

## 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 |
|--|

### 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 |
|---------------|------|------------------|-----------------------------------|-------|

| <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<br>gh                          |                |            |
| Shutter     | Off            | Off/ECS/SLS/<br>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<br>4psf/25psf/29.97p<br>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:<br>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<br>% |  |            |

**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 recording or output (vf also has peaking), helps with focus checks | 0          |
| VF DTL H level   | 0              | (-99~99)     |   | 0          |
| VF DTL V level   | 0              | (-99~99)     |   | 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 steps, same as box cursor                |            |
| Iris var height | 135            | 20~269          |   |            |
| Iris var H pos  | 0              | -460~460        | 4-pixel/line steps. Limited by box size, not allowed to go off edge of screen |            |
| Iris var V pos  | 0              | -249~249        |   |            |

**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        |                |              |   |            |
| ID-3        |                |              | 4 lines, each of 12 characters, alphanumeric, symbols, spaces allowed |            |
| ID-4        |                |              |   |            |

**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<br>~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           |  |              |
| 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.<br>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 crispened | 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;<br>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/<br>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+<br>/R/R+/YL-/YL+/G-<br>/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/<br>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/<br>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/-<br>20dB       |                                | -20dB      |
| AU ch12 AGC mode | Mono           | Mono/Streo                  |                                |            |
| AU ch34 AGC mode | Mono           | Mono/Streo                  |                                |            |
| AU AGC spec      | -6dB           | -6/-9/-12/-15/-<br>17dB     | Set saturation level           |            |
| AU limiter mode  | Off            | Off/-6/-9/-12/-15/-<br>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<br>/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<br>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/<br>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<br>being stored for each filter position | Off                         |
| Color bar sel    | 100%           | SMPTE/100%/75<br>%/ 4:3-1/4:3-<br>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<br>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<br>recording                                | Auto                        |
| User & all only  | Off            | Off/On                                    | Off=show all menus, On=show only<br>user menus                                  |                             |
| HDSDI remote I/F | Off            | Off/Chara/G-<br>tly/R-tly                 | VTR control via HDSDI for external<br>HDW-S250/S280 decks                       |                             |
| SD aspect pulse  | Off            | Off/On                                    | Control of aspect ratio on VBS/SDI<br>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<br>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<br>sf/24psf/25psf/29.<br>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 |            |
| Lens R/G/B V saw  | 0              | (-99~99)     | whichever channel(s) selected      |            |
| 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/<br>e/<br>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.