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Authors	CICCHETTI, ANDREA
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MARSIS Flash Memory Operations Requirements

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PREPARED by : Andrea Cicchetti

CHECKED by : Carlo Nenna

APPROVED by : Roberto Orosei



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1 INTRODUCTION

The aim of this document is to provide the necessary information for the implementation of the Flash Memory mechanism in the MARSIS Routine Operation through the PIOR/PMRQ commanding cycle.



2 FM PLANNING CYCLE

In order to allocate the SC resources, in term of necessary data rate on the bus OBDH, power budget and daily data volume, it is necessary to include the FM mechanism into the Planning Cycle.

2.1 MIRA RESOURCES PROFILE

The following MIRA FM operatives modes are requested in order to allocate the SC resources:

FMR_1	10 kbps	35 Watts
FMR_2	20 kbps	35 Watts
FMR_3	30 kbps	35 Watts
FMR_4	40 kbps	35 Watts
FMR_5	50 kbps	35 Watts
FMR_6	60 kbps	35 Watts
FMR_7	70 kbps	35 Watts
FMR_8	80 kbps	35 Watts
FMR_9	90 kbps	35 Watts
ERASE	0.3 kbps	30 Watts

2.2 FM OPERATION TYPES

FLASH MEMORY READ AND ERASE

The FM content, with this sequence, will be transferred from the internal MARSIS Flash Memory to the SSMM via OBDH. The next activity is to ERASE the FM content in order to be ready for the next FM science data acquisition.

If the OBDH available resources are not always optimum for the FM read section, it is necessary to insert a certain number of different FM operatives modes to avoid the OBDH conflicts with the other instruments, granting however the possibility to read the entire amount of data from the FM (see Fig. 2.1)

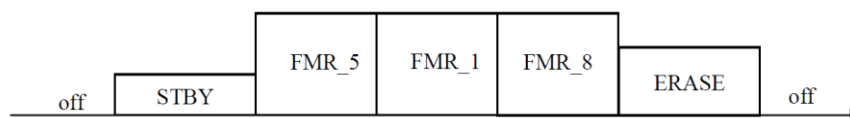


Fig 2-1 FM Read & Erase with different FM operatives modes

If all the OBDH resources are available, with no other instrument working (typically during the SCMN), the FMR_9 (90 Kbps) will be used to reduce the time to read the entire amount of data previously stored into the FM (see Fig.2.2).

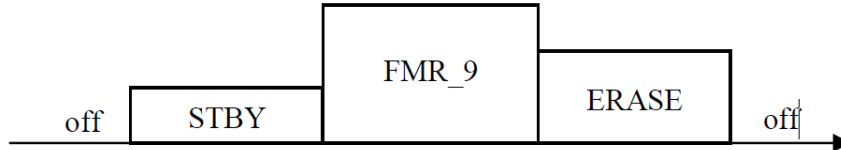


Fig 2-2 FM Read & Erase with one operative mode

FLASH MEMORY READ ONLY

This scenario is very similar to the previous one, with the only exception that no ERASE is performed at the end of the READ phase. The use of this configuration is envisioned when in the FM are stored very important science data.

Without the Erase command the FM data will remain stored and available for another READ session, to be executed in case of failure in the previous READ, or in S/C to ground downlink (see Fig.2.3)

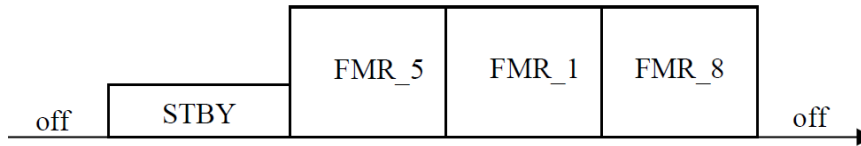


Fig 2-3 FM Read Only

FLASH MEMORY ERASE ONLY

In this case the only action is to delete the entire amount of data stored into the FM (see Fig 2.4).

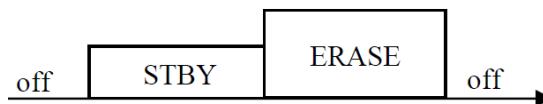


Fig 2-4 FM Erase Only



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2.3 MIRA TIMELINE

Following the MIRA timelines overview for the three different typology of FM operatives modes:

% FM-READ-ERASE

2608	NOP	3	SSRA	STBY	100.0	101.5
2608	NOP	3	SSRA	FMR_8	101.5	126.5
2608	NOP	3	SSRA	FMR_5	126.5	141.5
2608	NOP	3	SSRA	ERASE	141.5	146.5

% FM-READ-ONLY

2608	NOP	3	SSRA	STBY	100.0	101.5
2608	NOP	3	SSRA	FMR_8	101.5	126.5
2608	NOP	3	SSRA	FMR_5	126.5	141.5

% FM-ERASE-ONLY

2608	NOP	3	SSRA	STBY	100.0	101.5
2608	NOP	3	SSRA	ERASE	101.5	106.5



3 FM COMMANDING CYCLE

In this chapter it will be explained the steps involved in the generation of the FM telecommands. The input is the MIRA timelines. For this reason it is possible to define the entire FM mechanism into the PIOR file (see par.3.4).

3.1 FLASH MEMORY READ & ERASE PROCEDURES

3.1.1 GENERIC SCENARIO

The transition time for the generation of the FM standard telecommands (timing from MIRA timeline) it has been displayed with the red arrows, the production of the ZD and ZP records(timing from MIRA timeline), with the blue arrows (see Fig.3.1)

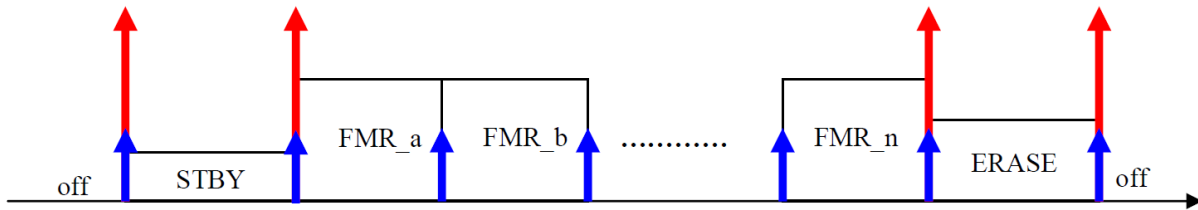


Fig 3-1.1-1 Flash Memory Read/Erase Main transition times

The letters a/b.....n can assume the values 1, 2, 3, 4, 5, 6, 7, 8, 9. Any combination of these FM activities will be possible.

3.1.2 TIMELINE OF EXAMPLE

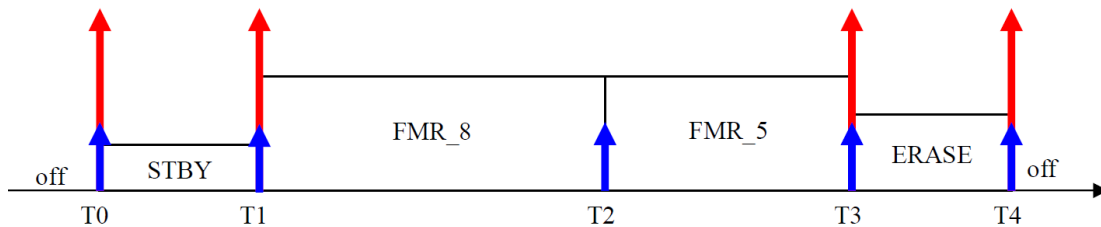


Fig 3.1.2-1 Flash Memory Read/Erase. Example with two FMR



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From T1 to T2 the available datarate on the OBDH is 80 Kbps and from T2 to T3 the available data rate it is just 50 Kbps.

T0: Transition from off to On

- Nominally MARSIS switch on.
- Generation of the STBY ZD and ZP records.

T1: Transition from STBY to FMR_8 (could be: FMR_1/2/3.../9)

- Generation of the FM read procedures
- Generation of the ZP and ZD records of the FMR_8 operative mode

T2: Not any procedures will be generated in this transition but only the ZD and ZP records of the FMR_5 operative mode.

T3: Transition from FMR_5(could be: FMR_1/2/3.../9) to ERASE

- Generation of the FM erase procedures.
- Generation of the ZP and ZD records of the ERASE operative mode

T4: Transition from ERASE to Off

- Nominally MARSIS switch off.
- ZD=ZP=0.



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3.1.3 COMMAND GENERATION DETAILS

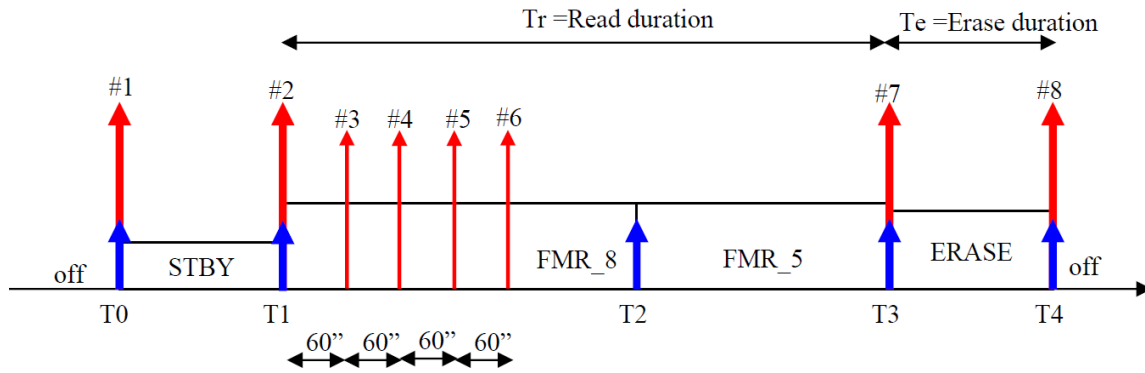


Fig 3.1.3-1 Flash Memory Read/Erase. Command Details

Where:

- #1: MARSIS Nominal Switch ON: H1AMIF01A0
- #2: MI_DUMP_FM: H1AMIF52A0
- #3: FM Dump Chip 0 H1AMIF52D1
- #4: FM Dump Chip 1 H1AMIF52D2
- #5: FM Dump Chip 2 H1AMIF52D3
- #6: FM Dump Chip 3 H1AMIF52D4
- #7: MARSIS FM Erase: H1AMIF51A0
- #8: MARSIS Nominal Switch OFF: H1AMIF06A0

The time delay for the generation of the FM Dump Chip 0/1/2/3 it has been set to 60 seconds.

The entire T_r duration is a value included between 25 minutes (maximum availability of OBDH) and 3 hours and half (minimum availability of OBDH). The exact calculation of T_r value is under the MARSIS team responsibility, as the evaluation of the single FMR_x blocks duration.



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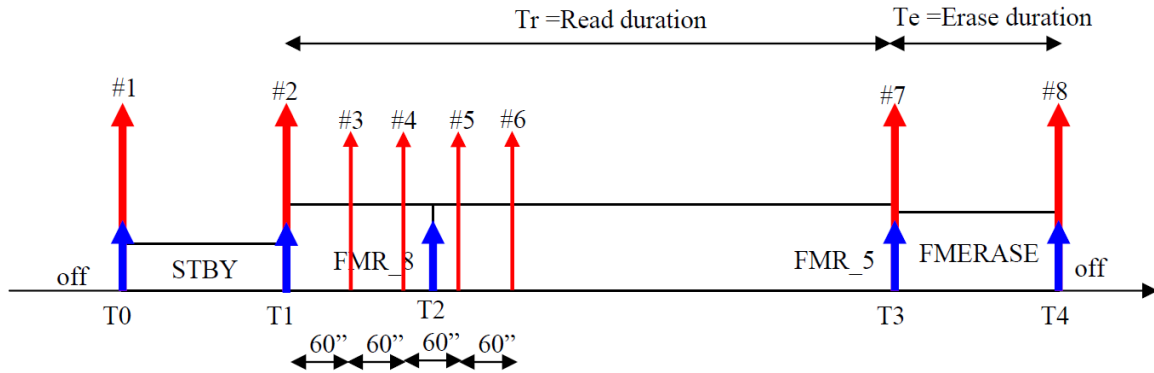


Fig 3.1.3-2 Flash Memory Read/Erasure, example of configuration

The difference with the previous description is the timing of the ZD and ZP records.

3.1.4 MIRA TIMELINE EXAMPLE

```
% FM-READ-ERASE
2608  NOP      3 SSRA  STBY   100.0  101.5
2608  NOP      3 SSRA  FMR_8 101.5  126.5
2608  NOP      3 SSRA  FMR_5 126.5  141.5
2608  NOP      3 SSRA  ERASE  141.5  146.5
```



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3.1.5 POR FILE EXAMPLE

C
C PERI DATE: 2006 JAN 22. DOY=22
C PERI TIME: 22:52:41
C

POR_ 00600 05-321T20:29:30.000Z
06-023T00:31:41.000Z 06-023T01:20:11.000Z 0008

C -----
C MARSIS Nominal Switch ON
C -----

H1AMIF01A0 S
H2I UTC T P 000
H3
H4
H5
S1 MPER 0000002608 01:40:00
S205-321T20:29:30Z alenia

C -----
C MI_DUMP_FM
C -----

H1AMIF52A0 S
H2I UTC T P 000
H3
H4
H5
S1 MPER 0000002608 01:41:30
S205-321T20:29:30Z alenia

C -----
C FM Dump Chip 0
C -----

H1AMIF52D1 S
H2I UTC T P 000
H3
H4
H5
S1 MPER 0000002608 01:42:30
S205-321T20:29:30Z alenia



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C -----
C FM Dump Chip 1
C -----

H1AMIF52D2 S
H2I UTC T P 000
H3
H4
H5
S1 MPER 0000002608 01:43:30
S205-321T20:29:30Z alenia

C -----
C FM Dump Chip 2
C -----

H1AMIF52D3 S
H2I UTC T P 000
H3
H4
H5
S1 MPER 0000002608 01:44:30
S205-321T20:29:30Z alenia

C -----
C FM Dump Chip 3
C -----

H1AMIF52D4 S
H2I UTC T P 000
H3
H4
H5
S1 MPER 0000002608 01:45:30
S205-321T20:29:30Z alenia

C -----
C MARSIS FM Erase
C -----

H1AMIF51A0 S
H2I UTC T P 000
H3
H4
H5
S1 MPER 0000002608 02:21:30
S205-321T20:29:30Z alenia



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C -----
C MARSIS Nominal Switch OFF
C -----

H1AMIF06A0 S
H2I UTC T P 009
H3
H4
H5
S1 MPER 0000002608 02:26:30
S205-321T20:29:30Z alenia

C123456789012345678901234567890123456789012345678901234567890

ZD 01:40:00	00000300
ZD 01:41:30	00080000
ZD 02:06:30	00050000
ZD 02:21:30	00000300
ZD 02:26:30	00000000

C123456789012345678901234567890123456789012345678901234567890

ZP 01:40:00	027.00
ZP 01:41:30	035.00
ZP 02:21:30	030.00
ZP 02:26:30	000.00



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3.2 FLASH MEMORY READ (ONLY) PROCEDURES

The same assumptions of the Paragraph 3.1 without the ERASE procedures

3.2.1 GENERIC SCENARIO

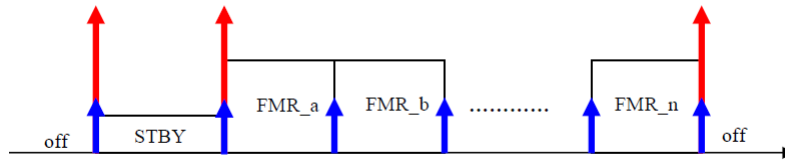


Fig 3.2.1-1 FM Read Only Scenario

3.2.2 TIMELINE OF EXAMPLE

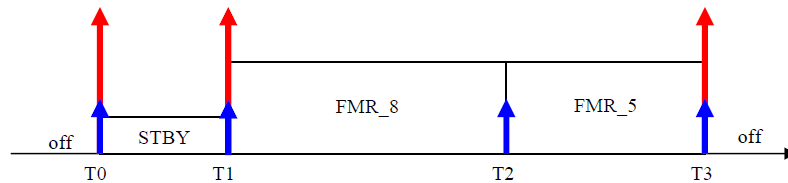


Fig 3.2.2-1 FM Read Only Timeline

3.2.3 COMMAND GENERATION DETAILS

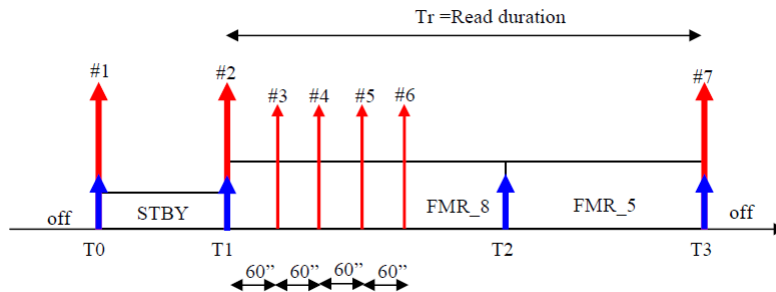


Fig 3.2.3-1 Flash Memory Read only, example of configuration



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Where:

#1: MARSIS Nominal Switch ON: H1AMIF01A0

#2: MI_DUMP_FM: H1AMIF52A0

#3: FM Dump Chip 0: H1AMIF52D1

#4: FM Dump Chip 1: H1AMIF52D2

#5: FM Dump Chip 2: H1AMIF52D3

#6: FM Dump Chip 3: H1AMIF52D4

#7: MARSIS Nominal Switch OFF: H1AMIF06A0

3.2.4 MIRA TIMELINE EXAMPLE

```
% FM-READ-ONLY
2608 NOP 3 SSRA STBY 100.0 101.5
2608 NOP 3 SSRA FMR_8 101.5 126.5
2608 NOP 3 SSRA FMR_5 126.5 141.5
```



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3.2.5 POR FILE EXAMPLE

```
C
C PERI DATE: 2006 JAN 22. DOY=22
C PERI TIME: 22:52:41
C
POR_ 00600 05-321T20:29:30.000Z
06-023T00:31:41.000Z 06-023T01:15:11.000Z 0007
```

```
C -----
C MARSIS Nominal Switch ON
C -----
```

```
H1AMIF01A0 S
H2I UTC    T P 000
H3
H4
H5
S1          MPER 0000002608 01:40:00
S205-321T20:29:30Z    alenia
```

```
C -----
C MI_DUMP_FM
C -----
```

```
H1AMIF52A0 S
H2I UTC    T P 000
H3
H4
H5
S1          MPER 0000002608 01:41:30
S205-321T20:29:30Z    alenia
```

```
C -----
C EM Dump Chip 0
C -----
```

```
H1AMIF52D1 S
H2I UTC    T P 000
H3
H4
H5
S1          MPER 0000002608 01:42:30
S205-321T20:29:30Z    alenia
```



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C -----
C FM Dump Chip 1
C -----

H1AMIF52D2 S
H2I UTC T P 000
H3
H4
H5
S1 MPER 0000002608 01:43:30
S205-321T20:29:30Z alenia

C -----
C FM Dump Chip 2
C -----

H1AMIF52D3 S
H2I UTC T P 000
H3
H4
H5
S1 MPER 0000002608 01:44:30
S205-321T20:29:30Z alenia

C -----
C FM Dump Chip 3
C -----

H1AMIF52D4 S
H2I UTC T P 000
H3
H4
H5
S1 MPER 0000002608 01:45:30
S205-321T20:29:30Z alenia

C -----
C MARSIS Nominal Switch OFF
C -----

H1AMIF06A0 S
H2I UTC T P 007
H3
H4
H5
S1 MPER 0000002608 02:21:30
S205-321T20:29:30Z alenia

C123456789012345678901234567890123456789012345678901234567890

ZD 01:40:00	00000300
ZD 01:41:30	00080000
ZD 02:06:30	00050000
ZD 02:21:30	00000000

C123456789012345678901234567890123456789012345678901234567890

ZP 01:40:00	027.00
ZP 01:41:30	035.00
ZP 02:21:30	000.00



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3.3 FLASH MEMORY ERASE (ONLY) PROCEDURES

3.3.1 GENERIC SCENARIO

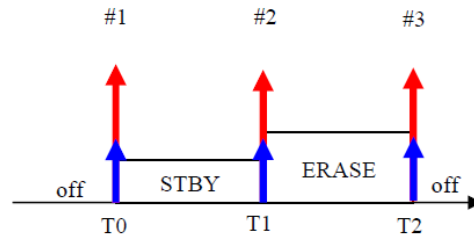


Fig 3-3.1-1 FM Erase Only Scenario

Where:

- #1: MARSIS Nominal Switch ON: H1AMIF01A0
- #2: MARSIS FM Erase: H1AMIF51A0
- #3: MARSIS Nominal Switch OFF: H1AMIF06A0

3.3.2 MIRA TIMELINE EXAMPLE

```
% FM-ERASE-ONLY
2608 NOP 3 SSRA STBY 100.0 101.5
2608 NOP 3 SSRA ERASE 101.5 106.5
```



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3.3.3 POR FILE EXAMPLE

C
C PERI DATE: 2006 JAN 22. DOY=22
C PERI TIME: 22:52:41
C

POR_ 00600 05-321T21:33:52.000Z
06-023T00:31:41.000Z 06-023T00:40:11.000Z 0003

C -----
C MARSIS Nominal Switch ON
C -----

H1AMIF01A0 S
H2I UTC T P 000
H3
H4
H5
S1 MPER 0000002608 01:40:00
S205-321T21:33:52Z alenia

C -----
C MARSIS FM Erase
C -----

H1AMIF51A0 S
H2I UTC T P 000
H3
H4
H5
S1 MPER 0000002608 01:41:30
S205-321T21:33:52Z alenia

C -----
C MARSIS Nominal Switch OFF
C -----

H1AMIF06A0 S
H2I UTC T P 005
H3
H4
H5
S1 MPER 0000002608 01:46:30
S205-321T21:33:52Z alenia

C123456789012345678901234567890123456789012345678901234567890

ZD 01:40:00 00000300
ZD 01:46:30 00000000

C123456789012345678901234567890123456789012345678901234567890

ZP 01:40:00 027.00
ZP 01:41:30 030.00
ZP 01:46:30 000.00



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3.4 PIOR-PMRQ REQUIREMENTS

In order to manage the FM mechanism with the PIOR/PMRQ routine cycle, the following items are requested

PIOR Requirements:

It is requested the following comment line into the PIOR file before and after each Flash Memory section:

! FLASH MEMORY FLAG START INSERTION POINT

This is necessary to make our system recognize the Flash Memory mechanism.

PMRQ Requirements:

The following options should be implemented and provided to MARSIS team:

Case of Flash Memory Read and Erase

- 1) To delete the entire timeline
- 2) To delete only the erase procedure (eventually reshaping the timing to avoid the lack)
- 3) To delete only the read procedures (eventually reshaping the timing to avoid the lack)

Case of Flash Memory Read Only

- 4) To delete the entire timeline
- 5) To insert the erase procedure (reshaping the timing without to exceed the allocated duration)

Case of Flash Memory Erase Only

- 6) To delete the entire timeline

In case of feasibility problems, alternative solutions shall be discussed with POS team.



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4 TRANSITION COMMANDS SUMMARY

FROM	TO	PROCEDURE	COMMENT
off	STBY	H1AMIF01A0	Marsis Nominal Switch On
STBY	FMR_1	H1AMIF52A0 H1AMIF52D1 H1AMIF52D2 H1AMIF52D3 H1AMIF52D4	MARSIS Flash Memory Read Procedures
	FMR_2		
	FMR_3		
	FMR_4		
	FMR_5		
	FMR_6		
	FMR_7		
	FMR_8		
	FMR_9		
FMR_1	ERASE	H1AMIF51A0	MARSIS Flash Memory Erase Procedure
FMR_2			
FMR_3			
FMR_4			
FMR_5			
FMR_6			
FMR_7			
FMR_8			
FMR_9			
ERASE	off	H1AMIF06A0	MARSIS Nominal Switch Off
FMR_1	off	H1AMIF06A0	MARSIS Nominal Switch Off
FMR_2			
FMR_3			
FMR_4			
FMR_5			
FMR_6			
FMR_7			
FMR_8			
FMR_9			
STBY	ERASE	H1AMIF51A0	MARSIS Flash Memory Erase Procedure