



LegalEyesSDi

legalEyesSDi(LESD), legalEyesSDiF(LESDF) &
legalEyesSDiS(LESDS)
26/11/08 v2.2

user manual

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I System Overview

The legalEyesSDi is a full-featured legaliser system using the evolutionDT platform. The main features of the legalEyesSDi series of legalisers are as follows:

- Provides Legalisation of the SDI Input signal with full 10 bit processing throughout.
- Two Independent SDI outputs for "Legalise" and user controllable "Raw/Legal/Indicate" (legalEyesSDiF & SDiS only).
- Integrated Safe-area generator (legalEyesSDiS only).
- Integrated Blanking generator.
- Indicate mode can show different colours for R,G and B components which are processed (legalEyesSDiF & SDiS only).
- Adjustable Clipping Levels.
- Adjustable soft clipping knee levels.
- Highly effective overshoot and undershoot suppression on the luminance signal.
- EDH re-insertion
- Integral luma and chroma gain, black level adjustment & hue rotation.
- EBU 2003 standard legalisation settings.
- 6 User Memories.

1.1 Legaliser Processing

A Block diagram of the legaliser is shown below. The SDI Input firstly goes to the Proc Amp Section. This enables the Luma gain to be adjusted from 0 to 200%, Similarly the chroma also is adjustable from 0 to 200%. Full 10 bit by 10 bit Multipliers are used with a rounded 10 bit product. Black level adjustment is also applied at this point as is hue adjustment which allows for $\pm 180^\circ$ of hue rotation. These controls are accessed via the "Picture" menu.

The next section is an analog blanking generator which forces all video outside of the analog edge to black.

After the blanking is the legaliser, which consists of a colour space conversion from Y,Cr,Cb to R,G,B. This first conversion then enters the RGB Clip unit. This has three purposes:

To Clip, and therefore legalise the incoming signal.

To provide a signal that indicates that a particular part of the signal is legal or illegal ("Not in clip", or "In clip").

To provide information to a "Colour Field Generator" (Not shown) to show parts of the picture that have been modified by the legaliser on the monitoring output (legalEyesSDiF & SDiS only).

The Clipping section consists of a 10 bit RAM Look Up Table. This Enables hard and soft clipping tables to be loaded into the RAM.

The legaliser section has a switch that either selects the fully bypassed input signal, or the "Clipped" or "Legalised" signal. Any signal that is within the specified RGB Legal parameters will pass through the unit transparently. When the unit senses that it is in an "Illegal" part of the signal, it will switch in its processing to output the Clipped (Modified) part of the signal.

The Overshoot and undershoot suppression is employed here. This basically will correct for very fast (Non aliased) edges. These edges will cause the signal, when passed through a 601 Filter to overshoot and undershoot. The "Over-Kill" System predicts these overshoots and undershoots and will "Soften out" ONLY the fast edges that may cause the luminance signal to go outside the legally defined specifications. (As defined by the Low and High Clip Menus). This actually as well as keeping the signal legal also can enhance the look of poorly aliased graphics. Lastly a new EDH is inserted into the output video.

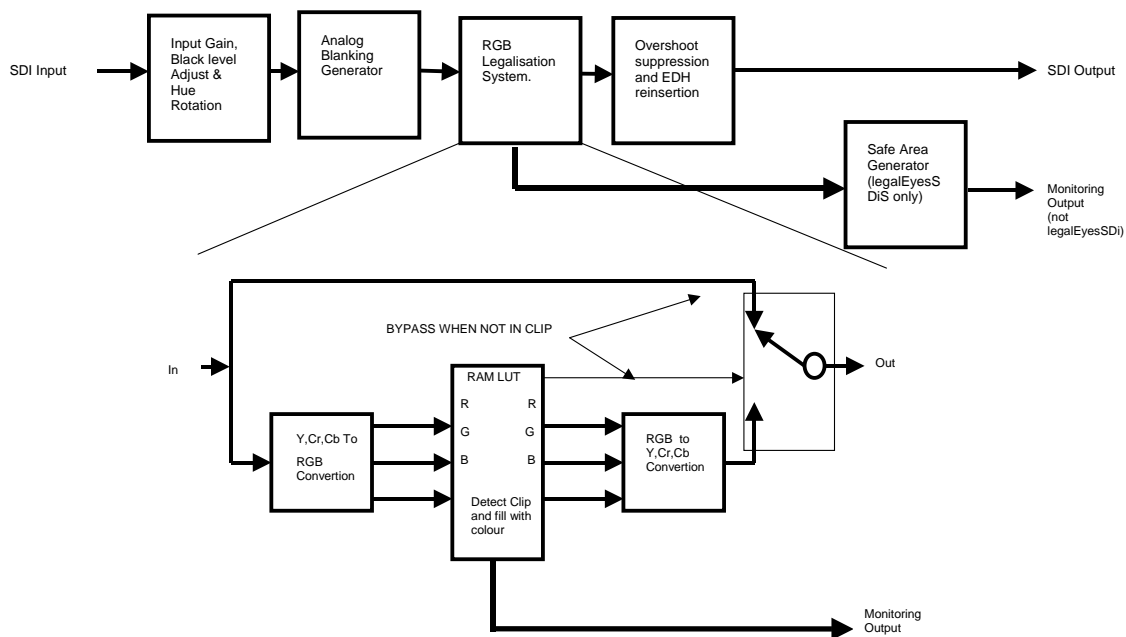


Figure 1-1 Legaliser Block Diagram.

2 Installation

2.1 Connections to a legalEyesSDi

The diagram below shows the typical connections to the legalEyesSDi.

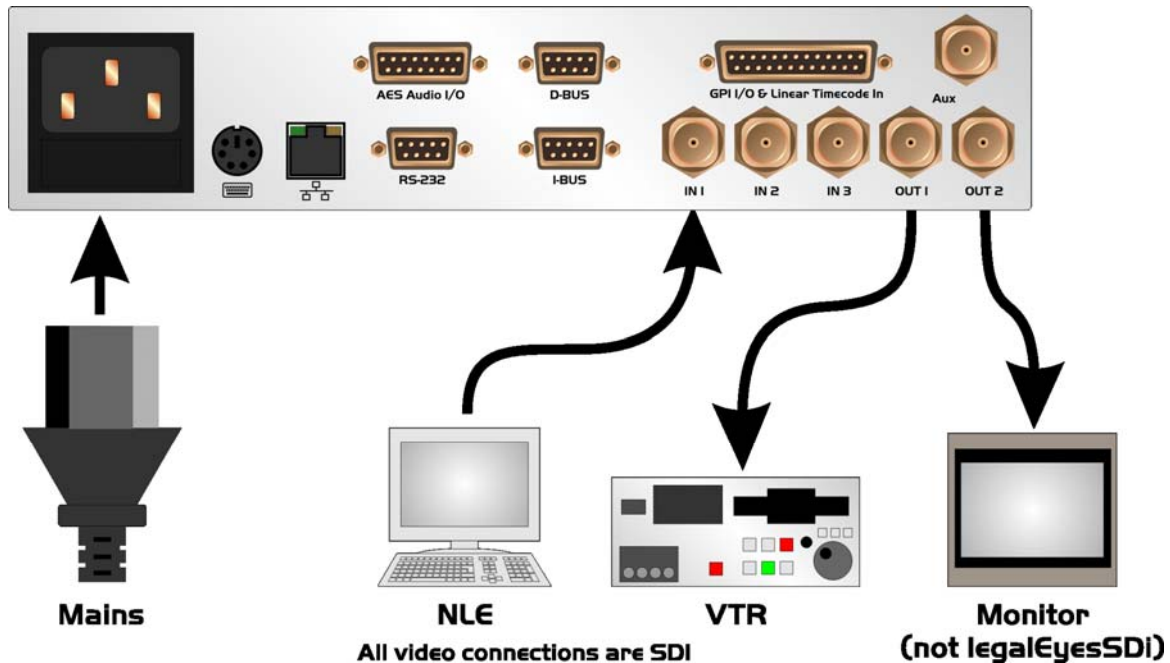


Figure 2 - Typical Connections

IN1 is the SDI input. OUT1 is the main SDI legalised output. OUT2 is the SDI monitoring output (legalEyesSDiF & SDiS only) which can be switched to show either the unlegalised output, the legalised output or the indicate display.

2.2 Associated Equipment for the legalEyesSDi

The legalEyesSDi in the evolutionDT platform is fully self-contained. The evolutionDT can optionally be rack mounted in with 1 or 2 units in a 19" rack using the optional FF-6 rack mounting. This is a factory-installed option and should be ordered with the product. Rack mounted units should be supported with suitable chassis supports.

3 Control Panel

Figure 3 shows the control panel of the evolutionDT platform.

1 - Power/Status LED

Green – Normal operation

Green Flashing - Version Information Display

Orange – Product is initialising

Flashing Red – Product is in Field Reprogramming Mode

2 - Menu Display/Button (1 of 4)

Displays Menu Information. The colour of the menu button indicates the function.

Green – adjustment menu. Pressing the menu or using the associated digipot(6) will adjust the menu value.

Yellow – information menu, no adjustment possible.

Blue – navigation menu. Pressing the button will take you up or down the menu hierarchy.

Red – multiple variable menu. Pressing the button will “open” the menu assigning one digipot(6) to each variable. The active LED(5) will light above the digipots associated with each variable.

3 - Next Menu Button

Within a layer of the menu hierarchy there may be more than four menus and where this is the case the “next” button will illuminate to show that further menus are available. Pressing the “next” button moves you to the next set of menus.

4 – Previous Menu Button

Within a layer of the menu hierarchy there may be more than four menus and where this is the case the “prev” button will illuminate to show that previous menus are available. Pressing the “prev” button moves you to the previous set of menus.

5 – Digipot Active LED (1 of 4)

Illuminates to indicate that the digipot below is active for adjustment of the associated menu variable.

6 – Digipot (1 of 4)

Allows for rapid adjustment of the associated menu variable.

7 – Next Device Button

It is possible to control more than one device from a single evolutionDT control panel. Where more than one device is assigned to the panel the “next dev” will move control to the next device in the device list.

In setup mode this button will pick up a free device and assign it to this panels device list. The button will flash to indicate that a free device is selected.

8 – Previous Device Button

Where more than one device is assigned to the panel the “prev dev” will move control to the previous device in the device list.

In setup mode this button will remove a device owned by this panel from this panels device list. The button will flash to indicate an owned device is selected.

9 – Info Button

This button displays all hardware, software and firmware version information for the currently selected product and this panel.

In setup mode where a free evolutionDT device is selected this button will flash indicating that the network address (box & slot) can be changed. Pressing this button will take you to the adjustment menus.

10 – Setup Button

Press and hold this button for four seconds to enter setup mode.

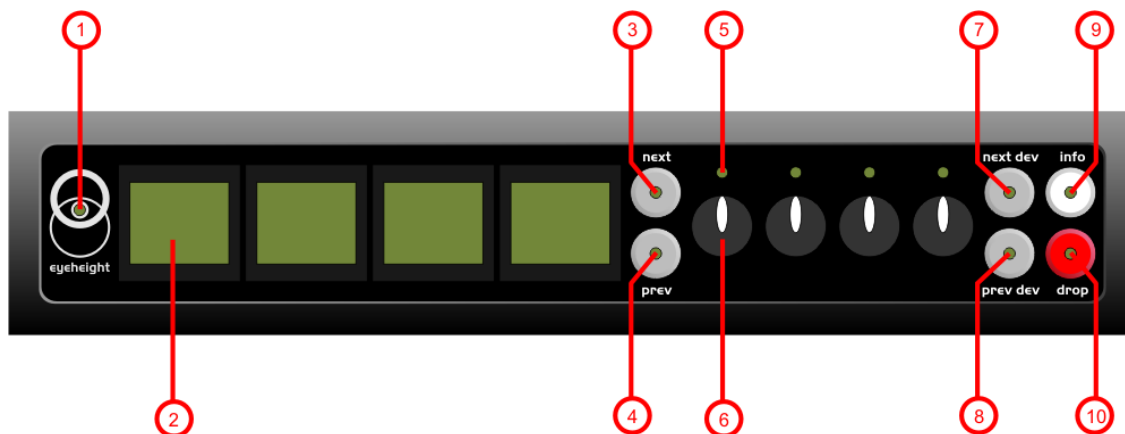


Figure 3 - evolutionDT Control Panel

4 Operation

4.1 Manual control of the legalEyesSDi

The legalEyesSDi is controlled using a set of MENUS. Each of these menus contains up to 3 parameters that are adjusted using the rotary digipots. The Menus define all of the adjustable operational parameters in the legalEyesSDi.

See chapter 3 Control Panel Operation for details of the control panel operation.

See section 3 of this chapter for the full list of menus.

4.2 Automation Control of the legalEyesSDi

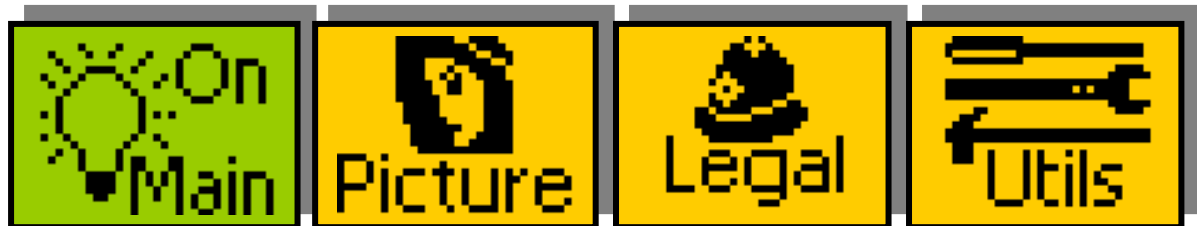
Automation of the evolutionDT products is achieved either via the RS232 port (currently not implemented) or via the I-Bus Port using an optional DG-9 (RS232 to I-Bus dongle). Automation control of the legalEyesSDi is performed using the geNETics Automation Protocol.

Genetics protocol is described in detail in the “geNETics User Guide” section titled “Automation Protocol on the geNETics Platform”. The menu list in section 3 of this chapter contains the data information for the protocol.

Please refer to the “User guide for the DG-9 eyeheight dongle and set-up software.

4.3 Operational Menus for the legalEyesSDi

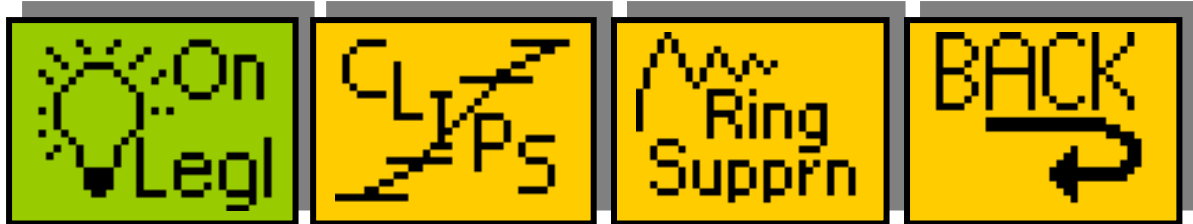
Menu 00-03: Top Level Menus



| Menu Num. | Heading | Automation | Function |
|-----------|------------------|--------------------|---|
| 00 | System ON or OFF | Off On [0→1] | This will switch in and out the system as a whole, effectively putting it into bypass mode. |

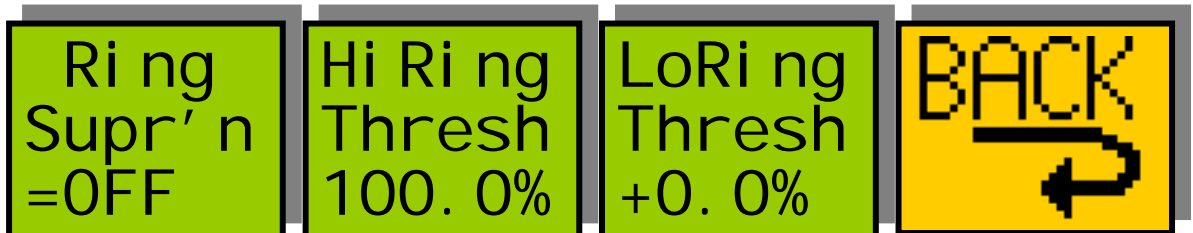
| | | | |
|----|-----------|------|---------------------------------------|
| 01 | PICTURE | none | Go To the main Picture menus (24-35) |
| 02 | LEGALISE | none | Go To the main Legaliser menus (4-23) |
| 03 | UTILITIES | none | Go To the main Utility menus (36-71) |

Menu 04-07: Legaliser Menus



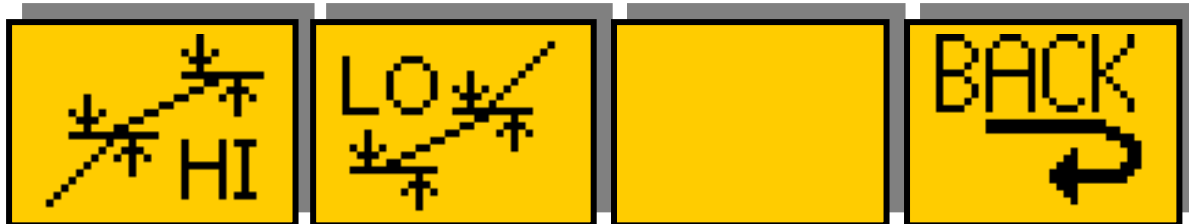
| Menu Num. | Heading | Automation | Function |
|-----------|-------------------|--------------------|---|
| 04 | Legaliser Status. | On Off [0→1] | This shows the status of the Legaliser block only. (NOT the Proc amp (Input Gain) or the Overshoot suppression. On=ON, Legaliser is active Off=OFF, Legaliser is in Bypass |
| 05 | CLIPS | none | Go To the Hi and Lo Clipping menus (12-23) |
| 06 | RING | none | Go To the Ring Suppression menus (8-11) |
| 07 | BACK | none | Go To the main menus (0-3) |

Menu 08-11: Ring control menus



| Menu Num. | Heading | Automation | Function |
|-----------|---------------------------------|--------------------------------|---|
| 08 | Ring Suppression Mode | Off Auto Manual [0→2] | Off= No overshoot or undershoot suppression is employed Auto= The Overshoot and Undershoot suppresser automatically tracks the Settings for the High and Low clip on the Legaliser section. Manual= The user can set the High and low Ring suppression thresholds manually. |
| 09 | High Ring Suppression Threshold | 51% → 109% [512→1023] | When "Ring Suppression" Mode is in "Manual". This menu allows the user to set the upper limit at which no luma signal can go beyond, whether this is due to its absolute level, or its achievable level as an overshoot or undershoot on a 601 filter. |
| 10 | Low Ring Suppression Threshold | -8% → 50% [0→511] | When "Ring Suppression" Mode is in "Manual". This menu allows the user to set the lower limit at which no luma signal can go below, whether this is due to its absolute level, or its achievable level as an overshoot or undershoot on a 601 filter. |
| 11 | BACK | none | Go To the Legaliser menus (4-7) |

Menu 12-15: Legaliser Clip and Knee Menus



| Menu Num. | Heading | Automation | Function |
|-----------|---------|------------|--|
| 12 | Hi | none | Go To the Hi Clip and Hi Knee Clipping menus (16-19) |
| 13 | Lo | none | Go To the Lo Clip and Lo Knee Clipping menus (20-23) |
| 14 | | none | Blank |
| 15 | BACK | none | Go To the legal menus (4-7) |

Menus 16-19: Legaliser High Clip and Knee settings



| Menu Num. | Heading | Automation | Function |
|-----------|-----------------|-------------------------------|---|
| 16 | High Clip Level | 51% → 109.4% [512→1023] | This indicates the High Clip point for the RGB Clipping. This is normally set to 100% for clipping at 0.7V in the analogue domain. |
| 17 | High Knee Level | 51% → 109.4% [512→1023] | This indicates the High Knee point for the RGB Clipping. This can be set to give a “soft clip” from this knee point to the hard clip point. |
| 18 | | none | Blank |
| 19 | BACK | none | Go To the clip menus (12-15) |

Menu 20-23: Legaliser Low Clip and Knee Settings



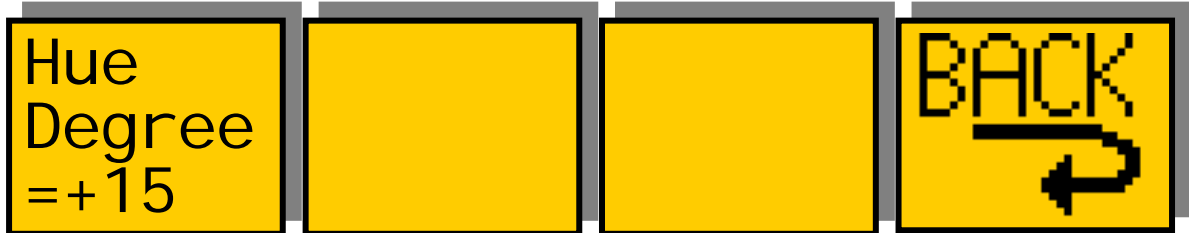
| Menu Num. | Heading | Automation | Function |
|-----------|----------------|--------------------------|---|
| 20 | Low Clip Level | -7.1%→ 50% [1→511] | This indicates the Low Clip point for the RGB Clipping. This is normally set to 0% for clipping at 0V in the analogue domain. |
| 21 | Low Knee Level | -7.1%→ 50% [1→511] | This indicates the Low Knee point for the RGB Clipping. This can be set to give a “soft clip” from this knee point to the Low clip point. |
| 22 | | none | Blank |
| 23 | BACK | none | Go To the clip menus (12-15) |

Menu 24-27: Processing Amplifier Menus



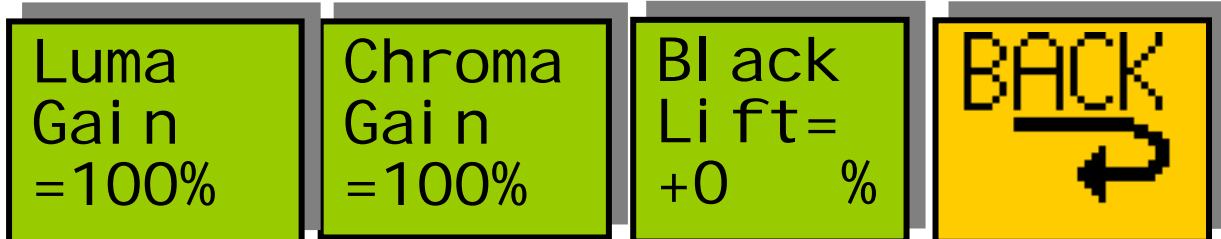
| Menu Num. | Heading | Automation | Function |
|-----------|-----------------------------------|--------------------|---|
| 24 | Lift, Gain, Hue and Black Control | On Off [0→1] | Active=Proc amp is processing, gain, hue and black controls are active Bypass= Unity Gain and no black offset. |
| 25 | HUE | none | Go To the Hue menus (28-31) |
| 26 | LIFT/GAIN | none | Go To the Luma, Chroma and Black menus (32-35) |
| 27 | BACK | none | Go To the main menus (0-4) |

Menu 28-31: Hue Control



| Menu Num. | Heading | Automation | Function |
|-----------|---------|---------------------------------------|---------------------------------|
| 28 | Hue | -180 to +180 degrees [-511 → +512] | Hue Rotation value, in degrees. |
| 29 | | none | Blank |
| 30 | | none | Blank |
| 31 | BACK | none | Go To the Picture menus (24-27) |

Menus 32-35: Processing amplifier status.



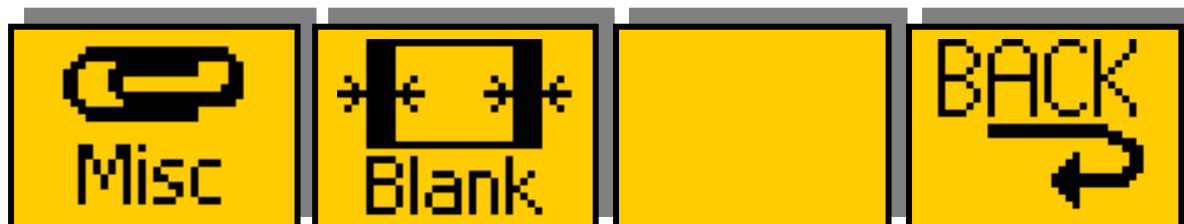
| Menu Num. | Heading | Automation | Function |
|-----------|-------------|--------------------------------|---------------------------------|
| 32 | Luma Gain | 0→200% [0→511] | Luminance Gain Adjustment |
| 33 | Chroma Gain | 0→200% [0→511] | Chrominance Gain Adjustment |
| 34 | Black Level | +/- 20% Range [-255→255] | Black level adjustment |
| 35 | BACK | none | Go To the Picture menus (24-27) |

Menus 36-39: Utility Menus



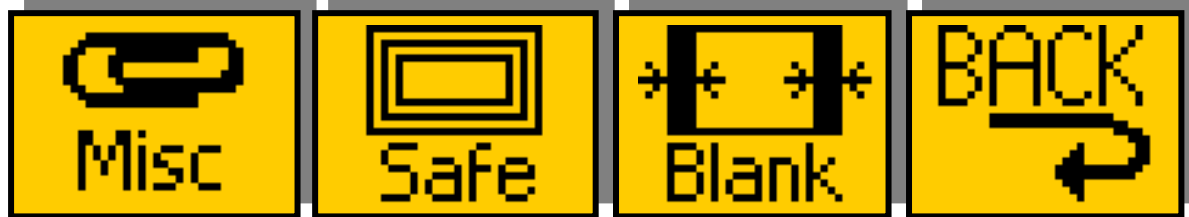
| Menu Num. | Heading | Automation | Function |
|-----------|---------|------------|---|
| 36 | MONITOR | none | Go To the Out of Gamut Colour menus (44-47) |
| 37 | MEMS | none | Go To the Memory and Software menus (48-71) |
| 38 | PRESET | none | Go To the Preset menus (92-95) |
| 39 | BACK | none | Go To the main menus (0-4) |

Menus 40-43 legalEyesSDi & legalEyesSDiF only: Utility Menus



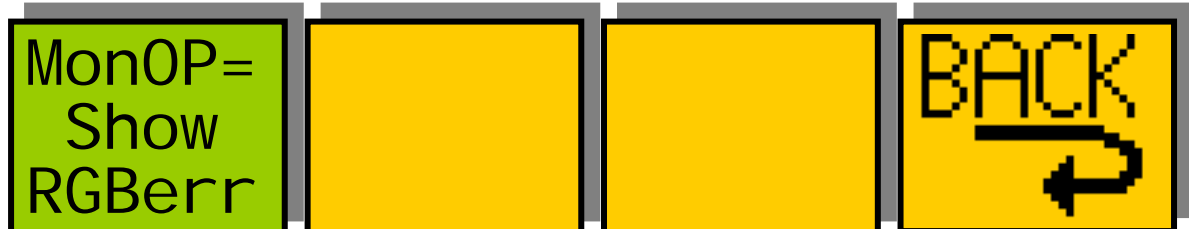
| Menu Num. | Heading | Automation | Function |
|-----------|---------|------------|---------------------------------------|
| 40 | MISC | none | Go To the Miscellaneous menus (72-75) |
| 41 | BLANK | none | Go To the Blanking menus (76-79) |
| 42 | | none | Blank |
| 43 | BACK | none | Go To the main menus (0-4) |

Menus 40-43 legalEyesSDiS only: Utility Menus



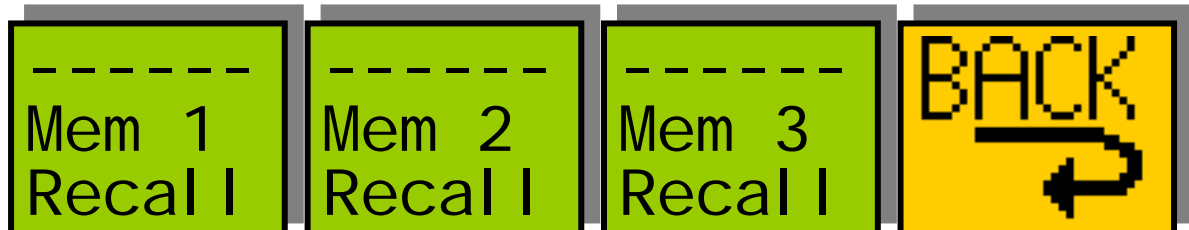
| Menu Num. | Heading | Automation | Function |
|-----------|---------|------------|---------------------------------------|
| 40 | MISC | none | Go To the Miscellaneous menus (72-75) |
| 41 | SAFE | none | Go To the Safe Area menus (80-83) |
| 42 | BLANK | none | Go To the Blanking menus (76-79) |
| 43 | BACK | none | Go To the main menus (0-4) |

Menus 44-47: Out of Gamut Colour



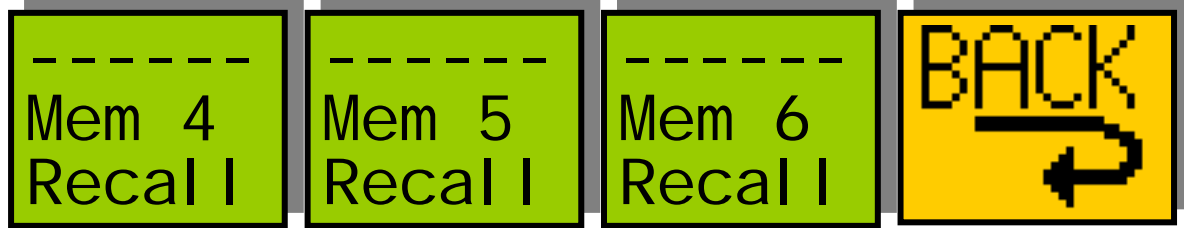
| Menu Num. | Heading | Automation | Function |
|-----------|---|---|--|
| 44 | Out of Gamut Colour (Has no effect on OL-1) | ShowRGBerr BlueSteady RedSteady GreenSteady WhiteSteady FlashRGBerr BlueFlash RedFlash GreenFlash WhiteFlash LegalOut RawOut [0→11] | This is the colour used to fill in the illegal parts of the picture on the indicate output. RGB Mode will individually indicate the Red, Green and Blue parts of the signal that are modified by the legaliser a corresponding colour. This menu only effects the legalEyesSDiF & SDiS |
| 45 | | none | Blank |
| 46 | | none | Blank |
| 47 | BACK | none | Go To the Utils menus (36-39) |

Menus 48-51: Memory Controls



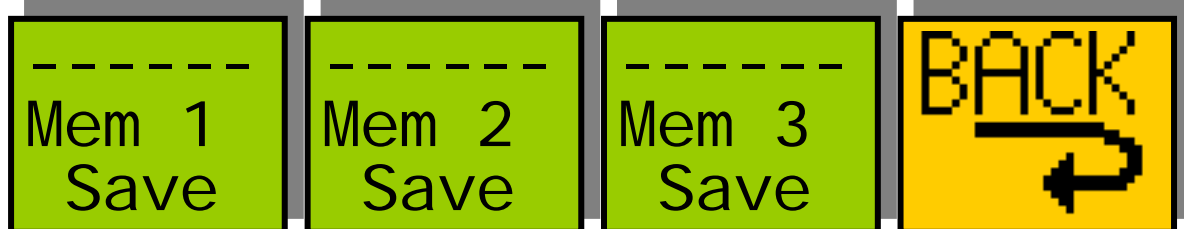
| Menu Num. | Heading | Automation | Function |
|-----------|---------|--------------------------|---|
| 48 | MEM1 | 1=Recall (Variable 1) | Pressing this will recall Memory number 1. User Names can be programmed in to the memories using a keyboard. See "geNETics User guide", section "Giving product Memories names" |
| 49 | MEM2 | 1=Recall (Variable 1) | Pressing this will recall Memory number 2. |
| 50 | MEM3 | 1=Recall (Variable 1) | Pressing this will recall Memory number 3. |
| 51 | BACK | none | Go To the Utils menus (36-39) |

Menus 52-53: Memory Controls



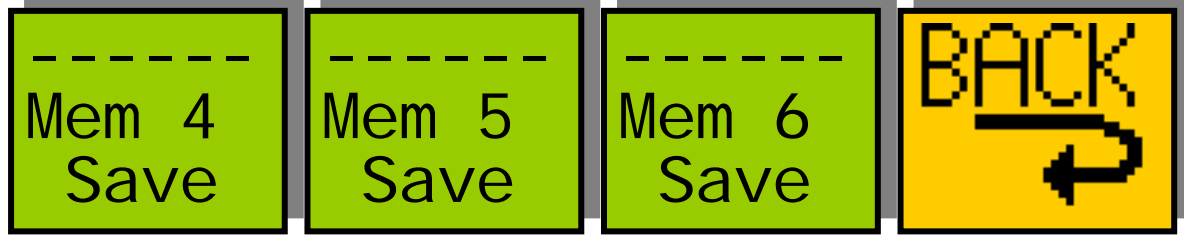
| Menu Num. | Heading | Automation | Function |
|-----------|---------|--------------------------|--|
| 52 | MEM4 | 1=Recall (Variable 1) | Pressing this will recall Memory number 4. |
| 53 | MEM5 | 1=Recall (Variable 1) | Pressing this will recall Memory number 5. |
| 54 | MEM6 | 1=Recall (Variable 1) | Pressing this will recall Memory number 6. |
| 55 | BACK | none | Go To the Utils menus (36-39) |

Menu 56-59: Memory Controls



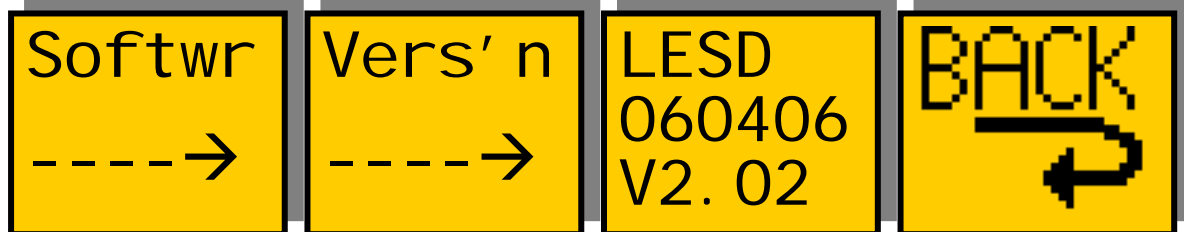
| Menu Num. | Heading | Automation | Function |
|-----------|--------------|------------|--|
| 56 | Save Mem. #1 | 1= Save | Pressing this will Save Memory number 1. |
| 57 | Save Mem. #2 | 1= Save | Pressing this will Save Memory number 2. |
| 58 | Save Mem. #3 | 1= Save | Pressing this will Save Memory number 3. |
| 59 | BACK | none | Go To the Utils menus (36-39) |

Menu 60-63: Memory Controls



| Menu Num. | Heading | Automation | Function |
|-----------|--------------|------------|--|
| 60 | Save Mem. #5 | 1= Save | Pressing this will Save Memory number 4. |
| 61 | Save Mem. #6 | 1= Save | Pressing this will Save Memory number 5. |
| 62 | Save Mem. #7 | 1= Save | Pressing this will Save Memory number 6. |
| 63 | BACK | none | Go To the Utils menus (36-39) |

Menu 64-67: Software Version




| Menu Num. | Heading | Automation | Function |
|-----------|------------------|------------|------------------------------------|
| 64 | | none | Blank |
| 65 | | none | Blank |
| 66 | Software Version | N/A | Shows the current software version |
| 67 | BACK | none | Go To the Utils menus (36-39) |

Menu 68-71: Power-on & Reset Controls

Set As
Pow On
Memory

Recall
Pow On
Memory

TOTAL!
RESET!
!!!!!!

BACK


| Menu Num. | Heading | Automation | Function |
|-----------|----------------------------|------------|---|
| 68 | Set As Pow On Memory | 1=save | Pressing this will save the current set up as the power on default. |
| 69 | Recall Pow On Memory | 1=Recall | Pressing this will recall the power on default settings. |
| 70 | TOTAL RESET | 1=Reset | Pressing this will reset the system. |
| 71 | BACK | none | Go To the Utils menus (36-39) |

Menus 72-75: Miscellaneous utility menus

Embed
EDH
=On

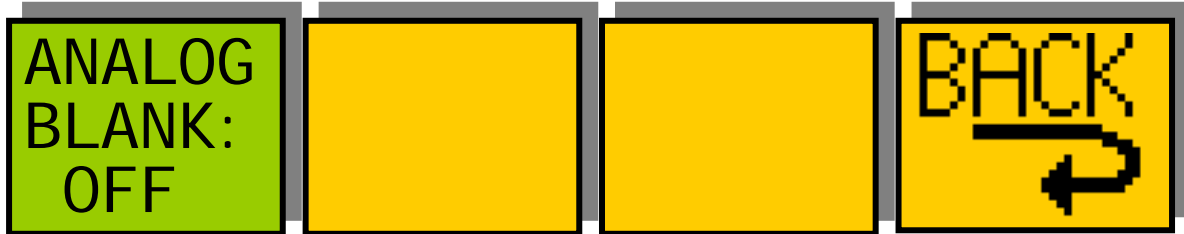
Moni tr
Fi l t e r
=Off

BACK


| Menu Num. | Heading | Automation | Function |
|-----------|--------------|--------------------|--|
| 72 | Embed EDH | Off On [0→1] | This will switch in and out the embedded EDH on the main output. |
| 73 | | | |

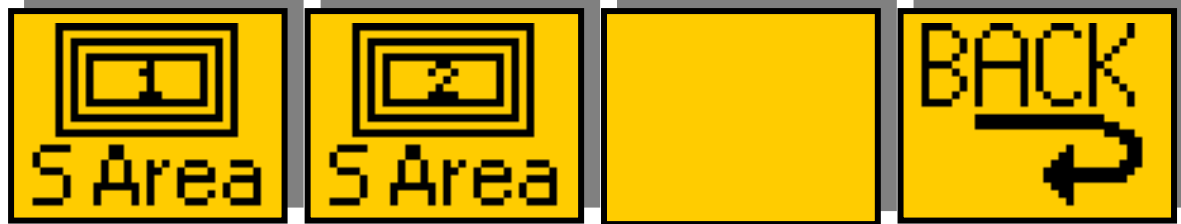
| | | | |
|----|----------------|---------------|--|
| 74 | Monitor Filter | 0=OFF 1=ON | This smoothes the monitor output so that transitions are slower. |
| 75 | BACK | none | Go To the Utils menus (36-39) |

Menus 76-79: Blanking menus



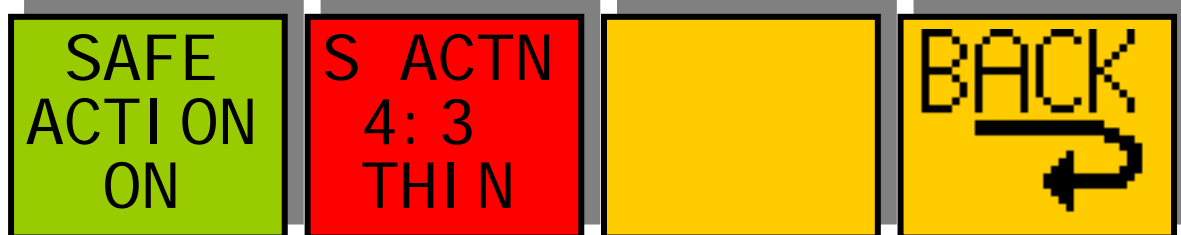
| Menu Num. | Heading | Automation | Function |
|-----------|-------------------|--------------------|---|
| 76 | Analogue Blanking | Off On [0→1] | This will switch in and out the analogue blanking on the main output. |
| 77 | | none | Blank |
| 78 | | none | Blank |
| 79 | BACK | none | Go To the Utils menus (36-39) |

Menus 80-83 legalEyesSDiS only: Safe Area menus



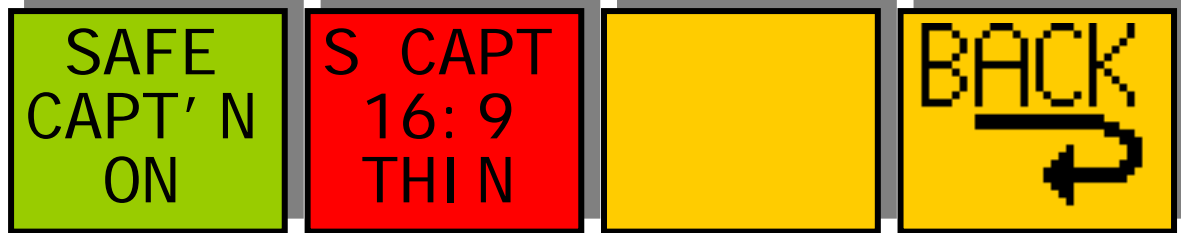
| Menu Num. | Heading | Automation | Function |
|-----------|-------------|------------|-------------------------------------|
| 80 | SAFE AREA 1 | none | Go To the Safe Area 1 menus (84-87) |
| 81 | SAFE AREA 2 | none | Go To the Safe Area 2 menus (88-91) |
| 82 | | none | Blank |
| 83 | BACK | none | Go To the Utils menus (36-39) |

Menus 84-87 legalEyesSDiS only: Safe Area 1 menus



| Menu Num. | Heading | Automation | Function |
|-----------|------------------------------------|---|---|
| 84 | Safe Area 1 on-off | On Off [0→1] Variable 3 | This Switches on and off the currently selected area. Pressing the "Red" switch next to this one and adjusting the rotary digipots with the lighted green LED's chooses the Selected area. |
| 85 | Area selected by menu #80 | <p><u>Digipot A</u> S.Action S.Capt. Dig Edge An Edge [0→3] (Variable 1)</p> <p><u>Digipot B</u> 4:3 16:9 16p4:3 16p149 43p16:9 [0→4] (Variable 2)</p> <p><u>Digipot C</u> Thin Thick Shade Black [0→3] (Variable 3)</p> | <p>When this button is pressed to "Green" the Three-line display in the window indicates the three options, which can be changed by adjusting the three rotary digipots A, B and C.</p> <p>"A" Determines the basic Function</p> <ul style="list-style-type: none"> • Selects "Safe Action" option • Selects "Safe Caption" option • Selects "Digital Edge" option • Selects the "An. Edge" option <p>"B" Determines the Screen Format</p> <ul style="list-style-type: none"> • Standard 4:3 Screen • Standard 16:9 Screen • 16:9 Shoot to protect 4:3 • 16:9 Shoot to protect 14:9 (*) • 4:3 Shoot to protect 16:9 (*) <p>(*) -- Not available in 525</p> <p>"C" Determines the Style of Indicate</p> <ul style="list-style-type: none"> • Thin White lines are used • Thick White lines are used • Shade is used for "danger area" • Black is used for "danger area" |
| 86 | | none | Blank |
| 87 | BACK | none | Go To the Utils menus (36-39) |

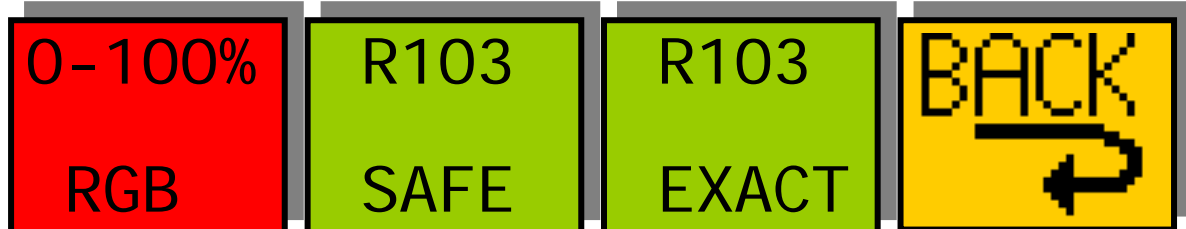
Menus 88-91 legalEyesSDiS only: Safe Area 2 menus



| Menu Num. | Heading | Automation | Function |
|-----------|---------------------------|---|---|
| 88 | Safe Area 2 on-off | On Off [0→1] Variable 3 | This Switches on and off the currently selected area. Pressing the "Red" switch next to this one and adjusting the rotary digipots with the lighted green LED's chooses the Selected area. |
| 89 | Area selected by menu #84 | <p><u>Digipot A</u> S.Action S.Capt. Dig Edge An Edge [0→3] (Variable 1)</p> <p><u>Digipot B</u> 4:3 16:9 16p4:3 16p149 43p16:9 [0→4] (Variable 2)</p> <p><u>Digipot C</u> Thin Thick Shade Black [0→3] (Variable 3)</p> | <p>When this button is pressed to "Green" the Three-line display in the window indicates the three options, which can be changed by adjusting the three rotary digipots A, B and C.</p> <p>"A" Determines the basic Function</p> <ul style="list-style-type: none"> • Selects "Safe Action" option • Selects "Safe Caption" option • Selects "Digital Edge" option • Selects the "An. Edge" option <p>"B" Determines the Screen Format</p> <ul style="list-style-type: none"> • Standard 4:3 Screen • Standard 16:9 Screen • 16:9 Shoot to protect 4:3 • 16:9 Shoot to protect 14:9 (*) • 4:3 Shoot to protect 16:9 (*) <p>(*) -- Not available in 525</p> <p>"C" Determines the Style of Indicate</p> <ul style="list-style-type: none"> • Thin White lines are used • Thick White lines are used • Shade is used for "danger area" • Black is used for "danger area" |

| | | | |
|----|------|------|-------------------------------|
| 90 | | none | Blank |
| 91 | BACK | none | Go To the Utils menus (36-39) |

Menus 92-95: Presets



| Menu Num. | Heading | Automation | Function |
|-----------|--------------------|-----------------------|--|
| 92 | 0-100% RGB Setting | 1=Recall | Pressing this will Set The system to RGB Clipping: Low Clip=0% High Clip=100% |
| 93 | TEK Safe Setting | 1=Recall (Variable 1) | Pressing this will Set The system to RGB Clipping and Luma Clipping: Low RGB Clip=-2.4% High RGB Clip=+102.5% Low Luma Clip=0% High Luma Clip=+101% These settings meet the requirements of EBU Rec 103, but pull the settings into a “more” legal setting. This might be regarded as a “safer” setting than meeting EBU 103 exactly. |
| 94 | EBU Exact Setting | 1=Recall (Variable 1) | Pressing this will Set The system to RGB Clipping and Luma Clipping: Low RGB Clip=-4.8% High RGB Clip=+104.9% Low Luma Clip=-0.4% High Luma Clip=+102.4% These settings represent the exact requirements of EBU Rec 103. |
| 95 | BACK | none | Go To the Utils menus (36-39) |

4.4 Appendix 4, technical specification

| | |
|--------------------------------------|--|
| SD-SDI Inputs 270Mbit, RL <-15db | 1 input (SD-SDI) |
| HD-SDI cable equalisation | At least 200 metres of PSF 1/3 or equivalent cable |
| SD-SDI Outputs 270Mbit, RL <-15db | 2 output (SD-SDI) |
| Control System connections. | eyeheight I-Bus, 2 wire network. |
| Control Surfaces | Option of 2 eyeheight control surfaces. Integral front mounted control panel or remote FP-9, flexipanel. |
| Chassis | Eyeheight evolution miniBox chassis. Either a half width 1RU assembly for desk mounting or a full 1RU assembly for 19 inch rack mounting. |
| Power Supply Input Range | 100→240V ac. 47-63 Hz |
| Power Supply Input Current | 1.8A Max |
| Operating Temperature | 0 ~ 30 degrees C |
| Operating Humidity | 5 ~ 95% non condensing |