

Colorimetric and Resolution requirements of cameras

Alan Roberts

ADDENDUM 24 : Menu settings for

Panasonic DVCPPro100 AJ-HPX2100

A brief assessment was made on an engineering sample of the AJ-HPX2100 (serial number 3610365-0612-5, found in an unusual place), a multi-standard HDTV cam-corder with a Canon HA22x7 HD lens. It is very similar in form and function to the HDX900, sharing many features and having a very similar menu set. Production models may differ slightly from the pre-production model initially assessed for this addendum. No manual was available for these tests.

The camera is switchable between 1080-line and 720-line HDTV standards, and between the base-normal frame rates of 29.97 and 25Hz. It can also be switched, in 1080 mode, between interlace (50i, 59.94i) and progressive (25psf, 29.97psf, and 23.98psf in both 2:3 and 2:3:3:2 pull-down) modes. In 720P mode it can also be switched to half-frame rate, and thus can generate a “film look” in the camera at system speed. It has specific “film-look” gamma curves that incorporate many of the contrast handling features of earlier cameras, making it a great deal easier to set up. The camera has 3 2²/₃ ccds (1280x720, progressively scanned) and records at 100Mb/s (DVCPProHD intra-frame coding) onto P2 solid-state cards instead of the small-format conventional DVCPPro tape used in the HDX900.

It is a little larger than the HDX900, being wider to accommodate the P2 cards instead of the tape mechanism, and has HDSDI output. It has many internal menus for setting the performance, such that it can then be used without external controls. It is not ideally suited to multi-camera operation (being a camcorder) but has enough features to make multi use possible. Monitoring and connectivity have been improved over previous Panasonic models; it will genlock to either analogue HD Y or analogue composite (PAL or NTSC as appropriate); there are two video outputs, one switchable between HDSDI, SDI (appropriate down-conversion), and composite (PAL or NTSC), the other between HDSDI and HD analogue Y for monitoring; it has a IEEE1394 (Firewire) output that will feed and control an external recorder.

There is an 8-second video cache memory. Using this, it is possible to record up to 8 seconds of events that occurred before pressing “Record”. The same circuitry is also used to provide a “slow-shutter” in which adjacent frames are summed to produce smeared pictures and reduced noise (or extra gain).

Video compression is still DVCPProHD, 6.7:1 for all the NTSC-related standards, 6.3:1 for all the PAL-related standards. The camera section has 14-bit adcs that deliver better noise performance than in earlier models. However, there are resolution issues that somewhat affect the usefulness of the camera in mixed format environments, it is not very good in SD, and is rather soft in HD.

In this setup, the gamma correction and knee are adjusted to capture about 2.5 stops of overload, and 1 stop of underexposure, to mimic film performance.

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Many menu items have little or no effect on the image. Those that do so are highlighted. The full menus are given for completeness. Where two values are given {f} denotes film use, {v} video. The film mode uses the “Filmlike1” gamma curve, which very closely resembles the best that can be done with a conventional gamma curve and knee, but with a nice smooth join; there seems no point in ignoring this curve since Panasonic have clearly put much effort into its design, and it works well. The photographic speed of the camera is unchanged (about 640 ASA) using this curve (“Filmlike2” is a similar curve but copes with about a stop less of overload and reduces the photographic “speed” by about a stop, also the manual knee controls have no effect in this mode so it is not possible to customise it; “Filmlike3” further reduces the exposure range and lowers the photographic “speed” of the camera by about one stop more; both these modes should produce better noise performance and thus may well be the best option for film-like work). The video mode uses conventional gamma and knee settings to achieve similar results but with more contrast compression in highlights. Both modes can cope with about 2.5 stops of overexposure (about 500% measured); the video mode (with optimal knee settings) has a slightly more pronounced change of slope in the knee but the difference is marginal. Total exposure range has been measured as about 11 stops.

The shutter can be set to HALF (i.e. 180°), which avoids the problem of having to work out what it should be from the field/frame rate.

Line Mix mode (available as a User Switch setting) appears to be the equivalent of EVS in other cameras. Switched on in 25p mode reduces the vertical resolution to the same as 50i, thus minimising most interlace twitter artefacts although the effect is not great.

Digital Super Gain is implemented by reducing the frame rate. This gives “free” gain without noise, provided the smeared pictures and lowered frame rate is acceptable.

When shooting at 59.94 rates, drop-frame time code is always used.

Viewfinder and monitoring outputs can both have markers, individually set.

The camera “Gain” switch stores many camera settings, allowing the user to set completely different conditions selectable by that switch. However, most users will want only different gain, the menu contents given here are appropriate for the range of gains quoted, it is for the user to decide which gain settings are appropriate and to set the other conditions accordingly. Beware that the recommended settings were derived during a short laboratory test of the camera, better settings may well be found once the camera goes into general use.

Simply switching the camera into SD mode (but still using the HD lens), it produces significant aliasing artefacts, giving the picture an uneasy “business”, particularly in 576-line (625, “PAL”) mode. It is a little better in 480-line mode (525, NTSC), probably because the down-conversion algorithm is a simple one with insufficient filtering/interpolation. The effects are visible but subtle and may easily be mistaken for noise or compression artefacts, but were clearly visible on the SDI output. If the camera is to be used to make SD pictures, it is better to set the camera in HD mode and use an external broadcast grade down-converter, or to convert in software. Alternatively, using a SD lens would also reduce the aliasing. I have given evidence for this in the final section of this document.

Factory settings are underlined where known; since the tests were done without access to a manual for this camera, some descriptions are not complete. Menu items that differ from the HDX900, or are new in this model, are italicised; items that have only been moved are not so marked, menus are not all in the same order as in the HDX900. Settings for the HDX900 have the same effects in this camera.

This should not be used as a substitute for reading the manual.

1 Menus and settings

SYSTEM SETTING

System mode

Main video standard setting

Item	Range	description	BBC
System Mode	<u>1080-59.94i</u> ,1080-50i,720-50-59.94P,720-50P,480-59.94,576-50i	Any change requires a power-off/on cycle to take effect. Different defaults for E/P models	1080-50i
Rec Signal	<u>Cam</u> ,1394,SDI	Picture source	
Camera Mode	50i,25p	N/A in 720p, contents change with Sys Mode	25p{f}, 50i{v}
VF Type	SD, <u>HD</u>		
PC Mode Select	USB dev,USB host		
PC Mode	On,Off		

Option mode

General options

Item	Range	description	BBC
Rec Tally	<u>Red</u> , Green, Char	Record indicator, Char puts REC in the v/f	
Access LED	Off,Slot side,LCD side,Both		
P.Off GPS Data	Hold, <u>Clear</u>	Holds GPS data while power off	
SDI Metadata	<u>On</u> ,Off	Embed UMID data into HDSDI	
SDI EDH	<u>On</u> ,Off	Embed error signals into HDSDI	
Save Switch (Aud out)	<u>Off</u> ,On		
Save Switch (lcd)	<u>Off</u> ,On		
Auto Rec	Off,Type 1,Type 2	Not sure what this does	

Rec function

Specialist recording functions

Item	Range	description	BBC
Pre Rec Mode	Off, <u>On</u>	Pre-roll time	
Pre Rec Time	0s~8s	Length of video cache	
Loop Rec Mode	<u>Off</u> ,On		
Rec Start	<u>Normal</u> ,All		
P.On Rec Slot Sel	<u>Hold</u> ,Slot 1	Which P2 slot to use on power-up	

Output sel

Signals on the displays

Item	Range	description	BBC
Output Item	TC,Status, <u>Menu only</u>	Stuff on the Video Out	
Monitor Out	VBS,VF,Y	Video monitoring output, on camera right	
Monitor Out Chara	On, <u>Off</u>	Adds characters on monitoring output	
LCD Mon Char	<u>On</u> ,Off	And lcd	
VF Mode	Cam, <u>Mem</u>	Mem=EE, Cam always shows the camera	
Thumbnail Out	<u>Off</u> ,On		

LCD monitor

Simple controls

Item	Range	description	BBC
Brightness	-7~+7		
Color Level	-7~+7		
Contrast	-7~+7		
Backlight	<u>Normal</u> ,High		
Self Shoot	<u>Mirror</u> ,Normal		

Genlock

Item	Range	description	BBC
Genlock	<u>Int</u> ,Ext	Genlock source	
GL.Phase	<u>HDSDI</u> ,Composit	Which is locked, other has ~90 line delay	
H.Phase Coarse	-100~ <u>0</u> ~100	Coarse H timing	
H.Phase Fine	-100~ <u>0</u> ~100	Fine H timing	

1394 Settings

Firewire controls

Item	Range	description	BBC
1394 Speed	S100,S200, <u>S400</u>	Firewire speed, Mb/s	
1394 In Ch	0~63, <u>Auto</u>	Assign channel number	

1394 Out Ch	0~63, <u>Auto</u>	Assign channel number	
1394 Control	Off, <u>Both</u>	External recorder, Both servos external to camera controls	
1394 Cmd Sel	<u>Rec_P</u> , Stop	External recorder, Stop or hold on RecPause	

PAINT MENUS

RB Gain Control

Colour balancing

<i>Item</i>	<i>Range</i>	<i>description</i>	<i>BBC</i>
R Gain AWB Pre	-200~ <u>0</u> ~200	Red gain in switch Preset balance	
B Gain AWB Pre	-200~ <u>0</u> ~200	Blue gain in switch Preset balance	
R Gain AWB A	-200~ <u>0</u> ~200	Red gain in switch A balance	
B Gain AWB A	-200~ <u>0</u> ~200	Red gain in switch A balance	
R Gain AWB B	-200~ <u>0</u> ~200	Red gain in switch B balance	
B Gain AWB B	-200~ <u>0</u> ~200	Red gain in switch B balance	
AWB A Gain Offset	On, <u>Off</u>	On adds A values above after rebalance in A	
AWB B Gain Offset	On, <u>Off</u>	On adds B values above after rebalance in B	

RGB Black Control

More colour balancing

<i>Item</i>	<i>Range</i>	<i>description</i>	<i>BBC</i>
Master Ped	-200~ <u>15</u> ~200	Master black level, 15's a bit high, 6 is better	6
R Pedestal	-100~ <u>0</u> ~100	Red ped, reports value from remote control	
G Pedestal	-100~ <u>0</u> ~100	Green	
B Pedestal	-100~ <u>0</u> ~100	Blue	
Pedestal Offset	On, <u>Off</u>	On enables these values	
R Flare	-100~ <u>0</u> ~100	Red flare correction	
G Flare	-100~ <u>0</u> ~100	Green	
B Flare	-100~ <u>0</u> ~100	Blue	

Matrix (User preset) A,B

Colour matrix, user settings

<i>Item</i>	<i>Range</i>	<i>description</i>	<i>BBC</i>
Matrix Table	<u>A</u> ,B	Two user tweakable matrices	
Matrix R-G	-63~ <u>0</u> ~63	Settings for matrix A or B	
Matrix R-B	-63~ <u>0</u> ~63		
Matrix G-R	-63~ <u>0</u> ~63		
Matrix G-B	-63~ <u>0</u> ~63		
Matrix B-R	-63~ <u>0</u> ~63		
Matrix B-G	-63~ <u>0</u> ~63		
L Matrix Table	<u>Off</u> ,A,B		Select matrix in Low
M Matrix Table	<u>Off</u> ,A,B	Mid	
H Matrix Table	<u>Off</u> ,A,B	High gain setting	

Color Correction

rather dangerous territory

<i>Item</i>	<i>Range</i>	<i>description</i>	<i>BBC</i>
R (Sat/Phase)	-63~63	Adjusts colour in 45 degree segments, tweaks saturation and hue. This is rather dangerous, but can be very useful for special effects, generally, you should avoid this unless you have good test kit, including comprehensive colour test charts.	
R-Mg (Sat/Phase)	-63~63		
Mg (Sat/Phase)	-63~63		
Mg-B (Sat/Phase)	-63~63		
B (Sat/Phase)	-63~63		
B-Cy (Sat/Phase)	-63~63		
Cy (Sat/Phase)	-63~63		
Cy-G (Sat/Phase)	-63~63		
G (Sat/Phase)	-63~63		
G-Yl (Sat/Phase)	-63~63		
Yl (Sat/Phase)	-63~63		
Yl-R (Sat/Phase)	-63~63		
Color Correct	<u>Off</u> ,On		

Low Setting

Low Level Gain switch position

<i>Item</i>	<i>Range</i>	<i>description</i>	<i>BBC</i> ¹
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¹ These values are suitable for when the gain is set to between -3 and +3 dB

Master Gain	-3,0~30dB	dB settings, 3dB steps	-3 ~ +3
H Dtl Level	0~ <u>10</u> ~63		6 {f} 20{v}
V Dtl Level	0~ <u>20</u> ~31		4 {f} 14{v}
Dtl Coring	0, <u>1</u> ~15		2
H Dtl Freq	0~ <u>18</u> ~31		31
Level Dep	0, <u>1</u> ~5	Low luma zone, no correction	1
Gamma	0.35~ <u>0.45</u> ~0.75	0.01 steps	0.45
Black Gamma	-3~ <u>Off</u> ~+3	No other controls	1
Matrix Table	A,B, <u>Off</u>	User preset matrices	Off
Color Corr.	On, <u>Off</u>	12 segment adjust, see above	Off

Mid Setting

Mid Level Gain switch position

Item	Range	description	BBC ²
Master Gain	-3~ <u>6</u> ~30dB	dB settings, 3dB steps	+3 ~ +9
H Dtl Lev	0~ <u>8</u> ~63		6 {f} 20{v}
V Dtl Lev	0~ <u>18</u> ~63		4 {f} 14{v}
Dtl Coring	0~ <u>2</u> ~15		2
H Dtl Freq	0~ <u>18</u> ~31		31
Level Dep	0, <u>1</u> ~5	Low luma zone, no correction	2
Gamma	0.35~ <u>0.45</u> ~0.75	0.01 steps	0.45
Black Gamma	-3~ <u>Off</u> ~+3		0
Matrix Table	A,B, <u>Off</u>	User preset matrices	Off
Color Correct	On, <u>Off</u>	12 segment adjust, see above	Off

High Setting

High Level Gain switch position

Item	Range	description	BBC ³
Master Gain	-3~ <u>12</u> ~30dB	dB settings, 3dB steps	+12 and above
H Dtl Lev	0~ <u>6</u> ~63		0 {f} 6{v}
V Dtl Lev	0~ <u>16</u> ~63		0 {f} 4{v}
Dtl Coring	0~ <u>3</u> ~15		8
H Dtl Freq	0~ <u>18</u> ~31		31
Level Dep	0~ <u>3</u> ~5	Low-luma zone, no correction	4
Gamma	0.35~ <u>0.55</u> ~0.75	0.01 steps	0.5
Black Str	-3~ <u>Off</u> ~+3		Off
Matrix Table	A,B, <u>Off</u>	User preset matrices	Off
Color Correct	On, <u>Off</u>	12 segment adjust, see above	Off

Additional Dtl

Detail, extra controls

Item	Range	description	BBC
Knee Ape Lvl	Off,1, <u>2</u> ~5	Correction in knee compressed zone	3
Dtl Gain +	-31~ <u>0</u> ~31	correction, +ve going edges	0
Dtl Gain -	-31~ <u>0</u> ~31	correction, -ve going edges	8
Dtl Clip	<u>0</u> ~63	Clip level of detail correction	47
Dtl Source	(G+B)/2, (R+G)/2, (2G+R+B)/4, (3G+R)/4, R, G	Doesn't make much difference except when noise level is high	(R+G)/2
V Dtl Freq	360TV,450TV,540TV, <u>630TV</u> ,720TV	TV lines, hump of response, only in 720P	720
H Dtl Line Mix	<u>0H</u> ,1H,2H	Vertical size of H detection window	0
Master Dtl	-31~ <u>0</u> ~31	Master control	0

Skin Tone Dtl

Item	Range	description	BBC
Skin Tone Dtl	<u>Off</u> ,A,B,AB	Select skin tone table, reduces wrinkles	Off
Skin Tone Zebra VF	On, <u>Off</u>	Zebra on skin tone detector	
Skin Tone Table	<u>A</u> ,B	Separate tables of target tones	
Skin Tone Get		Looks for skin tone	
Skin Dtl Coring	0~ <u>5</u> ~7		
Y Max	0~ <u>190</u> ~255	Max luma level for skin	
Y Min	0~ <u>10</u> ~255	Min luma level for skin	

² These values are suitable for gain settings of +3 to +9 dB.

³ These values are suitable for gain settings of 12dB and above.

I Center	0~ <u>35</u> ~255	Saturation mean level for skin	
I Width	0~ <u>55</u> ~255	Saturation range for skin	
Q Width	0~ <u>10</u> ~90	Hue mean level for skin	
Q Phase	-180~ <u>0</u> ~179	Hue range for skin	

Cam Main Menu 1, Knee Level

Don't use Auto knee, manual is better

Item	Range	description	BBC
Master Ped	-200~ <u>15</u> ~200	Duplicate entry for pedestal	6
Manual Knee	<u>On</u> ,Off	Valid only if AUTO is off	On
Knee Point	70%~ <u>93</u> ~107%	Manual break point	85
Knee Slope	0~ <u>85</u> ~99	Gain in knee zone, about 2.5 stops overload	99
White Clip	<u>On</u> ,Off		On
White Clip Lvl	90%~ <u>109</u> %		109%
A. Knee Point	80%~ <u>93</u> ~107%	Auto knee point	85%
A Knee Level	100~ <u>107</u> ~109		105
A.Knee Response	1~ <u>4</u> ~8	Auto knee response speed (low=fast)	4

Gamma

Differentials and colour tweaking

Item	Range	description	BBC
Master Gamma	0.35~ <u>0.45</u> ~0.75		0.45
R Gamma	-15~ <u>0</u> ~15	Set R away from Master	0
B Gamma	-15~ <u>0</u> ~15	Set B away from Master	0
Gamma Mode Sel	<u>DFLT</u> ,HD,SD,Filmlike1, Filmlike2,Filmlike3	HD=709, SD=BBC0.4, approximately	Filmlike1 {f} HD {v}

Camera Settings

Item	Range	description	BBC
Detail	<u>On</u> ,Off		Off {f} On {v}
High Color	On, <u>Off</u>	Hue/Saturation maintenance at high luma	On
Gamma	<u>On</u> ,Off		On
Test Saw	On, <u>Off</u>		
Flare	<u>On</u> ,Off		
H-F Compe	<u>On</u> ,Off	Wide-band detail enhancement	On

VF Display

User controls (RC=remote control)

Item	Range	description	BBC
Disp Condition	<u>Normal</u> /Hold	Show switch status: Normal=On, Hold when ModeCheck pressed	Normal
Disp Mode	1,2, <u>3</u>	1=off, 2=some, 3=all	3
VF Out	<u>Y</u> ,NAM,R,G,B	What you see, NAM=non-additive mix	Y
VF Dtl	<u>0</u> ~5	5 roughly doubles the HD detail in the v/f	
Zebra 1 detect	0%~ <u>70</u> ~109%	Set for skin tone (BL-TR)	65% {f} 70% {v}
Zebra 2 detect	0~ <u>85</u> ~109%	Set for white (TL-BR)	100%
Zebra 2	On, <u>Spot</u> ,Off	SPOT works only if Zebra 2>1	Spot
Low Light Lvl	Off,10%~ <u>35</u> %	Warns at low light level	35%
RC menu Disp	<u>On</u> ,Off	Shows menus in v/f when RC is connected	Off
Marker/Char Lvl	<u>50</u> %~100%	Marker/Character brightness	100%

VF Marker

Viewfinder stuff

Item	Range	description	BBC
Table	A,B	Switch between AB setups set below	
Centre Mark	Off, <u>1</u> ~4	Cross size/type	
Safety Mark	Off,1, <u>2</u>	1=box, 2=corners	
Safety Area	80%~ <u>90</u> ~100%	Size of safety area	
Frame Mark	On, <u>Off</u>	Frame marker	OFF
Frame Sig	<u>4</u> :3,13:9,14:9,Vista	Vista is 16:8.65	14:9
Frame Lvl	0~ <u>15</u>	Picture level outside frame mark, 15=same	15

VF User Box

More viewfinder stuff

Item	Range	description	BBC
User Box	On, <u>Off</u>	Custom frame	
User Box Width	1~ <u>13</u> ~100	Width, %	

User Box Height	1~13~100		
User Box H Pos	-50~0~50		
User Box V Pos	-50~0~50		

VF Indicator 1

And yet more

<i>Item</i>	<i>Range</i>	<i>description</i>	<i>BBC</i>
Extender	<u>On</u> ,Off	Lens extender	
Shutter	<u>On</u> ,Off	Shutter speed display	On
Filter	<u>On</u> ,Off	Filter position	On
White	<u>On</u> ,Off	Show AWB or Preset A/B	
Gain	<u>On</u> ,Off		
Iris	Offs,S+Iris,S	Iris/Super Iris (aperture/auto) display	
Camera ID	<u>Bar</u> ,Off	Show camera ID over bars	
ID Position	UpperR, <u>UpperL</u> , LowerR,LowerL	Placement	
Date/Time	<u>On</u> ,Off	Show time/date with camera ID	Off
Zoom Lvl	<u>On</u> ,Off	Focal length	
Color Temp	<u>On</u> ,Off		
System Mode	<u>On</u> ,Off	Camera system speed	
Camera Mode	<u>On</u> ,Off	I/P	

VF Indicator 2

And still more

<i>Item</i>	<i>Range</i>	<i>description</i>	<i>BBC</i>
P2 Card Remain	Off,One Card,Total	How much is left	
Battery	<u>On</u> ,Off		On
Audio Level	<u>On</u> ,Off		On
Time Code	<u>On</u> ,Off		
System Info	Off, Always, Normal		
Save LED	Save,P2 Card		
Rec Status	<u>On</u> ,Off		
Proxy Rec	<u>On</u> ,Off		

Mode Check Ind

What happens when you press Mode Check

<i>Item</i>	<i>Range</i>	<i>description</i>	<i>BBC</i>
Status	<u>On</u> ,Off	Get the status screen	On
!LED	<u>On</u> ,Off	Shows why !LED might be lit	On
Function	<u>On</u> ,Off	Function screen	On
Audio	<u>On</u> ,Off	Audio screen	On
P.On Ind	<u>On</u> ,Off	Get status screen up at power-on	On

! LED

VF warnings

<i>Item</i>	<i>Range</i>	<i>description</i>	<i>BBC</i>
Gain (0dB)	<u>On</u> ,Off		
Gain (-3dB)	<u>On</u> ,Off		
DS Gain	<u>On</u> ,Off		
Line Mix	<u>On</u> ,Off		
Shutter	<u>On</u> ,Off		
White Preset	<u>On</u> ,Off		
Extender	<u>On</u> ,Off		
Black Gamma	<u>On</u> ,Off		
Matrix	<u>On</u> ,Off		
Color Correct	<u>On</u> ,Off		
Filter	<u>On</u> ,Off		
ATW	<u>On</u> ,Off		

OPERATION

Camera ID

3 lines of text

<i>Item</i>	<i>Range</i>	<i>description</i>	<i>BBC</i>
ID1		Max 10 characters	
ID2			
ID3			

Shutter Speed

Select which speeds go onto the switch list

Item	Range	description	BBC
Synrho Scan	<u>On</u> ,Off	Speed set by buttons near filter wheel, longest exposure depends on frame rate	
Position 1	<u>On</u> ,Off	ON adds items to list of settings that can be cycled through using the little switch below the lens.	
Position 2	<u>On</u> ,Off		
Position 3	<u>On</u> ,Off		
Position 4	<u>On</u> ,Off		
Position 5	<u>On</u> ,Off		
Position 6	<u>On</u> ,Off		

Shutter Select

Item	Range	Factory 59.94	Factory 50	description	BBC
Position 1	(59.94) 1/100,1/120,1/250,1/500,1/1000,1/2000,HALF	1/100	1/60	HALF keeps exposure at 180° irrespective of field or frame rate	1/60
Position 2		1/120	1/120		1/120
Position 3		1/250	1/250		1/250
Position 4	(50) 1/60,1/120,1/250,1/500,1/1000,1/2000,HALF	1/500	1/500		1/500
Position 5		1/1000	1/1000		1/1000
Position 6		1/2000	1/2000		HALF

User SW

Assign user switches

Item	Range	Factory	description	BBC
User Main Sw	Inh,S.Gain,DS.Gain,LineMix,S.Iris,I.Over,S.Blk,B.Gamma,D.Zoom,ATW,Yget,DRS,Assist,C.Temp,Audio Ch1,AudioCh2, RecSw,RetSW,Pre.Rec,SlotSel,PCmode			
User 1 Sw				
User 2 Sw				

SW Mode

More general stuff

Item	Range	description	BBC
Ret Sw	R.Review,Cam Ret,D.Zoom	Review last few seconds/check Genlock input	R.Review
S.Blk Lvl	<u>-10</u> ,-20,-30	Super black level, not a good idea	
Auto Knee Sw	<u>On</u> ,Off,DRS	Disables Auto Knee switch	Off
D.Zoom x1	On,Off		
D.Zoom x2	On,Off		
D.Zoom x3	On,Off		
Shd,Abb Sw Ctl	On,Off	Does black shading with black balance if pressed >8seconds	On
Color Bars	<u>SMPTE</u> ,Full,Split,Arib	SMPTE default for P model, Full for E model, daft idea. Arib=multi-format bars	SMPTE
S.Gain Off	<u>L/M/H</u> ,S.Gain	Which switch cancels Super Gain	
DS.Gain Off	<u>L/M/H,DS.Gain</u>	Which switch cancels Digital Super Gain	
RC Check Sw	R.Review,PLAY		

White Balance Mode

Presets

Item	Range	description	BBC
Filter Inh	<u>On</u> ,Off	Off allows separate balance data to be stored for each filter wheel position	On
Shockless AWB	Off,Fast, <u>Normal</u> ,Slow1,Slow2,Slow3	Response speed to white change, 1~20 seconds	
AWB Area	<u>25%</u> ,50%,90%	Central screen target area	
Color Temp Pre	2300K~ <u>3200K</u> ~8000K	AWB set in Preset	3200K
AWB A Temp	2300K~ <u>3200K</u> ~8000K	AWB set in A, reports result of rebalance	3200K
AWB B Temp	2300K~ <u>3200K</u> ~8000K	AWB set in B, reports result of rebalance	3200K

User Sw Gain

Gain trickery

Item	Range	description	BBC
S.Gain	30,36,42,48dB		
DS.Gain	6,10,12,15,20dB	Free gain, sums adjacent frames.	

Lens/Iris

Item	Range	description	BBC
A.Iris Level	0~ <u>45</u> ~100	Auto iris target level, luma	
A.Iris Peak/Ave	0~ <u>30</u> ~100	Ratio, 0=average, 100=peak	

A.Iris Mode	<u>Norm1</u> ,Norm2,Centr	1=full frame, 2=not top, centre=spot	
S.Iris Level	0~80~100	Super Iris target (backlight compensation)	
Iris Gain	Cam, <u>Lens</u>	Where the iris gain control is	
Irtis Gain Value	1~ <u>10</u> ~20	Value used when set to Cam	

MAIN OPERATION

Battery/P2 Card

Item	Range	description	BBC
Battery Select	Propac14,Trimpac14,Hytron50, Hytron120, <u>Dionic90</u> , Dionic120,NP-L7,Endura7,Endura10,EnduraD, PagL95,BP-GL65/95,Nicd14,TypeA,TypeB	Set your power source type and all the warnings and meters will read correctly	
Card end time	2min,3min		
Card Remain	3min,5min		

Battery Setting 1

Decide which batteries exist in the list

Item	Range	description	BBC
Propac14	<u>Auto</u> ,Manual (11~ <u>13.8</u> ~15)	Select each battery with * Auto/Manual controls whether you can set the warning level voltage manually. Be sensible with this and you'll never have silly battery warnings	
Trimpac14	<u>Auto</u> ,Manual (11~ <u>13.6</u> ~15)		
Hytron50	<u>Auto</u> ,Manual (11~ <u>13.2</u> ~15)		
Hytron100	<u>Auto</u> ,Manual (11~ <u>13.0</u> ~15)		
Dionic90	<u>Auto</u> ,Manual (11~ <u>13.6</u> ~15)		
Dionic160	<u>Auto</u> ,Manual (11~ <u>13.1</u> ~15)		
NP-L7	<u>Auto</u> ,Manual (11~ <u>12.9</u> ~15)		
Endura7	<u>Auto</u> ,Manual (11~ <u>13.2</u> ~15)		
Endura10	<u>Auto</u> ,Manual (11~ <u>13.2</u> ~15)		
EnduraD	<u>Auto</u> ,Manual (11~ <u>13.2</u> ~15)		
PagL95	<u>Auto</u> ,Manual (11~ <u>13.5</u> ~15)		
BP-GL65/95	<u>Auto</u> ,Manual (11~ <u>13.6</u> ~15)		

Battery Setting 2

Continued

Item	Range	description	BBC
Nicd14	<u>Auto</u> ,Manual (11~ <u>13.2 end</u> ~ <u>13.8 near end</u> ~15)		
TypeA	<u>Auto</u> ,Manual (11~ <u>12.9 end</u> ~ <u>13.6 near end</u> ~ <u>14.6 full</u> ~17)		
TypeB	<u>Auto</u> ,Manual (11~ <u>12.4 end</u> ~ <u>13.0 near end</u> ~ <u>15.2 full</u> ~17)		

Mic/Audio 1

Item	Range	description	BBC
Front VR Ch1	Front,WL,Rear,All, <u>Off</u>	Where the audio control is, Ch1	
Front VR Ch2	Front,WL,Rear,All, <u>Off</u>	Audio control, Ch2	
Mic Lowcut Ch1	Front,Rear,WL, <u>Off</u>	Bass-cut filters, to 200Hz	
Mic Lowcut Ch2	Front,Rear,WL, <u>Off</u>		
Mic Lowcut Ch3	Front,Rear,WL, <u>Off</u>		
Mic Lowcut Ch4	Front,Rear,WL, <u>Off</u>		
Limiter 1	<u>On</u> / <u>Off</u>		
Limiter 2	<u>On</u> / <u>Off</u>		
Audio Level Ch3	<u>On</u> , <u>Off</u>		
Audio Level Ch3	<u>On</u> , <u>Off</u>		
Cue Rec Select	Ch1,Ch2,Ch3.Ch4,Ch1+2,Ch3+4	What goes onto the Cue Track	
Test Tone	<u>Normal</u> ,Always,Off,ChSel	Which channel(s) get test tone	

Mic/Audio 2

Item	Range	description	BBC
Front Mic Power	<u>On</u> ,Off	Phantom power	
Rear Mic Power	<u>On</u> ,Off	Phantom power	
Audio Out	<u>On</u> ,Off		
Monitor Select	<u>Stereo</u> ,Mix	What's monitored	
Front Mic level	- <u>40</u> ,-50dB		
Rear Mic Ch1 Level	-50,- <u>60dB</u>		
Rear Mic Ch2 Level	-50,- <u>60dB</u>		
Rear Line In Level	-3, <u>0</u> ,+4dB		
Audio Out level	-2, <u>0</u> ,+4dB		

Headroom	18,20dB	Ref level, Factory=(50) 18dB, (59.94) 20dB	18dB
Wireless Warn	On,Off	Warns when radio mic level is poor	

TC/UB

Time code and User Bits

Item	Range	description	BBC
TC Mode	<u>D</u> F,NDF	Always NDF at 50	NDF
UB Mode	<u>U</u> ser,Time,Date,Ext, TCG,FrmRate,Regen	User bits data	
VITC UB MODE	User/Ext,Time,Date,TCG, <u>F</u> rmRate,Regen		
TCG Set Hold	On,Off	Store TC when powered down	
First Rec TC	<u>R</u> egen,Preset	How TC is started	
P.Off LCD Display	On,Off	TC display when power OFF	
TC Out	TCG,TCG/TCR		
TC Disp Sel	<u>3</u> 0F,24F	Base for 59.94 frame count, always 25 at 50	
TC Video Synchro	<u>0</u> ,1,2,3	Correction for TC, refer to the manual	
Rec Review Regen	On,Off	On uses recorded TC on replay	

UMID Set/Info

Item	Range	description	BBC
Country		Input your data, displays "No-Info" until you do so	
Organization			
User			
Device Node			ID number of the product

FILE MENUS

SD Card Read/Write

Item	Range	description	BBC
R.Select	<u>1</u> ~8	File number to read	
Read		load from file	
W.Select	<u>1</u> ~8	File number to write	
Write		write to file	
Card Config		List titles on card	
Title Read		load user data	
Title1-8		Title, max 8 characters	

Cam Card R/W Select

Decide what gets saved on the card

Item	Range	description	BBC
System Mode R/W	On,Off	System and Camera Modes	
ID Read/Write	On,Off	On=save cam ID to card	
User Menu Select R/W	<u>O</u> n,Off	Load/save Menu items that are/aren't marked	
System Menu R/W	<u>O</u> n,Off		
Paint Menu level R/W	<u>O</u> n,Off		
Paint Menu Sw R/W	<u>O</u> n,Off		
VF Menu R/W	<u>O</u> n,Off		
Operation Menu R/W	<u>O</u> n,Off		
Mainte Menu R/W	<u>O</u> n,Off		
VTR Menu R/W	<u>O</u> n,Off		

Lens File

Item	Range	description	BBC
File No.	<u>1</u> ~8	Lens file number	
Read		Read it	
Write		Write it	
Reset All		Reset lens file data	
Title1-8		Max 12 characters	

Lens File Card R/W

Item	Range	description	BBC
Card File Select	<u>1</u> ~8	8 lens files	
Read			

Write			
Title Read			
Title1-8			Create a title

Scene

<i>Item</i>	<i>Range</i>	<i>description</i>	<i>BBC</i>
Read User Data.	<u>1</u> ~8	8 lens files	
Scene Sel			
Read			
Write			
Reset		Create a title	
Title1-4			

Initialise

Reset

<i>Item</i>	<i>Range</i>	<i>description</i>	<i>BBC</i>
Read Factory Data.		Resets User/Scene data	
Write User Data		Save User data in the camera	

MAINTENANCE

System Check

<i>Item</i>	<i>Range</i>	<i>description</i>	<i>BBC</i>
Color Check	On, <u>Off</u>	Displays RGBY levels	

Lens Adj

<i>Item</i>	<i>Range</i>	<i>description</i>	<i>BBC</i>
F2.8 adj	On, <u>Off</u>		
F16 adj	On, <u>Off</u>		

Black Shading

<i>Item</i>	<i>Range</i>	<i>description</i>	<i>BBC</i>
Correct	<u>On</u> ,Off		On
Detection (Dig)		This makes it happen	

White Shading

<i>Item</i>	<i>Range</i>	<i>description</i>	<i>BBC</i>
Correct	<u>On</u> ,Off		On
Saw/Para	-255~ <u>0</u> ~255	Values for R/G/B, H/V, Para/Saw	

Diagnostic 1

card/software versions, values for engineering sample camera tested on 8.5.2007

<i>Item</i>	<i>Range</i>	<i>description</i>	<i>BBC</i>
Camsoft Main		Internal flash software version	1.05-00.0.00
Cam Table		Table version	3.00-00.0.00
Pulse FPGA		Font version	1.05-00.0.00
UCIF FPGA			1.02-00.0.00
FM FPGA		Frame memories	1.00-00.0.00
Char FPGE		Characters	1.00-00.0.00
DC FPGA		Down-converters	1.00-00.0.00

Diagnostic 2

Some more

<i>Item</i>	<i>Range</i>	<i>description</i>	<i>BBC</i>
Syscon Soft			1.05-00.0.00
LCD Soft			3.03-00.0.00
P2CS OS			1.02-00.0.00
P2CS AP			1.05-00.0.00
Sh4 CTRL FPGA			1.02-00.0.00
PRC CTRL FPGA			1.03-00.0.00
Sysif FPGA			1.00-00.0.00
SDI in FPGA			1.02-00.0.00

Hours Meter

Usage record

<i>Item</i>	<i>Range</i>	<i>description</i>	<i>BBC</i>
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Operation		0008x10h	
P.On times		284	

2 Measurement results

2.1 Colour performance

Assessments were made visually, using Macbeth charts as usual; performance was the same as for the HDX900.

2.2 Resolution

A HDTV zone plate chart was used (Fig.1). This contains six circular patterns that fully explore the spatial frequency performance of the camera, up to 1920x1080 pixels per width and height. In this illustration, there is serious aliasing caused by the scaling used to present it here.



Figure 1 zone plate chart

2.2.1 Resolution at HDTV

Fig.2 shows a single quadrant of one pattern; for this exposure, the camera detail enhancement was turned off, so this is the native performance of the camera. There are clear null zones, where the wanted lower frequencies beat with the unwanted alias products, caused by the presence of higher frequencies, at 720 vertically and 1280 pixels horizontally. At first sight, this is to be expected from a camera using sensors of 1280x720 dimensions. However, it actually reveals that no tricks have been played in offset positioning of the sensors, precision horizontal offset of green from red and blue is a common trick to extend the resolution, and this can be done vertically as well. The resulting performance is a little disappointing. It is also evident that there is no optical spatial filtering in this camera, to suppress frequencies higher than can be resolved.

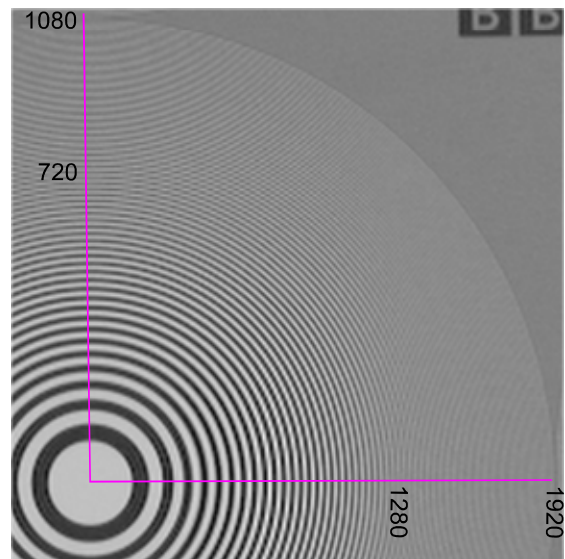


Figure 2 HD performance, detail off

Judicious use of some detail enhancement (values are given in the tables above) improves the visual effect somewhat, but cannot produce resolution above the sensor limits of 1280 and 720.

On moving pictures, the aliases are visible as a disturbing “business” on sharp edges. It is easy to confuse these effects with the artefacts of video compression, but this test was done using the live HDSDI output; the DVCPProHD compression system can be expected to make the aliasing look worse.

Aliasing can cause difficulties in post-production operations where keying is used, since edges are not always where they are supposed to be.

2.2.2 Resolution at SDTV

When the camera is set to HD, but the digital output switched to SD, it should be able to deliver full SD resolution if used with a HD lens; Fig.3 shows the result, plotted with square pixels, again via SDI. This is the mode in which the camera is used to record HD, but monitoring is only SD, therefore it is important to see how well it works.

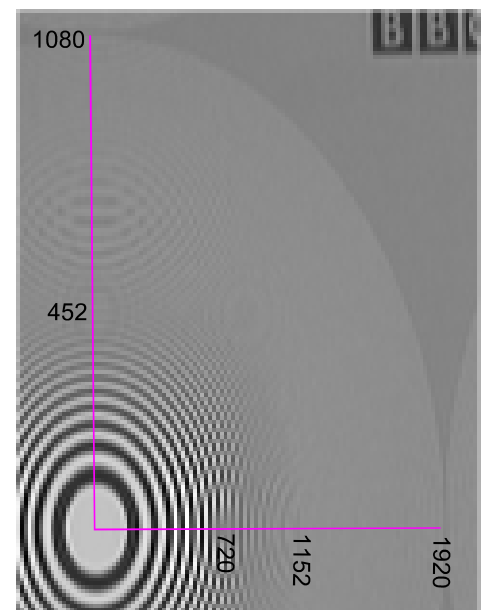


Figure 3 camera HD, output SD, detail off

Since the card was framed to fill the picture, the scales still relate to HDTV pixel and line numbers. There is no clean resolution above about 452 lines vertically, nor above 720 pixels horizontally, but there is very visible aliasing around and above these limits. This is due to high frequency content of the HD image in the camera not being properly suppressed in the SD output; it indicates that the down-converter is poor, not using adequate (but expensive) filtering.

If the camera is to be used only to produce SD, it can be set into one of the SD resolutions. Fig.4 shows the result when set to 576i (“PAL”). Vertical resolution is improved, extending to 576 (the strict limit of resolution for SD) albeit together with aliased higher frequencies, but resolution near 576 is visible as inter-line twitter on an interlaced display, and is distracting. Unfortunately, aliasing around and above 576 is still present, again indicating that the down-converter is not properly suppressing these higher vertical frequencies.

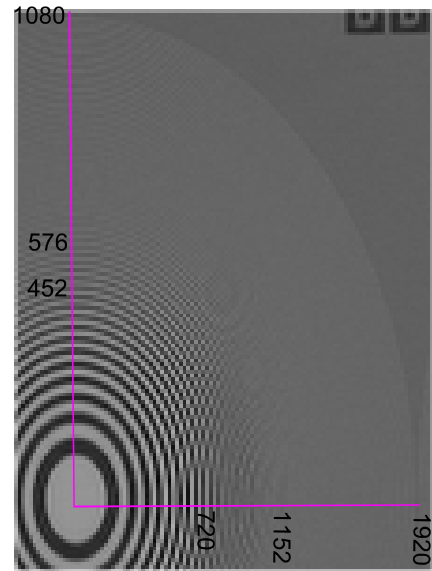


Figure 4 camera SD 50i, detail off

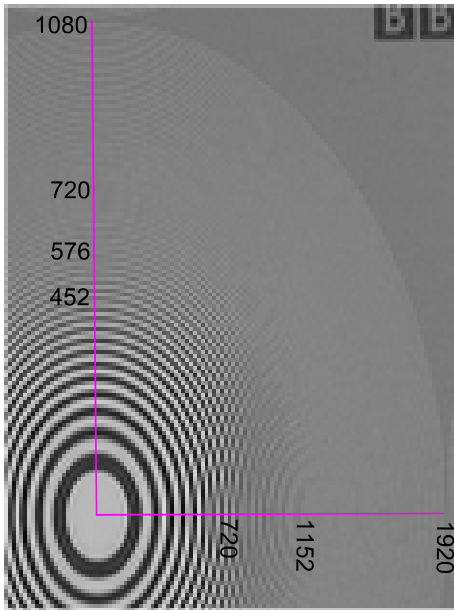


Figure 5 camera SD 25p, detail off

Horizontally, the result is the same as for setting the camera to HD and monitoring in SD, which is no surprise.

Fig. 5 shows the result for setting the camera to 25p. Horizontally, there is no change. Vertically, the aliased frequencies above 576 are rather more visible, and there is a clear null zone (plain grey area) at 720, the vertical resolution of the sensors. This confirms that the high frequencies in the camera are not being suppressed properly in the down-conversion process. It also indicates that the lens is delivering more detail to the camera than it can resolve, even when in HD mode (since it cannot, in theory, resolve more than 720 vertically and 1280 horizontally), and this is evidence that there is no optical low-pass filtering in the camera.

When the camera is set to NTSC resolution, the vertical aliasing is rather less visible, but this is probably because the interline twitter from resolution around 480 lines/picture height dominates.

2.2.3 Detail enhancement at SD

So far, all the illustrations are without detail enhancement. The values given in the menu tables increase visible sharpness at HD, without causing excessive ringing, this is the same performance as in the HDX900. Fig.6 shows the effect of the same settings on the SD picture at 50i.

Sadly, the enhancement is mostly to the visibility of the aliased vertical frequencies above 452, and not to the wanted frequencies, with the maximum effect being highly visible around 720. Any attempt at sharpening the HD picture by using more detail enhancement will have the effect of exacerbating these aliased frequencies, both in the HD and SD outputs. Any degree of detail enhancement increases the visibility of interlace twitter.

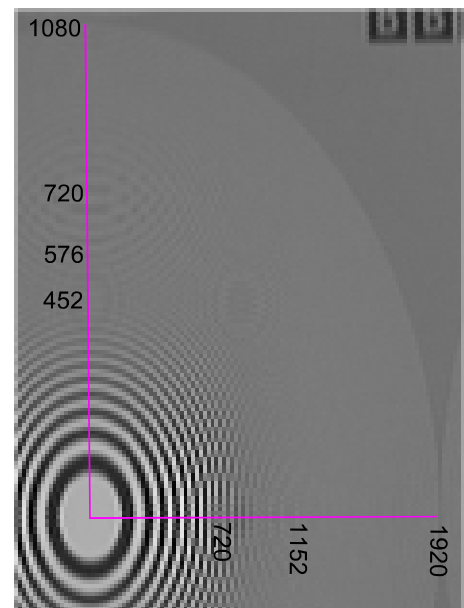


Figure 6 camera SD 50i, detail on

These aliased frequencies occur in static pictures on scenes with high amplitude detail, and are disturbing once you know what to look for, but are immediately visible in most moving pictures, where they create a “business” on moving edges

(because the aliased frequencies cause edges to move in the opposite direction to the bulk of a moving object, creating a disturbing rippling effect on edges).

2.3 Conclusion

The camera produces spatial aliases from frequencies above 640 cycles/picture width (called 1280 pixels) and 360 cycles/picture height (called 720 lines). This shows that the HD lens delivers more resolution to the camera than it can resolve, and that there is no optical spatial filter in the camera. Also, the down-conversion in this camera is not very good, which is a shame. If the camera is to be used to make SD pictures for programme use, it makes no sense to use an HD lens, or even a best-quality SD lens. It is far better to use the camera in HD mode, and to use an external down-converter.