XMM Optical Monitor

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XMM-OM (EM) INTEGRATED FUNCTIONAL TEST PROCEDURE

Document Number: XMM-OM/MSSL/SP/0146.05 12 February 1998

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Contents

Tables

1.0 Scope

The test procedure is applicable to the engineering model optical monitor test during the spacecraft integration and test phases.

The procedures will be conducted from the spacecraft EGSE, whereby the OM instrument station will follow the telecommand and telemetry transfer to and from the instrument. Analysis of science data will be performed on the OM instrument-station.

Only the prime interface of the optical monitor is used, no redundant testing will be performed.

2.0 Documentation

2.1 Applicable documents

2.2 Reference documents
Telecommand and telemetry document
Vx works command document (applicable to all italic and bracketed comments)

3.0 General requirements

3.1 Environmental conditions
No specific environmental conditions are envisaged other than those applicable for the XMM satellite.

3.2 Safety precautions
T.B.D

3.3 All packets of type, subtype 3,2, 3,3, 4,2 and 4,3 should invalidate the test.

File: ProcV2-2.DOC

Test Conductor .... Date ....

4.0 Test Procedures

The table below provides an overview of the test procedure to be used for the tests at spacecraft level.

The procedures are applicable to the engineering model of XMM-OM only.
Only the prime interface will be tested.

Description	To be performed	Test Sequence	Procedure
Interface test (prime) Estimated test time 20 minutes	AFT	Switch-on prime Boot mode test Switch-off	5.0 (ehmod_pwr_on) 5.1 (ehmod_boot_test) 5.8 (ehmod_pwr_off)
Short Functional Test (Prime) Estimated test time 30 minutes		Switch-on prime Boot mode test Switch to operational Filter wheel test Heater test Switch-off	5.0 5.1 5.2 (ehist_operation) 5.3 (ehist_fwl_test) 5.5 (ehist_htr_test) 5.8
Full Functional Test (Prime) Estimated test time 240 minutes		Switch-on prime Boot mode test Switch to operational Filter wheel test Dichroic test** Heater test Image Test (multiple window) Image test (full frame) Switch-off	5.0 5.1 5.2 5.3 5.4 (ehist_dic_test) 5.5 5.6 (ehist_img_multi) 5.7 (ehist_img_full) 5.8

** The Dichroic mechanism is a limited life system and must not be rotated more than tbd times.

The following section provides a detailed description of the test sequences to be used for testing of the optical monitor instrument.

Pass/Fail criteria

The following pass/fail criteria are applicable for all the tests performed on the OM:

- If one of the TC error packets is received the test shall be halted followed by a review board.
- TM parameters mentioned in the procedure will be checked. If not correct the test will be halted followed by a review board
- The test will be stopped if any TM parameter exceeds the defined limits.

5.0 Switch-on Test (Prime)

Description
Switch-on procedure for the OM prime.
Switch-on the OM prime power and prime keep-alive line and check for HK data.

Initial state
The OM is switched off (KAL prime can be on).

Final State
The OM prime is switched on and in basic mode.

Step	Action	TC/TM	Remarks	Pass	Notes
0	Initial State: OM 28V power switched off KAL line on				
1 1.1 1.2 1.3	Switch-on OM prime power Switch-off the S/C heater (if not switched off before) Switch-on 28V prime Switch-on KAL prime (if not switched on before)		Filter wheel to course S/C procedure S/C procedure S/C procedure		
2 2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8 2.9	Check Housekeeping Ensure HK monitor prog working Verify basic mode is operational Verify heaters are on Check DEMPSU +5VDPU +5VICU KAL ICU KAL DPU ICB Status Watchdog status (RBI config reg)	 90000	(HK Valid after 15 second) pref H5395 = 0 pref H5240 =ononoffoff pref H5365 = +5V (F)* pref H5370 = +5V (F)* pref H5375 = +3.3 (D)* pref H5380 = +3.3 (D)* pref H5320 = 0 pref H5345 = 1		
3 3.1 3.2 3.3	OM prime power measure OM +28V voltage and current (prime) Measure OM KAL voltage and current (prime) Compare with table 1		 S/C procedure report: voltage and current S/C procedure report: voltage and current		
4	Exit				

* All Voltage ranges are +/- 0.5V. Information in brackets is the real value in hex.

Power line	Voltage	Current
+28V main power	+28V +/- 2V	1750mA +/- 20mA
Keep Alive Line	+8V +/- 1V	<18mA

Table 1: OM power consumption (basic mode)

5.1 Basic Mode Test

Description
The function of the OM is tested in the basic mode test without loading the main application software (operational mode).
Dump IC memory and verify the operation of the KAL memory.

Initial state
The OM (prime) is switched on and in basic mode.

Final state
The OM (prime) is switched on and in basic mode.

Step	Action	TC/TM	Remarks	Pass	Notes
0	Initial State: OM (prime) is switched on and in basic mode KAL power line is on				
1 1.1 1.2 1.3 1.4	Check test command Send in-valid command *(tc_send)* Check packet response Check HK (bad TC counter) Send valid command *(tc_test)* Check packet response Check HK	 TC(0,0) 91202 90000 H1 91100 90000	 TM (3,2) Pref H5390 = 1 TM (3,1) Pref H5385 = 1		
2 2.1 2.2 2.3 2.4	Dump and verify KAL is OK Dump instruction space Address 0X4000 = Start Length = 16 (10 Hex) Words Compare contents: 85D0, 6ECB, 8320, 0906, B122 4820, 400E, 4800, 4007, 8520, FD40, 4820, 2000, 4810, 2002, B700, 0D00, 0D02, 0D04, 85F0	 H4100 94201			
3	IF memory contents is O.K the goto section 5.2, step 1.3. If memory contents is incorrect goto section 5.2, step 1.1.		If KAL O.K skip ICU load IF KAL bad re-load ICU		
3	Run supplementary test and exit				

Supplementary Low Level Test (for Basic and Operational)

Step	Action	TC/TM	Remarks	Pass	Notes
1.1	Send invalid type (15,3)				
1.2	Send invalid sub-type (5,15)				
1.3	Send wrong checksum				
2.1	Watchdog off		H5345		
2.2	RBI suspend		D6203		
2.3	Use RBI write to write a few words of data to 0xfc0		D3920		
2.4	Read back memory and compare		D3921		
2.5	RBI go		D7204		
2.6	Watchdog on		H5510		

5.2 Operational Mode Test

Description
The function of the OM is tested in the operational mode test.
Switch on secondary rail of OM-1 and test operation.
Test operation of DPU.

Initial state
The OM (prime) is switched on and in basic mode.

Final state
The OM (prime) is switched on and in operational mode.

Step	Action	TC/TM	Remarks	Pass	Notes
0	Initial state: OM switched on and in basic mode KAL power line is on				
1 1.1 1.2 1.3 1.4 1.5 1.6	Switch to operational mode Load main operational code *(< load_icu)* Check HK packet counter has increased by 168. Start Operational mode *(tc_mode 1) not acknowledged by* *TM (3,1)* Verfiy operational mode started Send test packet Check TM received (verify in operational mode)	 91100 90000 H9001 90000 H1 91100	 File : 'load ICU' [4] Pref H5385 = ++168 (hex) Pref H5390 = 1(hex) Pref H0410 = 1 (hex) Pref H5395 = 1 (hex)		
2 2.1 2.2	Verfify OM-1 secondary rails on Measure OM +28V voltage and current (prime) Compare with table 2		 S/C procedure report: voltage and current		
4 4.1 4.2 4.3 4.4 4.5 4.6 4.7 4.8 4.9 4.10 4.11 4.12	Check Housekeeping +28V secondary rail current (N/S) +5V secondary rail current (N/S) +25V secondary rail current +15V secondary rail current +11V secondary rail current +5.3V secondary rail current -5.3V secondary rail current -15V secondary rail current Heater status Check DEMPSU +5VDPU +5VICU KAL ICU	90000	 Pref H5310 = 2200mA [2] or = 1350 mA [2] Pref H5315 = 50mA [2] Pref H5280 = 47mA [2] Pref H5285 = 60 mA [2] Pref H5290 = 142 mA [2] Pref H5295 = 900 mA [2] Pref H5300= 548 mA [2] Pref H5305= 60 mA [2] Pref H5240 = onoffoffoff or = ononoffoff Pref H5365 = +5V [3] Pref H5370 = +5V [3] Pref H5380 = +3.3 V [3]		

4.13 4.14 4.15	KAL DPU ICB Status Watchdog status		Pref H5375 = +3.3 V [3] Pref H5320 = 0 (enable) Pref H5340 = 1 (enable)		
5 5.1 5.2 5.3 5.4 5.5 5.6	Test DPU (start-up sequence) Send DPU reset *(tc_reset_dsp)* Check TC received Examine HK heart beat count **Only for full functional test ….** Load DPU code procedure *(< load_dpu)* Send Load DPUOS Check TC Received	 H7201 91100 92201 90000 H7202 91100 92202	 'Packet received' Pref H7510 = 91 (hex) Pref H5410 (incrementing every 10 seconds) Ref: DPU Load Script Pref H7510 = 92 (hex) 'DPU OS ready'		
6	Run supplementary test and exit				

1 Step 5.4 and 5.5 should only be followed when performing a full functional test.
2 All currents should be within the nominal range +/- 15mA.
3 All voltages should be within the nominal range +/- 0.5V
4 There will be no telemetry command echo following this command.

Power Rail	Voltage	Current
+28V line	+28V +/- 2V	1350(onoffoffoff) -2250 (ononoffoff)
Keep Alive Line	+8V +/- 1V	8mA +/- 3mA

Table 2: OM power consumption (with OM-1 secondaries on)

Rail (V)	M	C
Pref H5365 (+5V DMPSU)	0.33	0
Pref H5370 (+5VICU)	0.33	0
Pref H5380 (KAL ICU)	0.25	0
Pref H5375 (KAL DPU)	0.25	0

Table 3: OM DEM Engineering data

Secondary Rail (mA)	M	C
Pref H5310 (+28V current N/S)	43.14	0
Pref H5315 (+5V current N/S)	0.98	0
Pref H5280 (+25V current)	0.34	0
Pref H5285 (+15V current)	0.48	0
Pref H5290 (+11V current)	1.35	0
Pref H5295 (+5.3V current)	6.2	0
Pref H5300 (-5.3V current)	-10.5	0
Pref H5305 (-15V current)	-1.1	0

Table 4: TMPSU Secondary current engineering data

Tables 3 and 4 provide coefficients from which real engineering values may be extracted using the equation of a straight line (Y= MX + C).

5.3 Filter Wheel Control Test

Description
The function of the OM filter wheel operation is tested in operational mode.
Command search for coarse sensor.
Command search for datum position.

Initial state
The OM (prime) is switched on and in operational mode.

Final state
The OM (prime) is switched on and in operational mode with filter wheel in datum position.

Step	Action	TC/TM	Remarks	Pass	Notes
0	Initial state: OM switched on and in operational mode KAL power line is on				
1 1.1 1.2 1.3 1.4	Test of filter wheel coarse command Command F/W off coarse sensor *(tc_fw_rel_steps 1000)* *(tc_fw_move)* Examine HK Command F/W to coarse sensor *(tc_fw_to_coarse)* *(tc_fw_move)* Examine HK	 H7606 H5600 92600 90000 H7609 H5600 92600 90000	 Pref H0290 = 1000 (dec) Pref H7010 = 60 (hex) Pref H5250 = 0 Pref H5150 = 0 Pref H7010 = 60 (hex) Pref H5250 = 1		
2 2.1 2.2	Test of filter wheel datum command Command F/W to datum *(tc_fw_to_datum)* *(tc_fw_move)* Examine HK	 H7608 H5600 92600 90000	 Pref H7010 = 60 (hex) Pref H5150 = 1 Pref H5265 = 0		
3	Exit				

WARNING
The Filter wheel is a limited life time device. Each rotation of the filter wheel must be recorded in the instrument log book for the flight model only.

5.4 Dichroic Control Test (beam deflector)

Description
The function of the OM dichroic (beam deflector) is tested in operational mode
Command dichroic to rotate clockwise through full movement.
Command dichroic to rotate anti-clockwise through full movement.

Initial state
The OM (prime) is switched on and in operational mode.

Final state
The OM (prime) is switched on and in operational mode.
The dichroic is at 'prime' interface position.

Step	Action	TC/TM	Remarks	Pass	Notes
0	Initial state: OM switched on and in operational mode KAL power line is on OM-1 secondary rails are on				
1 1.1 1.2 1.3 1.4	Test of dichroic command rotate clockwise Set-up dichroic full clockwise *(tc_dm_direction 1,0)* Command dichroic to move *(tc_dm_move)* Examine TM Examine HK for steps in last movement	 H7650 H5650 92600 90000	 Pref H0370 = 1 Pref H0375 = 0 Pref H7010 = 61 (hex) Pref H5275 = 32 (dec)		
2 2.1 2.2 2.3 2.4 2.5	Test of dichroic command rotate anti-clockwise Set-up dichroic full anti-clockwise *(tc_dm_direction -1,0)* Command dichroic to move *(tc_dm_move)* Wait up to 20 seconds Examine TM (test for event) Examine HK	 H7650 H5650 92600 90000	 Pref H0370 = -1 Pref H0375 = 0 Pref H7010 = 61 (hex) Pref H5275 = -31 (dec)		
3	Exit				

WARNING
The Dichroic is a limited life time device. Each movement of the dichroic wheel must be recorded in the instrument log book for the flight model instrument.

5.5 Heater Control Test

Description
The function of the heaters is tested in operational mode.
Each of the four main heaters are cycled on/off in turn.

Initial state
The OM (prime) is switched on and in operational mode.

Final state
The OM (prime) is switched on and in operational mode.

Step	Action	TC/TM	Remarks	Pass	Notes
0	Initial state: OM switched on and in operational mode KAL power line is on				
1 1.1	Prepare for heater switching Disable open loop control algorithm *(tc_heater_stop)* Examine TM Examine HK	 H6670 91100 90000	 Pref H5240 = 0		
2 2.1 2.2 2.3 2.4 2.5	Switch-on heater 1 (Main I/F) *(tc_heater_config 8)* Examine HK Measure S/C +28V voltage and current (prime) Compare with table 5 Switch-off heater 1 *(tc_heater_config 0)* Examine HK	 H7660 90000 H7660 90000	 Pref H0380 = onoffoffoff Pref H5240 = onoffoffoff S/C procedure report: voltage and current Pref H0380 = offoffoffoff Pref H5240 = offoffoffoff		
3 3.1 3.2 3.3 3.4 3.5 3.6	Switch on heater 2 (forward tube) Switch-on heater 2 *(tc_heater_config 4)* Examine HK Measure S/C +28V voltage and current (prime) Compare with table 5 Switch-off heater 2 *(tc_heater_config 0)* Examine HK	 H7660 90000 H7660 90000	 Pref H0380 = offonoffoff Pref H5240 = offonoffoff S/C procedure report: voltage and current Pref H0380 = offoffoffoff Pref H5240 = offoffoffoff		
4. 4.1 4.2 4.3 4.4 4.5	Switch on heater 3 (metering rods) Switch-on heater 3 *(tc_heater_config 2)* Examine HK Measure S/C +28V voltage and current (prime) Compare with table 5 Switch-off heater 3 *(tc_heater_config 0)*	 H7660 90000 H7660	 Pref H0380 = offoffonoff Pref H5240 = offoffonoff S/C procedure report: voltage and current Pref H0380 = offoffoffoff		

4.6	Examine HK	90000	Pref H5240 = offoffoffoff		
5 5.1 5.2 5.3 5.4 5.5 5.6	Switch on heater 4 (secondary mirror) Switch-on heater 4 *(tc_heater_config 1)* Examine HK Measure S/C +28V voltage and current (prime) Compare with table 5 Switch-off heater 4 *(tc_heater_config 0)* Examine HK	 H7660 90000 H7660 90000	 Pref H0380 = offoffoffon Pref H5240 = offoffoffon S/C procedure report: voltage and current Pref H0380 = offoffoffoff Pref H5240 = offoffoffoff		
6 6.1	Disable heater switching Enable open loop control algorithm *(tc_heater_start)*	 H5670			
7	Exit				

Heater	+28V Current (prime)
1 (Main Interface)	1405mA +/- 100mA
2 (Forward tube)	1633mA +/- 100mA
3 (Metering Rods)	1055mA +/- 100mA
4 (Secondary Mirror)	950mA +/- 100mA
Disable Heater Algorithm	822mA +/- 100mA

Table 5 Heater switching power profile

5.6 Image Acquisition Test - Multiple Window

Description
The function of the OM Image acquisition is tested in operational mode.
A multiple window image will be acquired and dumped to the instrument work station.

Initial state
The OM (prime) is switched on and in operational mode.
OM-1 secondary rails are switched on.

Final state
The OM (prime) is switched on and in operational mode.

Step	Action	TC/TM	Remarks	Pass	Notes
0	Initial state: OM switched on and in operational mode KAL power line is on OM-1 secondary rails are on				
1	Complete DPU reset *(< expose_window)*				
1.1	Send DPU reset	H7201			
1.2	Check TM received	91100 92201			
1.3	Enable DPUOS code	H7202	Pref H7510 = 91 (hex)		
1.4	Check TM received	91100 92202	 Pref H7510 = 92 (hex)		
1.5	Enable blue 1 dsp	H7207	Pref H0270 = 2 Pref H0520 = 0 Pref H0530 = 1 Exception BD[1]		
	Enable blue 2 dsp	H7207	Pref H0270 = 2 Pref H0520 = 1 Pref H0530 = 1		
	Enable red dsp	H7207	Pref H0270 = 2 Pref H0520 = 2 Pref H0530 = 1		
	Init DPU	H7248			
	Wait 2 minutes				
	Check for event	92210	H7520 = A520 (hex)		
2	Prepare DPU for image acquisition				
2.1	Set exposure number	H7238	Pref H0270 = 2 Pref H0520 = 0001		
2.2	Load DPU det window 0 param	H7245	Table 5.6-3 Window 0		
2.3	Load DPU det window 1 param	H7245	Table 5.6-3 Window 1		
2.4	Load DPU det window 2 param	H7245	Table 5.6-3 Window 2		
2.5	Load DPU det window 3 param	H7245	Table 5.6-3 Window 3		
2.6	Load DPU det window 4 param	H7245	Table 5.6-3 Window 4		
2.7	Load DPU det window 5 param	H7245	Table 5.6-3 Window 5		
2.8	Load DPU det window 6 param	H7245	Table 5.6-3 Window 6		

2.9 2.10 2.11 2.12 2.13 2.14 2.15 2.16 2.17 2.18 2.19 2.20	Load DPU det window 7 param Load DPU det window 8 param Load DPU det window 9 param Load DPU det window 10 param Load DPU det window 11 param Load DPU det window 12 param Load DPU det window 13 param Load DPU det window 14 param Load DPU det window 15 param Transfer constants to blue DSP Start blue 1 event processing Start blue 2 event processing	H7245 H7245 H7245 H7245 H7245 H7245 H7245 H7245 H7245 H7211 H7208 H7208	Table 5.6-3 Window 7 Table 5.6-3 Window 8 Table 5.6-3 Window 9 Table 5.6-3 Window 10 Table 5.6-3 Window 11 Table 5.6-3 Window 12 Table 5.6-3 Window 13 Table 5.6-3 Window 14 Table 5.6-3 Window 15 Pref H0270 = 2 Pref H0520 = 0 Pref H0530 = 1 Pref H0270 = 2 Pref H0520 = 1 Pref H0530 = 1		
3 3.1 3.2 3.3 3.4 3.5 3.6 3.7	Prepare BPE for image acquisition Set acquisition mode Examine HK Set event threshold Specify centroid channel boundaries Load channel boundaries Wait for event (< 2 minute) Specify window params Load window look-up table wait for event (< 1 minute)	 H7130 90000 H7131 H7100 H5100 92100 H7110 H5110 92100	 Pref H0110 = 2 Pref H5215 = 2 Pref H0120 = 30 Table 5.6-1 H7000 = 10 hex Table 5.6-2 H7000 = 11 hex		
4 4.1 4.2 4.3	Acquire image Start integration Wait 2 minutes to acquire data Stop integration	 H5130 H6130			
5 5.1 5.2	Finish image acquisition Stop blue 1 event processing Stop blue 2 event processing	 H7207 H7207	 Pref H0270 = 2 Pref H0520 = 0 Pref H0530 = 0 Pref H0270 = 2 Pref H0520 = 1 Pref H0530 = 0		
6	Dump DPU memory area [2] *(< dump_two_windows_fast)*		Table 5.6-4		
7	Exit				

[1] This exception is a recognised feature of the DEM - Blue Alert (NCR 48)
[2] The image will be examined by way of the instrument station.

Description	Pref	Value
Enable/Disable Verification	H0010	0
X Centroid Table Boundary 0	H0020	-1000
X Centroid Table Boundary 1	H0021	-750
X Centroid Table Boundary 2	H0022	-500
X Centroid Table Boundary 3	H0023	-250
X Centroid Table Boundary 4	H0024	0
X Centroid Table Boundary 5	H0025	250
X Centroid Table Boundary 6	H0026	500
X Centroid Table Boundary 7	H0027	750
X Centroid Table Boundary 8	H0028	1000
Y Centroid Table Boundary 0	H0030	-1000
Y Centroid Table Boundary 1	H0031	-750
Y Centroid Table Boundary 2	H0032	-500
Y Centroid Table Boundary 3	H0033	-250
Y Centroid Table Boundary 4	H0034	0
Y Centroid Table Boundary 5	H0035	250
Y Centroid Table Boundary 6	H0036	500
Y Centroid Table Boundary 7	H0037	750
Y Centroid Table Boundary 8	H0038	1000

Table 5.6-1 Centroid Table Boundaries

Description		Pref	Value
Enable/Disable Verification = 1/0		H0010	0
No of Windows		H0040	2
X_{low}	**Parameters for Window 1 (Units are CCD pixels)**	H0050	64
Y_{low}		H0051	15
X_{size}		H0052	64
Y_{size}		H0053	64
X_{low}	**Parameters for Window 2 (Units are CCD pixels)**	H0054	216
Y_{low}		H0055	77
X_{size}		H0056	64
Y_{size}		H0057	64
	All remaining parameters	H0058-H0109	0

Table 5.6-2 Window Parameters

Parameter	n	i	x0	y0	xsize	ysize	ID	kx	bb	aa (hex)	ky
Window 0	16	0	0	0	512	512	0	0	512	400000	0
Window 1	16	1	0	512	512	512	1	0	512	440000	0
Window 2	16	2	0	1024	512	512	2	0	512	480000	0
Window 3	16	3	0	1536	512	512	3	0	512	4C0000	0
Window 4	16	4	512	0	512	512	4	0	512	500000	0
Window 5	16	5	512	512	512	512	5	0	512	540000	0
Window 6	16	6	512	1024	512	512	6	0	512	580000	0
Window 7	16	7	512	1536	512	512	7	0	512	5C0000	0
Window 8	16	8	1024	0	512	512	8	0	512	600000	0
Window 9	16	9	1024	512	512	512	9	0	512	640000	0
Window 10	16	10	1024	1024	512	512	10	0	512	680000	0
Window 11	16	11	1024	1536	512	512	11	0	512	6C0000	0
Window 12	16	12	1536	0	512	512	12	0	512	700000	0
Window 13	16	13	1536	512	512	512	13	0	512	740000	0
Window 14	16	14	1536	1024	512	512	14	0	512	780000	0
Window 15	16	15	1536	1536	512	512	15	0	512	7C0000	0

Table 5.6-3 DPU Detector Window Table

The following table defines the parameters used on repeated calls to the IC_DUMP_RAM command (TC = H7220) used to dump two detector windows of DPU memory

Command	Address	Number of Words (hex)
Command 0	Offset Address* for Window 1 + 0	0x1000
Command 1	Offset Address* for Window 1 + 1000 hex	0x1000
	… and so on until …	
Command 3F Hex	Offset Address* for Window 1 + 3F000 hex	0x1000
Command 40 Hex	Offset Address* for Window 2 + 0	0x1000
Command 41 Hex	Offset Address* for Window 2 + 1000 hex	0x1000
	… and so on until ..	
Command 7F Hex	Offset Address* for Window 2 + 3F000 hex	0x1000

Table 5.6-4 Dump Two Windows

* See table 5.6-5

Window Number (hex)	Offset Address
0	0x400000
1	0x440000
2	0x480000
3	0x4C0000
4	0x500000
5	0x540000
6	0x580000
7	0x5C0000
8	0x600000
9	0x640000
A	0x680000
B	0x6C0000
C	0x700000
D	0x740000
E	0x780000
F	0x7C0000

Table 5.6-5 Window Offset Addresses

5.7 Image Acquisition Test - Full Frame

Description
The function of the OM Image acquisition is tested in operational mode.
A single window full frame image will be acquired and dumped to the instrument work station.

Initial state
The OM (prime) is switched on and in operational mode.
OM-1 secondary rails are switched on.

Final state
The OM (prime) is switched on and in operational mode.

Step	Action	TC/TM	Remarks	Pass	Notes
0	Initial state: OM switched on and in operational mode KAL power line is on OM-1 secondary rails are on				
1	Complete DPU reset *(< exp)*				
1.1	Send DPU reset	H7201			
1.2	Check TM received	91100 92201	 Pref H7510 = 91 (hex)		
1.3	Enable DPUOS code	H7202			
1.4	Check TM received	91100 92202	 Pref H7510 = 92 (hex)		
1.5	Enable blue 1 dsp	H7207	Pref H0270 = 2 Pref H0520 = 0 Pref H0530 = 1		
	Enable blue 2 dsp	H7207	Pref H0270 = 2 Pref H0520 = 1 Pref H0530 = 1		
	Enable red dsp	H7207	Pref H0270 = 2 Pref H0520 = 2 Pref H0530 = 1		
	Init DPU	H7248			
	Check for event	92210	H7520 = A520 (hex)		
2	Prepare DPU for image acquisition				
2.1	Set exposure number	H7238	Pref H0270 = 2 Pref H0520 = 2		
2.2	Load DPU det window 0 param	H7245	Table 5.6-3 Window 0		
2.3	Load DPU det window 1 param	H7245	Table 5.6-3 Window 1		
2.4	Load DPU det window 2 param	H7245	Table 5.6-3 Window 2		
2.5	Load DPU det window 3 param	H7245	Table 5.6-3 Window 3		
2.6	Load DPU det window 4 param	H7245	Table 5.6-3 Window 4		
2.7	Load DPU det window 5 param	H7245	Table 5.6-3 Window 5		
2.8	Load DPU det window 6 param	H7245	Table 5.6-3 Window 6		
2.9	Load DPU det window 7 param	H7245	Table 5.6-3 Window 7		

2.10	Load DPU det window 8 param	H7245	Table 5.6-3 Window 8		
2.11	Load DPU det window 9 param	H7245	Table 5.6-3 Window 9		
2.12	Load DPU det window 10 param	H7245	Table 5.6-3 Window 10		
2.13	Load DPU det window 11 param	H7245	Table 5.6-3 Window 11		
2.14	Load DPU det window 12 param	H7245	Table 5.6-3 Window 12		
2.15	Load DPU det window 13 param	H7245	Table 5.6-3 Window 13		
2.16	Load DPU det window 14 param	H7245	Table 5.6-3 Window 14		
2.17	Load DPU det window 15 param	H7245	Table 5.6-3 Window 15		
2.18	Transfer constants to blue DSP	H7211			
2.19	Start blue 1 event processing	H7208	Pref H0270 = 2 Pref H0520 = 0 Pref H0530 = 1		
2.20	Start blue 2 event processing	H7208	Pref H0270 = 2 Pref H0520 = 1 Pref H0530 = 1		
3	Prepare BPE for image acquisition				
3.1	Set acquisition mode	H7130	Pref H0110 = 3		
	Examine HK	90000	Pref H5215 = 3		
3.2	Set event threshold	H7131	Pref H0120 = 30		
3.3	Specify centroid channel boundaries	H7100	Table 5.6-1		
3.4	Load channel boundaries	H5100			
3.5	Wait for event (< 2 minute)	92100	H7000 = 10 hex		
3.6	Specify window params	H7110	Table 5.7-1		
3.7	Load window look-up table	H5110			
	wait for event (< 1 minute)	92100	H7000 = 11 hex		
4	Acquire image				
4.1	Start integration	H5130			
4.2	Wait 2 minutes to acquire data				
4.3	Stop integration	H6130			
5	Finish image acquisition				
5.1	Stop blue 1 event processing	H7207	Pref H0270 = 2 Pref H0520 = 0 Pref H0530 = 0		
5.2	Stop blue 2 event processing	H7207	Pref H0270 = 2 Pref H0520 = 1 Pref H0530 = 0		
6	Dump DPU memory area * *(< dump_all_fast OR* *< dump_all* *close_packet_archive)*		Table 5.7-2		
7	Exit				

* The image will be examined by way of the instrument station.

Description		Pref	Value
Enable/Disable Verification = 1/0		H0010	0
No of Windows		H0040	1
X_{low}	**Parameters for Window 1 (Units are CCD pixels)**	H0050	64
Y_{low}		H0051	15
X_{size}		H0052	256
Y_{size}		H0053	256
	All remaining parameters	H0054-H109	0

Table 5.7-1 Window Parameters

The following table defines the parameters used on repeated calls to the IC_DUMP_RAM command (TM = H7220) used to dump all detector windows from DPU memory

Command	**Address**	**Number of Words (hex)**
Command 0	Offset Address* for Window 0 + 0	0x1000
Command 1	Offset Address* for Window 0 + 1000 hex	0x1000
	… and so on until …	
Command 3F Hex	Offset Address* for Window 0 + 3F000 hex	0x1000
Command 40 Hex	Offset Address* for Window 1 + 0	0x1000
Command 41 Hex	Offset Address* for Window 1 + 1000 hex	0x1000
	… and so on until ..	
Command 7F Hex	Offset Address* for Window 1 + 3F000 hex	0x1000
	… and so on until ..	
Command 400 Hex	Offset Address* for Window 15 + 3F000 hex	0x1000

Table 5.7-2 Dump All Detector Windows

5.8 Switch-off

Description
Mode and state are checked and the appropriate procedure is followed to switch-off in an orderly way.

Initial state
The OM (prime) is switched on.

Final state
The OM (prime) is switched off. The KAL power lines may be left on.

Step	Action	TC/TM	Remarks	Pass	Notes
0	Initial state: OM switched on KAL power line is on				
1	Check OM mode if mode = Operational = Basic		 goto step 2 goto step 3		
2.	Switch off OM-1 secondary rails				
3	Disable heater algorithm				
4	Switch-off +28V prime power		S/C procedure report: voltage and current		
5	Switch-off KAL prime		S/C procedure report: voltage and current		
6	Exit				

Appendix

Parameter reference Table

Pref ID	HK Monitor
H5150	Fine Pick-Off Sensor
H5215	Acquisition Mode
H5240	Commanded Heater Status
H5250	Coarse Sensor Status
H5265	Filter Wheel Position Counter
H5275	S/w Dichroic Position Counter
H5280	Switched +25V Current
H5285	Switched +15V Current
H5290	Switched +11V Current
H5295	Switched +5.3V Current
H5300	Switched -5.3V Current
H5305	Switched -15V Current
H5320	ICB Status
H5340	RBI Status
H5345	RBI Config
H5365	MON+5DPU
H5370	MON+5ICU
H5375	MONVSBICU (KAL)
H5380	MONVSBDPU (KAL)
H5385	Good TC
H5390	Bad TC
H5395	OM State
H5410	Heartbeat Count

Table 6: Pref look-up Table