Colorimetric and Resolution requirements of cameras

Alan Roberts

ADDENDUM 1A : Menu settings for

Sony HDCAM, HDW900/3

Data for this section relevant to the modified version of the Sony HDW900 camera, with hardware and software revisions issued in 2003, and referred to as HDW900/3. It is little changed from the earlier version, but the changes have significance in that some settings for the original camera no longer do what they should.

This model developed from the earlier HDW700, which was a 1035-line camcorder, operating at 59.94 or 60Hz, interlaced. The later models are 1080-line and will also operate at various frame rates from 23.976 to 30Hz progressive, and 50 to 60Hz interlaced. They record a maximum data rate of about 144Mb/s onto Betacam-like tape, the transport speed varies with frame rate so tape duration depends on frame rate.

The camera is based on the familiar form of the Beta camcorder and is used mostly for portable, single-camera work. 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, although it can be controlled remotely.

The menu settings result from several measurement and usage sessions, mostly attempting to get a good "film-look", and the settings reflect that. It is useful to think of the camera, when used in this way, to be mimicing a film camera and neg-scan telecine, with "best light" transfer to tape. It is always assumed that a grading operation should be used in post-production, the settings give the colourist the same range of options as with film. The laboratory tests were made using a BTS LDK9000 as a reference camera, of the type used in the Eureka 1250-line system. The values for Gamma, Black Gamma and Knee allow nearly 3 stops of over-exposure and one of under-exposure relative to normal operation, although the knee has two points of inflexion which could conceivably cause colour contouring (although this has not been observed in practice). This setup approaches a film-look, provided that Detail correction is either off or set to a low level. Images are generally sharper than even for 35mm film, this can be an issue for production, but can generally be dealt with by using filters or some post-production softening. For use in Sport or Light Entertainment, it would probably be beneficial to switch off the Black Gamma, and to increase Detail Level to zero (factory setting).

Many of the menu items have little or no effect on image quality. Those that do so are highlighted. The full set of menu items is given for completeness.

One major new feature of the camera is custom-generated gamma curves, whereby the user can define a transfer characteristic and download it to the camera on a memory stick. An editor is available from Sony, to prepare the data, users should refer to Sony for more information on this.

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In boxes with numeric settings (e.g. –99~99), the values indicate the range, and zero means factory setting, not zero effect, and no scales are given. For each item, the set value is given (if set), then the range offered by the camera. Where two values are given, they are for film- or video-look, e.g. ON {f} OFF {v}.

OPERATION MENUS

OPERATION/1 VF DISPLAY viewfinder indicators for switch settings

Item	*Switch*	*description*	*BBC*
EX	3S/ON/OFF		
ZOOM	3S/ON/OFF		
ND	3S/ON/OFF		
CC	3S/ON/OFF		
IRIS	3S/ON/OFF		
WHITE	3S/ON/OFF	Each item can be set to be on or off, or on for 3 seconds each time its value changes	
D5600K	3S/ON/OFF		
GAIN	3S/ON/OFF		
SHUTT	3S/ON/OFF		
BATT	3S/ON/OFF		
TAPE	3S/ON/OFF		
TC	3S/ON/OFF		
AUDIO	3S/ON/OFF		
MESSAG	ALL/WRN/AT/OFF		

OPERATION/2 !IND warning indicators of abnormal settings

Item	*Switch*	*Range*	*description*	*BBC*
ND	ON/OFF	1~4	Each item can be on	
CC	ON/OFF	A~D	or off. Any item not at	
WHITE	ON/OFF	P/A/B	the NORMAL setting	
D5600K	ON/OFF	ON/OFF	(in the Range column)	
GAIN	ON/OFF	L/M/H	raises the ! indicator,	
SHUTT	ON/OFF	ON/OFF	but there's nothing to	
FAN	ON/OFF	AUTO1/AUTO2/MIN/MAX	say which one caused	
EXT	ON/OFF	ON/OFF	it.	
FORMAT	ON/OFF	23.98/24/25/29.97/30 (PsF) /50/59.97/60 (I)	Frame/field rate	24/25 for film

OPERATION/3 MARKER viewfinder markers

Item	*Switch*	*Range*	*description*	*BBC*
MARKER	ON/OFF			
CENTER	ON/OFF	1~4	type of centre marker	
SAFETY ZONE	ON/OFF	80%/90%/92.5%/95%	Dim outside zone	
EFFECT	ON/OFF			
ASPECT MODE		16:9/15:9/14:9/13:9/4:3/ VAR H /VAR V/ 1035/VISTA1/VISTA2/		
MASK	ON/OFF	0~100	Dim outside zone	
VAR WIDTH		0:1920 (VAR H) /0:1080 (VAR V)	User box in pixels./lines	

OPERATION/4 GAIN SW video gain switch

Item	*Range*	*description*	*BBC*
LOW	-3/0/3/6/12/18		0dB
MIDDLE	-3/0/3/6/12/18		6dB
HIGH	-3/0/3/6/12/18		12dB

OPERATION/5 ZEBRA/View Finder DeTaiL zebra and v/f detail enhancement

Item	*Switch*	*Range*	*description*	*BBC*
ZEBRA	ON/OFF	1/2/1&2		ON, 1&2
ZEBRA1		58%~82%	Set for skin tone	65%
ZEBRA2		88%~112%	Allows 1 stop over 100%	100%
VF DTL	ON/OFF	-99~99	this doesn't seem to work	OFF

OPERATION/6 AUTO IRIS metering area

Item	*Range*	*description*	*BBC*
WINDOW	1~6	Six window shapes	
OVERRIDE	-99~99	Manual control on lens	

OPERATION/7 BATT ALARM battery alarm levels

Item	*Range*	*description*	*BBC*
BATT		Heading	
TYPE	LITHIUM/ANTON/OTHERS1/ OTHERS2/AC ADP		LITHIUM
BEFORE END		Reflects voltage settings in	
END		maintenance menu	
DC IN		Heading	
TYPE	LITHIUM/ANTON/OTHERS1/OTHERS2/AC ADP		AC ADP
BEFORE END		Reflects voltage settings in	
END		maintenance menu	

OPERATION/8 OTHERS sets user switch and colour rebalancer

Item	*Switch*	*Range*	*description*	*BBC*
D5600K	ON/OFF		Shifts P3200 to D56	OFF
ASSIGNABLE 1		OFF/D12dB/D24dB/VTR/	D12/24=extra gain in digital	OFF
ASSIGNABLE 2		LENS RET/RETURN	processing, VT=start/stop	OFF

OPERATION/9 OPERATOR FILE read/write camera settings

Item	*Switch*	*Range*	*description*	*BBC*
READ (MS to CAM)	Press rotary encoder to execute		Memory stick read	
WRITE (CAM to MS)			Memory stick write	
PRESET			Factory reset	
FILE ID			Text field, enter what you like	
CAM CODE			User set	
DATE				

OPERATION/10 LENS FILE

Item	*Switch*	*Range*	*description*	*BBC*
FILE		1~16	Select lens file number	
LENS			Text entered in maint menu	
APERTURE			Only stores max aperture data	

PAINT MENUS

PAINT/1 SW STATUS parallel with switches in other menus

Item	*Switch*	*Range*	*description*	*BBC*
FLARE	ON/OFF			ON
GAMMA	ON/OFF			ON
BLK GAM	ON/OFF			ON {f} OFF {v}
KNEE	ON/OFF			ON
WHT CLIP	ON/OFF			ON
DETAIL	ON/OFF			ON {f} OFF {v}
LVL DEP	ON/OFF			ON
SKIN DTL	ON/OFF			OFF
MATRIX	ON/OFF			ON

PAINT/2 VIDEO LEVEL some parallel with controls in other menus

Item	*Switch*	*Range*	*description*	*BBC*
WHITE [R]		-99~99	White balance settings. Reports	
WHITE [G]		-99~99	values set by auto-white	
WHITE [B]		-99~99	balance, or enter values directly	
WHITE [M]		-99~99	Effectively master gain	
BLACK [R]		-99~99	Black balance settings. Reports	
BLACK [G]		-99~99	values set by auto-white	
BLACK [B]		-99~99	balance, or enter values directly	
BLACK [M]		-99~99	Effectively master black	
FLARE [R]		-99~99		
FLARE [G]		-99~99	Depends on lens used	
FLARE [B]		-99~99		
FLARE [M]		-99~99	Master flare correction	
GAMMA [R]		-99~99		0
GAMMA [G]		-99~99		0
GAMMA [B]		-99~99		0

GAMMA [M]		-99~99		0
V MOD [R]		-99~99		0
V MOD [G]		-99~99		0
V MOD [B]		-99~99		0
V MOD [B]		-99~99		0
FLARE	OFF/ON			OFF
V MOD	OFF/ON		Vertical shading modulation	ON
TEST	OFF/1/2		Sawtooth, 1=digital, 2=analogue	

PAINT/3 GAMMA

Item	*Switch*	*Range*	*description*	*BBC*
LEVEL [R]		-99~99		0
LEVEL [G]		-99~99		0
LEVEL [B[		-99~99		0
LEVEL [M]		-99~99		0
COARSE		0.40/0.45/0.50	Degree of curvature	0.45
TABLE		1~6	1=ENG (3.5 slope), 2/3=EFP (4.0), 4=SMPTE240 (4.0), 5=ITU709 (5.5), 6=BBC (5.0)	5
GAMMA	ON/OFF			ON
TEST	OFF/1/2		Duplicate of PAINT/2 item	

PAINT/4 BLK GAMMA black stretch

Item	*Switch*	*Range*	*description*	*BBC*
LEVEL [R]		-99~99		0
LEVEL [G]		-99~99		0
LEVEL [B]		-99~99		0
LEVEL [M]		-99~99	Set for max slope about 7.2	-60
RANGE [RGB]	OFF/ON	15%/25%/35%/50%	Upper limit of stretch	ON,35% {f} OFF {v}
LEVEL [Y]		-99~99		
RANGE [Y]	OFF/ON	15%/25%/35%/50%	Upper limit of stretch	OFF
TEST	OFF/1/2		Duplicate of PAINT/2 item	

PAINT/5 LOW KET SAT saturation in black stretch area

Item	*Switch*	*Range*	*description*	*BBC*
LEVEL		-99~99	Saturation in stretched part	
BLK CLIP	ON/OFF	-99~99	Value in Y curve where it stops	OFF

PAINT/6 KNEE

Item	*Switch*	*Range*	*description*	*BBC*
POINT [R]		-99~99		0
POINT [G]		-99~99	Set for 2.75 stops overload.	0
POINT [B]		-99~99	CCDs deliver nearly 3 stops	0
POINT [M]		-99~99	before clipping, knee starts at	36
SLOPE [R]		-99~99	about 85%, so keep skin tones	0
SLOPE [G]		-99~99	low to avoid unnatural faces.	0
SLOPE [B]		-99~99	Crucial element of film look.	0
SLOPE [M]		-99~99		62
WHT CLP [R]		-99~99		0
WHT CLP [G]		-99~99		0
WHT CLP [B]		-99~99		0
WHT CLP [M]		-99~99	About 106%	30
KNEE SAT LEVEL	ON/OFF	-99~99	saturation in compressed zone	OFF
KNEE	ON/OFF		Vital for film look	ON
KNEE SAT	ON/OFF		Both not needed, pictures look	OFF
WHT CLIP	ON/OFF		better without	OFF
TEST	OFF/1/2		Duplicate of PAINT/2 item	

PAINT/7 DETAIL 1

Item	*Switch*	*Range*	*description*	*BBC*
LEVEL		-99~99		-14 {f} 0 {v}
LIMITER [M]		-99~99		0
LIMITER [WHT]		-99~99		0
LIMITER [BLK]		-99~99		0
CRISP		-99~99		0
HV RATIO		-99~99		0

FREQ		-99~99		0
LVL DEP		-99~99		0
DETAIL	ON/OFF		default values are ok	OFF {f} ON {v}
LVL DEP	ON/OFF		default values are ok	ON

PAINT/8 DETAIL 2

Item	*Switch*	*Range*	*description*	*BBC*
FINE DTL	ON/OFF	-99~99	HF detail	OFF
KNEE APERTURE	ON/OFF	-99~99	Detail in knee compressed parts	ON, 0

PAINT/9 SKIN DETAIL

Item	*Switch*	*Range*	*description*	*BBC*
SKIN DTL	ON/OFF		if this is on, chan 1 can't be off	OFF
SKIN GATE	ON/OFF			
CHAN SW [1]	ON/OFF			
GATE [1]	ON/OFF			
PHASE [1]	AUTO	0~359		
WIDTH [1]		-99~99		
SAT [1]		-99~99		
LEVEL [1]		-99~99		
CHAN SW [2]	ON/OFF			
GATE [2]	ON/OFF			
PHASE [2]	AUTO	0~359		
WIDTH [2]		-99~99		
SAT [2]		-99~99		
LEVEL [2]		-99~99		
CHAN SW [3]	ON/OFF			
GATE [3]	ON/OFF			
PHASE [3]	AUTO	0~359		
WIDTH [3]		-99~99		
SAT [3]		-99~99		
LEVEL [3]		-99~99		

PAINT/10 USER MATRIX main matrix page

Item	*Switch*	*Range*	*description*	*BBC*
USER R-G		-99~99		
USER R-B		-99~99	Hand-crafted matrix, no clues	
USER G-R		-99~99	given about the scale of	
USER G-B		-99~99	coefficients. This needs a lab to	
USER B-R		-99~99	set up sensibly	
USER B-G		-99~99		
MATRIX	ON/OFF		Main matrix switch	ON
PRESET	ON/OFF	SMPTE-240M/ITU-709/SMPTE-WIDE/NTSC/EBU/ITU-601	Standard matrices, only ITU709 makes sense	ON, ITU709
USER MATRIX	ON/OFF		Off unless DoP has strong views	OFF
MULTI MATRIX	ON/OFF		Avoid at all costs	OFF

PAINT/11 MULTI MATRIX

Item	*Switch*	*Range*	*description*	*BBC*
PHASE		0~338 (22.5° steps)	Adjust hue and saturation of 22.5° segments independently	
HUE		-99~99		
SAT		-99~99		
ALL CLEAR			Resets all hue/sat settings to 0	
MATRIX	ON/OFF			ON
PRESET	ON/OFF	SMPTE-240M/ITU-709/SMPTE-WIDE/NTSC/EBU/ITU-601	Same item as PAINT/10	ON, ITU-709
USER MATRIX	ON/OFF		Off unless DoP has strong views	OFF
MULTI MATRIX	ON/OFF		Avoid at all costs	OFF

PAINT/12 SHUTTER

Item	*Switch*	*Range*	*description*	*BBC*
SHUTTER	ON/OFF	see below		ON {f} OFF{v}
ECS FREQ		see below	Avoids light/monitor strobing	
S-EVS	ON/OFF	0~100%	Enhanced Vertical res for interlace, 50%=film shutter	OFF, 50%

Shutter speeds	50I	1/60,1/125,1/250,1/500,1/1000,1/2000
	30PsF/29.97PsF	1/40,1/60,1/125,1/250,1/500,1/1000
	25PsF	1/30,1/50,1/100,1/250,1/500,1/1000
	24PsF/23.98PsF	1/32,1/48,1/96,1/125,1/250,1/500,1/1000
ECS frequencies	60i/59.94I	30.0~5600Hz
	50I	25.0~5600Hz
	30PsF/29.97PsF	30.4~2800Hz
	25PsF	25.3~2300Hz
	24PsF/23.98PsF	24.3~2300Hz

PAINT/13 SCENE FILE standard features

Item	*Switch*	*Range*	*description*	*BBC*
STORE		1~5		
STANDARD				
FILE ID				
CAM CODE				
DATE				

MAINTENACE MENUS

MAINTENANCE/1 AUTO SETUP software action mimicing hardware switches

Item	*Switch*	*Range*	*description*	*BBC*
AUTO BLACK				
AUTO WHITE				
AUTO LEVEL				
TEST	OFF/1/2		Duplicate of PAINT/2 item	

MAINTENANCE/2 WHITE SHADING

Item	*Switch*	*Range*	*description*	*BBC*
V SAW [R]		-99~99		
V SAW [G]		-99~99		
V SAW [B]		-99~99		
V PARA [R]		-99~99		
V PARA [G]		-99~99		
V PARA [B]		-99~99		
H SAW [R]		-99~99		
H SAW [G]		-99~99		
H SAW [B]		-99~99		
H PARA [R]		-99~99		
H PARA [G]		-99~99		
H PARA [B]		-99~99		
WHITE [R]		-99~99		
WHITE [G]		-99~99		
WHITE [B]		-99~99		
VMOD [R]		-99~99		
VMOD [G]		-99~99		
VMOD [B]		-99~99		
VMOD [M]	ON/OFF	-99~99		

MAINTENANCE/3 BLACK SHADING

Item	*Switch*	*Range*	*description*	*BBC*
V SAW [R]		-99~99		
V SAW [G]		-99~99		
V SAW [B]		-99~99		
V PARA [R]		-99~99		
V PARA [G]		-99~99		
V PARA [B]		-99~99		
H SAW [R]		-99~99		
H SAW [G]		-99~99		
H SAW [B]		-99~99		

H PARA [R]		-99~99		
H PARA [G]		-99~99		
H PARA [B]		-99~99		
BLK SET [R]		-99~99		
BLK SET [G]		-99~99		
BLK SET [G]		-99~99		
BLACK [R]		-99~99		
BLACK [G]		-99~99		
BLACK [B]		-99~99		
BLACK [B]		-99~99		
MASTER GAIN		-3/0/3/6/12/18dB		

MAINTENANCE/4 OHB MATRIX optical head block matrix

Item	*Switch*	*Range*	*description*	*BBC*
PHASE		0~338 (22.5° steps)	Adjust hue/sat in 22.5 degree	
HUE		-99~99	wedges, for matching cameras	
SAT		-99~99	together, AVOID this	
ALL CLEAR			Resets all hue/sat settings to 0	
MATRIX	ON/OFF		This controls all matrix settings	ON
OHB MATRIX	ON/OFF			OFF

MAINTENANCE/5 AUTO IRIS

Item	*Switch*	*Range*	*description*	*BBC*
WINDOW		1:6	Choice of window shape	
OVERRIDE		-99~99		
IRIS LEVEL		-99~99		
APL RATIO		-99~99		
IRIS GAIN		-99~99		

MAINTENANCE/6 CAM ID/DATE

Item	*Switch*	*Range*	*description*	*BBC*
CAM ID			Text	
DATE/TIME			Date and time	

MAINTENANCE/7 MULT-FORMAT scanning standard, field/frame rate

Item	*Switch*	*Range*	*description*	*BBC*
CURRENT		60/59.94/50 I /	Current frame/field rate	24/25PsF {f}
NEXT		30/29.97/25/24/23.98 PsF	Select then cycle powert	50I {v}

MAINTENANCE/8 VTR SETUP normal items

Item	*Switch*	*Range*	*description*	*BBC*
FF/REW AUDIO		CUE/EE		
PB AUDIO CH		1&2/3&4		
AU REC CH3/4		AUTO/1&2CH/MUTE		
AU REC 1KHz		MUTE/0dB/-20dB		
AU EMPHASIS	ON/OFF			
TC OUT		TCG/PB		
CTL TIMER		24H/+-10H		
REAL TIME		AUTO/MANU	Auto=DF/NDF for e.g. 59.94/60, Manu follows side switch	MANU

MAINTENANCE/9 BATT ALARM these settings appear in OPERATION/7

Item	*Switch*	*Range*	*description*	*BBC*
BATT TYPE		LITHIUM/ANTON/OTHERS 1/OTHERS2/AC ADP		LITHIUM
BEFORE END		11.0~17.0V		
END		11.0~17.0V		
DC-IN TYPE		LITHIUM/ANTON/OTHERS 1/OTHERS2/AC ADP		AC ADP
BEFORE END		11.0~17.0V		
END		11.0~17.0V		

MAINTENANCE/10 OTHERS 1

Item	*Switch*	*Range*	*description*	*BBC*
H PHASE		-3072:1023	Horizontal timing	
MONITOR OUT [Y]		-30~30	Signal gain controls for BNC	0
MONITOR OUT [Pb/Pr]		-30~30	monitoring outputs	0,0

MAINTENANCE/11 OTHERS 2

Item	*Switch*	*Range*	*description*	*BBC*
FAN MODE		AUTO1/AUTO2/MIN/MAX	fan speed	
MENU RESUME		OPE MENU/OFF/ALL	How menus reopen. OPE=last used, OFF=operator menus only	ALL
DATE TYPE		1:6	Usual choice of date formats	
WHITE MEMORY		2/8	How white balances are stored	

FILE MENUS

FILE/1 OPERATOR FILE as OPERATION/9

Item	*Switch*	*Range*	*description*	*BBC*
READ		MS to CAM	Memory stick read/write	
WRITE		CAM to MS		
PRESET				
STORE PRESET FILE				
FILE ID				
CAM CODE				
DATE				

FILE/2 SCENE FILE as PAINT/13

Item	*Switch*	*Range*	*description*	*BBC*
STORE		1~5		
STANDARD				
FILE ID				
CAM CODE				
DATE				

FILE/3 REFERENCE reference file

Item	*Switch*	*Range*	*description*	*BBC*
STORE FILE				
STANDARD				
FILE ID				
CAM CODE				
DATE				

FILE/4 LENS FILE not the same as OPERATION/10

Item	*Switch*	*Range*	*description*	*BBC*
STORE FILE			Action to store lens data	
FILE				
NO		1~16	File number	
NAME		e.g. HJ18x7.8B	Enter lens name	
F NO		F1.0~F3.4	Enter max aperture	
CENT MRK H POS		-20~20	Move lens centre markers	
CENT MRK V POS		-20~20		
STORE CENTER			Action to store new values	

FILE/5 OHB FILE

Item	*Switch*	*Range*	*description*	*BBC*
STORE FILE			Action to store OHB matrix settings, crashes hardware	

FILE/6 FILE CLEAR reset to factory settings, probably

Item	*Switch*	*Range*	*description*	*BBC*
PRESET OPERATOR			Operator settings to factory	
REFERENCE (ALL)	10 SEC CLEAR	ON/OFF	Reference settings to factory	
LENS (CURRENT)				
OHB WHITE SHAD				
OHB BLACK SHAD				
OHB ND OFFSET				
OHB MATRIX				

DIAGNOSIS/1 HOURS METER reports from the vtr

Item	*Switch*	*Range*	*description*	*BBC*
DRUM RUNNING				
TAPE TRAVEL				
OPERATION				
THREADING				

DIAGNOSIS/2 VTR STATUS reports and controls for vtr

Item	*Switch*	*Range*	*description*	*BBC*
CURRENT MOD		UNTHREAD/STOP/PLAY/FF/REW/ THREAD/REC/R.PAUSE/R.PREVIEW		
TAPE POS		TOP/TAPE OUT/STOP/PLAY/REC/REC PAUSE/ SEARCH/REW/EJECT/FF/REC REVIEW/END		
HUMID		DET/---		
REC INHIBIT	ON/OFF			
SLACK				

DIAGNOSIS/3 ROM VERSION report of card software versions

Item	*Switch*	*Range*	*description*	*BBC*
IF				
SV				
SY				

DIAGNOSIS/4 BOARD STATUS pcb reports

Item	*Switch*	*Range*	*description*	*BBC*
CAM OHB		OK/NG		
CAM VA		OK/NG		
CAM DPR		OK/NG		
CAM AD		OK/NG		
CAM IF		OK/NG		
CAM SG		OK/NG		
CAM DA		OK/NG		
VTR SV		OK/NG		
VTR SY		OK/NG		
VTR DEC A		OK/NG		
VTR DEC B		OK/NG		
VTR VN		OK/NG		
VTR EN		OK/NG		
VTR ENC		OK/NG		

DIAGNOSIS/5 TELE FILE

Item	*Switch*	*Range*	*description*	*BBC*
ID			20 characters	
SIZE		**KBYTE	Memory stick capacity	
REMAIN		**%	Free space	
STATUS		STANDBY/NO LABEL/WRITE PROTECT/ LABEL/UNKNOWN FORMAT		