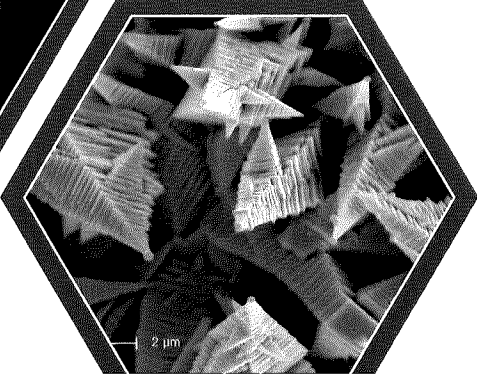
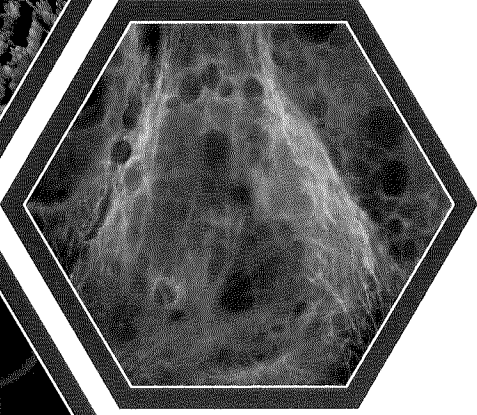
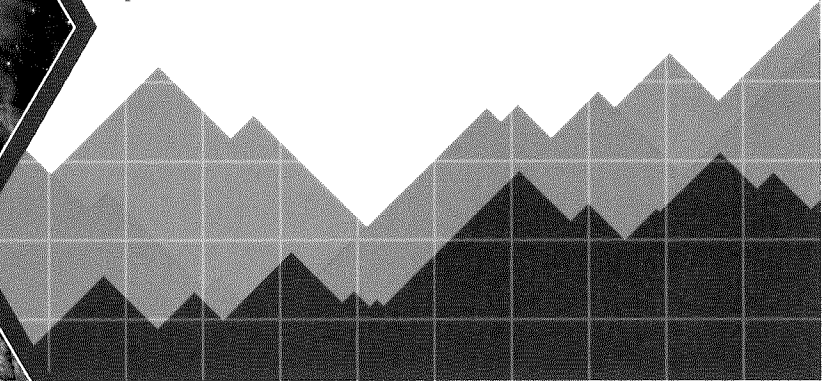
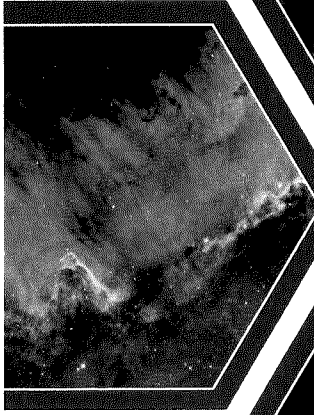
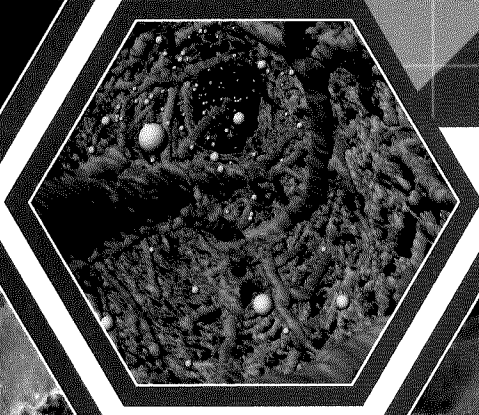
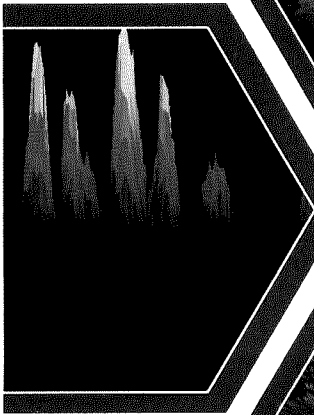
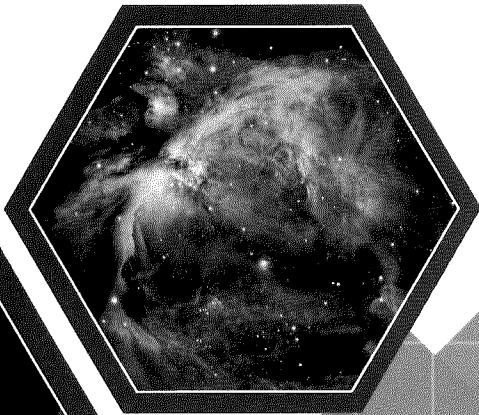


# ANDOR

an Oxford Instruments company

## System Performance Booklet





# ANDOR

## Returns Report

**Customer** UHAWAII **Returns No** R68049

**Classification** WARRANTY **Customer RMA No** None

Equipment Details	Model	Serial Number
Head	DW936N-BEX2-DD-99BR	CCD-25847
Card	ASE-01188	
PSU	PS-40 s/n CCD-25847	PS-29
Multi IO	ACC-ASE-01957	
Other	Mains cable	

### Reported Fault

Camera shutter doesn't seem to be working, the camera doesn't return an image and shows the sensor temperature as -105 when we set the temperature to -60°C.

### Diagnosis

Unable to confirm customer reported fault.  
No fault found with camera.

### Work Carried Out

Full system QC & new performance sheets completed: - Passed.

	Receipt Date	Work Complete	Passed For Shipping	Shipped
Date	30/09/2021	09/11/2021	09/11/2021	
Initials	PMC	RL	PGF	

**System Overview**

Description	Model	Serial Number
CCD Head ▽	D   W   9   36N   -	BEX2-DD-99BR
TE Cooler performance (✓)	High	Ultra-high ✓
Power Supply Units	PS -29	PS -40
	✓	✓
Accessories	LM-	MFL-
Serial/Batch Number		
Other		

▽ Sensor types are defined in Table 1 using the last two letters in box Model Number.

**CCD Details**

Manufacturer / Model No.	Pixels	Serial Number
E2V CCD42-40	2048x2048, 13.5µm x 13.5µm	19471-66-03

Special Features	(✓)	(✓)
NIMO	✓	Custom shutter ✓
Fringe Suppression		Custom Cables
Shielded Anti-Blooming		

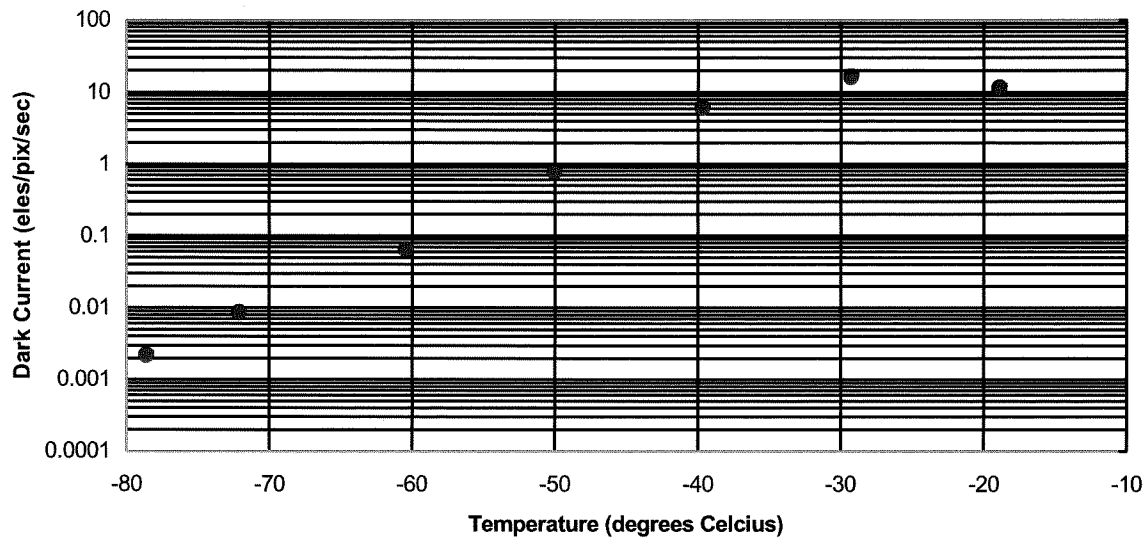
Window Variant	(✓)	(✓)
VUV-UV Parallel		NUV-Enhanced Parallel
Broadband VUV-NIR Wedged		Broadband VUV-NIR Parallel ✓
Broadband VIS-NIR Wedged		Broadband VIS-NIR Parallel
VIS-NIR Enhanced Wedged		Bose-Einstein 780nm Wedged
None		Other

**Summary of System Test Data**

**Readout Noise  $\blacklozenge 1$  and Base Mean Level  $\blacklozenge 2$**

A/D Rate MHz - all 16 bit	Preamp setting	CCD Sensitivity $\blacklozenge 3$ e- per A/D count		Single Pixel Noise electrons rms		Base Mean Level A/D counts	
		High Sensitivity Mode	High Capacity Mode	High Sensitivity Mode	High Capacity Mode	High Sensitivity Mode	High Capacity Mode
5.0	x1	6.9	22.3	41.2	111.5	2723	1175
5.0	x2	3.7	12.0	34.7	80.9	4366	1383
5.0	x4	1.8	6.5	28.1	65.2	5801	1308
3.0	x1	4.4	16.4	21.2	81.0	1008	784
3.0	x2	2.3	9.0	14.4	50.7	1846	1387
3.0	x4	1.1	4.6	11.6	40.6	2727	2523
1.0	x1	4.0	17.2	10.3	40.4	768	1048
1.0	x2	2.2	8.5	8.2	27.4	1189	1705
1.0	x4	1.1	4.7	6.9	24.6	1932	2916
0.05	x1	4.3	18.0	5.0	17.8	805	1069
0.05	x2	2.2	9.3	4.1	13.1	1234	1726
0.05	x4	1.1	4.8	3.6	11.3	2026	2946
<b>Saturation Signal per pixel <math>\blacklozenge 14</math></b>				128245		electrons	

**CCD Dark Current**



<b>Minimum Dark Current Achievable <math>\blacklozenge 4</math></b>	0.002087	electrons/pixel/sec		
<b>@ Sensor Temperature of <math>\blacklozenge 5</math></b>	-77.3	$^{\circ}\text{C}$	16.0	$^{\circ}\text{C}$ cooling water
<b>CCD Dark Current Uniformity better than <math>\blacklozenge 6</math></b>	0.724128	electrons/pixel/sec		



**Test Conditions**

<b>Readout Noise tested at</b>	-90	°C with	16	°C water
<b>Base Mean Level measured at</b>	-90	°C with	16	°C water
<b>Dark Current Uniformity tested at</b>	-50	°C with	16	°C water
<b>Blemishes tested at</b>	-50	°C with	16	°C water

**Custom Testing**

**System Passed for Shipping**

Signed

Date

**RAYMOND CLARKE**

**1<sup>ST</sup> NOVEMBER 2021**

	HEADBOARD	FPGA
Hardware Version #	AH	20.12
	SOLIS	SDK
Shipping Software Version #	--	--
	SOLIS	SDK
Testing Software Version #	4.32.30061.0	2.104.33061.0

▽ **Table 1; Key code to define the meanings of the last two letters in the Model Number**

Sensor Options			
OE	Open electrode	BV	BI + VIS (550nm) optimised
FI	Front illuminated (FI)	BR	BI + NIR (850) optimised
UV	FI+UV coating	BR-DD	BI + NIR +deepdepletion
FO	FI + Fibre optic	BN	BI with no AR coating
FI-DD	FI + deep depletion	FK	Fast Kinetics (masked; 3011 only)
BU2	Back Illuminated (BI) + 250nm UV optimised	KT	Kodak FI coating
BU	BI + UV (350nm) optimised		

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**Performance Notes**

- ◆1 Readout Noise is measured for both single pixel (SP) and fully vertically binned (FVB) with the CCD in darkness at temperature indicated and minimum exposure time. Noise values will change with pre-amplifier gain selection [PAG].
- ◆2 Average electronic DC offset for CCD in darkness at temperature indicated and minimum exposure time under dark conditions measured by single pixel (SP) for imaging systems and by (FVB) for spectroscopic systems.
- ◆3 Sensitivity is calculated in photoelectrons per A/D count from measurements of the Photon Transfer Curves.
- ◆4 Dark current falls exponentially with temperature. However, for a given temperature the actual dark current can vary by more than an order of magnitude from device to device. The devices are specified in terms of minimum dark current achievable rather than minimum temperature.
- ◆5 Minimum temperature achieved for thermoelectric (TE) cooler set to maximum value with water cooling
- ◆6 RMS (root mean square) deviation of dark current for fully binned operation for spectroscopic cameras, or full resolution image for imaging cameras, under dark conditions at temperature indicated (pixel/column defects not included). This variation is mainly cosmetic since it is fully subtractable without significant loss of performance.
- ◆7 Linearity is measured from a plot of Counts vs. Signal over the 16 bit dynamic range. Linearity is expressed as a %age deviation from a straight line fit. This quantity is not measured on individual systems.
- ◆8 RMS (root mean square) deviation from the average response of the CCD in fully binned operation for spectroscopic cameras, or full resolution image for imaging cameras, illuminated with uniform white light (defects not included).
- ◆9 White/black spots have signals >25% above/below the average (i.e >25% contrast) with uniform illumination across the sensor.
- ◆10 Columns whose signals have >10% contrast in binned operation with uniform illumination across the sensor for spectroscopic cameras,  $\geq 10$  black spots per column for imaging cameras.
- ◆11 Pixels which absorb charge as it is clocked through the defective area. When the light source is switched off, the signal from the trap appears to drop off more slowly than the signal from the surrounding pixels.
- ◆12 A spot can be up to 3 pixels in size. For Grade A devices, hot spots are counted if they exhibit >50 times the maximum specified dark current at the test temperature indicated.
- ◆13 A column is considered defective if >10 pixels are affected, or if the column exhibits >2 times the maximum specified dark current at the test temperature indicated.
- ◆14 Saturation Signal per pixel is measured at 1MHz PreAmp x1 High Sensitivity mode