

## Colorimetric and Resolution requirements of cameras

Alan Roberts

### **ADDENDUM 22 rev.2 : Sony HDCAM, HDW900RP and 790P**

**This document is a report of the results of tests that are the precursor of those described in the EBU technical document Tech3335. It is not an endorsement of the product.**

Data for this section is taken from the handbook and examination of a production model (serial number 10237) of the Sony HDW900R. The 790 appears to be almost identical, but does not have the international speed options of the 900R. Although not specifically tested, it is widely believed that the image processing is identical in the two cameras, and therefore the settings for the 900R should work in the 790. For the rest of this document, only the 900R will be referenced, but the data is expected to work in the 790. This revision contains more details on the 790's menus

This is a 1080-line camcorder, physically smaller than its predecessor the HDW900, and has the lower power consumption and enhancements to connectivity of the HDW750. It records at all the familiar HDTV frames rates using the same HDCAM algorithm and data rate as the HDW900, tapes are interchangeable. Mechanically, the lens mount appears to be more robust than on earlier models, so back focus problems may be less severe.

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 HD viewfinder can be replaced with an SD one (especially useful when the camera is to be genlocked to an SD source), or a colour one. A standard option is a live down-converter to SD, so the camera can be used in mixed environments. Video output is analogue or SDI, both at HD and SD. An 8-second buffer allows the camera to capture pictures before the record button is pressed, thus power can be saved by not keeping the tape transport in Stand By mode.

The menu settings result from one measurement and usage session, mostly to find the differences between this and previous models. When using the camera in film mode, it is useful to think of the camera as mimicking a film camera and telecine, with "best light" transfer to tape, with about 11 stops of tonal range. Due to the extraordinary flexibility of the controls, it is possible to make it mimic negative or positive film, and resolution can be tailored to 35mm or 16mm, to taste. Assuming that a grading operation will be used in post-production, the settings give the colourist the same range of options as with film. The values for Gamma, Black Gamma and Knee allow about 1.7 stops of over-exposure and at least one of under-exposure relative to normal operation. The "film" gamma mode compresses the entire contrast capture range, while the "video" mode preserves more accuracy over the lower exposure range. The film setup approaches a film-look, enhanced by the separated Detail and Aperture controls. With both Detail and Aperture off, images are generally sharper than even for 35mm film, this can be an issue for production. For use in Sport or Light Entertainment, it would probably be beneficial to switch off the Black Gamma, and to set Detail Level to zero (factory setting).

There are two HDSDI outputs; the analogue outputs of the original HDW900 have been removed. The monitoring output is analogue HD only, unless a down-converter board is installed.

HKD702 option board provides down-conversion for monitoring in PAL or NTSC, depending on frame rate (composite analogue or SDI).

HKD702R option board also performs 2:3 pull-down for 23.98psf monitored in NTSC. There does not appear to be a 2:3:3:2 option.

HKDW703 option board stores up to 8 seconds of video for pre-recording, and for intermittent (time-lapse) recording.

HKDW705R option board stores up to 64 frames, this can provide either a slow shutter (by summing consecutive frames) or can invert the image (required for some cine lenses).

RMB150/750 remote controls are suitable for this camera.

Filter wheel: the cross filter of the earlier model (position A) has been replaced with a 5600K filter (only in the F900R).

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### ADDENDUM 22 rev.1 : settings for Sony HDCAM, HDW900RP and HDW790P

“BBC” setting values are given for:

- Video {v}
- Negative film {f}

Where different values are needed for these settings, they are marked e.g. thus: On{v} Off{f}. Note that the film settings are not intended to reproduce precisely the performance of any particular film stock, merely to give a “look” that is representative of a generic film type. Sadly, this camera does not allow for negative detail “enhancement” (i.e. reduction, the earlier HDW900 and the 750 both offer detail reduction, which is necessary in order to excessively jerky motion), so optical filters may be needed to get a good film look (e.g. ¼ or ½ black Promist or equivalent). Ideally, such filters would be placed behind the lens in order for their effect to be constant over the range of zoom and focus.

Many of the menu items have little or no effect on image quality. Those that have significant effect are highlighted. The full set of menu items is given for completeness. In boxes with a range of numeric settings, e.g. -99~99, the values indicate the nominal range, and zero means no alteration to factory setting, not zero effect, and no scales are given. Values in parenthesis, e.g. (-99~99) are relative and depend on other settings, so individual cameras may exhibit different ranges. For each item, the factory setting is given, “BBC” settings are in the last column, where appropriate, and I explain the reasons for the values in footnotes throughout the tables where necessary.

The data files are used in “layers”, Factory, Service, Preset, User. The effect of a numeric data value in the user menus is the sum of all values for that item in all these layers. Only those in the Factory layer are absolute, thus it is vital to have all layers correctly set when entering new values, if the setup is to be copied from camera to camera. To return to Standard Setup (i.e. factory condition), go to menu FILE02 USER FILE 2 and select CLEAR USR PRESET, or FILE03 ALL FILE and select CLEAR ALL PRESET, and press the rotary encoder. Then values can be entered via menus or Memory Stick to achieve a specific setup. The range of values available in some items may not be those quoted in the camera manual, this is due to settings in the Factory layer which must not be altered.

TOP MENU	
User	Go to daily routine settings, 5 pages that can be customised
User menu customise	Customise user menu pages
All	Go to all menu pages
Operation	Settings for shot-by-shot control
Paint	Settings that normally need lab facilities to control properly
Maintenance	Camera maintenance, usually best avoided
File	Load/save reference files etc
Diagnosis	Check status of hardware/software
Service	Keep out of here if at all possible

**USER MENUS (5 pages)** as set up in CUSTOMISE pages, can contain anything from:-

OUTPUT SEL, FUNCTION1, VF DISP1, VF DISP2, “I” LED, MARKER1, GAIN SW, VF SETTINGS, AUTO IRIS, SHOT ID, SHOT DISP, SET STATUS, USER FILE, LENS FILE
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### OPERATION MENUS

**OPERATION01 OUTPUT SEL** setting output signals

<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
HD SDI out	On	Off/On	Switch off to save power	
SD rear BNC out sel	Off	Off/VBS/SDI	Optional downconvert, vbs=PAL comp	
Test out select	HD	HD/SD	Socket on camera side	

Down con mode	Crop	Szeze/Lettr/Crop	Format of downconverter from 16:9	Szeze
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<b>OPERATION02 FUNCTION1</b>				switch functions
<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
Assign Sw <1>	5600K	Off/F.Mic mono-stereo/Picture cache on-off/Test out	Set assignable switches, see handbooks	
Assign Sw <2>	F.Mic	character/Marker/Retake/ATW/ Return video/Lens ret/Rec switch/Turbo switch/Tele-file mark/Zebra/5600K etc.		
Turbo Sw	Turbo	Off/F.Mic mono-stereo/Picture cache on-off/Test out		
Front mic select	Streo	Mono/Streo		
DF/NDF	DF	DF/NDF	Drop Frame TC, only NTSC-type rates	
End search	OFF	Off/On	Search for end of recording	
Cache/Intval rec	OFF	Off/Cache/A.int/M.int	Cache recording, see handbooks	OFF
(Cache) Rec time	0	0~8	Time stored in cache before rec	
(A.int) Total take time	5 min	5~50 min, 1~100H	Auto interval recording	
(A.int) Rec time	5 sec	5~50 sec, 1~50 min	See handbooks	
(A/M.int) Prelighting	Off	Off/2sec/5sec/10sec		
(M.int) Number of frame	1	1/2/4/8		
(M.int) Trigger interval	M	M/1~10sec/1~10min/15~50min/1~24H		

<b>OPERATION03 FUNCTION2</b>				more switch functions
<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
5600K	Off	Off/On	Electronic rebalance	Off
White switch <B>	Mem	Mem/ATW	White bal B, Auto Tracing/Memory	Mem
Shockless white	1	Off1/2/3sec	Smooth transitions in auto white	Off
ATW speed	4	1~5	White balance response speed	
Low light	Off	Off/On	Warning message, low light level	
Low light level	0	(-99~99)	Threshold	
VF batt warning	10%	10%/20%	Battery warning threshold	
PB video	All	All/HDSDI	Output destination for replay	
ABD (vf menu)	Off	Off/On	Absolute or relative values in menus	

<b>OPERATION04 VF DISP1</b>				viewfinder display options
<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
VF disp	Off	Off/On	All on or off except menus	
VF display mode	3	1/2/3	1=least info, 3=most	
Disp extender	On	Off/On	Lens range extender	
Disp filter	On	Off/On	Filter wheels	
Disp white	On	Off/On	White balance setting	
Disp 5600K	On	Off/On	Rebalance	
Disp gain	On	Off/On	Gain switch	
Disp shutter	On	Off/On	Shutter speed	
Disp audio	On	Off/On	Audio levels	
Disp tape	On	Off/On	Tape left	

<b>OPERATION05 VF DISP2</b>				viewfinder display options
<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
Disp iris	On	Off/On	Iris setting	
Disp zoom	On	Off/On	Lens zoom	
Disp color temp	Off	Off/On	Colour temperature	
Disp batt remain	Off	Int/Volt/Auto	Battery voltage	ON
Disp dc in	Off	Off/On	4-pin voltage	
Disp WRR RF lvl	Off	Off/On	Radio mic receiver rf level	
Disp time code	Off	Off/On	Time code	

<b>OPERATION06 ! LED</b>				viewfinder warnings if not normal
<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
Gain	On	Off/On		

Shutter	On	Off/On	
White bal	On	Off/On	
5600K	On	Off/On	
ATW	On	Off/On	
Extender	On	Off/On	
Filter	Off	Off/On	
Override	On	Off/On	
Format	On	Off/On	

**OPERATION07 ! LED STD**

what's normal for the viewfinder warnings

<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
Gain	0dB	0dB/Low/Mid/Hi gh		
Shutter	Off	Off/ECS/SLS/ 1/33		1
White bal	AB	P/A/B/PA/PB/AB		
5600K	Off	Off/On		
ATW	Off	Off/On		
Extender	Off	Off/On		
Filter ND	1	1/2/3/4		
Filter CC	B	A/B/C/D		
Override	Off	Off/On		
Format	23.98	59.94i/50i/23.98/2 4psf/25psf/29.97p sf		25psf

**OPERATION08 MARKER1**

viewfinder markers, also on side socket monitor output

<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
Marker	Off	Off/On	All markers on/off	
Center	OFF	Off/On		
Center mark	3	1/2/3/4	Variants of centre cross marker	
Safety zone	Off	Off/On		ON
Safety area	90%	80/90/92.5/95%	Linear size of safety zone marker	90%
Aspect	Off	Off/On	Aspect ratio marker	ON
Aspect select	4:3	15:0/14:9/13:9/4: 3/1.85/2.35		14:9
Aspect mask	Off	Off/On	Darkens outside the mask in vf only	OFF
Aspect mask lvl	0	0~8	Degree of darkness	
100% marker	OFF	Off/On	Edge of raster, smaller in SD mode	OFF

**OPERATION09 MARKER2**

viewfinder markers, also on side socket monitor output

<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
User box	Off	Off/On	User defined marker box	Off
User box width	240	1~479	In 4-pixel steps	
User box height	135	1~269	In 4-line steps	
User box H pos	0	-479~479	4-pixel/line steps. Limited by box size,	
User box V pos	0	-268~268	not allowed to go off edge of screen	
Center H pos	0	-479~480	In 4-pixel/line steps, moves centre	
Center V pos	0	-270~269	marker	
Aspect safe zone	Off	Off/On		
Aspect safe area	90%	80%/90%/92.5/5 %		

**OPERATION10 GAIN SW**

gain switch settings

<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
Gain low	0dB	-3dB / 0dB / 6dB /	Usual gain settings	0dB
Gain mid	6dB	9dB / 12dB /		6dB
Gain high	12dB	18dB / 24dB /		12dB <sup>2</sup>

<sup>1</sup> ECS (Extended Clear Scan, e.g. to synchronise the camera to a crt display) variable shutter is adjustable over different ranges: 59.94i/29.97psf 30.00~4300Hz; 50i/25psf 25.00~4700Hz; 23.98psf/24psf 24.00~2000Hz. SLS (Slow Speed Shutter, free video gain at the expense of motion blur) requires the HKDW905R option card, it can be set to 1,2,3,4,5,6,7,8,19,32,64 frames. See the manual for details.

<sup>2</sup> Normally, high gains are to be avoided in HDTV cameras since the noise produced is excessive. However, even at +12dB gain, the tested camera produce noise levels better than the specified -54dB at all signal levels. This is evidence for the assumption that the gains of the ccd head amplifiers have been reduced (thereby reducing video noise levels, and camera sensitivity), effectively moving about a stop of exposure range from headroom into footroom.

Gain turbo	42dB	30dB / 36dB / 42dB		42dB
Turbo sw ind	Off	Off/On	Disables L/M/H switch when in turbo	OFF

**OPERATION11 VF SETTING**

more on the viewfinder

<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
Zebra	Off	Off/On		ON
Zebra select	1	1/2/Both		
Zebra1 det level	70%	50%~105%	Set for skin, 45=65% on grey scale	65%
Zebra2 det level	100%	95%~105%	Set for white, 0=100% on grey scale	100%
Aspect	Off	Off/On	Duplicates setting in OPERATION07	On
VF detail level	0	(-99~99)	Software detail enhancer, no affect on	0
VF DTL H level	0	(-99~99)	recording or output (vf also has	0
VF DTL V level	0	(-99~99)	peaking), helps with focus checks	0

**OPERATION12 AUTO IRIS**

<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
Iris override	Off	Off/On	Allows aim point control, ± 1 stop	Off
Iris speed	2	1/2/3/4/5	1=fast, 5=slow	
Clip highlight	Off	Off/On	Ignores signal over 100%	
Iris window	1	1/2/3/4/5/6/Var	Detection box shape	
Iris window ind	Off	Off/On	Checks iris window against box cursor	
Iris var width	240	20~479	VARiable box, set in in 4-pixel/line	
Iris var height	135	20~269	steps, same as box cursor	
Iris var H pos	0	-460~460	4-pixel/line steps. Limited by box size,	
Iris var V pos	0	-249~249	not allowed to go off edge of screen	

**OPERATION13 SHOT ID**

identifying shots for tape

<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
ID-1				
ID-2			4 lines, each of 12 characters,	
ID-3			alphanumerics, symbols, spaces	
ID-4			allowed	

**OPERATION14 SHOT DISP**

this goes over colour bars as a caption

<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
Shot date	Off	Off/On		Off
Shot time	Off	Off/On		Off
Shot model name	Off	Off/On	Camera model name	Off
Shot serial number	Off	Off/On	Camera serial number	Off
Shot ID sel	Off	Off/ID-1~4	Selection from OPERATION12	Off
Shot blink char	Off	Off/On	Characters can flash	Off

**OPERATION15 SET STATUS**

select what comes up when STATUS switch is ON

<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
Status abnormal	On	Off/On	Enables the “!” warnings: shows GAIN, SHUTTER, WHT PRESET, ATW RUN, EXTENDER, FILTER, OVERRIDE	On
Status function	On	Off/On	Enables function screen: shows ASSIGN SW1, ASSIGN SW2, LOOP REC, REAR BNC, TEST OUT, HD SDI	On
Status audio	On	Off/On	Enables audio status screen: shows EMPHASYS, CH1/2/3/4 SOURCE, sound levels	On

**OPERATION16 TEST OUT**

what comes out of the side socket marked TEST

<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
Test out marker	Off	Off/On	All vf markers	Off
Test out VF disp	Off	Off/On	All vf text	Off
Test out menu	Off	Off/On	All menus	Off
Test out zebra	Off	Off/On	Zebras as set for vf	Off
Output select	Y	Y/R/G/B	HD outputs, Y becomes SD VBS if the SD down-converter option is installed	Off

**OPERATION17 OFFSET WHITE**

deliberate offsets from white balance

<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
Offset white <A>	Off	Off/On	Settings work only if auto white is off	Off
Warm cool <A>	3200	1592~27585K	Coarse R/B balance	
Warm cool bal <A>	0	(-99~99)	Fine R/B balance	
Offset white <B>	Off	Off/On	Settings work only if auto white is off	Off
Warm cool <B>	3200	1592~27585K	Coarse R/B balance	
Warm coolbal <B>	0	(-99~99)	Fine R/B balance	

**OPERATION18 SHT ENABLE**shutter speeds/modes for the external shutter switch<sup>3</sup>

<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
Shutter ECS	On	Off/On	Extended Clear Scan, dialable shutter	
Shutter 132	On	Off/On		
Shutter 1/33	On	Off/On		
Shutter 1/40	On	Off/On		
Shutter 1/48	On	Off/On		
Shutter 1/50	On	Off/On		
Shutter 1/60	On	Off/On		
Shutter 1/96	On	Off/On		
Shutter 1/100	On	Off/On		
Shutter 1/120	On	Off/On		
Shutter 1/125	On	Off/On		
Shutter 1/250	On	Off/On		
Shutter 1/500	On	Off/On		
Shutter 1/1000	On	Off/On		
Shutter 1/2000	On	Off/On		

**OPERATION19 LENS FILE**

<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
Lens file select	1	1~32	Select lens file	
F.ID			Display file ID	
L.ID			Display lens details from file	
L.MF				

**OPERATION20 UMID SET**

<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
Ex-ownership rec	Off	Off/On		
Country code			See handbooks for details	
Organization				
User code				
Instance no	Rnd	Rnd/Gen		
Time zone	00	00~25.1A~1F/2A ~2F/32/3A~3F		
Machine		n		

**PAINT****PAINT01 SW STATUS**

main controls

<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
Gamma	On	Off/On		On
Black gamma	Off	Off/On		On{v} Off{f}
Matrix	Off	Off/On		On
Knee	On	Off/On		On{v} Off{f}
White clip	On	Off/On		On{v} Off{f}
Detail	On	Off/On		On{v} Off{f}
Aperture	On	Off/On		On{v} Off{f}
Flare	On	Off/On		On
EVS	Off	Off/On	Enhanced Vertical resolution System	Off
Test saw	Off	Off/Analog/Digit	Analog replaces the ccd signal. works only if BARS are OFF.	

**PAINT02 WHITE**colour temperatures stored by the WHITE A/B switch<sup>4</sup>

<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
Color temp <A>	3200	(2088~19000K)	Tweaks R/B gains indirectly	
C temp bal <A>	0	(-99~99)	Fine control	

<sup>3</sup> Different values are present in the 790, speeds relevant to the version (50 or 59.94Hz).<sup>4</sup> Note that strange behaviour happens here if the D5600 option is enabled.

R gain <A>	0	(-99~99)	Tweaking these changes the colour temperature setting
B gain <A>	0	(-99~99)	
5600K <A>	Off	Off/On	
Color temp <B>	3200	(2088~19000K)	Tweaks R/B gains indirectly
C temp bal <B>	0	(-99~99)	Fine control
R gain <B>	0	(-99~99)	Tweaking these changes the colour temperature setting
B gain <B>	0	(-99~99)	
5600K <B>	Off	Off/On	

**PAINT03 BLACK/FLARE**

master black settings

<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
Master black	0	(-99~99)		
R black	0	(-99~99)		0
B black	0	(-99~99)		0
Master flare	0	(-99~99)		0
R flare	0	(-99~99)		0
G flare	0	(-99~99)		0
B flare	0	(-99~99)		0
Flare	On	Off/On		On
Output select	Y	Y/R/G/B	Duplicates setting in OPERATION15	Y

**PAINT04 GAMMA**

main gamma controls

<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
Gamma	On	Off/On	All curve bending	On
Master gamma	0	(-99~99)	These controls have huge range, limits and centres depend on whether STD or FILM gamma is selected	0
R gamma	0	(-99~99)		0
G gamma	0	(-99~99)		0
B gamma	0	(-99~99)		0
Output select	Y	Y/R/G/B	Duplicated in OPERATION15	Y
Gamma sel	STD	STD/HG/User	FILM gamma has built-in soft knee	STD{v} HG{f}
Gamma sel (STD)	3	1~4	1=ENG (~3.5x), 2=SMPTE240 (~4x), 3=ITU709 (~4.5x), 4=BBC (~5x) <sup>5</sup>	4{v}
Gamma sel (HG)	4	1~4		1~4{f} <sup>6</sup>
Gamma sel (User)	1	1~5	User-loaded gamma curves from CVP editor, refer to manuals for details	

**PAINT05 BLK GAMMA**

independent slope at black

<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
Black gamma	On	Off/On		On{v} Off{f}
Black gam range	High	Low/Mlow/Mhigh/High	Extent of modification	Mhigh{v} <sup>7</sup>
Master blk gamma	0	(-99~99)	Raises slope to about 7.5x	56{v}
R blk gamma	0	(-99~99)		0
G blk gamma	0	(-99~99)		0
B blk gamma	0	(-99~99)		0
Output select	Y	Y/R/G/B	Duplicates setting in OPERATION15	Y

**PAINT06 KNEE**

highlight compression

<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
Knee	On	Off/On		On
Knee point	95.0	50%~109%	Two soft bends, this sets the lower	85{v}
Knee slope	0	(-99~99)	Affects both segment slopes (curved)	+62{v}
White clip	On	Off/On		Off <sup>8</sup>

<sup>5</sup> The gamma curves are fairly good but not perfect. STD1 (ENG) has a slope of 2.73 near black, STD2 4.2, STD3 4.25, STD4 4.5. All these values are lower than ideal for the claimed curves, STD1 produces the lowest noise, STD4 the best colour rendition.

<sup>6</sup> The “Hyper gamma” curves do good job of looking like film, slopes near black range from 3.85 and 4.65, but the curve is intended to compress contrast over the entire range, not just over the lower range (below the knee) of the STD curves. If the production is going to be graded (so all shots will be colour/exposure-modified), then curves 3 or 4 should be used; if grading is not guaranteed, then curves 1 or 2 should be used (because these will not produce signals above 100%). Curves 1 and 3 are best for low-key scenes.

<sup>7</sup> Black Gamma is more subtle (less extreme) in this camera than in other Sony cameras, it is possible to get some “Black Press” as well as “Black Stretch”, the amount I’ve settled on is quite small but helps to keep colour rendition optimal.

White clip level	108.0	100.0~109.5%		108%
Knee saturation	On	Off/On	Not needed, True Eye keeps colours	Off
Knee sat level	0	(-99~99)	right	

**PAINT07 KNEE2**

Individual highlight compression

<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
Knee saturation	Off	Off/On		Off
Knee point (R)	0	-45.0~14.0		
Knee slope (R)	0	(-99~99)		
Knee point (G)	0	-45.0~14.0		
Knee slope (G)	0	(-99~99)		
Knee point (B)	0	-45.0~14.0		
Knee slope (B)	0	(-99~99)		

**PAINT08 DETAIL1**

<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
Detail	On	Off/On	All DETAIL compensation	Off
Aperture	On	Off/On	Separate APERTURE correction	On{v} Off{f}
Detail level	0	(-99~99)	Overall level	
Aperture level	0	(-1~14)	Overall level	14{v} <sup>9</sup>
DTL H/V ratio	0	(-99~99)	Only changes vertical amount	0
Crispensing	0	(-99~99)	Signal level range that gets crisped	0
Level depend	On	Off/On	Detail level dependency	0
Level depend lvl	0	(-99~99)	Detail level range affected	On
Detail freq	0	(-99~99)	Frequency of detail compensation	99{v}

**PAINT09 DETAIL2**

<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
Knee aperture	On	Off/On	Extra detail above knee point	On
Knee apt level	0	(-99~99)		0
DTL white limit	0	(-99~99)	Detail +ve excursion limit	
DTL black limit	0	(-99~99)	Detail -ve excursion limit	
DTL V-black limit	0	(-99~99)	Vertical detail -ve excursion limit	
H/V control mode	V	HV/V	Sets function of HV Ratio in DETAIL1; HV=H and V, V=Vonly <sup>10</sup>	

**PAINT10 SD DETAIL**

extra controls for downconverter, if fitted

<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
SD detail	On	Off/On	All as for HD	Off
SD detail level	0	(-99~99)		
SD crispensing	0	(0~15)		
SD DTL white limit	0	(-99~99)		
SD DTL black limit	0	(-99~99)		
SD level depend	On	Off/On		
SD level depend level	0	(-8~7)		
SD DTL freq	0	(-2~1)		
SD DTL H/V ratio	0	(-3~4)		
SD cross color	0	(0~15)		

**PAINT11 SKIN DETAIL**

<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
Skin detail all	Off	Off/On	All skin detail on/off	Off
Skin detect	Exec		Press rotary encoder to detect skin colour	
Skin area ind	Off	Off/On	Zebra display of target area	

<sup>8</sup> White clip can be turned off if colour grading is to be used, because colours will be brought into legality in post-production. Using the knee settings I've given for video-look, setting the clipper on at 100% will sacrifice the top 1.3 stops of highlight handling. BUT, tell everyone that you've used illegal colours, or they'll get clipped at ingest time.

<sup>9</sup> Aperture and Detail both have the same effect on horizontal resolution, but Aperture has no effect on vertical resolution. Setting value +14 in Aperture results in a flat frequency response to 960 (of 1920), falling gracefully to 1440 (the limit of recording). The same effect can be had horizontally with a Detail setting of about +12, but produces nasty effects vertically (ringing edges and excessive interlace twitter); if only Detail is to be used, then a value of about -20 is reasonable (i.e. does not produce too much ringing on edges)

<sup>10</sup> Setting this to V allows separate control of H and V resolution, using Aperture for H and Detail for V. This may be useful in some circumstances but would be tricky to set up without decent technical test facilities (it took me 1.5 days to measure what it does).



Skin DTL select	1	1/2/3	3 separate banks of skin detail controls	
Skin detail	On	Off/On	Separate controls for each bank	
Skin detail level	1	(-99~99)	Detail level	
Skin DTL sat	0	(-99~99)	Saturation change	
Skin DTL hue	0	(0-359)	Hue change	
Skin DTL width	40	(0~359)	Target hue angle width	

**PAINT12 MTX LINEAR**

camera matrix

<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
Matrix	Off	Off/On	All matrices	On
Matrix (User)	Off	Off/On	Roll your own matrix	Off
Matrix (Preset)	Off	Off/On	Standard matrices	On
Matrix (Preset) sel	2	1~6	SMPTE240/ITU709/SMPTE-WIDE/ NTSC/EBU(i.e.PAL)/ITU601	2 <sup>11</sup>
Matrix R-G	0	(-99~99)		
Matrix R-B	0	(-99~99)		
Matrix G-R	0	(-99~99)		
Matrix G-B	0	(-99~99)		
Matrix B-R	0	(-99~99)		
Matrix B-G	0	(-99~99)		

**PAINT13 MTX MULTI**

multi-linear matrix, for advanced knob twiddlers only

<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
Matrix	Off	Off/On	All matrices	On
Matrix (multi)	Off	Off/On	Roll your own 16-segment matrix	Off
Matrix area ind	Off	Off/On	Use zebra to show active region	
Matrix color det	Exec		Press rotary encoder to select current area	
Matrix MTX preset				
MTX (multi) axis	B	B/B+/MG-/MG+ /R/R+/YL-/YL+/G- /G/G+/CY/CY+/B-	14 hue angle zones	
MTX (multi) hue	0	(-99~99)	Adjustment	
MTX (multi) sat	0	(-99~99)	Adjustment	

**PAINT14 V MODULATION**

temporary white V sawtooth lens shading correction

<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
Vmod	Off	Off/On		Off
Master Vmod	0	(-99~99)	Collective control	
R Vmod	0	(-99~99)		
G Vmod	0	(-99~99)		
B Vmod	0	(-99~99)		
Output select	Y	Y/R/G/B	Duplicates setting in OPERATION15	

**PAINT14 SATURATION**

extra saturation control

<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
Saturation	Off	Off/On	All saturation tweaks on/off	Off
Sat level	0	(-99~99)	Dangerous stuff unless you have decent test facilities	Off <sup>12</sup>
Low key sat	Off	Off/On	Collective control	
L key sat leve	0	(-99~99)		
L key say range	High	Low/Lmid/Hmid/ High		
Y black gamma	Off	Off/On	Keeps saturations right	13
Y black gamma level	0	(-99~99)	Slope	
Y black gamma range	High	Low/Lmid/Hmid/ High		

**PAINT16 SCENE FILE**

<sup>11</sup> SMPTE240 is the defunct Japanese 1035-line system. Only Option 2 (ITU.709) makes any sense here, because the camera always and only makes HD signals.

<sup>12</sup> Low Key Saturation can help to keep colours right at the bottom end of the contrast range, the price is in extra video noise. This would need proper test facilities to set sensibly.

<sup>13</sup> Y Black Gamma is an alternative to Black Gamma. Conventional Black Gamma acts on each of R G and B separately (increasing luma and chroma noise), and produces best colour rendering. Y Black Gamma acts only on the coded luma signal (i.e. does not affect the colour difference signals but does not increase chroma noise). This can affect colour rendering in unpredictable ways and is probably not a good idea.

<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
1			Select scene file or factory STANDARD. Always load STANDARD first when setting up a camera.	
2				
3				
4				
5				
Standard			Open box indicator to read from camera, filled box indicator to read from memory stick.	
Scene recall	Exec		Press rotary encoder to read/recall it	
Scene store	Exec		Press rotary encoder to save it	
F ID			16 character file ID	

**MAINTENANCE****MAINTENANCE01 WHITE SHADING**

lens corrections

<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
Shading CH sel	Test	R/G/B/test	Select channel, lower items change	
Output select	Y	Y/R/G/B	Duplicates setting in OPERATION15	Y
R/G/B white H saw	0	(-99~99)		0
R/G/B white H para	0	(-99~99)		0
R/G/B white V saw	0	(-99~99)		0
R/G/B white V para	0	(-99~99)		0
White saw/para	On	Off/On	All on/off	ON

**MAINTENANCE02 BLK SHADING**

lens corrections

<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
Shading CH sel	Test	R/G/B/test	Select channel, lower items change	
Output select	Y	Y/R/G/B	Duplicates setting in OPERATION15	Y
R/G/B black H saw	0	(-99~99)		0
R/G/B black H para	0	(-99~99)		0
R/G/B black V saw	0	(-99~99)		0
R/G/B black V para	0	(-99~99)		0
Black saw/para	On	Off/On	All on/off	ON
Master black	0	(-99~99)		
Master gain (tmp)	0dB	-3dB to 42dB	Gain changes only for this operation	12dB

**MAINTENANCE03 LEVEL ADJ**

Test output signal levels

<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
Y LEVEL	0	(-99~99)		0
SYNC LEVEL	0	(-99~99)		0
Pr LEVEL	0	(-99~99)		0
Pb LEVEL	0	(-99~99)		0
OUTPUT SELECT	Y	Y/R/G/B	Duplicates setting in OPERATION15	

**MAINTENANCE04 SD LEVEL ADJ**

downconverter output signal levels

<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
SD VBS level	0	(-99~99)		0
SD VBS setup level	0	0/7.5%	7.5% for NTSC except Japan	0

**MAINTENANCE05 BATTERY**

voltage parameters, sets warning levels

<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
Before end 1	5%	5%~100%	For Sony BP-GL batteries	
End 1	0%	0~5%		
Before end 2	11.3	11.0~17.0V	For Sony BP-L batteries	
End 2	11.0	10.5~11.5V		
Before end 3	11.8	11.0~17.0V	For other batteries or external video	
End 3	11.0	10.5~14.0V		

**MAINTENANCE06 AUDIO-1**

vtr audio controls

<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
Audio out (F/R)	Cue	Cue/EE	Output during FF/REW	
Rec audio out	EE	EE/Save	Output during recording, save=none	
Camera adapter	Enabl	Enabl/Dsabl	Channels 3&4 from adaptor	
Audio CH 3/4 mode	SW	CH1-2/SW	Record 3&4 from 1&2 or as above	
Front mic ref	-50dB	-60/-50/-40		
Rear mic ref	-60dB	-60/-50/-40	Output while recording	
Rear mic +48V	Enabl	Enabl/Dsabl	Rear XLR can detect audio itself	

**MAINTENANCE07 AUDIO-2**

<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
Au rec emphasis	Off	Off/On		On
Cue rec	On	Off/On		On
Au ref level	-20dB	-16dB/-18dB/- 20dB		-20dB
AU ch12 AGC mode	Mono	Mono/Streo		
AU ch34 AGC mode	Mono	Mono/Streo		
AU AGC spec	-6dB	-6/-9/-12/-15/- 17dB	Set saturation level	
AU limiter mode	Off	Off/-6/-9/-12/-15/- 17dB	Limit level for manual control	
AU out limiter	On	Off/On		

**MAINTENANCE08 AUDIO-3**

<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
AU SG (1kHz)	Off	On/Off/Auto	On=tone with bars	
Mic ch1 level	Front	Side1/Front/F+S1	Which knob controls level	
Mic ch2 level	Front	Side2/Front/F+S2		
Rear1/WRR level	Front	Side1/Front/F+S1		
Rear2/WRR level	Front	Side2/Front/F+S2		
Audio select ch3	Auto	Auto/Man		
Audio select ch4	Auto	Auto/Man		
LVL control ch3	70	0~100	Auto time correction of built-in watch	
LVL control ch4	70	0~100		

**MAINTENANCE09 TIMECODE**

<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
TC out	Auto	Auto/Genie	Auto outputs live or recorded TC	
DF/NDF	DF	DF/NDF		14
Ext-LK ubit	Int	Int/Ext	Lock source for LTFC ubit	
LTC ubit	Fix	Fix/Time		
VITC ubit	Fix	Fix/Time		
Watch auto adj	On	Off/On		
Ubit group ID	000	000/101		

**MAINTENANCE10 VTR MODE**

vtr markers

<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
Rec tally blink	On	Off/On	Tally blink when tape/battery near end	
Rec start beep	Off	Off/On		
LCD display hold	Timer	Timer/Off/Cont	What's on the led when power's off	
LCD hold timer	1H	1H/3H/8H	Length of lcd display after power off	
Shot time disp	MD:HM	MG:HM/DM:HM /D:HMS	Date/time format	
Video out (F/R)	EE	EE/PB	Video output in FF/REW	
STBY off timer	60min	Off/5/10/30/60mi n		
Stop key freeze	Off	Off/Frame/Field		

**MAINTENANCE11 SHOT MARKER**

<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
LTC ub-marker	Set	Set/All/Off	Write markers un UBITs of LTC	
Rec start mark	Off	Off/On		
Shot marker 1	Off	Off/On		
Shot marker 2	Off	Off/On		

**MAINTENANCE12 PRESET WHITE**

Control of preset white balance

<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
Color temp <P>	3200			
C temp bal <P>	0	(-99~99)		
R gain	0	(-99~99)		
B gain	0	(-99~99)		
5600K	Off	Off/On		
AWB enable	Off	Off/On		

**MAINTENANCE13 DCC**

auto knee

<sup>14</sup> Drop Frame TC is relevant only at NTSC-related camera speeds (23.98, 29.97psf, 59.94i), not relevant at 25/50Hz.

<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
DCC function sel	DCC	DCC/ FIX	Fix=fixed knee, DCC=dynamic	Fix
DCC D range	0	(-99~99)		0
DCC point	600%	400/450/500/550/ 600%		15
DCC gain	0	(-99~99)		0
DCC delay time	0	(-99~99)		0
Preknee point	Auto	Auto/Fix		0

**MAINTENANCE13 AUTO IRIS2**

auto iris

<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
Iris window	1	1/2/3/4/5/6/Var	6 shapes and variable	
Iris window ind	Off	Off/On	Shows iris box in vf	
Iris level	0	(-99~99)	Convergence level	
Iris APL ratio	0	(-99~99)	High=average, low=peak	
Iris var width	240	20~479	4-pixel/line steps. Limited by box size,	
Iris var height	135	20~269	not allowed to go off edge of screen	
Iris var H pos	0	-460~460	In 4-pixel/line steps, moves centre	
Iris var V pos	0	-249~249	marker	
Iris speed	2	1/2/3/4/5	1=fast, 5=slow	
Clip high light	Off	Off/On	Limits detection level to 100%	

**MAINTENANCE15 FUNCTION3**

more odds &amp; sods

<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
Wht filter inh	Off	Off/On	Inhibits separate white balance values being stored for each filter position	Off
Color bar sel	100%	SMPTE/100%/75 %/ 4:3-1/4:3- 2/4:3-3		SMPTE
Sht disp mode	Sec	Sec/Deg	VF display of shutter	Sec{v} deg{f} <sup>16</sup>
RM common memory	Off	Off/On	Remote control, ON keeps changes after disconnection, OFF loses them	Off
VTR start/stop	RM	RM/Para/Cam	Remote control of vtr	
Fan	On	Off/On/Auto	Cooling fan, Auto switches off when recording	Auto
User & all only	Off	Off/On	Off=show all menus, On=show only user menus	
HDSDI remote I/F	Off	Off/Chara/G- tly/R-tly	VTR control via HDSDI for external HDW-S250/S280 decks	
SD aspect pulse	Off	Off/On	Control of aspect ratio on VBS/SDI output when sending HDSDI	

**MAINTENANCE16 GENLOCK**

<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
Genlock	On	Off/On	Genlocks to HD trisync	ON
Return Video	Off	Off/On	Show HD return feed on press Lens Ret	ON
GL phase coarse	0	(-99~99)		
GL phase fine	0	(-99~99)		

**MAINTENANCE17 ND COMP**

colour compensation for ND filters

<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
ND offset adj	Off	Off/On	Allow separate colpou balance for each filter position	
Clear ND offset	Exec		Press rotary encoder to do it	

**MAINTENANCE18 FORMAT**

operating mode

<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
Current	display			
Next	23.98	59.94i/50i/23.98p sf/24psf/25psf/29. 97psf <sup>17</sup>	Set this then power off/on to change	25psf for film <sup>18</sup>

<sup>15</sup> The DCC range assumes that up to 600% exposure can be dealt with in the camera. In the test upon which this document is written, overexposure of only about 320% could be handled despite all manipulations of the knee. In general, it is best not to use DCC anyway (it's another, unseen, pair of hands on the controls) but to rely on either the fixed knee or the film (HG) gamma curves to deal with the exposure range.

<sup>16</sup> Shutter display depends on the user, most film people like it in degrees, most video people like it as time.

<b>MAINTENANCE19 VANC RX</b>				
<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
UMID line1	0	0/9~20	TV line on which UMID goes, field 1	
UMID lin2	0	0/564~593	Field 2	

**FILE****FILE01 USER FILE**

lens corrections

<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
User file load	Exec	Press rotary encoder	load/save USER file from memory stick	
User file save	Exec			
F.ID		text	16 characters	
User preset	Exec		Resets USER menus to standard	

**FILE02 USER FILE 2**

customising, memory stick operations

<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
Store user preset	Exec	Press rotary encoder	Save USER data and use as PRESET	
Clear user preset	Exec		Return USER data to factory settings	
Customize reset	Exec		Reset customised menus to factory	
Load custom data	Off	Off/On	Load customised menus	
Load out of user	Off	Off/On	Load items in USER categories as well	
Before file page	Off	Off/On	Save only data from before USER page	
User load white	Off	Off/On	Read out WHITE data	

**FILE03 ALL FILE**

powerful customising, memory stick operations

<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
All file load	Exec	Press rotary encoder	Read all menu items from stick	
All file save	Exec		Save all menu items to stick	
F.ID	Exec		16 characters	
All preset	Exec		Reset all menu items to standard settings. numeric ranges go back to e.g. -99~99	
Store all preset	Exec		Save all menu items and use in PRESET layer, changes numeric ranges.	
Clear all preset	Exec		Return all menus to factory settings	
3sec clr preset	Off	Off/On	Set PRESET layer to to factory settings when MENU knob pressed for 3 seconds	

**FILE04 SCENE FILE**

less dangerous memory stick stuff

<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
1				
2			RECALL/CANCEL scene file, Open	
3			box reads file from memory stick, filled	
4			box cancels scene file	
5				
Standard			Returns to standard setting	
Scene recall	Exec	Press rotary encoder	Brings up secondary menus to save/load scene files	
Scene store	Exec			
F.ID			16 characters	

**FILE05 REFERENCE FILE**

less dangerous memory stick stuff

<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
Reference store	Exec	Press rotary encoder	Save REF file in main unit	
Reference clear	Exec		Reset REF file to factory settings	
Reference load	Exec		Read REF file from memory stick	
Reference save	Exec		Save Ref file to memory stick	
F.ID			16 characters	
Scene white data	Off	Off/On	Allow/disallow white data in scene file	

<sup>17</sup> In the P version of the 790, only 50i/25psf is available; presumably the other version has all the NTSC-related speeds.

<sup>18</sup> There is no SD output at 24psf, because there is no 48Hz tv system. For 59.94i, 23.98 and 29.97psf, SD output is NTSC. Also, the HDW900's options of 60i and 30psf have been dropped in the HDW900R.

**FILE06 USER GAMMA**User generated gamma data, uses CVP editor<sup>19</sup>

<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
User gamma loads	Exec	Press rotary encoder	Copy gamma file from Memory Stick	
User gamma reset	Exec			
F.ID			Gamma name in memory	
F.ID			Gamma name on Memory Stick	
Date		Off/On	Date Memory stick file created	

**FILE07 LENS FILE 1**

<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
Lens file recall	Exec	Press rotary encoder	Brings up secondary menus, load/save up to 5 files to camera or memory stick	
Lens file store	Exec			
F.ID			16 characters	
Source			Number of selected lens file	
Lens no offset	Exec		Resets lens file data to factory settings	
Lens auto recall	On	Off/On		
L.ID			Lens ID when available	
L.MF			Lens file memory number	

**FILE08 LENS FILE 2**

<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
Lens M vmod	0	(-99~99)	Master V Mod correction	
Lens center H	0	-480~479	Centre marker position in steps of 2	
Lens center V	0	-270~269	pixels/lines	
Output select	Y	Y/R/G/B	Duplicates setting in OPERATION15	
Lens R flare	0	(-99~99)		
Lens G flare	0	(-99~99)		
Lens B flare	0	(-99~99)		
Lens W-R offset	0	(-99~99)		
Lens W-B offset	0	(-99~99)	Red and Blue white gain offsets	

**FILE09 LENS FILE 3**

<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
Shading ch sel	0	R/G/B/Test	Master V Mod correction	
Output sel	Y	Y/R/G/B	Like setting in OPERATION15	
Lens R/G/B H saw	0	(-99~99)		
Lens R/G/B H para	0	(-99~99)	Sawtooth and parabola settings for whichever channel(s) selected	
Lens R/G/B V saw	0	(-99~99)		
Lens R/G/B V para	0	(-99~99)		

**FILE10 MEMORY STICK**

memory stick options

<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
M.S format	Exec	Press rotary encoder	Wipes it clean	
MS in > jump tp	Off	Off/User/All/Scene/ e/ Lens/Refer/User1	Action on inserting memory stick, jump to a menu page	All <sup>20</sup>

**FILE11 TELE FILE**

format stick

<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
Tele file clear	Exec	Press rotary encoder		
Tele file mark	OK	OK/NG/KP		
ID			20 characters	
Size	kbyte	0~9999	Memory label capacity	
Remain	%	0~100%	Memory label free space	
Status			STANDBY=write enabled/NO LABEL= not attached/WRITE PROTECT/UNKOWN FORMAT=write disabled/UNFORMAT=not formatted, MEMORY FULL/NEAR FULL	

<sup>19</sup> User gammas are not available in the 790.<sup>20</sup> This is a good idea. When Memory Stick is inserted, the ALL FILE menu page automatically pops up to deal with it.

**DIAGNOSIS****DIAGNOSIS01 HOURS METER**

vtr usage meters

<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
Reset meter	Exec	Press rotary encoder	Menu to reset any of lower four meters	
Drum running			Drum rotation hours	
Tape running			Tape running hours	
Operation			Power-on hours	
threading			Number of threadings	
Drum running 2				
Tape running 2				
Operation 2				
Threading 2			Resettable meters	

**DIAGNOSIS02 TIME/DATE**

<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
Adjust	Exec	Press rotary encoder		
Hour	12			
Min	55			
Sec	58			
Year	00			
Month	06			
Day	24			

**DIAGNOSIS03 ROM VERSION**

software versions

<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
AT : Ver				
SS : Ver				
FP : Ver				
EQ : Ver				

**DIAGNOSIS04 DEV STATUS**

self diagnosis

<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
I/O EEprom LSI				
NVRAMAM SCI				

**DIAGNOSIS05 OPTION BOARD**

reports on hardware option boards

<i>item</i>	<i>factory</i>	<i>range</i>	<i>comment</i>	<i>BBC</i>
Down converter		O/-	O=installed, -=not installed	
Picture cache		O/-	8 second looping video store	
Slow shutter		O/-	Slow shutter, sums frames in cache	

Further menus exist but are accessible only by setting internal switches. They are best left to qualified service personnel.