Change Report

Issue	Rev.	Pg.	Date	Changes	Orig.
1,2				Original versions w/o change reports	Rj
3	0	all	22.03.95	Complete reworking of the document Rapid Command Macros (RCMs) are deleted, the information included into the RCPs P15 delay time increased to wait for the results (and protect later procedure results from being misinterpreted) P16 ZERETSTD,0 deleted (command was possible, but not mandatory in this case) P25 'DefHVUp'added P26 'DummyPatch' replaced with 'DefHVDown' P28, P29, P30, P31 added Column „Chapter" omitted Existing diagrams revised and new added to Section 3.2 (former Section 3.3) P21: Change of delay times for compliance with Floperman	Rj
3	1		10.11.95	Adaptions in section A.3.0 P3: Installation of RAPID patch A (P31) added P23: New sun pulse sector and offset parameters P24: Replaced by procedure 'IELOn' (on JSOC request) P27: Replaced by procedure 'IELOff' (on JSOC request) P31: New procedure 'RAPPatchA' added Change in comments of P21, P28 and P29 Error corrected in figure on pg A3-10 (in states CM 15.0M1), reordering of transitions in the upper right corner of the figure	Rj
3	2		03.04.96	P32, P33 added Updates in section A.3.0 and A.3.1.1 Revision of P3 (Commissioning): • no waiting time after P1 • data evaluation time after P20 • data evaluation time after P17 • P24 (old version) replaced by P27 + P24 • data evaluation time after P11 • P19 and P4 deleted: both are already used within P31	Rj

3	3	10 10 10, 11 12 9 2, 9 4 4 3 7 8, 9 1	10.03.97	Direct link from CM 00.000 to CM 14.0M1 is redundant: deleted Default for IES is autoswitching mode <u>on</u> → transition P28 replaced by P12 . Variable N of CM is undefined in most cases, because of autoswitching mode for IES Change of mode transition for IES histogram mode Footnotes in P32 and P33 deleted P31 renamed to RAPPatch, now just a dummy RCP P13 and P14 do not control IES int. time anymore, because of autoswitching. P11 and P12 are redundant now → replaced P11 becomes RCP IESInterCal P12 becomes RCP IESAccAuto P3: P11→P14, P12→P13 P21: Command sequence is changed P28, P29, P32, P33: Now with autoswitching <u>off</u> Text adapted to the above changes, small corrections	Rj
		all 2,9 7 4 4 10, 12 12 9 4	08.01.99	Now this is a document for both PHOENIX and Cluster II versions of RAPID. The differences are marked in the text. Changing of RCP names in the overview table and in the RCP definitions, because of different integrations times between the PHOENIX and Cluster II version. Also change of the description and comment in the RCP definitions; footnote added. P28: IESAccTime2 → IESAccTimeMode0 P32: IESAccTime10 → IESAccTimeMode1 P33: IESAccTime50 → IESAccTimeMode2 P29: IESAccTime100 → IESAccTimeMode3 P21: comment updated P12: comment updated P11: fixed physical address deleted → will be provided by the RAPID team when needed integration times changed: x µs → int. mode y^I correction: in CM24.0M4 'Histo.' deleted P31: changed because of existing Phoenix-Patch P11: delay after last LUT-setting changed	cd
3	4	 2,9 7 4 10,12 all	08.02.99	Now the integration times in the IES are the same for both Phoenix and the new Cluster II versions of RAPID (2 µs, 5 µs, 15 µs and 50 µs). Change of RCP names in the overview table and in the RCP definitions. Also change of RCP comments and descriptions in the RCP definitions. P28: IESAccTimeMode0 → IESAccTime2 P32: IESAccTimeMode1 → IESAccTime5 P33: IESAccTimeMode2 → IESAccTime15 P29: IESAccTimeMode3 → IESAccTime50 P21: comment updated P12: comment updated integration times changed: int. mode y^I → x µs page numbering corrected: from (old) A3-1 on : (new) page number= (old) page+1	cd

Issue	Rev.	Pg.	Date	Changes	Orig.
4	0	2, 10	08.03.2000	Add **P34**, IESAccTime with parameter	pwd
		3		Add 6 voltage parameters to **P2**	
		3		Revise **P3** for new commissioning plan	
		4		Add memory range parameter to **P4**	
		4		Add 4 voltage parameters to **P6**	
		5		Add parameters and load addresses to **P11**	
		6		Add INT_TIME parameter to **P16**	
		8		Add voltage parameters to **P18**	
		8		Revise **P21** by calling **P16** four times	
		15		Add deflection voltage parameters to **P25**	
		10		Add reference to **P31** to patch codes in Inst. User's Guide	
		13		Add “cold” to “standby”; remove superfluous int. times Add **P34** with parameters ies_hi and ies_lo	
		15		Add parameters to **P16**; add **P34** and parameters	
		all		Change page numbers so change sheets roman and main text is arabic, starting with A3-1. All pages renumbered	
4	1	9	06.06.2000	Change **P23** to take parameters for setting sun offset	pwd
4	1	13,15	19.06.2000	Change IES M mode parameter to explicit value of 1	pwd
4	2	3	02.08.2000	Add **P23** parameters to its usage in **P3**	pwd
		7		Add extra commands at end of **P17**	
4	3	11	09.05.2001	Add **P36**, same as **P23** with "Load Configuration" at start	pwd
		11		Add procedure **P35** to recover from DPU reset	
4	4	11	25.07.2001	Add **P37**, same as **P36** without configuration loading/storing	pwd
		9		Remove IFFT from **P35**	

A.3.0 Introduction

RAPID owns a command set of more than 50 commands, each one capable of changing the internal state of the instrument in one or more parameters. However, only a subset of the commands will be used on a regular basis, while others are only used a few times for fine tuning during commissioning and in later project phases.
The overall instrument status is called operational mode OM. The OM is a result of the used (external) telemetry mode and the instrument's (internal) configuration mode CM. For RAPID the distinction between OM and CM is relevant for the scientific output but not for the commanding of the instrument.
Command sequences that are always issued in a specific order are combined to RAPID Command Procedures (RCP). Each RCP is composed of RAPID commands (ESA syntax) or other RCPs.

Operational mode OM	level 3
RAPID Command Procedures (RCP)	level 2
RAPID commands (8-character ESA syntax)	level 1

Level structure of RAPID commanding

RCPs serve as a link between the ESA command syntax and the operational mode level and are designed to provide the following features:
1. Lower probability of miscommanding (e.g. no missing or toggled commands in a sequence)
2. Clearer, human readable procedure names (compared with the rather cryptic ESA 8-character syntax)
3. Procedure numbers can serve as references in OM transition diagrams (compare section A.3.2)
4. Possibility of commanding on OM (equivalent to CM) level for the RAPID team

RCPs are defined for the use as:
- short reference for command sequences that are used during commissioning (P3, P17, P20, P21, P22, P23, P31)
- guideline for program up- and download (P4, P19)
- tool for measurement mode fine tuning (P12, P13, P14, P28, P29, P24, P27,P32,P33,P34)
- short reference for all commands needed for CM or OM transitions

In the following section A.3.1 all RCPs are defined in tables with the respective number and name. A description follows, if the RCP name is not self-explanatory. The next column lists the RAPID commands belonging to the RCP, command parameters are separated by a comma. The column 'Delay' indicates the waiting time in minutes after the respective command or RCP. Delay times of more than 10 minutes normally are used as data evaluation times. Comments are added to each command to make the internal structure of the procedure understandable.
Section A.3.2 contains a set of transition diagrams, visualising which RCP combinations are needed to switch between OMs.

A.3.1 RAPID Command Procedures (RCP)

A.3.1.1 RCP overview

	RCP Name
P1	PowerOn
P2	HVActivation
P3	Commissioning
P4	MemoryDump
P5	HotStandBy
P6	PowerUp
P7	StandBy
P8	PowerDown
P9	EmergencyPowerDown
P10	EmergencyHVOff
P11	IESInterCal
P12	IESAccAuto
P13	HighFluxMode
P14	LowFluxMode
P15	IIMSTest
P16	IESTest
P17	HVCommissioning
P18	HVUp

	RCP Name
P19	ProgramUpload
P20	IIMSCommissioningA
P21	IESCommissioning
P22	IIMSCommissioningB
P23	SunSync
P24	IELOn
P25	DefHVUp
P26	DefHVDown
P27	IELOff
P28	IESAccTime2
P29	IESAccTime50
P30	IESCalibration
P31	RAPPatch
P32	IESAccTime5
P33	IESAccTime15
P34	IESAccTime, INT_TIME
P35	HVUp_Conf
P36	SunSync_V2
P37	SunSync_V3

Note: the procedure **P35** is a variant of **P06** with additional commands to ensure the RAPID configuration after a possible DPU reset which would turn off the HV power supply and deactivate the patches and reset the sun pulse location within the sector. On resumption of data taking, **P35** is issued to be sure that these aspects of the configuration are properly set.

P36 replaces **P23** which is too unsafe. The latter sets the sun pulse parameters and then stores the configuration, while the former, the newer one, loads the configuration beforehand. This ensures that the wrong configuration is not stored.

But even **P36** has its problems, because it is often called when the high voltages are on, and loading configuration at this time sets the limits to the stored values of 0. This does not turn down the voltages, but it does deactivate the functionality of the limits. **P37** avoids this by not touching the configuration.

A.3.1.2 RCP definitions

	RCP Name	Description	Command	Delay [min]	Comment
P1	PowerOn	Switch on default mode	?RAP?ONN[i]	2.0	Switch on LCL RAPID (A/B)

	RCP Name	Description	Command	Delay [min]	Comment
P2	HVActivation	IIMS HV on	ZERSRELS,2	0.0	IIMS HV relay on
			ZERALIMS,STA_LIM	0.5	Start MCP limit value
			ZERSTASE,1	0.0	Enable start MCP stepping
			ZERALEVS, STA_SET	2.0	Set Start MCP HV level
			ZERSTASE,0	1.0	Disable Start MCP stepping
			ZERPLIMS, STO_LIM	0.5	Stop MCP limit value
			ZERSTOSE,1	0.0	Enable Stop MCP stepping
			ZERPLEVS, STO_SET	2.0	Set Stop MCP HV level
			ZERSTOSE,0	1.0	Disable Stop MCP stepping
			ZERDLIMS, DEF_LIM	0.5	Deflection HV limit value
			ZERDEFSE,1	0.0	Enable Deflectn HV stepping
			ZERDLEVS, DEF_SET	2.0	Set Deflection HV level
			ZERDEFSE,0	1.0	Disable Deflectn HV stepping
			ZERIFFTE,1	5.0	Start IIMS IFFT

	Parameter	Description	Allowed Values	Def.	Comment
1	STA_LIM	Start MCP limit	0 – 15	8 5	Phoenix Unit on FM6 (S/C 2) Other units
2	STA_SET	Set Start MCP HV	0 – 15	8 5	Phoenix Unit on FM6 (S/C 2) Other units
3	STO_LIM	Stop MCP limit	0 – 15	8 5	Phoenix Unit on FM6 (S/C 2) Other units
4	STO_SET	Set Stop MCP HV	0 – 15	8 5	Phoenix Unit on FM6 (S/C 2) Other units
5	DEF_LIM	Deflection limit	0 – 15	0	All units
6	DEF_SET	Set Deflection HV	0 – 15	0	All units

	RCP Name	Description	Command	Delay [min]	Comment
P3	Commissioning	Comprehensive test sequence for IIMS and IES	P1	0.0	PowerOn
			P31	30.0	Install RAPID Patches
			P32	1.0	Set IES int. time 5 µs
			P20	50.0	IIMSCommissioningA
			P33	1.0	Set IES int. time 15 µs
			P17	460.0	HVCommissioning
			P28	31.0	Set IES int. time 2 µs
			P29	1.0	Set IES int time 50 µs
			P22	100.0	IIMSCommissioningB
			P21	80.0	IESCommissioning
			P23,14,212	30.0	SunSynch
			P27	5.0	IELOff
			P24	30.0	IELOn
			P16,40h	10.0	IESTest, 2 µs, fixed
			P14	30.0	LowFluxMode
			P13	0.0	HighFluxMode

	RCP Name	Description	Command	Delay [min]	Comment
P4	MemoryDump	Memory Dump Sequence	BERRCADS, RANGE ZERIRCKS,1 ZERIRCKS,0	0.0 0.0	Define memory range Start RAM check Stop RAM check
	Parameter	**Description**	**Allowed Values**	**Def.**	**Comment**
1	RANGE	Memory Range			Range and RAM check duration will be provided by RAPID time when needed.

	RCP Name	Description	Command	Delay [min]	Comment
P5	HotStandBy	HV down (HV relay on)	ZERALIMS,0 ZERPLIMS,0 ZERDLIMS,0	0.0 0.0 0.0	Start MCP limit value Stop MCP limit value Deflection HV limit value

	RCP Name	Description	Command	Delay [min]	Comment
P6	PowerUp	Standard power-on sequence (boot sequence)	?RAP?ONN[i] ZERCFGSS,1 ZERSRELS,2 ZERALIMS, STA_LIM ZERSTASE,1 ZERALEVS, STA_SET ZERSTASE,0 ZERPLIMS, STO_LIM ZERSTOSE,1 ZERPLEVS, STO_SET ZERSTOSE,0 ZERIFFTE,1	2.0 1.0 0.0 0.0 0.0 2.0 2.0 0.0 0.0 2.0 2.0 5.0	Switch on LCL RAPID (A/B) Load instrument configuration IIMS HV relay on Start MCP limit value Enable start MCP stepping Set Start MCP HV level Disable Start MCP stepping Stop MCP limit value Enable Stop MCP stepping Set Stop MCP HV level Disable Stop MCP stepping Start IIMS IFFT
	Parameter	**Description**	**Allowed Values**	**Def.**	**Comment**
1	STA_LIM	Start MCP limit	0 – 15	8 5	Phoenix Unit on FM6 (S/C 2) Other units
2	STA_SET	Set Start MCP HV	0 – 15	8 5	Phoenix Unit on FM6 (S/C 2) Other units
3	STO_LIM	Stop MCP limit	0 – 15	8 5	Phoenix Unit on FM6 (S/C 2) Other units
4	STO_SET	Set Stop MCP HV	0 – 15	8 5	Phoenix Unit on FM6 (S/C 2) Other units

	RCP Name	Description	Command	Delay [min]	Comment
P7	StandBy	HV down, HV relay off	ZERDLIMS,0 ZERALIMS,0 ZERPLIMS,0 ZERSRELS,32 ZERIFFTE,1	0.0 0.0 2.0 0.0 5.0	Deflection HV limit value Start MCP limit value Stop MCP limit value IIMS HV relay off Start IIMS IFFT

	RCP Name	Description	Command	Delay [min]	Comment
P8	PowerDown	Power off sequence	ZERDLIMS,0	0.0	Deflection HV limit value
			ZERALIMS,0	0.0	Start MCP limit value
			ZERPLIMS,0	2.0	Stop MCP limit value
			ZERSRELS,32	0.0	IIMS HV relay off
			ZERCFGSS,0	1.0	Store instrument configuation
			?RAP?FFN[i]	0.0	Switch off LCL RAPID (A/B)

	RCP Name	Description	Command	Delay [min]	Comment
P9	Emergency-PowerDown	Power off	?RAP?FFN[i]	0.0	Switch off LCL RAPID (A/B)

	RCP Name	Description	Command	Delay [min]	Comment
P10	Emergency-HVOff	HV off	ZERSRELS,32	0.0	IIMS HV relay off

	RCP Name	Description	Command	Delay [min]	Comment
P11	IESInterCal	Intercalibration of RAPID/IES with PEACE	BERPLADS, add (see below)	0.0	Load address
			BERPLDCS 02 FF FF 32	0.5	Write FFh, FFh
			ZERECMDS, INT_TIME1	0.5	Select 1 of 4 int. times
			ZERELUTS 51h	1.0	Look direction 1
			ZERELUTS 52h	1.0	Look direction 2
			ZERELUTS 53h	1.0	Look direction 3
			ZERELUTS 54h	1.0	Look direction 4
			ZERELUTS 55h	1.0	Look direction 5
			ZERELUTS 56h	1.0	Look direction 6
			ZERELUTS 57h	1.0	Look direction 7
			ZERELUTS 58h	1.0	Look direction 8
			ZERELUTS 59h	1.0	Look direction 9
			BERPLADS, add (see below)	0.0	Load address
			BERPLDCS 02 00 00 00	0.0	Write 00h, 00h
			ZERELUTS, INT_TIME2	0.0	Set final int. time

Note: the add address above is: 02h 3Ah D4h Phoenix Unit on FM6 (S/C 2)
02h 5Eh DCh Other units

	Parameter	Description	Allowed Values	Def.	Comment
1	INT_TIME1	Sets integration time for the test	0h, 80h, 40h, C0h	0h	2, 5, 15, 50 µs, fixed
2	INT_TIME2	Sets integration time at completion of test	0h, 1h, 2h, 3h, 40h, 41h, 42h, 43h	41h	2, 5, 15, 50 µs, autoswitching 2, 5, 15, 50 µs, fixed

	RCP Name	Description	Command	Delay [min]	Comment
P12	IESAccAuto	IES autoswitching mode	ZERELUTS,3	0.0	Select IES autoswitching mode and start with 50 µs integration time

	RCP Name	Description	Command	Delay [min]	Comment
P13	HighFluxMode		ZERSMODS,0	0.0	IIMS serial measurement mode

	RCP Name	Description	Command	Delay [min]	Comment
P14	LowFluxMode		ZERSMODS,1	0.0	IIMS parallel meas. mode

	RCP Name	Description	Command	Delay [min]	Comment
P15	IIMSTest		ZERIFFTE,1	10.0	Start IIMS IFFT

	RCP Name	Description	Command	Delay [min]	Comment
P16	IESTest	Histogram mode with INT_TIME parameter	ZERELUTS, INT_TIME ZERETSTE,60h	0.0 5.0	Set integration time Start IES test mode
	Parameter	**Description**	**Allowed Values**	**Def.**	**Comment**
1	INT_TIME	Sets fixed integration time	40h, 41h, 42h, 43h	41h	2, 5, 15, 50 µs, fixed

	RCP Name	Description	Command	Delay [min]	Comment
P17	HVCommis-sioning	First IIMS HV on sequence	ZERSRELS,2	1.0	IIMS HV relay on
			ZERALIMS,2	1.0	Start Mcp limit value
			ZERSTASE,1	0.0	Enable start MCP stepping
			ZERALEVS,2	2.0	Set Start MCP HV level
			ZERSTASE,0	5.0	Disable Start MCP stepping
			ZERPLIMS,2	1.0	Stop MCP limit value
			ZERSTOSE,1	0.0	Enable Stop MCP stepping
			ZERPLEVS,2	2.0	Set Stop MCP HV level
			ZERSTOSE,0	5.0	Disable Stop MCP stepping
			ZERALIMS,3	0.0	Start MCP limit value
			ZERSTASE,1	0.0	Enable start MCP stepping
			ZERALEVS,3	2.0	Set Start MCP HV level
			ZERSTASE,0	60.0	Disable Start MCP stepping
			ZERPLIMS,3	0.0	Stop MCP limit value
			ZERSTOSE,1	0.0	Enable Stop MCP HV level
			ZERPLEVS,3	2.0	Set stop MCP HV level
			ZERSTOSE,0	60.0	Disable Stop MCP stepping
			ZERALIMS,4	0.0	Start MCP limit value
			ZERSTASE,1	0.0	Enable start MCP stepping
			ZERALEVS,4	2.0	Set Start MCP HV level
			ZERSTASE,0	10.0	Disable Start MCP stepping
			ZERPLIMS,4	0.0	Stop MCP limit value
			ZERSTOSE,1	0.0	Enable Stop MCP HV level
			ZERPLEVS,4	2.0	Set stop MCP HV level
			ZERSTOSE,0	10.0	Disable Stop MCP stepping
			ZERALIMS,5	0.0	Start MCP limit value
			ZERSTASE,1	0.0	Enable start MCP stepping
			ZERALEVS,5	2.0	Set Start MCP HV level
			ZERSTASE,0	10.0	Disable Start MCP stepping
			ZERPLIMS,5	0.0	Stop MCP limit value
			ZERSTOSE,1	0.0	Enable Stop MCP HV level
			ZERPLEVS,5	2.0	Set stop MCP HV level
			ZERSTOSE,0	10.0	Disable Stop MCP stepping

	RCP Name	Description	Command	Delay [min]	Comment
P17		(continued)	ZERALIMS,8	0.0	Start MCP limit value
			ZERSTASE,1	0.0	Enable start MCP stepping
			ZERALEVS,8	2.0	Set Start MCP HV level
			ZERSTASE,0	10.0	Disable Start MCP stepping
			ZERPLIMS,8	0.0	Stop MCP limit value
			ZERSTOSE,1	0.0	Enable Stop MCP stepping
			ZERPLEVS,8	2.0	Set Stop MCP HV level
			ZERSTOSE,0	10.0	Disable Stop MCP stepping
			ZERALIMS,7	0.0	Start MCP limit value
			ZERPLIMS,7	1.0	Stop MCP limit value
			ZERIFFTE,1	10.0	Start IIMS IFFT
			ZERDLIMS,6	0.0	Deflection HV limit value
			ZERDEFSE,1	0.0	Enable Deflection HV stepping
			ZERDLEVS,6	2.0	Set Deflection HV level
			ZERDEFSE,0	15.0	Disable Deflection HV stepping
			ZERDLIMS,7	0.0	Deflection HV limit value
			ZERDEFSE,1	0.0	Enable Deflection HV stepping
			ZERDLEVS,7	2.0	Set Deflection HV level
			ZERDEFSE,0	10.0	Disable Deflection HV stepping
			ZERDLIMS,8	0.0	Deflection HV limit value
			ZERDEFSE,1	0.0	Enable Deflection HV stepping
			ZERDLEVS,8	2.0	Set Deflection HV level
			ZERDEFSE,0	10.0	Disable Deflection HV stepping
			ZERDLIMS,9	0.0	Deflection HV limit value
			ZERDEFSE,1	0.0	Enable Deflection HV stepping
			ZERDLEVS,9	2.0	Set Deflection HV level
			ZERDEFSE,0	10.0	Disable Deflection HV stepping
			ZERDLIMS,10	0.0	Deflection HV limit value
			ZERDEFSE,1	0.0	Enable Deflection HV stepping
			ZERDLEVS,10	2.0	Set Deflection HV level
			ZERDEFSE,0	10.0	Disable Deflection HV stepping
			ZERDLIMS,11	0.0	Deflection HV limit value
			ZERDEFSE,1	0.0	Enable Deflection HV stepping
			ZERDLEVS,11	2.0	Set Deflection HV level
			ZERDEFSE,0	10.0	Disable Deflection HV stepping
			ZERDLIMS,12	0.0	Deflection HV limit value
			ZERDEFSE,1	0.0	Enable Deflection HV stepping
			ZERDLEVS,12	2.0	Set Deflection HV level
			ZERDEFSE,0	10.0	Disable Deflection HV stepping
			ZERDLIMS,13	0.0	Deflection HV limit value
			ZERDEFSE,1	0.0	Enable Deflection HV stepping
			ZERDLEVS,13	2.0	Set Deflection HV level
			ZERDEFSE,0	10.0	Disable Deflection HV stepping
			ZERDLIMS,14	0.0	Deflection HV limit value
			ZERDEFSE,1	0.0	Enable Deflection HV stepping
			ZERDLEVS,14	2.0	Set Deflection HV level
			ZERDEFSE,0	10.0	Disable Deflection HV stepping
			ZERDLIMS,15	0.0	Deflection HV limit value
			ZERDEFSE,1	0.0	Enable Deflection HV stepping
			ZERDLEVS,15	2.0	Set Deflection HV level
			ZERDEFSE,0	60.0	Disable Deflection HV stepping
			ZERIFFTE,1	10.0	Start IIMS IFFT
			ZERDEFSE,1	0.0	Enable Deflection HV stepping
			ZERDLEVS,0	2.0	Set Deflection HV level
			ZERDEFSE,0	0.0	Disable Deflection HV level
			ZERDLIMS,0	2.0	Deflection HV limit value

	RCP Name	Description	Command	Delay [min]	Comment
P18	HVUp	HV increase to nominal level	ZERALIMS, STA_LIM	0.0	Start MCP limit value
			ZERSTASE,1	0.0	Enable start MCP stepping
			ZERALEVS, STA_SET	2.0	Set Start MCP HV level
			ZERSTASE,0	2.0	Disable Start MCP stepping
			ZERPLIMS, STO_LIM	0.0	Stop MCP limit value
			ZERSTOSE,1	0.0	Enable Stop MCP stepping
			ZERPLEVS, STO_SET	2.0	Set Stop MCP HV level
			ZERSTOSE,0	2.0	Disable Stop MCP stepping
			ZERDLIMS,0	0.0	Deflection HV limit value

	Parameter	Description	Allowed Values	Def.	Comment
1	STA_LIM	Start MCP limit	0 – 15	8 5	Phoenix Unit on FM6 (S/C 2) Other units
2	STA_SET	Set Start MCP HV	0 – 15	8 5	Phoenix Unit on FM6 (S/C 2) Other units
3	STO_LIM	Stop MCP limit	0 – 15	8 5	Phoenix Unit on FM6 (S/C 2) Other units
4	STO_SET	Set Stop MCP HV	0 – 15	8 5	Phoenix Unit on FM6 (S/C 2) Other units

	RCP Name	Description	Command	Delay [min]	Comment
P19	ProgramUpload	Program upload sequence	BERPLADS,tbp[ii]	0.0	Set memory load address
			BERMLDCS,tbp[iii]	0.0	Upload program bytes

	RCP Name	Description	Command	Delay [min]	Comment
P20	IIMSCommis-sioningA	Commissioning of IIMS with HV off	ZERIFFTE,1	5.0	Start IIMS IFFT
			ZERSLOPS,2	2.0	Set TAC slope
			ZERIFFTE,1	5.0	Start IIMS IFFT
			ZERSLOPS,3	2.0	Set TAC slope
			ZERIFFTE,1	5.0	Start IIMS IFFT
			ZERSLOPS,1	2.0	Set TAC slope
			ZERIFFTE,1	5.0	Start IIMS IFFT
			ZERSLOPS,0	2.0	Set TAC slope
			ZERIFFTE,1	5.0	Start IIMS IFFT

	RCP Name	Description	Command	Delay [min]	Comment
P21	IESCommis-sioning	Commissioning of IES	P28	10.0	Select integration time 2 µs
			P32	10.0	Select integration time 5 µs
			P33	10.0	Select integration time 15 µs
			P29	10.0	Select integration time 50 µs
			P12	10.0	Select autoswitching with initial integration time 50 µs
			P16, 40h	5.0	Histogram mode at 2 µs
			P16, 41h	5.0	Histogram mode at 5 µs
			P16, 42h	5.0	Histogram mode at 15 µs
			P16, 43h	5.0	Histogram mode at 50 µs
			P28	0.0	Select integration time 2 µs
			P30	10.0	IES Calibration

	RCP Name	Description	Command	Delay [min]	Comment
P22	IIMSCommis-sioningB	Commissioning of IIMS with HV on	ZERSMODS,1	15.0	IIMS parallel measurement mode
			ZERSMODS,0	0.0	IIMS serial measurement mode
			ZERTRMDS,1	5.0	IIMS Trigger mode 1
			ZERTRMDS,2	5.0	IIMS Trigger mode 2
			ZERTRMDS,3	5.0	IIMS Trigger mode 3
			ZERTRMDS,4	5.0	IIMS Trigger mode 4
			ZERTRMDS,5	5.0	IIMS Trigger mode 5
			ZERTRMDS,0	0.0	IIMS Trigger mode 0
			ZERSSECS,8	10.0	Set sunpulse sector
			ZERSSECS,0	5.0	Set sunpulse sector
			ZERIFFTE,1	30.0	Start IIMS IFFT
			ZERDLIMS,10	0.0	Deflection HV limit value
			ZERDEFSE,1	0.0	Enable Deflection HV stepping
			ZERDLEVS,10	2.0	Set Deflection HV level
			ZERDEFSE,0	2.0	Disable Deflection HV stepping
			ZERIFFTE,1	10.0	Start IIMS IFFT
			ZERDEFSE,1	0.0	Enable Deflection HV stepping
			ZERDLEVS,0	2.0	Set Deflection HV level
			ZERDEFSE,0	0.0	Disable Deflection HV stepping

	RCP Name	Description	Command	Delay [min]	Comment
P23	SunSync	Establish sector orientation with respect to sun	ZERSSECS, SSEC[iv]	0.0	Set sunpulse sector
			ZERSSUNS, SOFF[v]	0.0	Set sunpulse sector offset
			ZERCFGSS,0	0.0	Store instrument configuration
	Parameter	**Description**	**Allowed Values**	**Def.**	**Comment**
1	SSEC	Sector RAPID is in when sun pulse comes	0 – 15	14	All units
2	SOFF	Offset within sector	0 – 255	212	All units

	RCP Name	Description	Command	Delay [min]	Comment
P24	IELOn	Switch on IEL	ZERFCLKS,2	0.0	IEL I/F on

	RCP Name	Description	Command	Delay [min]	Comment
P25	DefHVUp	Switch on Deflection HV	ZERDLIMS, DEF_LIM	0.0	Deflection HV limit value
			ZERDEFSE,1	0.0	Enable Deflection HV stepping
			ZERDLEVS, DEF_SET	2.0	Set Deflection HV level
			ZERDEFSE,0	0.0	Disable Deflection HV stepping
	Parameter	**Description**	**Allowed Values**	**Def.**	**Comment**
1	DEF_LIM	Deflection limit	0 – 15	15	All units
2	DEF_SET	Set Deflection HV	0 – 15	15	All units

	RCP Name	Description	Command	Delay [min]	Comment
P26	DefHVDown	Switch off Deflection HV	ZERDLIMS,0	2.0	Deflection HV limit value 0

	RCP Name	Description	Command	Delay [min]	Comment
P27	IELOff	Switch off IEL	ZERFCLKS,0	0.0	IEL I/F off

	RCP Name	Description	Command	Delay [min]	Comment
P28	IESAccTime2	Switching IES to integration time 2 µs	ZERELUTS,40h	0.0	Select integration time 2 µs

	RCP Name	Description	Command	Delay [min]	Comment
P29	IESAccTime50	Switching IES to integration time 50 µs	ZERELUTS,43h	0.0	Select integration time 50 µs

	RCP Name	Description	Command	Delay [min]	Comment
P30	IESCalibration	Performing the IES calibration sequence	ZERECALS,1 ZERECALS,0	5.0 0.0	IES calibration on IES calibration off

	RCP Name	Description	Command	Delay [min]	Comment
P31	RAPPatch	Installation of RAPID Patch Code	[See section 5.3 of the Instrument User's Guide for the coding, and table in section 5.3.3 for S/C assign-ments.]	0.0	Patch Code A is for Phoenix, to make it like the others; Patch Code B solves a boot problem on all units; Patch Codes C0, C1, C2, C3 load IES LUTs to each unit. These are uploaded at Power On.

	RCP Name	Description	Command	Delay [min]	Comment
P32	IESAccTime5	Switching IES to integration time 5 µs	ZERELUTS,41h	0.0	Select integration time 5 µs

	RCP Name	Description	Command	Delay [min]	Comment
P33	IESAccTime15	Switching IES to integration time 15 µs	ZERELUTS,42h	0.0	Select integration time 15 µs

	RCP Name	Description	Command	Delay [min]	Comment
P34	IESAccTime	Switching IES to in-tegration time with a parameter.	ZERELUTS, INT_TIME	0.0	Select integration time accord-ing to parameter INT_TIME.
	Parameter	**Description**	**Allowed Values**	**Def.**	**Comment**
1	INT_TIME	Sets integration time and autoswitching	0h, 1h, 2h, 3h, 40h, 41h, 42h, 43h	41h	2, 5, 15, 50 µs, autoswitching 2, 5, 15, 50 µs, fixed

	RCP Name	Description	Command	Delay [min]	Comment
P35	HVUp_Config	Activate patches, set sun sync, IIMS HV on, set voltages	ZERPDISE,1 ZERSSECS,SSEC ZERSSUNS,SOFF ZERSRELS,2 ZERALIMS, STA_LIM ZERSTASE,1 ZERALEVS, STA_SET ZERSTASE,0 ZERPLIMS, STO_LIM ZERSTOSE,1 ZERPLEVS, STO_SET ZERSTOSE,0 ZERDLIMS, DEF_LIM ZERDEFSE,1 ZERDLEVS, DEF_SET ZERDEFSE,0	0.0 0.0 0.0 0.0 0.5 0.0 2.0 1.0 0.5 0.0 2.0 1.0 0.5 0.0 2.0 1.0	Activate Patches Set sunpulse sector Set sunpulse sector offset IIMS HV relay on Start MCP limit value Enable start MCP stepping Set Start MCP HV level Disable Start MCP stepping Stop MCP limit value Enable Stop MCP stepping Set Stop MCP HV level Disable Stop MCP stepping Deflection HV limit value Enable Deflectn HV stepping Set Deflection HV level Disable Deflectn HV stepping

	Parameter	Description	Allowed Values	Def.	Comment
1	SSEC	Sector when sun pulse comes	0 – 15	14	All units
2	SOFF	Offset within sector	0 – 255	212	All units
3	STA_LIM	Start MCP limit	0 – 15	8 5	Phoenix Unit on FM6 (S/C 2) Other units
4	STA_SET	Set Start MCP HV	0 – 15	8 5	Phoenix Unit on FM6 (S/C 2) Other units
5	STO_LIM	Stop MCP limit	0 – 15	8 5	Phoenix Unit on FM6 (S/C 2) Other units
6	STO_SET	Set Stop MCP HV	0 – 15	8 5	Phoenix Unit on FM6 (S/C 2) Other units
7	DEF_LIM	Deflection limit	0 – 15	0	All units
8	DEF_SET	Set Deflection HV	0 – 15	0	All units

	RCP Name	Description	Command	Delay [min]	Comment
P36	SunSync_V2	Establish sector orientation with respect to sun	ZERCFGSS,1 ZERSSECS, SSEC[vi] ZERSSUNS, SOFF[vii] ZERCFGSS,0	1.0 0.0 0.0 0.0	Load instrument configuration Set sunpulse sector Set sunpulse sector offset Store instrument configuration

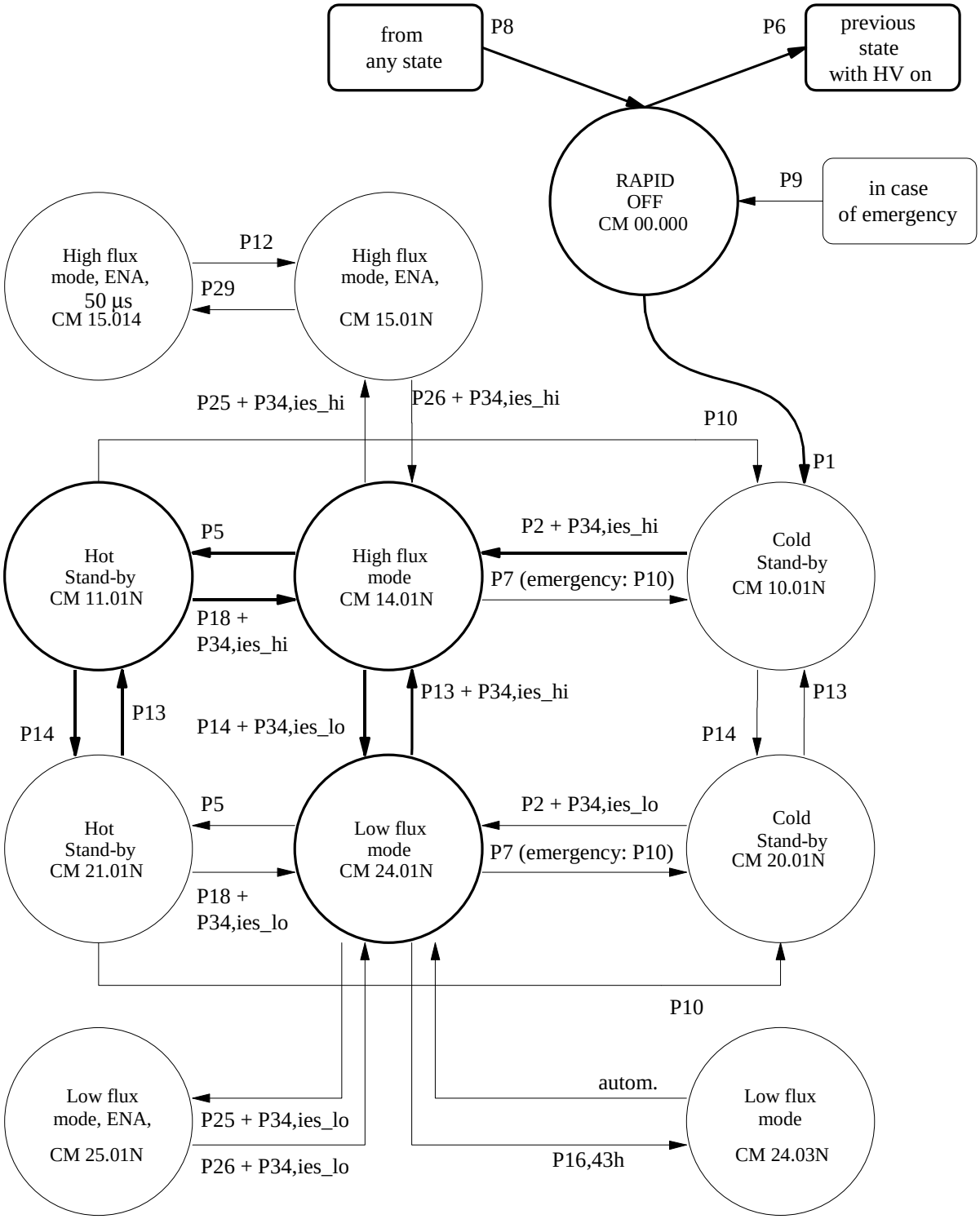
	Parameter	Description	Allowed Values	Def.	Comment
1	SSEC	Sector RAPID is in when sun pulse comes	0 – 15	14	All units
2	SOFF	Offset within sector	0 – 255	212	All units

	RCP Name	Description	Command	Delay [min]	Comment
P37	SunSync_V3	Establish sector orientation with respect to sun	ZERSSECS, SSEC[viii] ZERSSUNS, SOFF[ix]	0.0 0.0	Set sunpulse sector Set sunpulse sector offset

	Parameter	Description	Allowed Values	Def.	Comment
1	SSEC	Sector RAPID is in when sun pulse comes	0 – 15	14	All units
2	SOFF	Offset within sector	0 – 255	212	All units

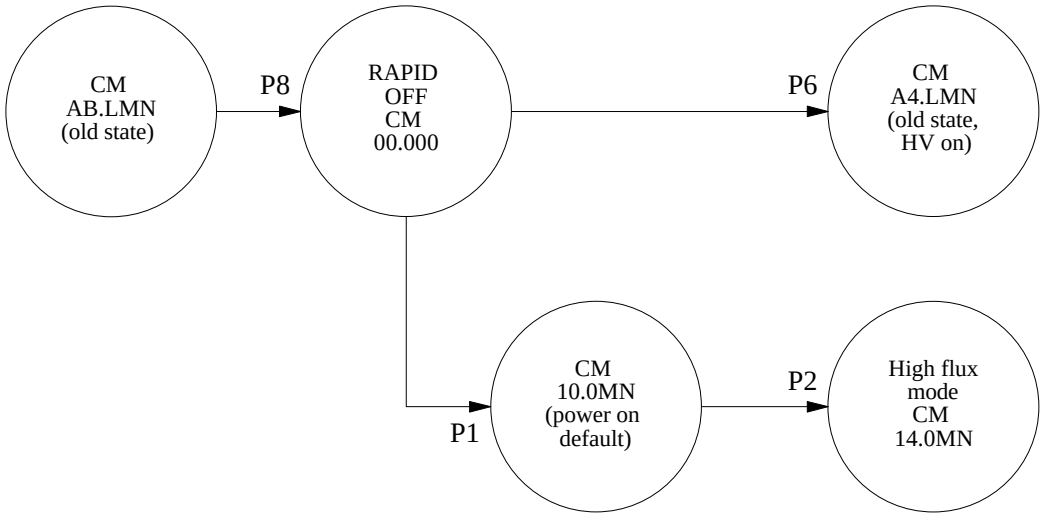
[i] Decision for adequate command is done by S/C operator.
[ii] Address will be provided by RAPID team when needed.
[iii] Data will be provided by RAPID team when needed.
[iv] The sector number is calculated including the *offset* information defined in DS-QMW-TN-0007 Issue 1, Rev 2. This parameter might change during the mission.
[v] The sun pulse offset to the sector boundary is calculated including the *offset* information defined in DS-QMW-TN-0007 Issue 1, Rev 2. This parameter might change during the mission.
[vi] The sector number is calculated including the *offset* information defined in DS-QMW-TN-0007 Issue 1, Rev 2. This parameter might change during the mission.
[vii] The sun pulse offset to the sector boundary is calculated including the *offset* information defined in DS-QMW-TN-0007 Issue 1, Rev 2. This parameter might change during the mission.
[viii] The sector number is calculated including the *offset* information defined in DS-QMW-TN-0007 Issue 1, Rev 2. This parameter might change during the mission.
[ix] The sun pulse offset to the sector boundary is calculated including the *offset* information defined in DS-QMW-TN-0007 Issue 1, Rev 2. This parameter might change during the mission.

A.3.2 Operational Mode transitions (OM)

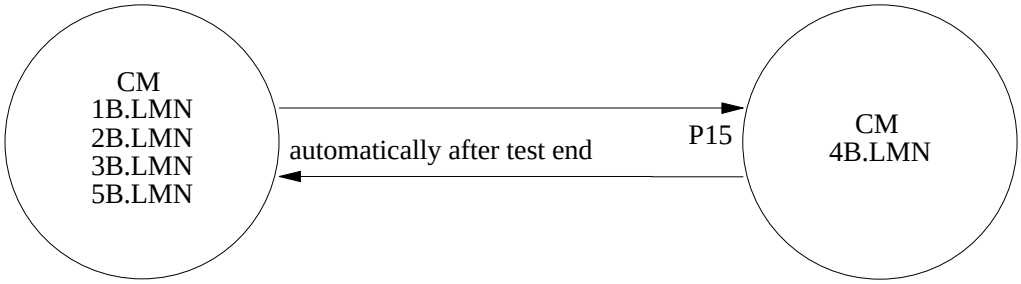


Autoswitching: ies_lo = ies_hi = 03h
No autoswitching: ies_lo = 43h; ies_hi = 40h

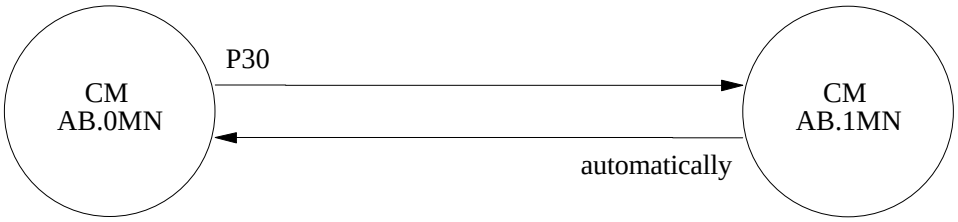
RAPID: Routine operations with required RCPs



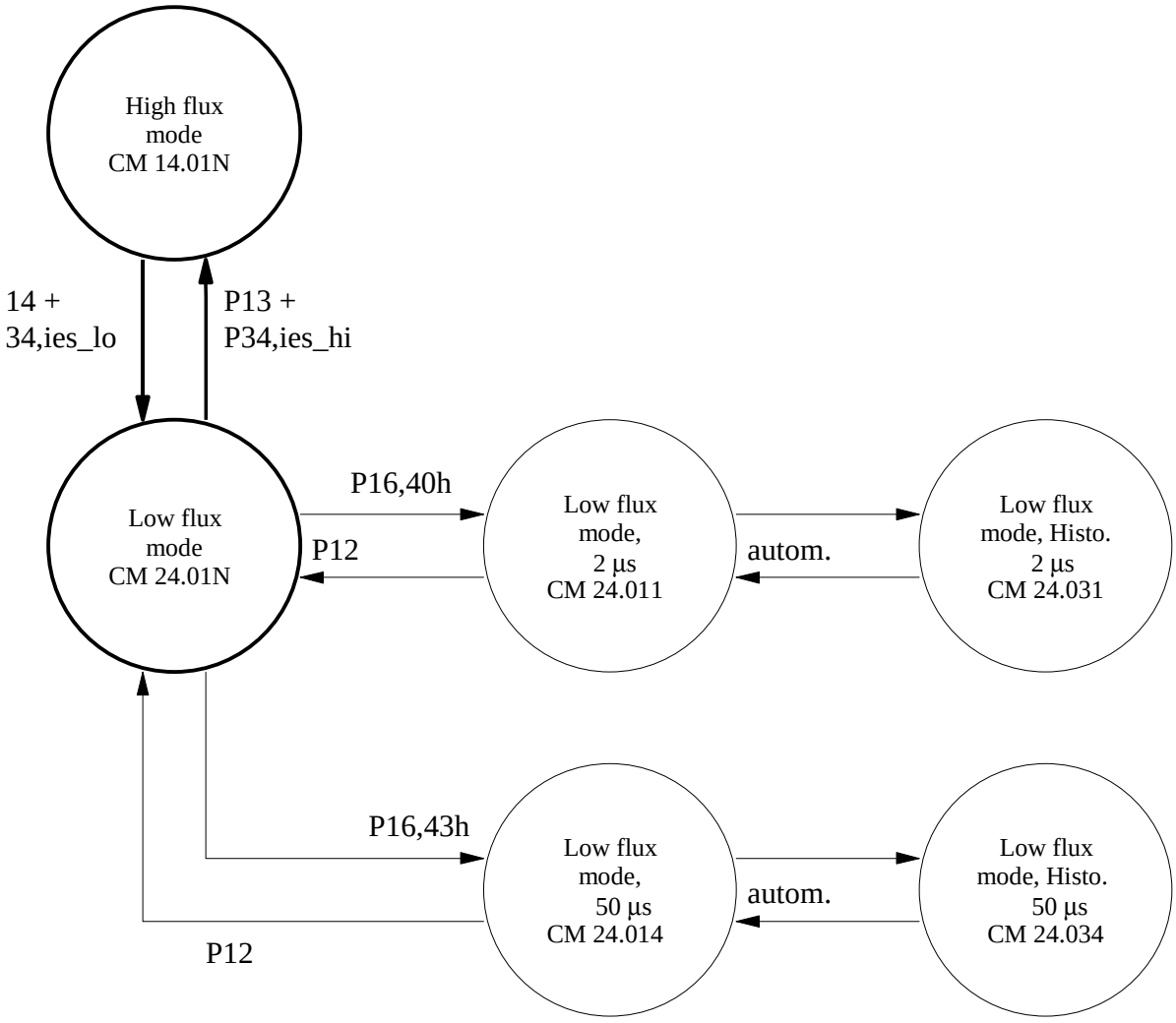
RAPID: power cycle with and without using stored configuration



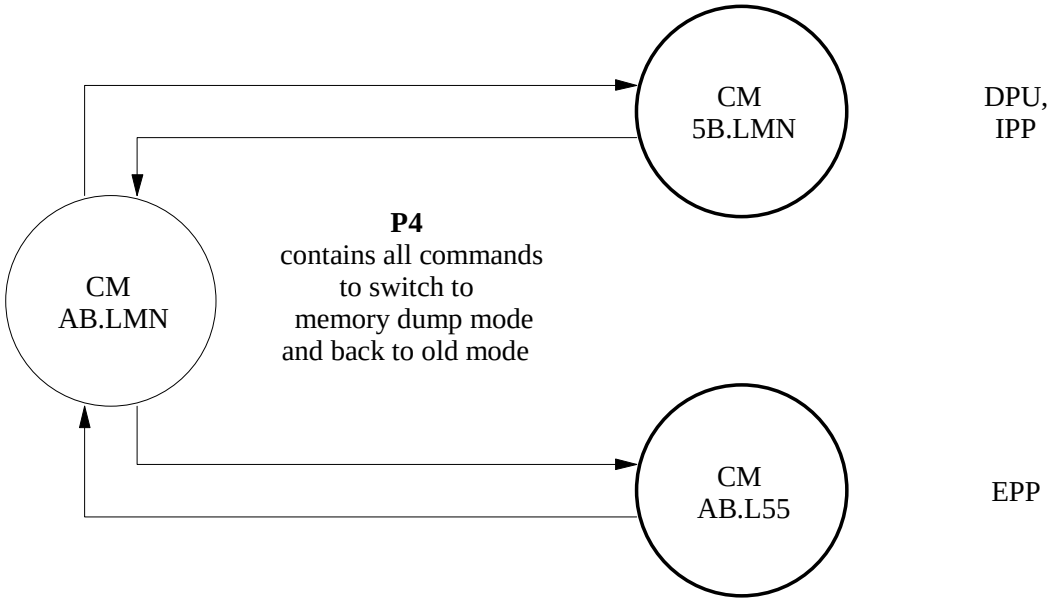
RAPID: In-flight functional test (IFFT) of IIMS



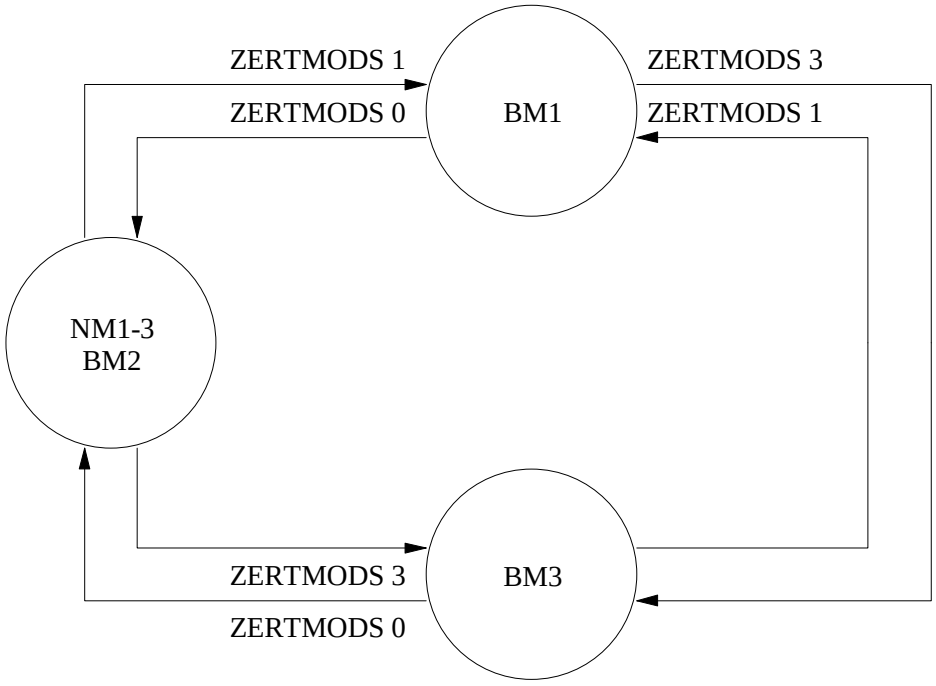
RAPID: IES calibration mode



RAPID: IES histogram mode



RAPID: Memory dump modes



RAPID: TM transitions and required commands