

Panasonic AJ-UFC1800 Universal Format Converter



**System Reference, Ver. 1.11
Operating Software Level 1.49**

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Features Overview

Overview

The purpose of the AJ-UFC1800 is to create a spatial conversion from any input video format to any output video format. The input may be any standard video format (high definition or standard definition), and the output may also be any standard video format (high definition or standard definition) as long as it has a related frame rate to the input format. Frame rate conversion is not performed by the system, but frame rates from input to output may be changed by the insertion or removal of 3:2 or 2:2 pull-down.

While performing a conversion, the end user will usually have to make additional adjustments regarding aspect ratio, color space, audio & video timing adjustments, etc. The AJ-UFC1800 allows all of these types of adjustments to be made using a simple front panel control system.

Features

- Conversion between most video formats with related frame rates. See table below.
- Special film modes to handle 3:2 pull-down and segmented frames.
- All digital processing, 10 bit, 4:2:2.
- 1035I <-> 1080I conversions in field or frame (3:2) mode.
- Extensive pan, zoom and crop function.
- Internal test pattern generator.
- 16 user presets with the first 8 remotely selected by GPI.
- Compact 3U size.

Format Name	Active Sample (H/V)	Serial (bps)	SMPTE	Group A			Group B	Group C
				60p	60i	30p	50i	24p
1125i	1920 x 1080 (1035)	1.5G	292M		●	●	●	●
750p	1280 x 720	1.5G	296M	●				
525i	720 x 483	270M	259M		●	●		
525p	720 x 483	360M	294M	●				
625i	720 x 576	270M	259M				●	●

Note: Conversions can be made between any formats within the same group. Conversion between Group A and Group C are done using a 3:2 pull-down function.

Specifications

[Power requirements:]

Power supply : AC100V-120V , 50-60Hz
AC220V-240V , 50-60Hz
Power consumption : 115W

[GENERAL:]

Operating temperature : 5 to 40 °
Operating humidity : 10% to 90%
Weight : 18 Kg
Dimensions : 424(W) x 133(H) x 500(D)

[VIDEO INPUTS:]

1 HD SDI input – SMPTE 292M (1080I/P, 720P, 1035I)
1 SD SDI input – SMPTE 259M, 294M (480P, 480I, 576I)

[VIDEO OUTPUTS:]

2 HD SDI outputs – SMPTE 292M (1080I/P, 720P, 1035I)
2 SD SDI outputs – SMPTE 259M, 294M (480P, 480I, 576I)

Output level adjustment: 0 - 1.4
Black level adjustment: +7.4 / -7.5 IRE
Video line advance adjustment: 0 - 7 H
System H phase adjustment: 0 - less than 1H

[SYNC:]

1 External sync reference input – analog bi-level or tri-level sync
loop thru with 75 ohm ON/OFF switch
1 Genlock output - bi-level (0 to -2V into 75 ohms) or tri-level (+/-300mV into 75 ohms)

[AUDIO:]

8 AES/EBU digital audio inputs
8 AES/EBU digital audio outputs
SMPTE 272M embedded audio

Output timing adjustment: 0 - 170ms

[TIME CODE:]

External Time Code input/output

Note: All previous I/Os are on BNC connectors.

[CONTROL:]

1 GPI control port – 8 contact closure sensors to activate system presets
1 RS-232 control port – for connection to a PC for system programming or remote control

Note: The control ports are 9 pin, D-sub. connectors.

[ACCESSORIES:]

Power cord, 1pc.

Controls

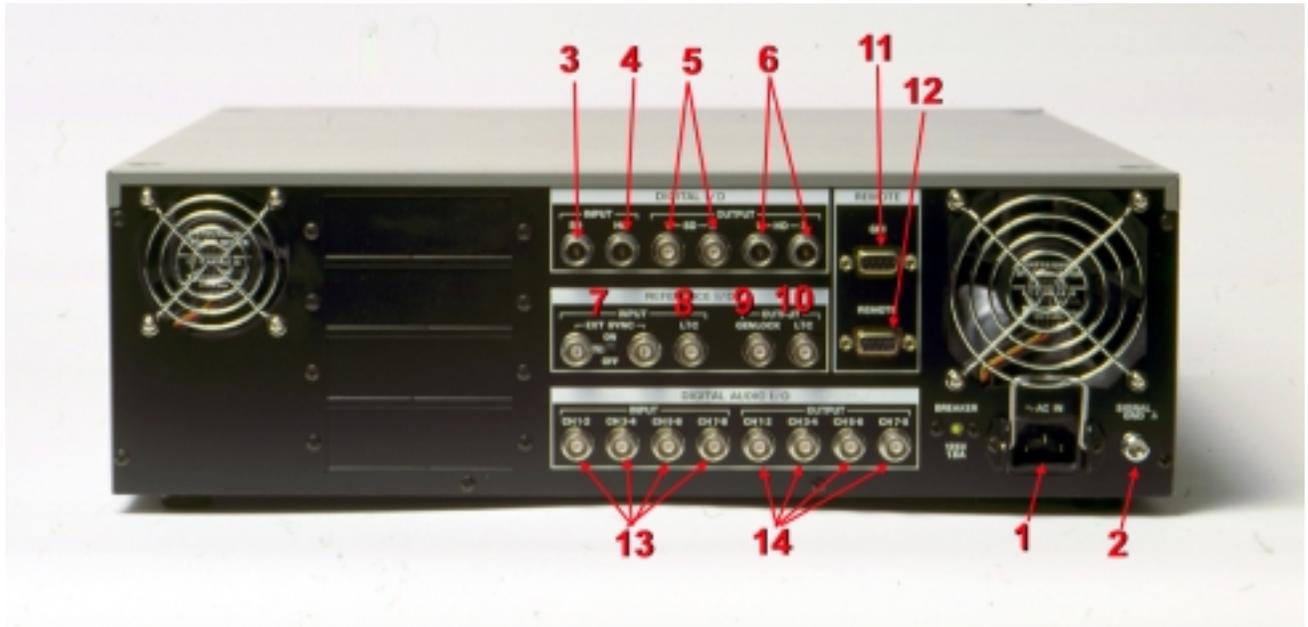
Front Panel



- (1) **POWER switch** After ON is pushed, it will take about 30 seconds for the system to initialize.
- (2) **CONTROL switch** This is used to switch between operation from the front panel and the remote connectors on the rear panel. When it is set to REMOTE, front panel operation is disabled. **The front panel will indicate this on all menus. Current settings can be viewed, but they cannot be modified in this mode.** When it is set to LOCAL, the remote connector is disabled.
- (3) **Display panel** All menus are displayed on a 40x4 line character display.
- (4) **Function buttons** F1-F5 follow the labels assigned to them for each system menu.
- (5) **EXIT key** The EXIT key is used to go up one level in the system menus. At the top level, it will cycle through the available menus.
- (6) **ADJUST LED** This lights when the Control knob is active.
- (7) **Control knob** When the ADJUST LED is lit, this controls the selected function shown on the display panel. If no adjustment is selected, it cycles through the choice of menus.

- (8) HOME key** Selects the HOME menu. This displays the selected conversion and allows all settings to be viewed.
- (9) PRESET key** Selects the PRESET menu. Allows up to sixteen system configurations to be saved and/or restored.
- (10) VIDEO IN key** Selects the VIDEO IN menu. Allows the selection of SD and HD video inputs, auto input detection and film modes.
- (11) VIDEO OUT key** Selects the VIDEO OUT menu. Allows the selection of SD and HD video outputs and field versus frame filtering for film derived outputs.
- (12) FILTER key** Selects the FILTER menu. H and V filters and enhancement levels can be adjusted from this menu.
- (13) TIMING key** Selects the TIMING menu. Reference selections and video phasing can be adjusted from this menu.
- (14) RESIZE key** Selects the RESIZE menu. Pan, zoom and crop adjustments can be made here.
- (15) GAIN key** Selects the GAIN menu. Video gain and black level adjustments can be made here.
- (16) DIAG key** Selects the DIAGNOSTICS menu. When the warning light (17) is illuminated, error messages can be viewed here. The status of all monitored systems can also be viewed here.
- (17) WARNING LED** Signals a potential system problem. This will not light for masked errors.
- (18) AUDIO key** Selects the AUDIO menu. Allows for audio channel mapping, synchronization and delay adjustments.
- (19) TEST key** Selects the TEST menu. Allows H, V and frame based test patterns to be selected as the video input. **Frame patterns can also be saved and/or restored here.**
- (20) SETUP key** Selects the SETUP menu. Background color, power-up mode, **system password** and time code mapping selections are available here.

Rear Panel



Power supply section

- (1) **AC input socket** This is connected to the power outlet using the supplied cable.
- (2) **GND (ground) terminal** It is recommended that this unit be grounded when connected to other units.

Digital video input/output section

- (3) **SD SERIAL IN connector (BNCx1)** SDTV serial digital signals are input to this connector.
- (4) **HD SERIAL IN connector (BNCx1)** HDTV serial digital signals are input to this connector.
- (5) **SD SERIAL OUT 1,2 connectors (BNCx2)** SD serial digital signals are output from these connectors.
- (6) **HD SERIAL OUT 1,2 connectors (BNCx2)** HD serial digital signals are output from these connectors.

Reference input/output section

- (7) **EXT SYNC IN connectors (BNCx2)** Tri-level/bi-level sync signals or black burst signal are input to these connectors as the reference signal. A loop-through format and a 75 Ω termination switch are provided.
- (8) **LTC IN connector (BNCx1)** The time code signals are input to this connector.
- (9) **GENLOCK SYNC OUT connector (BNCx1)** The tri-level/bi-level sync signals, for genlocking external inputs, are output from this connector.
- (10) **LTC OUT connector (BNCx1)** The time code signals are output from this connector.

Remote control section

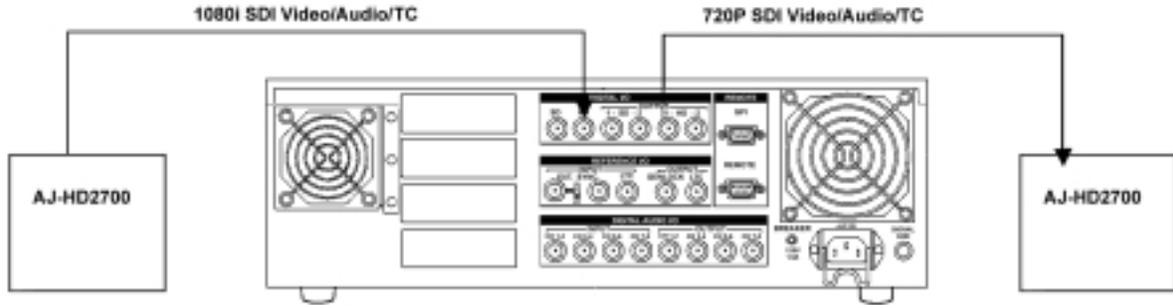
- (11) **GPI connector (9P)** Switch closure remote control connector.
- (12) **REMOTE IN connector (RS-232, 9P)** RS-232 serial remote input connector.

Digital audio input/output section

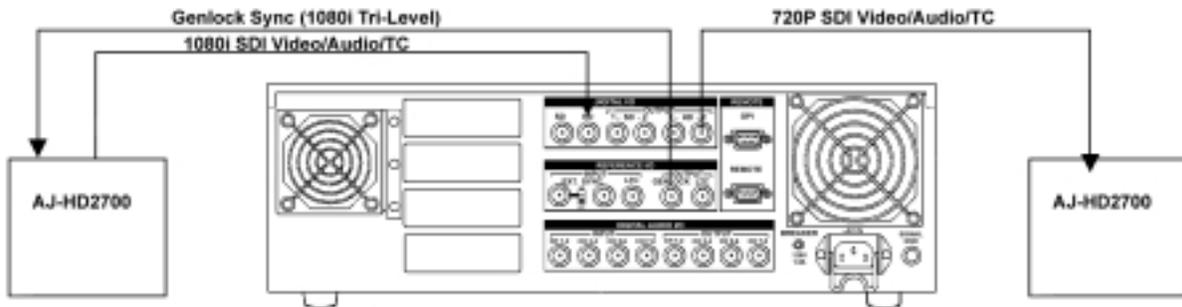
- (13) **DIGITAL AUDIO IN CH 1/2, 3/4, 5/6, 7/8 connectors (BNCx4)** AES digital audio signals are input to these connectors.
- (14) **DIGITAL AUDIO OUT CH 1/2, 3/4, 5/6, 7/8 connectors (BNCx4)** AES digital audio signals are output to these connectors.

Connections

Input Reference

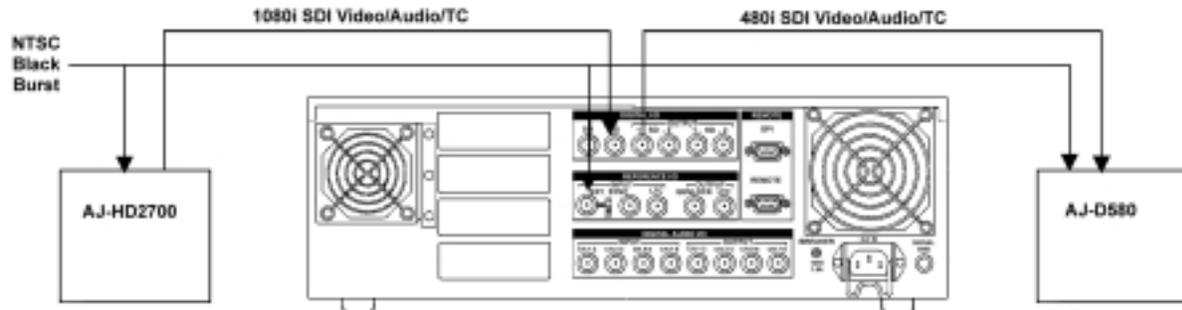


Output Reference



Missing output sync reference signal to EXT SYNC IN!

Black Burst Reference



Operation

Basic operation

VIDEO IN Press VIDEO IN to select the input format and frame rate.



FORMAT Press FORMAT(F1) to select an HxV value. Pressing the function key or turning the knob will cycle through the range of choices. AUTO SD or AUTO HD will attempt to detect the input format if a signal is present.

F RATE Press F RATE(F2) to select the frame rate. Pressing the function key or turning the knob will cycle through the range of choices. AUTO SD or AUTO HD will attempt to detect the input format if a signal is present.

VIDEO OUT Press VIDEO OUT to select the output format and frame rate.



FORMAT Press FORMAT(F1) to select an HxV value. Pressing the function key or turning the knob will cycle through the range of choices.

F RATE Press F RATE(F2) to select the frame rate. Pressing the function key or turning the knob will cycle through the range of choices.

This will set the system to nominal conversion settings. These settings can be modified under the following menus.

FILTER Press FILTER to change the conversion filters and to add enhancement.



H RESP Press H RESP(F1) to select a horizontal filter response. Pressing the function key or turning the knob will cycle through the NARROW, STANDARD and WIDE choices.

V RESP Press V RESP(F2) to select a vertical filter response. Pressing the function key or turning the knob will cycle through the NARROW, STANDARD and WIDE choices.

H ENH Press H ENH(F3) to add horizontal enhancement. Pressing the function key or turning the knob will change the amount in 0.5dB steps.

V ENH Press V ENH(F4) to add vertical enhancement. Pressing the function key or turning the knob will change the amount in 0.5dB steps.

2-D ENH Press 2-D ENH(F5) to add both horizontal and vertical enhancement at the edge of the band. Pressing the function key or turning the knob will change the amount in 1dB steps. This control may have limited effect on upconverted signals.

RESIZE Press RESIZE to change the zoom, pan or crop settings. Press EXIT or turn the knob until ZOOM/PAN is displayed. The double arrow ">>" signifies that multiple menus are available at this level.



ZM MODE Press ZM MODE(F1) and select VARIABLE.



ZOOM H,V


Press ZOOM H(F2) and ZOOM V(F3) to change the zoom factor. This will lock the horizontal and vertical adjustments together. Turn the knob to set the desired size.

EXIT


Press EXIT to go to the CROP menu.

L, R, T, B


Press LEFT(F1), RIGHT(F2), TOP(F3) or BOTTOM(F4) to remove portions of the input frame. Small adjustments can be made by successively pushing the function keys or the knob can be used to easily cover the full range of control.

EXIT


Press EXIT to view the resizing PRESETS menu. F1-5 are shortcut keys to select popular picture sizes such as letterbox and 14x9.

If the output image does not completely cover the output frame, a black background will be displayed. To change the background color, go to the SET UP menu.

SET UP


Press SET UP and then press EXIT or turn the knob until BACKGROUND COLOR is displayed. The double arrow ">>" signifies that multiple menus are available at this level.

BG COL


Press BG COL(F1) to select a predefined color or select CUSTOM and then use F3-5 to set the RGB values.

Film mode operation

For 24Hz progressive input:

VIDEO IN


Press VIDEO IN to select the input format and 24Hz frame rate.

FORMAT


Press FORMAT(F1) to select an HxV progressive value. Pressing the function key or turning the knob will cycle through the range of choices.

F RATE


Press F RATE(F2) to select a 23.98/24Hz frame rate. Pressing the function key or turning the knob will cycle through the range of choices.

VIDEO OUT


Press VIDEO OUT to select the output format and frame rate. 24, 30, 48 and 60Hz rates are all possible.

FORMAT


Press FORMAT(F1) to select an HxV value. Pressing the function key or turning the knob will cycle through the range of choices.

F RATE


Press F RATE(F2) to select the frame rate. Pressing the function key or turning the knob will cycle through the range of choices. If a 29.97/30Hz or 59.94/60Hz rate is chosen, then a 3:2 sequence is inserted. The sequence will be A Frame aligned with one hour time code values whenever possible.

FLD/FRM


Press FLD/FRM(F3) to select field or frame filtering for 23.98/24Hz interlaced or segmented frame outputs.

For 24Hz interlaced(segmented) input:

VIDEO IN



Press VIDEO IN to select the input format and 24Hz frame rate.

FORMAT



Press FORMAT(F1) to select an HxV interlaced value. Pressing the function key or turning the knob will cycle through the range of choices.

F RATE



Press F RATE(F2) to select a 23.98/24Hz frame rate. Pressing the function key or turning the knob will cycle through the range of choices.

PULLDN



Press PULLDN(F3) to select the 2:2 pull-down mode. Pressing the function key or turning the knob will cycle through the range of choices.

Output selection is the same as above.

For 30/60Hz input:

VIDEO IN



Press VIDEO IN to select the input format and 30/60Hz frame rate.

FORMAT



Press FORMAT(F1) to select an HxV value. Pressing the function key or turning the knob will cycle through the range of choices.

F RATE



Press F RATE(F2) to select a 29.97/30Hz or 59.94/60Hz frame rate. Pressing the function key or turning the knob will cycle through the range of choices.

PULLDN



Press PULLDN(F3) to select the 3:2 pull-down mode. Pressing the function key or turning the knob will cycle through the range of choices.

TIMING



Press TIMING to select the 3:2 REFERENCE and A Frame position.

3:2 REF



Press 3:2 REF(F4) to select the 3:2 pull-down reference. Pressing the function key or turning the knob will cycle through the range of choices. EXT requires a special black burst reference to be used (conforming to SMPTE 318). TIME CODE will use one hour values as A Frame locations. MANUAL requires the position to be set each time the input sequence is interrupted.

3:2 POS

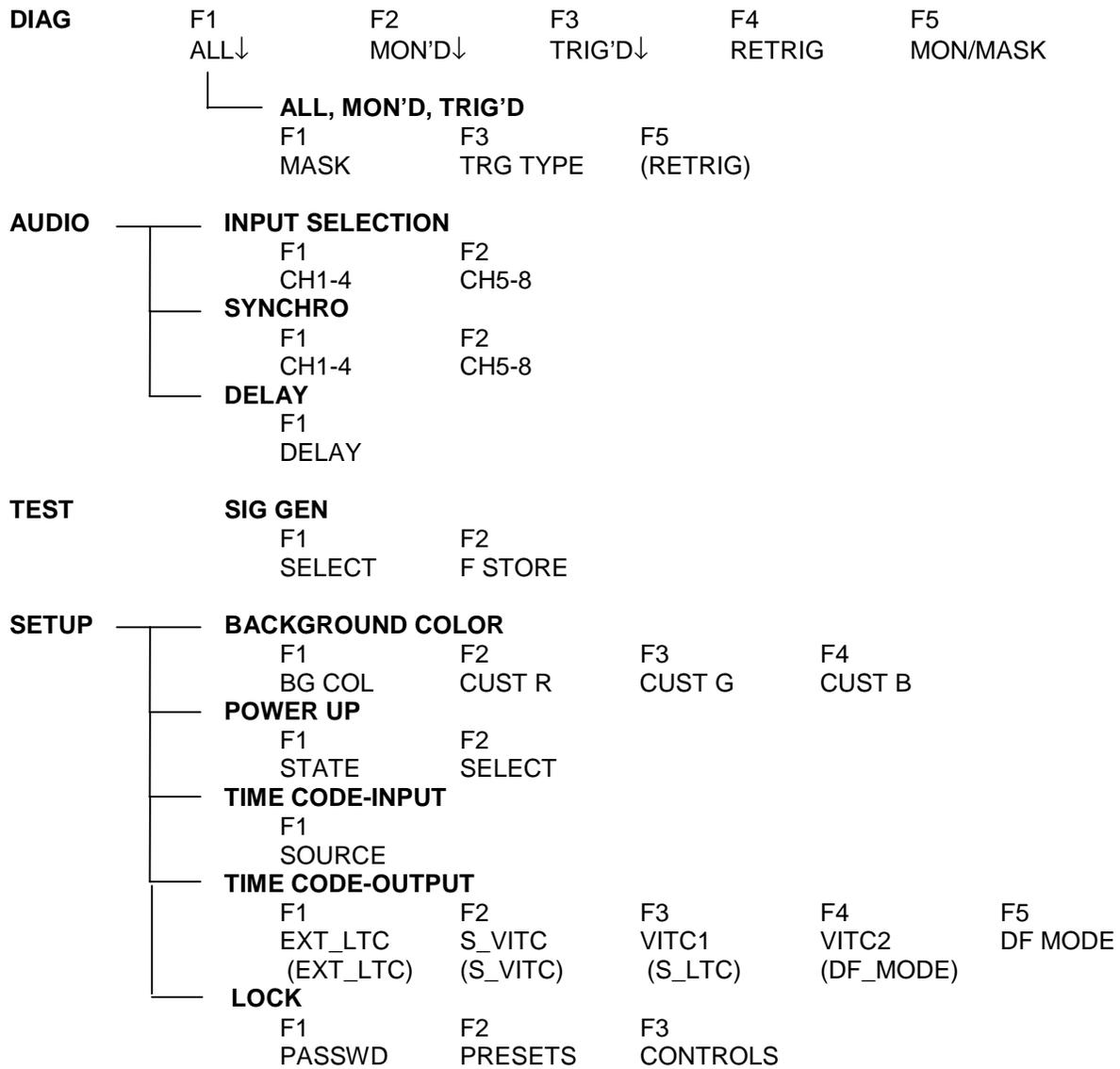


Press 3:2 POS(F5) to select the A Frame position with respect to the 3:2 reference. Pressing the function key or turning the knob will cycle through the range of choices. This allows for manually setting the position or offsetting the position from normal reference points.

Output selection is the same as above.

MENU TREE

HOME	F1	F2	F3	F4 VERSION	F5 DEFAULTS
PRESET	F1 SAVE	F2 RECALL	F3 TITLE	F4 DELETE	F5 (DETAILS)
	TITLE				
	F1 <-	F2 ->	F3 SP/CLR	F4 SAVE	
VIDEO IN	F1 FORMAT	F2 F RATE	F3 PULLDN		
VIDEO OUT	F1 FORMAT	F2 F RATE	F3 FLD/FRM		
FILTER	F1 H RESP	F2 V RESP	F3 H ENH	F4 V ENH	F5 2-D ENH
TIMING	SYSTEM				
	F1 REF IN	F2 GL TYPE	F3 LIN ADV	F4 SYS H	
	FILM MODE				
	F1 "A" POS	F2 3:2 REF	F3 TC SYNC		
RESIZE	ZOOM/PAN				
	F1 ZM MODE	F2 ZOOM H	F3 ZOOM V	F4 PAN H	F5 PAN V
	CROP				
	F1 LEFT	F2 RIGHT	F3 TOP	F4 BOTTOM	
	PRESETS				
	F1 FIT H	F2 FIT V	F3 FIT H&V	F4 14:9	F5 13:9
GAIN	Y-Pr-Pb				
	F1 Y	F2 Pr	F3 Pb	F4 BLACK	
	CONV COLORIMETRY				
	F1 INPUT	F2 OUTPUT			



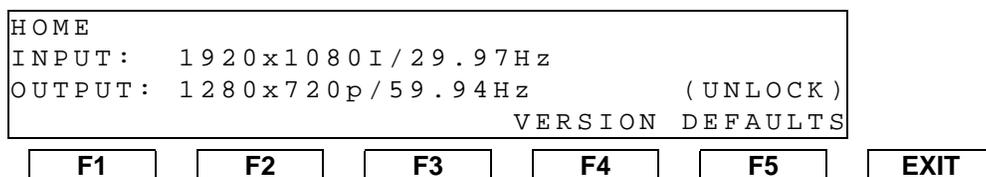
Front Panel Controls

All operation of the AJ-UFC1800 is performed by means of the front panel controls. These controls are used to activate presets, select input and output formats, adjust control settings, and perform diagnostic testing. The front panel consists of a 4x40 character display, 5 function buttons, an *EXIT* button, 12 menu buttons, and a control knob for making adjustments. There is also a *LOCAL/REMOTE* switch to select either front panel or remote control modes. In remote mode, the remote port is active and the front panel controls are ignored. In local mode, the front panel is active and the remote ports are disabled.

All of the front panel menus, with descriptions of their operation are shown below. In all cases, the *EXIT* button takes the user back to the previous menu.

Home Menu

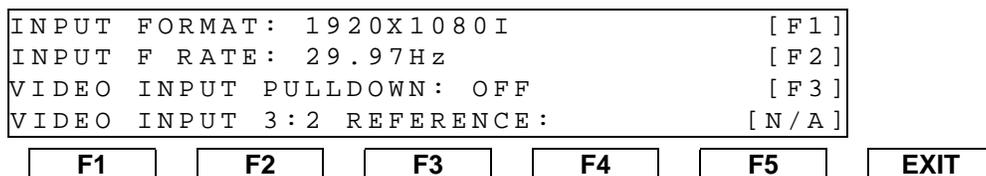
The *HOME* menu is activated by pushing the *HOME* button on the UFC front panel. This menu shows what input and output formats have been selected in the current configuration.



F4 – Displays the current version of the system software.

F5 – Sets all parameters to factory default values. Input and output format selections are preserved. This button must be held for more than two seconds.

Turning the knob displays all of the system parameters that are currently set for this conversion.



The function keys take you directly to the menu that sets the related parameter. If a given parameter does not apply to the current set-up, then “[N/A]” will appear instead of a function key number. On returning to the *HOME* menu, you will return to the same location in the menu. Pressing *EXIT* will return to the top display showing the input and output formats.

Preset Menu

The *PRESET* menu is activated by pushing the *PRESET* button on the UFC front panel. This menu allows the user to look at preset system configurations that have been saved in memory. All system parameters are stored in a preset file, including input and output formats, zoom & pan settings, timing adjustments, etc. Up to 16 preset files are stored in the system, and can be saved or recalled from this menu. The first eight presets can be password protected.

PRESET

SYSTEM PRESET 1			
TITLE: HD I TO HD P			
1920X1080I/30HZ-;1280X720P/60Hz			
SAVE	RECALL	TITLE	DELETE

F1 **F2** **F3** **F4** **F5** **EXIT**

Knob – Scrolls through the available presets (#1 to #16).

F1 – Saves the current system configuration to the displayed preset.

F2 – Recalls the displayed preset to the current system configuration.

F3 – Calls up the title menu.

F4 – Deletes the current system configuration stored in the displayed preset number.

Note: F2-F4 will not appear unless the corresponding preset is already saved. F1, F2 and F4 must be held for more than two seconds to take effect.

TITLE

This menu allows a text string to be set to label the current preset file.

SYSTEM PRESET1 >> TITLE CHANGE			
TITLE:			
^			
<-	->	SP/CLR	SAVE

F1 **F2** **F3** **F4** **F5** **EXIT**

F1 – Moves the cursor to the left.

F2 – Moves the cursor to the right.

F3 – Inserts a space or clears the current character.

F4 – Saves the text to the displayed preset number.

Video In Menus

The *VIDEO IN* menus are activated by pushing the *VIDEO IN* button on the UFC front panel. These menus allow the user to select the input video format for the system. The format, and frame rate, are selected independently, with the system providing feedback to the user if the format & frame rate selected are not compatible. These menus also allow the user to select film processing modes and to select the source of the 3:2 reference. Pull-down mode selects the frame processing that will be performed by the system: either none, 2:2 pull-down, or 3:2 pull-down. For 3:2 pull-down cases, a reference must be provided to signal the start of a 5 frame, 3:2 sequence. This reference may come from time code, SMPTE 318 black burst with frame flags or can be manually set.

VIDEO IN

If SD or HD auto detect mode is selected, then the related SDI input is monitored for format information. If a valid format is detected, then the system is configured for that particular format

VIDEO IN					
FORMAT:	1920X1080i		30Hz		
FORMAT	F RATE	PULLDN			
F1	F2	F3	F4	F5	EXIT

F1 – Activates knob to select an input video format (e.g., AUTO HD, 1920x1080I, 1280x720P).

F2 – Activates knob to select an input frame rate (AUTO HD, AUTO SD, 60, 59.94, 50, 48, 47.95, 30, 29.97, 25, 24, 23.98).

F3 – Activates knob to select the 2:2 or 3:2 pull-down frame processing mode for input (OFF, 2:2 or 3:2).

VIDEO IN (auto format mode)

VIDEO IN					
FORMAT:	AUTO HD				
detected mode:	1920x1080i		30Hz		
FORMAT	F RATE	PULLDN			
F1	F2	F3	F4	F5	EXIT

Note: Function keys operate the same as above.

Video Out Menu

The *VIDEO OUT* menu is activated by pushing the *VIDEO OUT* button on the UFC front panel. This menu allows the user to select the output video format for the system. The format and frame rate are selected independently, with the system providing feedback to the user if the format & frame rate selected are not compatible. The output frame rate must also match the input frame rate; either matching exactly, or related through 2:2 or 3:2 pull-down (for example: if the input frame rate is 60, the output may be 60, 30, or 24).

VIDEO OUT					
FORMAT:	1920X1080i		24Hz		
FORMAT	F RATE	FLD / FRM			
F1	F2	F3	F4	F5	EXIT

F1 – Activates knob to select an output video format (e.g., 1920x1080I, 1280x720P).

F2 – Activates knob to select an output frame rate (60, 59.94, 50, 48, 47.95, 30, 29.97, 25, 24, 23.98).

F3 – Selects either field or frame filtering for 2:2 or 3:2 film outputs. This selection only appears when it is appropriate.

Filter Menu

The *FILTER* menu is activated by pushing the *FILTER* button on the UFC front panel. This menu allows the user to select the filtering and enhancement responses for the system. The user may select different responses or enhancement settings depending upon the type of conversion being done (up or down) or the nature of the source material (soft material may need more enhancement, noisy material may need less).

F I L T E R					
H R E S P	V R E S P	H E N H	V E N H	2 - D E N H	
F1	F2	F3	F4	F5	EXIT

F1 – Activates knob to select the horizontal filter response (Wide, Standard, or Narrow).

F2 – Activates knob to select the vertical filter response (Wide, Standard, or Narrow).

F3 – Activates knob to select the amount of horizontal enhancement (0 to +6dB in 0.5dB steps).

F4 – Activates knob to select the amount of vertical enhancement (0 to +6dB in 0.5dB steps).

F5 – Activates knob to select the amount of two-dimensional enhancement (0 to +7dB in 1dB steps).

Note: H ENH and V ENH operate on the input format during the band-limiting process while 2-D ENH operates on the output format. H ENH and V ENH have upper mid-band peaks while 2-D ENH has its peak at the upper band edge.

Timing Menu

The *TIMING* menu is activated by pushing the *TIMING* button on the UFC front panel. The *SYSTEM* menu allows the user to select the sync reference for the system, as well as the type of sync used for the genlock output (bi-level or tri-level). Timing of the output video with respect to sync may also be adjusted by line (line advance) or by sample (horizontal position). If the horizontal position exceeds the total number of samples per output line; line advance will automatically be increased by one, and the horizontal position will be reset to zero.

The *FILM MODE* menu allows for selection of a 3:2 reference, if applicable and allows for offsetting the film frame position that is referenced. When time code is used as a reference, the hour that is used as the synchronization point may also be set.

SYSTEM

T I M I N G >> S Y S T E M					
R E F I N	G L T Y P E	L I N A D V	S Y S H		
F1	F2	F3	F4	F5	EXIT

F1 – Activates knob to select the sync reference (Input, External Bi-Level, External Tri-Level, or Black Burst).

F2 – Activates knob to select the genlock output sync type (Bi-Level or Tri-Level).

F3 – Activates knob to select the line advance value (0-7H).

F4 – Activates knob to select the horizontal position value (0-1H).

Note: If an external sync source is selected, the video input must be vertically locked to the same source.

FILM MODE

TIMING >> FILM MODE					
"A" POS 3:2 REF TC SYNC					
F1	F2	F3	F4	F5	EXIT

F1 – Activates knob to manually set the A Frame position or to offset the position from the nominal value when triggering from an external reference.

F2 – Activates knob to select the source of the 3:2 reference (EXT, TIME CODE or MANUAL).

F3 – Activates knob to select the synchronization point for a time code reference (1-23 hours).

Note: F2 is only active for 3:2 inputs or outputs. F3 is only active when TIME CODE is selected as a reference.

Resize Menus

The *RESIZE* menus are activated by pushing the *RESIZE* button on the UFC front panel. These menus allow the user to set values of all resizing adjustments. Three submenus are available by turning the knob: *ZOOM/PAN*, *CROP* and *PRESETS*.

ZOOM/PAN

Zoom is the scale factor applied to the input image so that zoom = 1 means the input frame size just fits the output frame size (either horizontally or vertically, whichever is larger). Pan is the spatial offset of the input frame from the center position of the output frame, where pan = 1 or -1 means the input frame just leaves the output frame.

RESIZE >> ZOOM/PAN					
CURRENT PRESET: FIT H&V					
ZM MODE	ZOOM H	ZOOM V	PAN H	PAN V	
F1	F2	F3	F4	F5	EXIT

F1 – Activates knob to select the horizontal & vertical zoom mode (Variable, Pass H, Pass V or Pass H&V).

F2 – Activates knob to select the horizontal zoom value (.25 to 8).

F3 – Activates knob to select the vertical zoom value (.25 to 8).

F4 – Activates knob to select the horizontal pan value (-1 to +1).

F5 – Activates knob to select the vertical pan value (-1 to +1).

Note 1: Pass modes map input samples directly to output samples using no filtering.

Note 2: Holding F2 and F3 down for 1 sec. locks H and V zoom control together.

CROP

Crop is the number of samples or lines that are removed from a given edge of the input frame. (This is usually done to get rid of edge anomalies.)

RESIZE >> CROP					
LEFT	RIGHT	TOP	BOTTOM		
F1	F2	F3	F4	F5	EXIT

F1 – Activates knob to select the left crop value.

F2 – Activates knob to select the right crop value.

F3 – Activates knob to select the top crop value.

F4 – Activates knob to select the bottom crop value.

PRESETS

The *FIT* functions are used to automatically set up different aspect ration conversions from input to output. Some examples follow. If input=16x9 and output=4x3: then *FIT H*=letterbox, *FIT V*=side cut, *FIT H&V*=anamorphic squeeze. If input=4x3 and output=16x9: then *FIT H*=top&bottom cut, *FIT V*=side panel, *FIT H&V*=anamorphic stretch.

RESIZE >> PRESETS					
ZOOM H: 1.333333		ZOOM V: 1.000000			
CURRENT PRESET: FIT H&V					
FIT H	FIT V	FIT H&V	14:9	13:9	
F1	F2	F3	F4	F5	EXIT

- F1 – Scales to match input size to output size along horizontal axis (maintaining the aspect ratio).
- F2 – Scales to match input size to output size along vertical axis (maintaining the aspect ratio).
- F3 – Scales to match input size to output size along both horizontal and vertical axis (may distort the aspect ratio).
- F4 – Sets a 14x9 aspect ratio when the input and output formats have different aspect ratios.
- F5 – Sets a 13x9 aspect ratio when the input and output formats have different aspect ratios.

Note: CURRENT PRESET will only be displayed if a preset size is active.

Gain Menus

The *GAIN* menus are activated by pushing the *GAIN* button on the UFC front panel. This menu allows the user to adjust the color component gains and black level settings of the system. These adjustments may be used for color correction of the input video, and also for changing the brightness and contrast of the image. Alternate color space conversion matrices can be selected if the user wants to override the normal format settings. Two submenus are available by turning the knob: *LEVEL ADJUST* and *COLOR MATRICES*.

LEVEL ADJUST

GAIN > Y - Pr - Pb					
Y	Pr	Pb	BLACK		
F1	F2	F3	F4	F5	EXIT

- F1 – Activates knob to select the Y gain value (0-1.4).
- F2 – Activates knob to select the Pr gain value (0-1.4).
- F3 – Activates knob to select the Pb gain value (0-1.4).
- F4 – Activates knob to select the black level value (+7.4/- 7.5 IRE).

COLOR MATRICES

GAIN > CONV COLORIMETRY					
INPUT	OUTPUT				
F1	F2	F3	F4	F5	EXIT

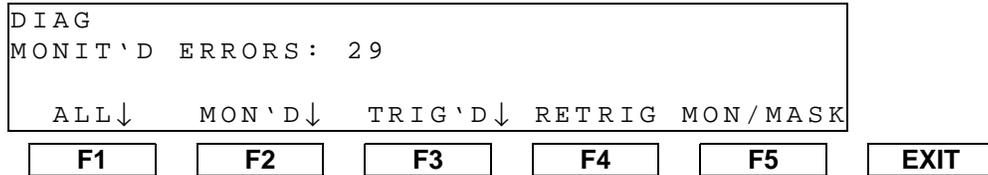
- F1 – Activates knob to select the input color matrix (240, 601, 709).
- F2 – Activates knob to select the output color matrix (240, 601, 709).

Note: Default values are set when input or output formats are changed.

Diagnostics Menu

The *DIAGNOSTICS* menu is activated by pushing the *DIAG* button on the UFC front panel. This menu shows any errors or warnings that have been detected by the system. Three submenus are available from the top menu: *ALL*, *MONITORED & TRIGGERED*.

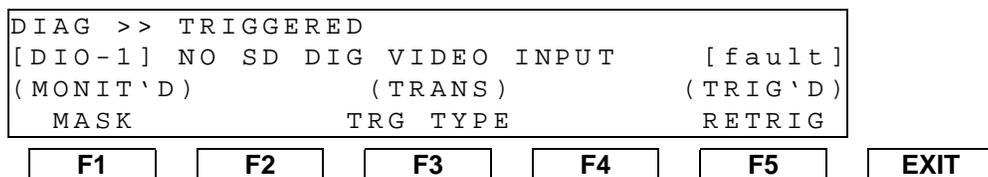
DIAG



- F1 – Opens up the ALL submenu to show all possible error messages.
- F2 – Opens up the MONITORED submenu to show which error conditions are being monitored.
- F3 – Opens up the TRIGGERED submenu to show all monitored errors that have been detected.
- F4 – Acknowledges all detected errors and resets their triggers.
- F5 – Touch this button to monitor all error conditions. Hold this button in until it flashes to mask all error detection.

ALL, MONITORED, TRIGGERED

The same functions are available under each submenu. The knob is used to scroll through all error conditions that are applicable to the respective submenu.



- F1 – On the ALL submenu, this toggles between masking or monitoring the displayed error condition. Only the mask option is available on the other two submenus.
- F3 – Selects between a level trigger or a transition trigger for the displayed error condition. Transition triggers are useful for detecting error conditions that only occur for a brief period of time.
- F5 – Resets the transition trigger for the displayed error condition. The error condition must be cleared in order to retrigger.

Note: Masking and subsequently monitoring an error will automatically reset its trigger. The error condition does not have to be removed first.

Audio Menus

The *AUDIO* menus are activated by pushing the *AUDIO* button on the UFC front panel. These menus allow the user to change audio routing and delay in the system, as well as enable or disable the audio synchronizers (sample rate converters). Each block of 4 outputs can have their input source selected independently, and also have their synchronizers enabled or disabled. The serial digital input may contain 4/8 channels of embedded audio, and the serial digital output of the system may also contain 4/8 channels of embedded audio which correspond to audio outputs 1-4/5-8. Three submenus are available by turning the knob: *INPUT SELECT*, *SYNCHRONIZER* and *DELAY*.

INPUT SELECTION

AUDIO >> INPUT SELECTION					
CH 1 - 4		CH 5 - 8			
F1	F2	F3	F4	F5	EXIT

F1 – Activates knob to select the input source for audio output channels 1-4 (AES1-4, AES5-8, SDI 1-4 or SDI 5-8).
F2 – Activates knob to select the input source for audio output channels 5-8 (AES1-4, AES5-8, SDI 1-4 or SDI 5-8).
Note: When an SD input is selected, SDI 5-8 can not be selected.

SYNCHRONIZER

AUDIO >> SYNCHRONIZER					
CH 1 - 4		CH 5 - 8			
F1	F2	F3	F4	F5	EXIT

F1 – Enables or disables the synchronizer for audio channels 1-4.
F2 – Enables or disables the synchronizer for audio channels 5-8.

DELAY

Audio delay is a global adjustment where the default (delay = 0) position delays the audio just enough to match the video processing delay through the system. Additional delay can be added by the user with the delay setting on this menu.

AUDIO >> DELAY					
DELAY					
F1	F2	F3	F4	F5	EXIT

F1 – Activates knob to select the amount of audio delay (0 to 170ms).
Note: The zero value on the display corresponds to the amount of video processing delay. Therefore the displayed range is (–video delay) to (170ms –video delay).

Test Menus

The *TEST* menu is activated by pushing the *TEST* button on the UFC front panel. This menu allows the user to activate the internal test pattern generator, select patterns, or activate the frame store feature.

SIGNAL GEN

TEST > SIG GEN					
SELECT F STORE					
F1	F2	F3	F4	F5	EXIT

F1 – Activates knob to select the test pattern (Off, Stored Frame and various H/V based patterns).

F2 – Captures current video image to frame store. This is only active when SELECT is set to “OFF”.

Setup Menus

The *SETUP* menus are activated by pushing the *SETUP* button on the UFC front panel. These menus allow the user to set the background color, power-up settings, time of day and time code input/output modes. Five submenus are available by turning the knob: *BACKGROUND COLOR*, *POWER UP*, *SYSTEM TIME*, *TIME CODE-INPUT* and *TIME CODE-OUTPUT*.

BACKGROUND COLOR

This menu allows the user to adjust the background color settings of the system. The background color shows through when the input frame does not completely fill the output frame (due to zoom, pan, or crop settings). The background color is selected from a preset list, or a custom color may be selected by setting RGB values manually.

SETUP > BACKGROUND COLOR					
BG COLOR: CUSTOM RGB = 0 0 0					
BG COL	CUST R	CUST G	CUST B		
F1	F2	F3	F4	F5	EXIT

F1 – Activates knob to select the background color (Black, Sub-Black, Blue, White or Custom).

F2 – Activates knob to select the custom red value (0 to 255).

F3 – Activates knob to select the custom green value (0 to 255).

F4 – Activates knob to select the custom blue value (0 to 255).

Note: F2, F3 and F4 only appear when CUSTOM is selected.

POWER UP

SETUP > POWER UP					
MODE: LAST STATE					
STATE SELECT					
F1	F2	F3	F4	F5	EXIT

F1 – Activates knob to select the power-up mode (Last state, Default or Preset 1-16).

F2 – Selects the displayed state as the power up mode.

Note: This state is momentarily displayed on the front panel during power up.

TIME CODE-INPUT

This menu allows the user to select the source for LTC and indicate drop frame or non-drop frame TC.

SETUP > TIME CODE-INPUT						
SOURCE DF MODE						
F1	F2	F3	F4	F5	EXIT	

F1 – Selects whether the time code source is from the serial input or from the external TC connector (S_LTC, EXT_LTC or S_VITC).

F2 – When this is on AUTO, the time code source drop frame flag is used. Otherwise, non-drop frame mode is set (AUTO, OFF).

Note: When an SD input is selected, S_LTC cannot be selected.

TIME CODE-OUTPUT

This menu allows the user to select the source for SD_VITC and indicate drop frame or non-drop frame TC. For an HDTV output, the following menu is seen.

SETUP > TIME CODE-OUTPUT						
EXT LTC S VITC S LTC DF MODE						
F1	F2	F3	F4	F5	EXIT	

F1 – Selects whether the external LTC is on or off.

F2 – Selects whether the SDI output VITC is on or off.

F2 – Selects whether the SDI output LTC is on or off.

F4 – Selects between drop frame mode and non-drop frame mode.

Note: If the input TC source is not available, then the TC output selections will be forced to the off setting until the source is present.

For an SDTV output, the following menu is seen.

SETUP > TIME CODE-OUTPUT						
EXT LTC S VITC VITC1 VITC2 DF MODE						
F1	F2	F3	F4	F5	EXIT	

F1 – Selects whether the external LTC is on or off.

F2 – Selects whether the SDI output VITC is on or off.

F3 – Activates knob to select the line for VITC1 insertion on SD outputs.

F4 – Activates knob to select the line for VITC2 insertion on SD outputs.

F5 – Selects between drop frame mode and non-drop frame mode.

Note: If the input TC source is not available, then the TC output selections will be forced to the off setting until the source is present.

LOCK

This menu allows the user to set a system password by using the menu keys.

SETUP >> LOCK					
PASSWD PRESETS CONTROLS					
F1	F2	F3	F4	F5	EXIT

F1 – Allows the system password to be set.

F2 – Locks or unlocks user presets 1-8.

F3 – Locks or unlocks the control panel and remote ports.

SET PASSWORD

If a password already exists, then it must be entered to set a new password. To clear an existing password, hold down the F2 and F3 keys for at least 3 seconds. A sequence of four menu keys must be entered.

SETUP >> LOCK					USE
ENTER NEW PASSWORD: ****					MENU
					KEYS
PASSWD PRESETS CONTROLS					
F1	F2	F3	F4	F5	EXIT

PRESETS

Allows the user presets to be locked or unlocked by entering the system password.

SETUP >> LOCK					USE
LOCK PRESETS: ****					MENU
					KEYS
PASSWD PRESETS CONTROLS					
F1	F2	F3	F4	F5	EXIT

CONTROLS

Allows the front panel controls and remote ports to be locked or unlocked by entering the system password.

SETUP >> LOCK					USE
LOCK CONTROLS: ****					MENU
					KEYS
PASSWD PRESETS CONTROLS					
F1	F2	F3	F4	F5	EXIT

Error messages

No.	Message	Error description	Remedy
DIO-1	NO SD DIG VIDEO INPUT	No signal is detected on the SD serial input.	Check SD input signal.
DIO-2	NO HD DIG VIDEO INPUT	No signal is detected on the HD serial input.	Check HD input signal.
DIO-3	HD SDI CRC ERROR	A checksum error was found on the HD serial input.	Check HD SDI input cable and/or source.
DIO-4	NO SD EMBEDDED AUDIO INPUT	No embedded audio signal is detected on the SD serial input.	This may not be supported by the source equipment.
DIO-5	SD SDI AUDIO ERROR	A checksum error was found on the SD embedded audio input.	Check SD SDI input cable and/or source.
DIO-6	NO HD EMBED AUD INPUT, CH1-4	No embedded audio signal is detected on CH1-4 on the HD serial input.	Check the source.
DIO-7	HD SDI AUDIO ERROR, CH1-4	A checksum error was found on the HD embedded audio input.	Check HD SDI input cable and/or source.
DIO-8	NO HD EMBED AUD INPUT, CH5-8	No embedded audio signal is detected on CH5-8 on the HD serial input.	This may not be supported by the source equipment.
DIO-9	HD SDI AUDIO ERROR, CH5-8	A checksum error was found on the HD embedded audio input.	Check HD SDI input cable and/or source. Check for support from source.
DIO-10	SD SDI EDH ERROR	An EDH error was detected on the SD serial input.	Check SD SDI input cable and/or source.
DIO-11	NO SD EDH IN SDI	EDH information was not found on the SD serial input.	Check source. Not all equipment supports EDH.
DIO-12	NO EXT LTC	An error was found on the external LTC input.	Check cable and/or source.
DIO-13	NO HD LTC	An error was found on the HD embedded LTC input.	Check source.
DIO-14	NO HD VITC	An error was found on the HD VITC input.	Check source.
DIO-15	NO SD VITC	An error was found on the SD VITC input.	Check source.
AUD-4	AES/EBU NOT LOCKD TO VID	The external audio signals are not locked to the input video.	Make sure that the audio synchronizers are turned on.
AUD-1	CH 1/2 AUDIO PARITY ERROR	A parity error was found on the external audio signal.	Check cable and/or source.
AUD-2	CH 1/2 AUDIO CRC ERROR	A checksum error was found on the external audio signal.	Check cable and/or source.
AUD-3	CH 3/4 AUDIO PARITY ERROR	A parity error was found on the external audio signal.	Check cable and/or source.
AUD-4	CH 3/4 AUDIO CRC ERROR	A checksum error was found on the external audio signal.	Check cable and/or source.
AUD-5	CH 5/6 AUDIO PARITY ERROR	A parity error was found on the external audio signal.	Check cable and/or source.

AUD -6	CH 5/6 AUDIO CRC ERROR	A checksum error was found on the external audio signal.	Check cable and/or source.
AUD -7	CH 7/8 AUDIO PARITY ERROR	A parity error was found on the external audio signal.	Check cable and/or source.
AUD -8	CH 7/8 AUDIO CRC ERROR	A checksum error was found on the external audio signal.	Check cable and/or source.
SYS -1	FAN STOPPED	The rear panel cooling fan has stopped.	Check for obstruction.
MM- 1	NO EXT SYNC	Reference is external sync, but no signal is detected.	Check EXT SYNC input.
MM- 2	NO SMPTE 318 SYNC	Reference is SMPTE 318, but signal is incorrect.	Connect a SMPTE 318 signal to EXT SYNC.
MM- 3	NO INPUT LOCK	Input PLL is not locked.	Make sure that input source matches the selected format.
MM- 4	NO OUTPUT LOCK	Output PLL is not locked.	Input source must be locked to the external reference.

Others

INDICATORS

L1 PCB LED

D3 - D0 LED (Red): These LEDs show the input frame rate. See table:

LED	Status	1125i	1125p	750p	525i	525p	625i
D3 - D0	0000	30	30	60	30	60	
	0001	29.97	29.97	59.94	29.97	29.94	
	0010	24	24	24			
	0011	23.98	23.98	23.98			
	0100	25	25	50			
	0101						25
	0110			30		30	24
	0111			29.97		39.97	23.98

Note: 1 is on, 0 is off.

CRC LED (Green): When CRC errors are not present, the LED is lit.

L2 PCB LED

D3 LED (Red): Processor error.

D4 LED (Green): Flashes when the system microprocessor is running.

Remote connectors

The RS-232 serial port supports downloads of new system software and limited remote control operation. The GPI port allows remote selection of PRESETS 1-8 when the front panel REMOTE/LOCAL switch is in the "REMOTE" position. The GPI inputs are active low so that a connection between pins 1-8 and pin 9 will select the corresponding PRESET.

RS-232 pins:	1 – NC	GPI pins:	1 – preset 1
	2 – receive		2 – preset 2
	3 – transmit		3 – preset 3
	4 – NC		4 – preset 4
	5 – GND		5 – preset 5
	6 – NC		6 – preset 6
	7 – NC		7 – preset 7
	8 – NC		8 – preset 8
	9 – NC		9 – GND

30/29 Frame Time Code NDF <-> DF Conversion

	NDF	DF	difference	
	00:00:00:00	24:01:22:26		
	00:00:03:17	24:01:26:13		
	00:00:03:18	00:00:00:00	-00:00:03:18	
	00:59:00:00	00:58:59:28	-00:00:00:02	
	00:59:00:01	00:58:59:29	-00:00:00:02	
	00:59:00:02	00:59:00:02	00:00:00:00	
SYNC POINT	01:00:00:00	01:00:00:00	00:00:00:00	
	01:00:59:29	01:00:59:29	00:00:00:00	
	01:01:00:00	01:01:00:02	+00:00:00:02	1min. = 2Frame
	01:01:59:27	01:01:59:29		
	01:01:59:28	01:02:00:02	+00:00:00:04	
	01:01:59:29	01:02:00:03		
	01:02:00:00	01:02:00:04		
	01:02:59:25	01:02:59:29		
	01:02:59:26	01:03:00:02	+00:00:00:06	
	01:02:59:27	01:03:00:03		
	01:02:59:28	01:03:00:04		
	01:02:59:29	01:03:00:05		
	01:03:00:00	01:03:00:06		
	01:03:59:23	01:03:59:29		
	01:03:59:24	01:04:00:02	+00:00:00:08	
	01:04:00:00	01:04:00:08		
	01:04:59:21	01:04:59:29		
	01:04:59:22	01:05:00:02	+00:00:00:10	
	01:05:00:00	01:05:00:10		
	01:05:59:19	01:05:59:29		
	01:05:59:20	01:06:00:02	+00:00:00:12	
	01:06:00:00	01:06:00:12		
	01:06:59:17	01:06:59:29		
	01:06:59:18	01:07:00:02	+00:00:00:14	
	01:07:00:00	01:07:00:14		
	01:07:59:15	01:07:59:29		
	01:07:59:16	01:08:00:02	+00:00:00:16	
	01:08:00:00	01:08:00:16		

30/29 Frame Time Code NDF <-> DF Conversion

NDF	DF	difference	
01:08:59:13	01:08:59:29		
01:08:59:14	01:09:00:02	+00:00:00:18	
01:09:00:00	01:09:00:18		
01:09:59:11	01:09:59:29		
01:09:59:12	01:10:00:00	+00:00:00:18	10min. = 18Frame
01:09:59:29	01:10:00:17		
01:10:00:00	01:10:00:18		
01:10:00:01	01:10:00:19		
01:19:58:24	01:20:00:00	+00:00:01:06	
01:29:58:06	01:30:00:00	+00:00:01:24	
01:39:57:18	01:40:00:00	+00:00:02:12	
01:49:57:00	01:50:00:00	+00:00:03:00	
01:59:56:12	02:00:00:00	+00:00:03:18	1Hr. = 3sec.18F
02:59:52:24	03:00:00:00	+00:00:07:06	
03:59:49:06	04:00:00:00	+00:00:10:24	
04:59:45:18	05:00:00:00	+00:00:14:12	
05:59:42:00	06:00:00:00	+00:00:18:00	
06:59:38:12	07:00:00:00	+00:00:21:18	
07:59:34:24	08:00:00:00	+00:00:25:06	
08:59:31:06	09:00:00:00	+00:00:28:24	
09:59:27:18	10:00:00:00	+00:00:32:12	
10:59:24:00	11:00:00:00	+00:00:36:00	
11:59:21:12	12:00:00:00	+00:00:39:18	
12:59:16:24	13:00:00:00	+00:00:43:06	
13:59:13:06	14:00:00:00	+00:00:46:24	
14:59:09:18	15:00:00:00	+00:00:50:12	
15:59:06:00	16:00:00:00	+00:00:54:00	
16:59:02:12	17:00:00:00	+00:00:57:18	
17:58:58:24	18:00:00:00	+00:01:01:06	

30/29 Frame Time Code NDF <-> DF Conversion

NDF	DF	difference	
18:58:55:06	19:00:00:00	+00:01:04:24	
19:58:51:18	20:00:00:00	+00:01:08:12	
20:58:48:00	21:00:00:00	+00:01:12:00	
21:58:44:12	22:00:00:00	+00:01:15:18	
22:58:41:24	23:00:00:00	+00:01:19:06	
23:58:37:05	23:59:59:29	+00:01:22:24	
23:58:37:06	24:00:00:00	+00:01:22:24	Irregular Value
23:59:37:06	24:01:00:02	+00:01:22:26	
00:00:00:00	24:01:22:26		

30/29 -> 24/23 Frame Time Code

NDF -> NDF Conversion

3:2 PullDown

	NDF 30frame	Actual VIDEO OUTPUT	NDF 24frame	Frame Sequence	difference
	00:00:00:00		00:00:00:00	A	
	00:00:03:16				
	00:00:03:17		00:00:03:13		
	00:00:03:18		00:00:03:14		
	00:59:00:00		00:59:00:00	A	
	00:59:59:28			D	
	00:59:59:29	00:59:59:29	00:59:00:23		
	00:59:59:29	00:59:29:29	00:59:00:23		
SYNC POINT 0	01:00:00:00	01:00:00:00	01:00:00:00	A	00:00:00:00
	01:00:00:00	01:00:00:00	01:00:00:00		
1	01:00:00:01			B	
	01:00:00:01	01:00:00:02	01:00:00:01		
2	01:00:00:02	01:00:00:01	01:00:00:01		
	01:00:00:02	01:00:00:03	01:00:00:02	C	
3	01:00:00:03	01:00:00:02	01:00:00:02		
	01:00:00:03			D	
4	01:00:00:04	01:00:00:04	01:00:00:03		
	01:00:00:04	01:00:00:04	01:00:00:03		
0	01:00:00:05	01:00:00:05	01:00:00:04	A	
	01:00:00:05	01:00:00:05	01:00:00:04		
1	01:00:00:06			B	
	01:00:00:06	01:00:00:07	01:00:00:05		
2	01:00:00:07	01:00:00:06	01:00:00:05		
	01:00:00:07	01:00:00:08	01:00:00:06	C	
3	01:00:00:08	01:00:00:07	01:00:00:06		
	01:00:00:08			D	
4	01:00:00:09	01:00:00:09	01:00:00:07		
	01:00:00:09	01:00:00:09	01:00:00:07		
0	01:00:00:10	01:00:00:10	01:00:00:08	A	
	01:00:00:10	01:00:00:10	01:00:00:08		
1	01:00:00:11			B	
	01:00:00:11	01:00:00:12	01:00:00:09		
2	01:00:00:12	01:00:00:11	01:00:00:09		
	01:00:00:12	01:00:00:13	01:00:00:10	C	
3	01:00:00:13	01:00:00:12	01:00:00:10		
	01:00:00:13			D	
4	01:00:00:14	01:00:00:14	01:00:00:11		
	01:00:00:14	01:00:00:14	01:00:00:11		
0	01:00:00:15	01:00:00:15	01:00:00:12	A	
	01:00:00:15	01:00:00:15	01:00:00:12		
1	01:00:00:16			B	
	01:00:00:16	01:00:00:17	01:00:00:13		
2	01:00:00:17	01:00:00:16	01:00:00:13		
	01:00:00:17	01:00:00:18	01:00:00:14	C	
3	01:00:00:18	01:00:00:17	01:00:00:14		
	01:00:00:18			D	
4	01:00:00:19	01:00:00:19	01:00:00:15		

30/29 -> 24/23 Frame Time Code

NDF -> NDF Conversion

	NDF 30frame	Actual VIDEO OUTPUT	NDF 24frame	Frame Sequence	difference
	01:00:00:19.	01:00:00:19.	01:00:00:15.		
0	01:00:00:20.	01:00:00:20.	01:00:00:16.	A	
	01:00:00:20.	01:00:00:20.	01:00:00:16.		
1	01:00:00:21.			B	
	01:00:00:21.	01:00:00:22.	01:00:00:17.		
2	01:00:00:22.	01:00:00:21.	01:00:00:17.		
	01:00:00:22.	01:00:00:23.	01:00:00:18.	C	
3	01:00:00:23.	01:00:00:22.	01:00:00:18.		
	01:00:00:23.			D	
4	01:00:00:24.	01:00:00:24.	01:00:00:19.		
	01:00:00:24.	01:00:00:24.	01:00:00:19.		
0	01:00:00:25.	01:00:00:25.	01:00:00:20.	A	
	01:00:00:25.	01:00:00:25.	01:00:00:20.		
1	01:00:00:26.			B	
	01:00:00:26.	01:00:00:27.	01:00:00:21.		
2	01:00:00:27.	01:00:00:26.	01:00:00:21.		
	01:00:00:27.	01:00:00:28.	01:00:00:22.	C	
3	01:00:00:28.	01:00:00:27.	01:00:00:22.		
	01:00:00:28.			D	
4	01:00:00:29.	01:00:00:29.	01:00:00:23.		
	01:00:00:29.	01:00:00:29.	01:00:00:23.		
0	01:00:01:00	01:00:01:00	01:00:01:00	A	00:00:00:00

30/29 -> 24/23 -> 30/29 Frame Time Code Conversion

NDF -> NDF

3:2 PullDown

	NDF 30frame	Frame Sequence	Actual VIDEO OUTPUT	NDF 30frame
	00:00:00:00	A		00:00:00:00
	00:00:03:16			00:00:03:16
	00:00:03:17			00:00:03:17
	00:00:03:18			00:00:03:18
	00:59:00:00	A		00:59:00:00
	00:59:59:28.	D	00:59:59:29.	00:59:59:28.
	00:59:59:29		00:59:59:29	00:59:59:29
	00:59:59:29.		00:59:59:29.	00:59:59:29.
SYNC POINT	0 01:00:00:00	A	01:00:00:00	01:00:00:00
	01:00:00:00.		01:00:00:00.	01:00:00:00.
1	01:00:00:01	B	01:00:00:02	01:00:00:01
	01:00:00:01.		01:00:00:01.	01:00:00:01.
2	01:00:00:02		01:00:00:02	01:00:00:02
	01:00:00:02.	C	01:00:00:02.	01:00:00:02.
3	01:00:00:03		01:00:00:03	01:00:00:03
	01:00:00:03.	D	01:00:00:04.	01:00:00:03.
4	01:00:00:04		01:00:00:04	01:00:00:04
	01:00:00:04.		01:00:00:04.	01:00:00:04.
0	01:00:00:05	A	01:00:00:05	01:00:00:05
	01:00:00:05.		01:00:00:05.	01:00:00:05.
1	01:00:00:06	B	01:00:00:07	01:00:00:06
	01:00:00:06.		01:00:00:06.	01:00:00:06.
2	01:00:00:07		01:00:00:07	01:00:00:07
	01:00:00:07.	C	01:00:00:07.	01:00:00:07.
3	01:00:00:08		01:00:00:08	01:00:00:08
	01:00:00:08.	D	01:00:00:09.	01:00:00:08.
4	01:00:00:09		01:00:00:09	01:00:00:09
	01:00:00:09.		01:00:00:09.	01:00:00:09.
0	01:00:00:10	A	01:00:00:10	01:00:00:10
	01:00:00:10.		01:00:00:10.	01:00:00:10.
1	01:00:00:11	B	01:00:00:12	01:00:00:11
	01:00:00:11.		01:00:00:11.	01:00:00:11.
2	01:00:00:12		01:00:00:12	01:00:00:12
	01:00:00:12.	C	01:00:00:12.	01:00:00:12.
3	01:00:00:13		01:00:00:13	01:00:00:13
	01:00:00:13.	D	01:00:00:14.	01:00:00:13.
4	01:00:00:14		01:00:00:14	01:00:00:14
	01:00:00:14.		01:00:00:14.	01:00:00:14.
0	01:00:00:15	A	01:00:00:15	01:00:00:15
	01:00:00:15.		01:00:00:15.	01:00:00:15.
1	01:00:00:16	B	01:00:00:17	01:00:00:16
	01:00:00:16.		01:00:00:16.	01:00:00:16.
2	01:00:00:17		01:00:00:17	01:00:00:17
	01:00:00:17.	C	01:00:00:17.	01:00:00:17.
3	01:00:00:18		01:00:00:18	01:00:00:18
	01:00:00:18.	D	01:00:00:19.	01:00:00:18.
4	01:00:00:19		01:00:00:19	01:00:00:19

30/29 -> 24/23 -> 30/29 Frame Time Code NDF -> NDF Conversion

	NDF 30frame	Frame Sequence	Actual VIDEO OUTPUT	NDF 30frame
	01:00:00:19.		01:00:00:18.	01:00:00:19.
0	01:00:00:20	A	01:00:00:20	01:00:00:20
	01:00:00:20.		01:00:00:20.	01:00:00:20.
1	01:00:00:21	B	01:00:00:22	01:00:00:21
	01:00:00:21.		01:00:00:21.	01:00:00:21.
2	01:00:00:22		01:00:00:22	01:00:00:22
	01:00:00:22.	C	01:00:00:22.	01:00:00:22.
3	01:00:00:23		01:00:00:23	01:00:00:23
	01:00:00:23.	D	01:00:00:24.	01:00:00:23.
4	01:00:00:24		01:00:00:24	01:00:00:24
	01:00:00:24.		01:00:00:24.	01:00:00:24.
0	01:00:00:25	A	01:00:00:25	01:00:00:25
	01:00:00:25.		01:00:00:25.	01:00:00:25.
1	01:00:00:26	B	01:00:00:27	01:00:00:26
	01:00:00:26.		01:00:00:26.	01:00:00:26.
2	01:00:00:27		01:00:00:27	01:00:00:27
	01:00:00:27.	C	01:00:00:27.	01:00:00:27.
3	01:00:00:28		01:00:00:28	01:00:00:28
	01:00:00:28.	D	01:00:00:29.	01:00:00:28.
4	01:00:00:29		01:00:00:29	01:00:00:29
	01:00:00:29.		01:00:00:29.	01:00:00:29.
0	01:00:01:00	A	01:00:01:00	01:00:01:00

30/29 <-> 24/23 Frame Time Code

NDF <-> NDF Conversion

SlowPAL 25frame count 3:2 PullDown

	NDF 30frame	VIDEO OUTPUT	NDF 25frame	Frame Sequence	difference
	00:00:00:00		00:01:12:00	A	-00:01:12:00
	00:00:03:00		00:01:19:05		
	00:00:03:16				
	00:00:03:17		00:01:19:18		
	00:00:03:18		00:01:19:19		
	00:59:00:00		00:59:02:10	A	-00:00:02:10
	00:59:59:28			D	
	00:59:59:29	00:59:59:29	00:59:00:24		
	00:59:59:29	00:59:29:29	00:59:00:24		
SYNC POINT 0	01:00:00:00	01:00:00:00	01:00:00:00	A	00:00:00:00
	01:00:00:00	01:00:00:00	01:00:00:00		
1	01:00:00:01			B	
	01:00:00:01	01:00:00:02	01:00:00:01		
2	01:00:00:02	01:00:00:01	01:00:00:01		
	01:00:00:02	01:00:00:03	01:00:00:02	C	
3	01:00:00:03	01:00:00:02	01:00:00:02		
	01:00:00:03			D	
4	01:00:00:04	01:00:00:04	01:00:00:03		
	01:00:00:04	01:00:00:04	01:00:00:03		
0	01:00:00:05	01:00:00:05	01:00:00:04	A	
	01:00:00:05	01:00:00:05	01:00:00:04		
1	01:00:00:06			B	
	01:00:00:06	01:00:00:07	01:00:00:05		
2	01:00:00:07	01:00:00:06	01:00:00:05		
	01:00:00:07	01:00:00:08	01:00:00:06	C	
3	01:00:00:08	01:00:00:07	01:00:00:06		
	01:00:00:08			D	
4	01:00:00:09	01:00:00:09	01:00:00:07		
	01:00:00:09	01:00:00:09	01:00:00:07		
0	01:00:00:10	01:00:00:10	01:00:00:08	A	
	01:00:00:10	01:00:00:10	01:00:00:08		
1	01:00:00:11			B	
	01:00:00:11	01:00:00:12	01:00:00:09		
2	01:00:00:12	01:00:00:11	01:00:00:09		
	01:00:00:12	01:00:00:13	01:00:00:10	C	
3	01:00:00:13	01:00:00:12	01:00:00:10		
	01:00:00:13			D	
4	01:00:00:14	01:00:00:14	01:00:00:11		
	01:00:00:14	01:00:00:14	01:00:00:11		
0	01:00:00:15	01:00:00:15	01:00:00:12	A	
	01:00:00:15	01:00:00:15	01:00:00:12		
1	01:00:00:16			B	
	01:00:00:16	01:00:00:17	01:00:00:13		
2	01:00:00:17	01:00:00:16	01:00:00:13		
	01:00:00:17	01:00:00:18	01:00:00:14	C	
3	01:00:00:18	01:00:00:17	01:00:00:14		
	01:00:00:18			D	
4	01:00:00:19	01:00:00:19	01:00:00:15		

30/29 <-> 24/23 Frame Time Code

NDF <-> NDF Conversion

	NDF 30frame	Actual VIDEO OUTPUT	NDF 25frame	Frame Sequence difference
	01:00:00:19.	01:00:00:19.	01:00:00:15.	
0	01:00:00:20	01:00:00:20	01:00:00:16	A
	01:00:00:20.	01:00:00:20.	01:00:00:16.	
1	01:00:00:21			B
	01:00:00:21.	01:00:00:22	01:00:00:17	
2	01:00:00:22	01:00:00:21.	01:00:00:17.	
	01:00:00:22.	01:00:00:23	01:00:00:18	C
3	01:00:00:23	01:00:00:22.	01:00:00:18.	
	01:00:00:23.			D
4	01:00:00:24	01:00:00:24	01:00:00:19	
	01:00:00:24.	01:00:00:24.	01:00:00:19.	
0	01:00:00:25	01:00:00:25	01:00:00:20	A
	01:00:00:25.	01:00:00:25.	01:00:00:20.	
1	01:00:00:26			B
	01:00:00:26.	01:00:00:27	01:00:00:21	
2	01:00:00:27	01:00:00:26.	01:00:00:21.	
	01:00:00:27.	01:00:00:28	01:00:00:22	C
3	01:00:00:28	01:00:00:27.	01:00:00:22.	
	01:00:00:28.			D
4	01:00:00:29	01:00:00:29	01:00:00:23.	
	01:00:00:29.	01:00:00:29.	01:00:00:23.	
0	01:00:01:00	01:00:01:00	01:00:00:24	A +00:00:00:01
	01:00:01:00.	01:00:01:00.	01:00:00:24.	1sec. = 1Frame
	01:00:01:01			B
	01:00:01:01.	01:00:01:02	01:00:01:00	
	01:00:01:02	01:00:01:01.	01:00:01:00.	
	01:00:01:02.	01:00:01:03	01:00:01:01	C
	01:00:01:03	01:00:01:02.	01:00:01:01.	
	01:00:01:03.			D
	01:00:01:04	01:00:01:04	01:00:01:02	
	01:00:01:04.	01:00:01:04	01:00:01:02.	
	01:00:01:05	01:00:01:04.	01:00:01:03	A
	01:00:01:05.	01:00:01:05.	01:00:01:03.	
	01:00:01:06			B
	01:00:01:06.	01:00:01:07	01:00:01:04	
	01:00:01:07	01:00:01:06.	01:00:01:04.	
	01:00:01:07.	01:00:01:08	01:00:01:05	C
	01:00:01:08	01:00:01:07.	01:00:01:05.	
	01:00:01:08.			D
	01:00:01:09	01:00:01:09	01:00:01:06	
	01:00:01:09.	01:00:01:09.	01:00:01:06.	
	01:00:01:10	01:00:01:10	01:00:01:07	A
	01:00:01:10.	01:00:01:10.	01:00:01:07.	
	01:00:01:11			B
	01:00:01:11.	01:00:01:12	01:00:01:08	
	01:00:01:12	01:00:01:11.	01:00:01:08.	
	01:00:01:12.	01:00:01:13	01:00:01:09	C
	01:00:01:13	01:00:01:12.	01:00:01:09.	
	01:00:01:13.			D
	01:00:01:14	01:00:01:14	01:00:01:10	
	01:00:01:14.	01:00:01:14.	01:00:01:10.	
	01:00:01:15	01:00:01:15	01:00:01:11	A
	01:00:01:15.	01:00:01:15.	01:00:01:11.	

30/29 <-> 24/23 Frame Time Code

NDF <-> NDF Conversion

NDF 30frame	Actual VIDEO OUTPUT	NDF 25frame	Frame Sequence difference
01:00:01:16			B
01:00:01:16.	01:00:01:17	01:00:01:12	
01:00:01:17	01:00:01:16.	01:00:01:12.	
01:00:01:17.	01:00:01:18	01:00:01:13	C
01:00:01:18	01:00:01:17.	01:00:01:13.	
01:00:01:18.			D
01:00:01:19	01:00:01:19	01:00:01:14	
01:00:01:19.	01:00:01:19.	01:00:01:14.	
01:00:01:20	01:00:01:20	01:00:01:15	A
01:00:01:20.	01:00:01:20.	01:00:01:15.	
01:00:01:21			B
01:00:01:21.	01:00:01:22	01:00:01:16	
01:00:01:22	01:00:01:21.	01:00:01:16.	
01:00:01:22.	01:00:01:23	01:00:01:17	C
01:00:01:23	01:00:01:22.	01:00:01:17.	
01:00:01:23.			D
01:00:01:24	01:00:01:24	01:00:01:18	
01:00:01:24.	01:00:01:24.	01:00:01:18.	
01:00:01:25	01:00:01:25	01:00:01:19	A
01:00:01:25.	01:00:01:25.	01:00:01:19.	
01:00:01:26			B
01:00:01:26.	01:00:01:27	01:00:01:20	
01:00:01:27	01:00:01:26.	01:00:01:20.	
01:00:01:27.	01:00:01:28	01:00:01:21	C
01:00:01:28	01:00:01:27.	01:00:01:21.	
01:00:01:28.			D
01:00:01:29	01:00:01:29	01:00:01:22	
01:00:01:29.	01:00:01:29.	01:00:01:22.	
01:00:02:00	01:00:02:00	01:00:01:23	A +00:00:00:02
01:00:02:00.	01:00:02:00.	01:00:01:23.	
01:00:02:01			B
01:00:02:01.	01:00:02:02	01:00:01:24	
01:00:02:02	01:00:02:01.	01:00:01:24.	
01:00:02:02.	01:00:02:03	01:00:02:00	C
01:00:02:03	01:00:02:02.	01:00:02:00.	
01:00:02:03.			D
01:00:02:04	01:00:02:04	01:00:02:01	
01:00:02:04.	01:00:02:04.	01:00:02:01.	
01:00:03:00		01:00:02:22	A +00:00:00:03
01:00:03:00.		01:00:02:22.	
01:00:03:01			B
01:00:03:01.		01:00:02:23	
01:00:03:02		01:00:01:23.	
01:00:03:02.		01:00:01:24	C
01:00:03:03		01:00:01:24.	
01:00:03:03.			D
01:00:03:04		01:00:03:00	
01:00:03:04.		01:00:03:00.	
01:00:25:00		01:00:24:00	A +00:00:01:00
01:00:50:00		01:00:48:00	A +00:00:02:00

30/29 <-> 24/23 Frame Time Code

NDF <-> NDF Conversion

NDF 30frame ^{Actual} VIDEO OUTPUT NDF 25frame Frame Sequence difference

01:01:00:00 **01:00:57:15** **A** **+00:00:02:10**

1min. = 60Frame

29 <-> 23 Frame Time Code

DF <-> NDF Conversion

3:2 PullDown

	NDF 29frame	DF 29frame	NDF 23frame	Frame Sequence difference	
	00:00:00:00	24:01:22:26	00:00:00:00	A	
	00:00:03:16	24:01:26:12			
	00:00:03:17	24:01:26:13	00:00:03:13.		
	00:00:03:18	00:00:00:00	00:00:03:14.		
	00:59:00:00	00:58:59:28	00:59:00:00	A	-00:00:00:02
	00:59:00:01	00:58:59:29			
	00:59:00:02	00:59:00:02	00:59:00:01.		
	00:59:00:03	00:59:00:03	01:00:00:02.		
SYNC POIN 0	01:00:00:00	01:00:00:00	01:00:00:00	A	00:00:00:00
	01:00:00:00.	01:00:00:00.	01:00:00:00.		
1	01:00:00:01	01:00:00:01		B	
	01:00:00:01.	01:00:00:01.	01:00:00:01		
2	01:00:00:02	01:00:00:02	01:00:00:01.		
	01:00:00:02.	01:00:00:02.	01:00:00:02	C	
3	01:00:00:03	01:00:00:03	01:00:00:02.		
	01:00:00:03.	01:00:00:03.		D	
4	01:00:00:04	01:00:00:04	01:00:00:03		
	01:00:00:04.	01:00:00:04.	01:00:00:03.		
0	01:00:00:05	01:00:00:05	01:00:00:04	A	
	01:00:00:05.	01:00:00:05.	01:00:00:04.		
1	01:00:00:06	01:00:00:06		B	
	01:00:00:06.	01:00:00:06.	01:00:00:05		
2	01:00:00:07	01:00:00:07	01:00:00:05.		
	01:00:00:07.	01:00:00:07.	01:00:00:06	C	
3	01:00:00:08	01:00:00:08	01:00:00:06.		
	01:00:00:08.	01:00:00:08.		D	
4	01:00:00:09	01:00:00:09	01:00:00:07		
	01:00:00:09.	01:00:00:09.	01:00:00:07.		
0	01:00:00:10	01:00:00:10	01:00:00:08	A	
	01:00:00:10.	01:00:00:10.	01:00:00:08.		
1	01:00:00:11	01:00:00:11		B	
	01:00:00:11.	01:00:00:11.	01:00:00:09		
2	01:00:00:12	01:00:00:12	01:00:00:09.		
	01:00:00:12.	01:00:00:12.	01:00:00:10	C	
3	01:00:00:13	01:00:00:13	01:00:00:10.		
	01:00:00:13.	01:00:00:13.		D	
4	01:00:00:14	01:00:00:14	01:00:00:11		
	01:00:00:14.	01:00:00:14.	01:00:00:11.		
0	01:00:00:15	01:00:00:15	01:00:00:12	A	
	01:00:00:15.	01:00:00:15.	01:00:00:12.		
1	01:00:00:16	01:00:00:16		B	
	01:00:00:16.	01:00:00:16.	01:00:00:13		
2	01:00:00:17	01:00:00:17	01:00:00:13.		
	01:00:00:17.	01:00:00:17.	01:00:00:14	C	
3	01:00:00:18	01:00:00:18	01:00:00:14.		
	01:00:00:18.	01:00:00:18.		D	
4	01:00:00:19	01:00:00:19	01:00:00:15		

29 <-> 23 Frame Time Code

DF <-> NDF Conversion

	NDF 29frame	DF 29frame	NDF 23frame	Frame Sequence difference	
	01:00:00:19.	01:00:00:19.	01:00:00:15.		
0	01:00:00:20	01:00:00:20	01:00:00:16	A	
	01:00:00:20.	01:00:00:20.	01:00:00:16.		
1	01:00:00:21	01:00:00:21		B	
	01:00:00:21.	01:00:00:21.	01:00:00:17		
2	01:00:00:22	01:00:00:22	01:00:00:17.		
	01:00:00:22.	01:00:00:22.	01:00:00:18	C	
3	01:00:00:23	01:00:00:23	01:00:00:18.		
	01:00:00:23.	01:00:00:23.		D	
4	01:00:00:24	01:00:00:24	01:00:00:19		
	01:00:00:24.	01:00:00:24.	01:00:00:19.		
0	01:00:00:25	01:00:00:25	01:00:00:20	A	
	01:00:00:25.	01:00:00:25.	01:00:00:20.		
1	01:00:00:26	01:00:00:26		B	
	01:00:00:26.	01:00:00:26.	01:00:00:21		
2	01:00:00:27	01:00:00:27	01:00:00:21.		
	01:00:00:27.	01:00:00:27.	01:00:00:22	C	
3	01:00:00:28	01:00:00:28	01:00:00:22.		
	01:00:00:28.	01:00:00:28.		D	
4	01:00:00:29	01:00:00:29	01:00:00:23		
	01:00:00:29.	01:00:00:29.	01:00:00:23.		
0	01:00:01:00	01:00:01:00	01:00:01:00	A	00:00:00:00
	01:00:59:28.	01:00:59:28.		D	
4	01:00:59:29	01:00:59:29	01:00:59:23		
	01:00:59:29.	01:00:59:29.	01:00:59:23.		
0	01:01:00:00	01:01:00:02	01:01:00:00	A	+00:00:00:02
					1min. = 2Frame
	01:01:59:26	01:01:59:28			
	01:01:59:27	01:01:59:29	01:01:59:21.		
	01:01:59:28	01:02:00:02	01:01:59:22.		
	01:01:59:29	01:02:00:03	01:01:59:23		
	01:02:00:00	01:02:00:04	01:02:00:00	A	+00:00:00:04
	01:02:59:25	01:02:59:29	01:02:59:20		
3	01:02:59:26	01:03:00:02			
	01:02:59:27	01:03:00:03	01:02:59:21.		
4	01:02:59:28	01:03:00:04	01:02:59:22.		
	01:02:59:29	01:03:00:05	01:02:59:23		
0	01:03:00:00	01:03:00:06	01:03:00:00	A	+00:00:00:06
	01:03:59:23	01:03:59:29	01:03:59:18.		
	01:03:59:24	01:04:00:02	01:03:59:19		
	01:04:00:00	01:04:00:08	01:04:00:00	A	+00:00:00:08
	01:04:59:20	01:04:59:28	01:04:59:16		
	01:04:59:21	01:04:59:29			
	01:04:59:22	01:05:00:02	01:04:59:17.		
	01:05:00:00	01:05:00:10	01:05:00:00	A	+00:00:00:10

29 <-> 23 Frame Time Code

DF <-> NDF Conversion

NDF 29frame	DF 29frame	NDF 23frame	Frame Sequence difference	
01:05:59:19	01:05:59:29	01:05:59:15		
01:05:59:20	01:06:00:02	01:05:59:16		
01:06:00:00	01:06:00:12	01:06:00:00	A	+00:00:00:12
01:06:59:16	01:06:59:28			
01:06:59:17	01:06:59:29	01:06:59:13.		
01:06:59:18	01:07:00:02	01:06:59:14.		
01:07:00:00	01:07:00:14	01:07:00:00	A	+00:00:00:14
01:07:59:15	01:07:59:29	01:07:59:12		
01:07:59:16	01:08:00:02			
01:07:59:17	01:00:00:03	01:07:59:13.		
01:08:00:00	01:08:00:16	01:08:00:00	A	+00:00:00:16
01:08:59:13	01:08:59:29	01:08:59:10.		
01:08:59:14	01:09:00:02	01:08:59:11		
01:09:00:00	01:09:00:18	01:09:00:00	A	+00:00:00:18
01:09:59:11	01:09:59:29			
01:09:59:12	01:10:00:00	01:08:59:09.		
01:09:59:13	01:10:00:01	01:08:59:10.		
01:09:59:29	01:10:00:17	01:09:59:23		
01:10:00:00	01:10:00:18	01:10:00:00	A	+00:00:00:18
01:10:00:01	01:10:00:19	01:10:00:01		10min. = 18Frame
01:19:58:24	01:20:00:00	01:19:58:19		
01:20:00:00	01:20:01:06	01:20:00:00	A	+00:00:01:06
01:29:58:06	01:30:00:00			
01:29:58:07	01:30:00:01	01:29:58:05.		
01:30:00:00	01:30:01:24	01:30:00:00	A	+00:00:01:24
01:39:57:18	01:40:00:00	01:39:57:14.		
01:40:00:00	01:40:02:12	01:40:00:00	A	+00:00:02:12
01:49:57:00	01:50:00:00	01:49:57:00		
01:50:00:00	01:50:03:00	01:50:00:00	A	+00:00:03:00
01:59:56:12	02:00:00:00	01:59:56:09.		
02:00:00:00	02:00:03:18	02:00:00:00	A	+00:00:03:18
				1Hr. = 3sec.18F
02:59:52:24	03:00:00:00	02:59:52:19		

29 <-> 23 Frame Time Code

DF <-> NDF Conversion

NDF 29frame	DF 29frame	NDF 23frame	Frame Sequence difference	
03:00:00:00	03:00:07:06	03:00:00:00	A	+00:00:07:06
03:59:49:06 03:59:49:07	04:00:00:00 04:00:00:01	03:59:49:05.		
04:00:00:00	04:00:10:24	04:00:00:00	A	+00:00:10:24
04:59:45:18	05:00:00:00	04:59:45:14.		
05:00:00:00	05:00:14:12	05:00:00:00	A	+00:00:14:12
05:59:42:00	06:00:00:00	05:59:42:00		
06:00:00:00	06:00:18:00	06:00:00:00	A	+00:00:18:00
06:59:38:12	07:00:00:00	06:59:56:09.		
07:00:00:00	07:00:21:18	07:00:00:00	A	+00:00:21:18
07:59:34:24	08:00:00:00	07:59:34:19		
08:00:00:00	08:00:25:06	08:00:00:00	A	+00:00:25:06
08:59:31:06 08:59:31:07	09:00:00:00 09:00:00:01	08:59:31:05.		
09:00:00:00	09:00:28:24	09:00:00:00	A	+00:00:28:24
09:59:27:18	10:00:00:00	09:59:27:14.		
10:00:00:00	10:00:32:12	10:00:00:00	A	+00:00:32:12
11:00:00:00	11:00:36:00	11:00:00:00	A	+00:00:36:00
12:00:00:00	12:00:39:18	12:00:00:00	A	+00:00:39:18
13:00:00:00	13:00:43:06	13:00:00:00	A	+00:00:43:06
14:00:00:00	14:00:46:24	14:00:00:00	A	+00:00:46:24
15:00:00:00	15:00:50:12	15:00:00:00	A	+00:00:50:12
16:00:00:00	16:00:54:00	16:00:00:00	A	+00:00:54:00
17:00:00:00	17:00:57:18	17:00:00:00	A	+00:00:57:18
18:00:00:00	18:01:01:06	18:00:00:00	A	+00:01:01:06
19:00:00:00	19:01:04:24	19:00:00:00	A	+00:01:04:24
20:00:00:00	20:01:08:12	20:00:00:00	A	+00:01:08:12

30/29 <-> 24/23 Frame Time Code DF <-> NDF Conversion

SlowPAL 25frame count 3:2 PullDown

	NDF 30frame	DF 29frame	NDF 25frame	Frame Sequence difference
	00:00:00:00	24:01:22:26	00:01:12:00	A
	00:00:03:00		00:01:19:05	A
	00:00:03:16	24:01:26:12		
	00:00:03:17	24:01:26:13	00:01:19:18.	
	00:00:03:18	00:00:00:00	00:01:19:19.	
	00:59:00:00	00:58:59:28	00:59:02:10	
	00:59:00:01	00:58:59:29		
	00:59:00:02	00:59:00:02	00:59:02:11.	
	00:59:00:03	00:59:00:03	00:59:02:12.	
SYNC POINT 0	01:00:00:00	01:00:00:00	01:00:00:00	A 00:00:00:00
	01:00:00:00.	01:00:00:00.	01:00:00:00.	
1	01:00:00:01	01:00:00:01		B
	01:00:00:01.	01:00:00:01.	01:00:00:01	
2	01:00:00:02	01:00:00:02	01:00:00:01.	
	01:00:00:02.	01:00:00:02.	01:00:00:02	C
3	01:00:00:03	01:00:00:03	01:00:00:02.	
	01:00:00:03.	01:00:00:03.		D
4	01:00:00:04	01:00:00:04	01:00:00:03	
	01:00:00:04.	01:00:00:04.	01:00:00:03.	
0	01:00:00:05	01:00:00:05	01:00:00:04	A
	01:00:00:05.	01:00:00:05.	01:00:00:04.	
1	01:00:00:06	01:00:00:06		B
	01:00:00:06.	01:00:00:06.	01:00:00:05	
2	01:00:00:07	01:00:00:07	01:00:00:05.	
	01:00:00:07.	01:00:00:07.	01:00:00:06	C
3	01:00:00:08	01:00:00:08	01:00:00:06.	
	01:00:00:08.	01:00:00:08.		D
4	01:00:00:09	01:00:00:09	01:00:00:07	
	01:00:00:09.	01:00:00:09.	01:00:00:07.	
0	01:00:00:10	01:00:00:10	01:00:00:08	A
	01:00:00:10.	01:00:00:10.	01:00:00:08.	
1	01:00:00:11	01:00:00:11		B
	01:00:00:11.	01:00:00:11.	01:00:00:09	
2	01:00:00:12	01:00:00:12	01:00:00:09.	
	01:00:00:12.	01:00:00:12.	01:00:00:10	C
3	01:00:00:13	01:00:00:13	01:00:00:10.	
	01:00:00:13.	01:00:00:13.		D
4	01:00:00:14	01:00:00:14	01:00:00:11	
	01:00:00:14.	01:00:00:14.	01:00:00:11.	
0	01:00:00:15	01:00:00:15	01:00:00:12	A
	01:00:00:15.	01:00:00:15.	01:00:00:12.	
1	01:00:00:16	01:00:00:16		B
	01:00:00:16.	01:00:00:16.	01:00:00:13	
2	01:00:00:17	01:00:00:17	01:00:00:13.	
	01:00:00:17.	01:00:00:17.	01:00:00:14	C
3	01:00:00:18	01:00:00:18	01:00:00:14.	
	01:00:00:18.	01:00:00:18.		D
4	01:00:00:19	01:00:00:19	01:00:00:15	

30/29 <-> 24/23 Frame Time Code DF <-> NDF Conversion

	NDF 30frame	DF 29frame	NDF 25frame	Frame Sequence difference	
	01:00:00:19.	01:00:00:19.	01:00:00:15.		
0	01:00:00:20	01:00:00:20	01:00:00:16	A	
	01:00:00:20.	01:00:00:20.	01:00:00:16.		
1	01:00:00:21	01:00:00:21		B	
	01:00:00:21.	01:00:00:21.	01:00:00:17		
2	01:00:00:22	01:00:00:22	01:00:00:17.		
	01:00:00:22.	01:00:00:22.	01:00:00:18	C	
3	01:00:00:23	01:00:00:23	01:00:00:18.		
	01:00:00:23.	01:00:00:23.		D	
4	01:00:00:24	01:00:00:24	01:00:00:19		
	01:00:00:24.	01:00:00:24.	01:00:00:19.		
0	01:00:00:25	01:00:00:25	01:00:00:20	A	
	01:00:00:25.	01:00:00:25.	01:00:00:20.		
1	01:00:00:26	01:00:00:26		B	
	01:00:00:26.	01:00:00:26.	01:00:00:21		
2	01:00:00:27	01:00:00:27	01:00:00:21.		
	01:00:00:27.	01:00:00:27.	01:00:00:22	C	
3	01:00:00:28	01:00:00:28	01:00:00:22.		
	01:00:00:28.	01:00:00:28.		D	
4	01:00:00:29	01:00:00:29	01:00:00:23		
	01:00:00:29.	01:00:00:29.	01:00:00:23.		
0	01:00:01:00	01:00:01:00	01:00:00:24	A	+00:00:00:01
	01:00:01:00.	01:00:01:00.	01:00:00:24.		1sec. = 1Frame
1	01:00:01:01	01:00:01:01		B	
	01:00:01:01.	01:00:01:01.	01:00:01:00		
2	01:00:01:02	01:00:01:02	01:00:01:00.		
	01:00:01:02.	01:00:01:02.	01:00:01:01	C	
3	01:00:01:03	01:00:01:03	01:00:01:01.		
	01:00:01:03.	01:00:01:03.		D	
4	01:00:01:04	01:00:01:04	01:00:01:02		
	01:00:01:04.	01:00:01:04.	01:00:01:02.		
	01:00:59:28.	01:00:59:28.		D	
	01:00:59:29	01:00:59:29	01:00:57:14		
	01:00:59:29.	01:00:59:29.	01:00:57:14.		
	01:01:00:00	01:01:00:02	01:00:57:15	A	+00:00:02:12
	01:01:59:26	01:01:59:28			
	01:01:59:27	01:01:59:29			
	01:01:59:28	01:02:00:02			
	01:01:59:29	01:02:00:03			
	01:02:00:00	01:02:00:04	01:01:55:05	A	+00:00:04:20
	01:02:59:25	01:02:59:29			
	01:02:59:26	01:03:00:02			
	01:02:59:27	01:03:00:03			
	01:02:59:28	01:03:00:04			
	01:02:59:29	01:03:00:05			
	01:03:00:00	01:03:00:06	01:02:52:20	A	+00:00:07:05
	01:03:59:23	01:03:59:29			
	01:03:59:24	01:04:00:02			

30/29 <-> 24/23 Frame Time Code DF <-> NDF Conversion

NDF 30frame	DF 29frame	NDF 25frame	Frame Sequence difference
01:04:00:00	01:04:00:08		A
01:04:59:20	01:04:59:28		
01:04:59:21	01:04:59:29		
01:04:59:22	01:05:00:02		
01:05:00:00	01:05:00:10		A
01:05:59:19	01:05:59:29		
01:05:59:20	01:06:00:02		
01:06:00:00	01:06:00:12		A
01:06:59:16	01:06:59:28		
01:06:59:17	01:06:59:29		
01:06:59:18	01:07:00:02		
01:07:00:00	01:07:00:14		A
01:07:59:15	01:07:59:29		
01:07:59:16	01:08:00:02		
01:08:00:00	01:08:00:16		A
01:08:59:13	01:08:59:29		
01:08:59:14	01:09:00:02		
01:09:00:00	01:09:00:18		A
01:09:59:11	01:09:59:29		
01:09:59:12	01:10:00:00		
01:09:59:13	01:10:00:01		
01:09:59:29	01:10:00:17		
01:10:00:00	01:10:00:18		A
01:10:00:01	01:10:00:19		10min. = 18Frame
01:19:58:24	01:20:00:00		
01:20:00:00	01:20:01:06		A
01:29:58:06	01:30:00:00		
01:30:00:00	01:30:01:24		A
01:39:57:18	01:40:00:00		
01:40:00:00	01:40:02:12		A
01:49:57:00	01:50:00:00		
01:50:00:00	01:50:03:00		A

30/29 <-> 24/23 Frame Time Code DF <-> NDF Conversion

NDF 30frame	DF 29frame	NDF 25frame	Frame Sequence difference
01:59:56:12	02:00:00:00		
02:00:00:00	02:00:03:18		A
			1Hr. = 3sec.18F
02:59:52:24	03:00:00:00		
03:00:00:00	03:00:07:06		A
03:59:49:06	04:00:00:00		
04:00:00:00	04:00:10:24		A
04:59:45:18	05:00:00:00		
05:00:00:00	05:00:14:12		A
05:59:42:00	06:00:00:00		
06:00:00:00	06:00:18:00		A
06:59:38:12	07:00:00:00		
07:00:00:00	07:00:21:18		A
07:59:34:24	08:00:00:00		
08:00:00:00	08:00:25:06		A
08:59:31:06	09:00:00:00		
09:00:00:00	09:00:28:24		A
09:59:27:18	10:00:00:00		
10:00:00:00	10:00:32:12		A
11:00:00:00	11:00:36:00		A
12:00:00:00	12:00:39:18		A
13:00:00:00	13:00:43:06		A
14:00:00:00	14:00:46:24		A
15:00:00:00	15:00:50:12		A
16:00:00:00	16:00:54:00		A
17:00:00:00	17:00:57:18		A
18:00:00:00	18:01:01:06		A
19:00:00:00	19:01:04:24		A

30/29 <-> 24/23 Frame Time Code DF <-> NDF Conversion

NDF 30frame	DF 29frame	NDF 25frame	Frame Sequence difference
20:00:00:00	20:01:08:12		A
21:00:00:00	21:01:12:00		A
22:00:00:00	22:01:15:18		A
23:00:00:00	23:01:19:06		A
23:58:37:05	23:59:59:29		A
23:58:37:06	24:00:00:00		Irregular Value
23:59:37:06	24:01:00:02		
00:00:00:00	24:01:22:26		A