LCL 67-70 for SCC B. Selecting one of them in the Switch PCDU Unit ON/OFF TC is sufficient as it acts on all of them at the same time. In addition, due to a cabling swap problem, LCL 63-66 actually apply to for SCC B and LCL 67-70 apply to SCC A.

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		- APID / Event ID = 0x0681 / 0x0003 (SCE Red.)

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5.3.3.2.3 DB_OBCP_P_SCE_OFF

OBCP DB_OBCP_P_SCE_OFF		
ID	DB_OBCP_P_SCE_OFF	0x2308
Triggered by	Event 0x000B from SCE Nom. Or Red.	Internal FDIR - Electronics over temperature
	Event 0x009C from CDMS	DLL FDIR
	Event 0x00AF from CDMS	TFL TC FDIR
	Event 0x00BD from CDMS	TFL TM FDIR
Type		Normal
Time-Out		600 seconds (TBC)
OBCP Parameters	SCE_SUBS_ID_CMD	Default value = 100
	SCE_SUBS_ID_META	Default value = 370

ACTIONS		
Instrument request	CDMS OBSW Action	Implementation
	Disable all EAT entries associated with SCE related events that could contradict or interfere with current OBCP execution, i.e. : - 0x000B from SCE Nom. & Red. as they trigger the current OBCP - 0x009C, 0x00AF, 0x00BD from CDMS as they trigger the current OBCP - 0x0003 from SCE Nom. & Red. as they would switch ON SCC	Send TC(19,5) "Disable Actions" with the following parameters: - N = 0x0007 (7 entries) - APID / Event ID = 0x0680 / 0x000B (SCE Nom.) - APID / Event ID = 0x0681 / 0x000B (SCE Red.) - APID / Event ID = 0x0010 / 0x009C (CDMS DLL FDIR) - APID / Event ID = 0x0010 / 0x00AF (CDMS TFL TC FDIR) - APID / Event ID = 0x0010 / 0x00BD (CDMS TFL TM FDIR) - APID / Event ID = 0x0680 / 0x0003 (SCE Nom.) - APID / Event ID = 0x0681 / 0x0003 (SCE Red.)
	Stop execution of all running SCE OBCP that could contradict or interfere with current OBCP execution: - DB_OBCP_P_SCE_20A_POWER_ON as it would switch ON SCC	Send TC(18,4) "Stopping a procedure", with the following parameters: - Procedure-ID = DB_OBCP_P_SCE_20A_POWER_ON
	Disable all commanding of SCE from the MTL[111]	Send TC(11,2) "Disable Release of Telecommands" with the following parameters:[112] - N = 2 (Two sub-schedules) - SUBSCHEDULE-ID = <SCE_SUBS_ID_CMD> (SCE command sub-schedule) - SUBSCHEDULE-ID = <SCE_SUBS_ID_META> (SCE meta subschedule) - M = 0 (All APID)
	Declare the two SCE RT as OFF	Send TC(8,4,10,1) with the following parameters: - RTA = <SDB_RTA_SCE_A_VALUE> - F0 / M0 = 0_b / 1_b (RTA OFF) - F1 / M1 = 0_b / 0_b (Flag ignored) - F2 / M2 = 0_b / 0_b (Flag ignored) - F3 / M3 = 0_b / 0_b (Flag ignored) - F4 / M4 = 0_b / 0_b (Flag ignored)

[111] TBC: This is not clearly requested by SCE but is done for consistency purpose.
[112] According to [RD10]

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		- F5 / M5 = 0_b / 0_b (Flag ignored) - F6 / M6 = 0_b / 0_b (Flag ignored) - F7 / M7 = 0_b / 0_b (Flag ignored) - F8 / M8 = 0_b / 0_b (Flag ignored) - F9 / M9 = 0_b / 0_b (Flag ignored) - F10 / M10 = 0_b / 0_b (Flag ignored) - F11 / M11 = 0_b / 0_b (Flag ignored) - CNT / M_C = 01_b / 0_b (Flag ignored) Send TC(8,4,10,1) with the following parameters: - RTA = <SDB_RTA_SCE_B_VALUE> - F0 / M0 = 0_b / 1_b (RTA OFF) - F1 / M1 = 0_b / 0_b (Flag ignored) - F2 / M2 = 0_b / 0_b (Flag ignored) - F3 / M3 = 0_b / 0_b (Flag ignored) - F4 / M4 = 0_b / 0_b (Flag ignored) - F5 / M5 = 0_b / 0_b (Flag ignored) - F6 / M6 = 0_b / 0_b (Flag ignored) - F7 / M7 = 0_b / 0_b (Flag ignored) - F8 / M8 = 0_b / 0_b (Flag ignored) - F9 / M9 = 0_b / 0_b (Flag ignored) - F10 / M10 = 0_b / 0_b (Flag ignored) - F11 / M11 = 0_b / 0_b (Flag ignored) - CNT / M_C = 01_b / 0_b (Flag ignored)
Shutdown both power lines	OPEN LCL related to both nominal and redundant Sorption Cooler Compressors OPEN LCL related to both nominal and redundant SCE	/* SCC A */ Send TC(8,4,112,3) “Switch PCDU Unit OFF” with the following parameters: - PCDU Unit Code = 0x0043 (LCL 67 = SCC A1)[113] /* SCC B */ Send TC(8,4,112,3) “Switch PCDU Unit OFF” with the following parameters: - PCDU Unit Code = 0x003F (LCL 63 = SCC B1)[114] /*Nominal SCE */ Send TC(8,4,112,3) “Switch PCDU Unit OFF” with the following parameters: - PCDU Unit Code = 0x0036 (54 = SCE Red)[115] /*Redundant SCE */ Send TC(8,4,112,3) “Switch PCDU Unit OFF” with the following parameters: - PCDU Unit Code = 0x0035 (53 = SCE Nom)[116]
	Mark SCE units as OFF in order to inform the Thermal Control Management function that OFF thresholds have to be used.	N/A[117]
	Enable EAT entries that triggered the current OBCP: - 0x000B from SCE Nom. & Red. - 0x009C, 0x00AF, 0x00BD from	Send TC(19,4) “Enable Actions” with the following parameters: - N = 0x0005 (5 entries) - APID / Event ID = 0x0680 / 0x000B (SCE Nom.)

[113] The Sorption Cooler Compressor is powered by four // OP-LCL, originally LCL 63-66 for SCC A. & LCL 67-70 for SCC B. Selecting one of them in the Switch PCDU Unit ON/OFF TC is sufficient as it acts on all of them at the same time. In addition, due to a cabling swap problem, LCL 63-66 actually apply to for SCC B and LCL 67-70 apply to SCC A.
[114] The Sorption Cooler Compressor is powered by four // OP-LCL, originally LCL 63-66 for SCC A. & LCL 67-70 for SCC B. Selecting one of them in the Switch PCDU Unit ON/OFF TC is sufficient as it acts on all of them at the same time. In addition, due to a cabling swap problem, LCL 63-66 actually apply to for SCC B and LCL 67-70 apply to SCC A.
[115] Due to a cabling swap problem on the SCS, this command actually applies to the Nominal SCE
[116] Due to a cabling swap problem on the SCS, this command actually applies to the Redundant SCE
[117] The SCE units are not thermally controlled so it is not possible (and not needed) to mark them OFF.

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	CDMS	- APID / Event ID = 0x0681 / 0x000B (SCE Red.) - APID / Event ID = 0x0010 / 0x009C (CDMS DLL FDIR) - APID / Event ID = 0x0010 / 0x00AF (CDMS TFL TC FDIR) - APID / Event ID = 0x0010 / 0x00BD (CDMS TFL TM FDIR)

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5.4 Common PLANCK OBCP

5.4.1 DB_P_PL_SC_MODE_OBCP

OBCP DB_P_PL_SC_MODE_OBCP		
ID	DB_P_PL_SC_MODE_OBCP	0x0001
Triggered by	S/C mode transition to EAM or SAM or SM	
Type		Normal
Time-Out		30 seconds (TBC)
OBCP Parameters	None	
ACTIONS		
Instrument request	CDMS OBSW Action	Implementation
HFI : Do nothing		
LFI: Do nothing		
SCE: Do nothing		

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6. LIST OF ID OF THE DATAPOOL USED BY THOSE OBCPS

Datapool ID	Herschel	Planck
DID_OBCP_32_OFFSET_000	SPIRE_SUBS_ID_CMD	HFI_SUBS_ID_CMD
DID_OBCP_32_OFFSET_001	SPIRE_SUBS_ID_META	HFI_PL_SIDE
DID_OBCP_32_OFFSET_002		HFI_RESTART_INDEX
DID_OBCP_32_OFFSET_010		Current HFI_RESTART_INDEX (temporary output)
DID_OBCP_32_OFFSET_011		HFI_CONF_A (temporary output)
DID_OBCP_32_OFFSET_012		HFI_CONF_B (temporary output)
DID_OBCP_32_OFFSET_050	PACS_SUBS_ID_CMD	LFI_SUBS_ID_CMD
DID_OBCP_32_OFFSET_051	PACS_PL_SIDE	LFI_SUBS_ID_META
DID_OBCP_32_OFFSET_100	HIFI_SUBS_ID_CMD	SCE_SUBS_ID_CMD
DID_OBCP_32_OFFSET_101	HIFI_PL_SIDE	SCE_SUBS_ID_META
DID_OBCP_32_OFFSET_102		SCE_PL_SIDE
DID_OBCP_32_OFFSET_110	HIFI_CONF (temporary output)	

7. IN ADDITION TO THE SPECIFIC TBD/TBC IDENTIFIED IN THE PREVIOUS SECTIONS, THE FOLLOWING GENERAL ISSUES NEED TO BE CLARIFIED.

7.1 OBCP Telecommand Verification Report

- What Verification Report shall be requested for all TC generated by the OBCP (i.e. what Ack Field shall be used in these TC)?

- In addition to Acceptance and Execution reports, shall the generation of a TM(1,9) “Telecommand Contents Report” be requested for each of these TC ?

7.2 OBCP TM/TC rate

- In order to minimise the number of TC and TM (mainly TM(1,x) depending on outcome of 7.1) sent by one OBCP, it is suggested not to send more than one TC per second by adding adequate delay between two consecutive TC. As no tight timing constraint is requested by Instruments and it was agreed to have low priority for OBCP execution, this is assumed to be acceptable.

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7.3 OBCP simplification vs. P/L FDIR hierarchy

- A policy to avoid the interference/contradiction between recovery sequences executed by the P/L OBCP has been defined (stopping EAT entries and OBCP execution) based on the analysis of the content of these sequences. Simplification (e.g. only one recovery at a time, use of semaphore…) could be applied if FDIR hierarchy/criticality and likelihood to get parallel failures are specified by Instruments. This would also ease the maintenance of the P/L OBCP which will be more independent from each other.

END OF DOCUMENT

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