XMM Flight Operation Procedures
(Version 2 and following updates)

Change and comments for the EPIC MOS 1&2 instruments
(EPIC-EST-TN-010)

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This document summarises all the changes to be implemented in the currently existing XMM Flight Operation Procedures relevant to the EPIC MOS instruments (Issue 2 and following updates up to Delta 2.6).
Only the latest Issue of each Procedure or Sequence has been considered. Therefore, in order to avoid repetitions, the changes are sorted in reverse order: from Delta 2.6 back to Delta 2.2 and, eventually, FOP v2.
For each procedure or sequence, it is reported the step where at least one parameter has to be modified: the new parameter value(s) are shown in ***bold slanted*** characters.

Delta 2.6

FCP_EM1_0110 (1,1) - FF FIXED OTS
ES4100 – SET FP TEMP (Step 1)
E0129 "VACUUMSENSORSTAT" = ***OFF***
ES2100 – SET_CCD_VOLTS (Step 2)
Confirm they are the last updated values
ES2600 - SET HBR DEFAULTS (Step 3)
E0079 "FASTPATTERNTHRES" = ***3***
ES2610 - SET_HBR_BPTS (Step 4)
Now these data have been updated
ES2150 - ZERO AND START SEQ PCS (Step 9.6)
E0133 "EMAECOMMANDADDR." = 33 (Sequencer/Port Control for AnChains 1&2)
E0160 "EMAECOMMANDDATUM" = ***129***
ES1400 - CONFIG GENERAL (Step 11)
E0176 "ANCH1/2 INTSIMUL" = 1 (as before, but which means ***AnChain1-Normal-Node0***)

FCP_EM1_7901 (1,1) - LW SUPER ED
ES2150 - ZERO AND START SEQ PCS (Step 6)
E0133 "EMAECOMMANDADDR." = 33 (Sequencer/Port Control for AnChains 1&2)
E0160 "EMAECOMMANDDATUM" = ***129***
ES1400 - CONFIG GENERAL (Step 6.1)
E0176 "ANCH1/2 INTSIMUL" = 1 (as before, but which means ***AnChain1-Normal-Node0***)

FCP_EM1_7902 (1,1) - SW SUPER ED
ES2150 - ZERO AND START SEQ PCS (Step 6)
E0133 "EMAECOMMANDADDR." = 33 (Sequencer/Port Control for AnChains 1&2)
E0160 "EMAECOMMANDDATUM" = ***129***
ES1400 - CONFIG GENERAL (Step 6.1)
E0176 "ANCH1/2 INTSIMUL" = 1 (as before, but which means ***AnChain1-Normal-Node0***)

FCP_EM1_7911 (1,0) - FF SUPER ED FIXED OTS
ES1400 - CONFIG GENERAL (Step 6.1)
E0176 "ANCH1/2 INTSIMUL" = 1 (as before, but which means ***AnChain1-Normal-Node0***)

FCP_EM1_7990 (1,0) - IM SWITCH TO LOW GAIN
ES2801 - SET GAIN LO (Step 3.1)
E0176 "ANCH1/2 INTSIMUL" = 1 (as before, but which means ***AnChain1-Normal-Node0***)

FCP_EM1_7991 (1,0) - TI SWITCH TO LOW GAIN
ES2801 - SET GAIN LO (Step 3.1)
E0176 "ANCH1/2 INTSIMUL" = 1 (as before, but which means ***AnChain1-Normal-Node0***)

SEQ_EM1_2444 (1,0) - SET EDU WINS FF/TI (Step 2)
E0104 "EDU IDENTIFIER" = 0
E0139 "WINDOW X0" = 255
E0140 "WINDOW Y0" = 0
E0141 "WINDOW X SIZE" = 100
E0142 "WINDOW Y SIZE" = 602 (right only for Diagnostic, ***1*** for O&V, ***0*** for Observation)

SEQ_EM1_5500 (1,0) - SW INSTANCES
The maximum memory length for the EMDH memory dump is 7FFF=32767 and not FFFF=65535, therefore the 3 dumps must be performed as follows:

First dump = 0x1A000 to 0x3FFFF
E0051 - DUMP EMDH MEMORY
E0300 "START ADDRESS" = ***106496***
E0301 "LENGTH" = ***32767***
E0051 - DUMP EMDH MEMORY
E0300 "START ADDRESS" = ***139263***
E0301 "LENGTH" = ***32767***
E0051 - DUMP EMDH MEMORY
E0300 "START ADDRESS" = ***172030***
E0301 "LENGTH" = ***32767***
E0051 - DUMP EMDH MEMORY
E0300 "START ADDRESS" = ***204797***
E0301 "LENGTH" = ***32767***
E0051 - DUMP EMDH MEMORY
E0300 "START ADDRESS" = ***237564***
E0301 "LENGTH" = ***24580***

Second dump = 0x9E000 to 0xC8A3B
E0051 - DUMP EMDH MEMORY
E0300 "START ADDRESS" = ***647168***
E0301 "LENGTH" = ***32767***
E0051 - DUMP EMDH MEMORY
E0300 "START ADDRESS" = ***679935***
E0301 "LENGTH" = ***32767***
E0051 - DUMP EMDH MEMORY
E0300 "START ADDRESS" = ***712702***
E0301 "LENGTH" = ***32767***
E0051 - DUMP EMDH MEMORY
E0300 "START ADDRESS" = ***745469***
E0301 "LENGTH" = ***32767***
E0051 - DUMP EMDH MEMORY
E0300 "START ADDRESS" = ***778236***
E0301 "LENGTH" = ***32767***
E0051 - DUMP EMDH MEMORY
E0300 "START ADDRESS" = ***811003***
E0301 "LENGTH" = ***10817***

Last dump = 0xC8A41 to 0xCB538

E0051 - DUMP EMDH MEMORY
E0300 "START ADDRESS" = ***821825***
E0301 "LENGTH" = ***11000***

SEQ_EM1_7036 (1,0) - LW DIAG EXP
The number of expected pixels for the LW diagnostic is 310x300=93000 and not 610x602=367220 as in FF mode. Therefore the sequence has to be changed as follows:

E0006 - ENTER CCDD MODE (Step 3)
E0001 "REJECTED FRAMES" = 5
E0002 "EXP. FRAME PIXEL" = ***93000***

SEQ_EM1_7056 (1,0) - TI DIAGNOSTIC
Since a "frame" in Timing mode is just a binned row, the number of rejected frames has to be changed as follows:

E0006 - ENTER CCDD MODE (Step 3)
E0001 "REJECTED FRAMES" = ***3010***
E0002 "EXP. FRAME PIXEL" = 60200

EVD_EM1_7000 (1,1) - FF SUPER ED
ES2150 - ZERO AND START SEQ PCS (Step 6)
E0133 "EMAECOMMANDADDR." = 33 (Sequencer/Port Control for AnChains 1&2)
E0160 "EMAECOMMANDDATUM" = ***129***
ES1400 - CONFIG GENERAL (Step 6.1)
E0176 "ANCH1/2 INTSIMUL" = 1 (as before, but which means ***AnChain1-Normal-Node0***)
ES1500 - FF INT TIME (Step 6.4)
E0148 "EMCRGROUP1INTTIM" = **2.6** sec
E0149 "EMCRGROUP2INTTIM" = **2.6** sec
E0150 "EMCRGROUP3INTTIM" = **2.6** sec
E0151 "EMCRGROUP4INTTIM" = **2.6** sec

Delta 2.5

FCP_EM1_1109 (1,3) - OFFSET VARIANCE
ES2150 - ZERO AND START SEQ PCS (Step 2.6)
E0133 "EMAECOMMANDADDR." = 33 (Sequencer/Port Control for AnChains 1&2)
E0160 "EMAECOMMANDDATUM" = ***129***
ES1400 - CONFIG GENERAL (Step 2.8)
E0176 "ANCH1/2 INTSIMUL" = 1 (as before, but which means ***AnChain1-Normal-Node0***)
ES2150 - ZERO AND START SEQ PCS (Step 11)
E0133 "EMAECOMMANDADDR." = 33 (Sequencer/Port Control for AnChains 1&2)
E0160 "EMAECOMMANDDATUM" = ***129***

FCP_EM1_1114 (1,3) – THRESHOLD
ES1400 - CONFIG GENERAL (Step 2.7)
E0176 "ANCH1/2 INTSIMUL" = 1 (as before, but which means ***AnChain1-Normal-Node0***)
At Step 2.8 " Set integration time", sequence **EE1500 -** FF INT TIME must be replaced with **EE1504 -** RFS INT TIME, since the Refreshed Frame Store EMAE sequences were uploaded.

FCP_EM1_1124 (1,0) - THRESHOLD LO GAIN
In order to readout data in Low Gain mode from Node 0 of all CCDs, the following changes must be implemented:
EE1401 - CONFIG CCD1 (Step 2.6)
E0133 "EMAECOMMANDADDR." = 33 (Sequencer/Port Control for AnChains 1&2)

E0160 "EMAECOMMANDDATUM" = ***130***
E0133 "EMAECOMMANDADDR." = 97 (Sequencer/Port Control for AnChains 3&4)
E0160 "EMAECOMMANDDATUM" = ***130***
E0133 "EMAECOMMANDADDR." = 161 (Sequencer/Port Control for AnChains 5&6)
E0160 "EMAECOMMANDDATUM" = ***130***
E0133 "EMAECOMMANDADDR." = 225 (Sequencer/Port Control for AnChains 7&8)
E0160 "EMAECOMMANDDATUM" = ***130***

ES1400 - CONFIG GENERAL (Step 2.7)
E0215 ' ' ANCHAIN2PWON/OFF' ***ON***
E0214 ' ' ANCHAIN1PWON/OFF' ***OFF***
E0176 "ANCH1/2 INTSIMUL" = ***2*** (Analogue Chain2_/10 - Node 0)
E0183 "ANCH3/4 INTSIMUL" = ***2*** (Analogue Chain_/10 - Node 0)
E0190 "ANCH5/6 INTSIMUL" = ***2*** (Analogue Chain_/10 - Node 0)
E0197 "ANCH7/8 INTSIMUL" = ***2*** (Analogue Chain_/10 - Node 0)

EE2411 - SET_EDU_THRESHOLDS-ZERO (Step 2.9)
E0112 ' ' EDU 0 OPER. MODE' ***STOP***
E0113 ' ' EDU 1 OPER. MODE' ***RUN***

EE2430 - ZERO_NORM_OFFSET_TABLES (Step 2.11)
E0104 ' ' EDU IDENTIFIER' ' = 1
E0108 ' ' OST IDENTIFIER' ' = 0
E0105 ' ' EDU ZONE' ***NORMAL AREA***

EE7115 - FF OFFSET CCD1 (Step 3.1)
E0039 "HBR 1 PROCESSING" = ***DISABLED***
E0040 "HBR 2 PROCESSING" = ***TRANSPARENT***
E0104 ' ' EDU IDENTIFIER' ***1*** =
E0108 ' ' OST IDENTIFIER' ' = 7
E0105 ' ' EDU ZONE' ' = NORMAL AREA

EE2415 - SET EDU THRESHOLDS – TH (Step 10)
E0112 ' ' EDU 0 OPER. MODE' ***STOP***
E0120 ' ' EDU 0 SCIEN.MODE' ***TRANSPARENT***
E0113 "EDU 1 OPER. MODE" = ***RUN***
E0121 "EDU 1 SCIEN.MODE" = ***THRESHOLD***

EE7123 - TH START EXP (Step 11.1)
E0039 ' ' HBR 1 PROCESSING' ***DISABLED***
E0040 ' ' HBR 2 PROCESSING' ***EDU THRESH***.

At Step 2.8 " Set integration time", sequence **EE1500 -** FF INT TIME must be replaced with **EE1504 -** RFS INT TIME, since the Refreshed Frame Store EMAE sequences were uploaded.

FCP_EM1_1201 (1,0) - SLEW START
ES1400 - CONFIG GENERAL (Step 1.4)
E0176 "ANCH1/2 INTSIMUL" = 1 (as before, but which means ***AnChain1-Normal-Node0***)

FCP_EM1_7900 (1,0) - FF SUPER ED
ES1400 - CONFIG GENERAL (Step 6.1)
E0176 "ANCH1/2 INTSIMUL" = 1 (as before, but which means ***AnChain1-Normal-Node0***)
ES1500 - FF INT TIME (Step 6.4)
E0148 "EMCRGROUP1INTTIM" = ***2.6*** sec
E0149 "EMCRGROUP2INTTIM" = ***2.6*** sec
E0150 "EMCRGROUP3INTTIM" = ***2.6*** sec
E0151 "EMCRGROUP4INTTIM" = ***2.6*** sec

Delta 2.2

FCP_EM1_1102 (1,3) - LARGE WINDOW
ES1400 - CONFIG GENERAL (Step 2.4)
E0176 "ANCH1/2 INTSIMUL" = 1 (as before, but which means ***AnChain1-Normal-Node0***)

FCP_EM1_1103 (1,3) - SMALL WINDOW
ES1400 - CONFIG GENERAL (Step 2.4)
E0176 "ANCH1/2 INTSIMUL" = 1 (as before, but which means ***AnChain1-Normal-Node0***)

FCP_EM1_1104 (1,3) – TIMING
ES1400 - CONFIG GENERAL (Step 2.4)
E0176 "ANCH1/2 INTSIMUL" = 1 (as before, but which means ***AnChain1-Normal-Node0***)
EE1520 - TI INT TIME (Step 2.5)
E0148 "EMCRGROUP1INTTIM" = 102.4 sec
E0149 "EMCRGROUP2INTTIM" = ***2.6*** sec
E0150 "EMCRGROUP3INTTIM" = ***2.6*** sec
E0151 "EMCRGROUP4INTTIM" = ***2.6*** sec
EE7415 - TI OFFSET CCD1 (Step 3.1)
E0139 ' ' WINDOW X0' ***255***
E0246 ' ' INITIAL MEDIAN' ***100***
E0247 ' ' INITIAL SIGMA' ***20***
EE1441 - TI CONFIG CCD1 (Step 10.3)
E0142 ' ' WINDOW Y SIZE' ***0*** (to be considered as 1024)

FCP_EM1_1106 (1,4) - LARGE WINDOW FREE RUNNING
ES1400 - CONFIG GENERAL (Step 2.4)
E0176 "ANCH1/2 INTSIMUL" = 1 (as before, but which means ***AnChain1-Normal-Node0***)
EE1520 - TI INT TIME (Step 2.5)
E0148 "EMCRGROUP1INTTIM" = 102.4 sec
E0149 "EMCRGROUP2INTTIM" = ***2.6*** sec
E0150 "EMCRGROUP3INTTIM" = ***2.6*** sec
E0151 "EMCRGROUP4INTTIM" = ***2.6*** sec

FCP_EM1_1107 (1,3) - SMALL WINDOW FREE RUNNING
ES1400 - CONFIG GENERAL (Step 2.4)
E0176 "ANCH1/2 INTSIMUL" = 1 (as before, but which means ***AnChain1-Normal-Node0***)
EE1520 - TI INT TIME (Step 2.5)
E0148 "EMCRGROUP1INTTIM" = 102.4 sec
E0149 "EMCRGROUP2INTTIM" = ***2.6*** sec
E0150 "EMCRGROUP3INTTIM" = ***2.6*** sec
E0151 "EMCRGROUP4INTTIM" = ***2.6*** sec

FCP_EM1_1108 (1,3) - TIMING COMPRESSED
ES1400 - CONFIG GENERAL (Step 2.4)
E0176 "ANCH1/2 INTSIMUL" = 1 (as before, but which means ***AnChain1-Normal-Node0***)
EE1520 - TI INT TIME (Step 2.5)
E0148 "EMCRGROUP1INTTIM" = 102.4 sec
E0149 "EMCRGROUP2INTTIM" = ***2.6*** sec
E0150 "EMCRGROUP3INTTIM" = ***2.6*** sec
E0151 "EMCRGROUP4INTTIM" = ***2.6*** sec

EE7415 - TI OFFSET CCD1 (Step 3.1)

E0139 ' ' WINDOW X0' ***255***
E0246 ' ' INITIAL MEDIAN' ***100***
E0247 ' ' INITIAL SIGMA' ***20***

EE1441 - TI CONFIG CCD1 (Step 10.3)
E0142 ' ' WINDOW Y SIZE' ***0*** (to be considered as 1024)

FCP_EM1_1111 (1,3) - DOUBLE NODE
ES1410 - CONFIG GENERAL - D.N. (Step 2.4)
E0176 "ANCH1/2 INTSIMUL" = 1 (as before, but which means ***AnChain1-Normal-Node0***)
EE7515 - DN OFFSET CCD1 (Step 3)
E0141 ' ' WINDOW X SIZE' ***310***
E0243 ' ' CCD MODE' ***IMAGINGWINDOW***
E0250 ' ' FIELD OF VIEW P1' ***0***
E0251 ' ' FIELD OF VIEW P2' ***0***
E0252 ' ' FIELD OF VIEW P3' ***0***
E0253 ' ' FIELD OF VIEW P4' ***0***
E0254 ' ' FIELD OF VIEW P5' ***0***
E0255 ' ' FIELD OF VIEW P6' ***0***
E0256 ' ' FIELD OF VIEW P7' ***0***
E0257 ' ' FIELD OF VIEW P8' ***0***
E0300 ' ' START ADDRESS' ***80432***
E0300 ' ' START ADDRESS' ***80738***
EE7525 - DN OFFSET CCD1 ALTERNATE (Step 4)
E0141 ' ' WINDOW X SIZE' ***310***
E0242 ' ' READOUT NODE' ***1***
E0243 ' ' CCD MODE' ***IMAGINGWINDOW***
E0250 ' ' FIELD OF VIEW P1' ***0***
E0251 ' ' FIELD OF VIEW P2' ***0***
E0252 ' ' FIELD OF VIEW P3' ***0***
E0253 ' ' FIELD OF VIEW P4' ***0***
E0254 ' ' FIELD OF VIEW P5' ***0***
E0255 ' ' FIELD OF VIEW P6' ***0***
E0256 ' ' FIELD OF VIEW P7' ***0***
E0257 ' ' FIELD OF VIEW P8' ***0***
E0300 ' ' START ADDRESS' ***80432***
E0300 ' ' START ADDRESS' ***80738***

FCP_EM1_1120 (1,1) - DIAGNOSTIC RPP
ES1400 - CONFIG GENERAL (Step 2.6)
E0176 "ANCH1/2 INTSIMUL" = 1 (as before, but which means ***AnChain1-Normal-Node0***)

SEQ_EM1_1503 (1,0) - DN INT TIME
E0152 ' ' EMCR2FIRSTCYCDEL' ***0*** sec

SEQ_EM1_2422 (2,1) - SW PATCH OT
EU055 - LOAD TABLES TC3 (Step 3.1)
E0300 "START ADDRESS" = ***80788***

SEQ_EM1_2423 (2,1) - LW PATCH OT
EU055 - LOAD TABLES TC3 (Step 3.1)
E0300 "START ADDRESS" = ***80888***

SEQ_EM1_2424 (2,1) - DN PATCH OT

EU055 - LOAD TABLES TC3 (Step 2.1)
E0300 "START ADDRESS" = ***80432***
EU055 - LOAD TABLES TC3 (Step 3.1)
E0300 "START ADDRESS" = ***80738***

SEQ_EM1_7215 (2,0) - FF OFFSET CCD1N2
E0005 - ENTER O MODE (Step 5)
E0242 ' ' READOUT NODE' ***1*** =

SEQ_EM1_7245 (2,0) - TI OFFSET CCD1
E0005 - ENTER O MODE (Step 5)
E0139 ' ' WINDOW X0' ***255***
E0246 ' ' INITIAL MEDIAN' ***100***
E0247 ' ' INITIAL SIGMA' ***20***=

FOP v2

FCP_EM1_0010 (1,2) - BASIC CONFIG.
ES4100 - SET FP TEMP (Step 1)
E0129 "VACUUMSENSORSTAT" = ***OFF***

FCP_EM1_0100 (1,2) - REF. CONFIG.
ES2150 - ZERO AND START SEQ PCS (Step 4.6)
E0133 "EMAECOMMANDADDR." = 33 (Sequencer/Port Control for AnChains 1&2)
E0160 "EMAECOMMANDDATUM" = ***129***

FCP_EM1_1101 (1,2) - PRIME FULL WINDOW
EE1400 - CONFIG GENERAL (Step 2.4)
E0176 "ANCH1/2 INTSIMUL" = 1 (as before, but which means ***AnChain1-Normal-Node0***)
EE1500 - FF INT TIME (Step 2.5)
E0148 "EMCRGROUP1INTTIM" = ***2.6*** sec
E0149 "EMCRGROUP2INTTIM" = ***2.6*** sec
E0150 "EMCRGROUP3INTTIM" = ***2.6*** sec
E0151 "EMCRGROUP4INTTIM" = ***2.6*** sec

FCP_EM1_1110 (1,2) – DIAGNOSTIC
EE1400 - CONFIG GENERAL (Step 2.4)
E0176 "ANCH1/2 INTSIMUL" = 1 (as before, but which means ***AnChain1-Normal-Node0***)
EE1500 - FF INT TIME (Step 2.5)
E0148 "EMCRGROUP1INTTIM" = ***2.6*** sec
E0149 "EMCRGROUP2INTTIM" = ***2.6*** sec
E0150 "EMCRGROUP3INTTIM" = ***2.6*** sec
E0151 "EMCRGROUP4INTTIM" = ***2.6*** sec