SDI Control Point

User Manual

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KAYA INSTRUMENTS

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2 Revision History

Version	Date	Notes
1.0	11/2020	Initial release
1.1	12/2020	Minor corrections: styling and visual corrections
1.2	03/2021	Added Genlock configuration in section 6.1
2.0	05/2021	Added Region of Interest tab, section 6.7 Added RS485 interface support and Multi-Camera Mode (sections 4.2 and 4.3) Added video output time-code control support to In-Out Tab (section 6.1) Added extended auto-exposure features configurations to In-Out Tab (section 6.1)
2.1	11/2021	Added Genlock crosslock, termination and offset feature configurations, section 6.1

Table 1 – Revision History

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3 Overview

3.1 Introduction

This manual describes the usage of KAYA's SDI Control Point GUI. It is used to set up and operate SDI cameras and is currently available for both Windows and Linux; the document thoroughly covers the different screens and menus of SDI Control Point. Be sure to use the latest firmware and software to guarantee best results.

3.2 Disclaimer

It is important to note that some parameters might vary slightly compared to this document or may be absent entirely, subject to the active firmware capabilities: a firmware upgrade might be needed to support complete functionality set. Please feel free to contact our team over at support@kayainstruments.com with any questions that may arise.

Please Note that KAYA will provide no warranty for SDI Control Point. It is a free software published under GPLv3 that uses the QT framework by the QT Company and other open source components. The software's license as well as all other third-party software licenses used in SDI Control Point can be easily accessed via the Information Tab (6.9 for a detailed explanation). Users may redistribute the software under certain conditions as elaborated in the license.

SDI Control Point's source code can be found at github.com/KAYA-Instruments/SDI-Camera-GUI

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4 Connecting to the Device

4.1 RS232

The connect dialog will open immediately after Launching SDI Control Point. The right tab is for RS232:

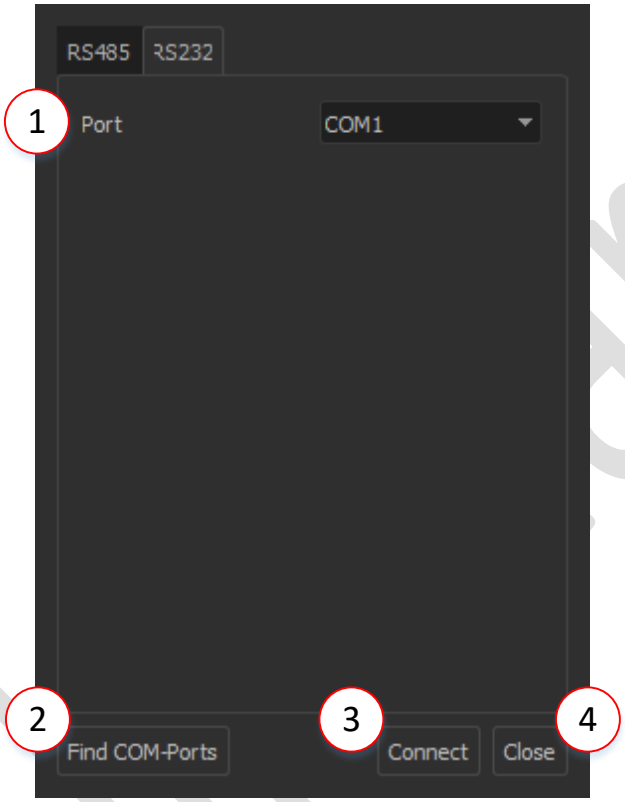

Figure 1 – Device connection process, RS232

#	Description
1	COM-Port to which the device is connected.
2	Scan for all available COM-Port and add them to the Port list
3	Connects to the device which is specified through the above mentioned settings.
4	Closes the Connection Dialog.

Table 2 – Connection screen GUI legend

4.2 RS485

The connect dialog will open immediately after Launching SDI Control Point. The left tab is for RS485:

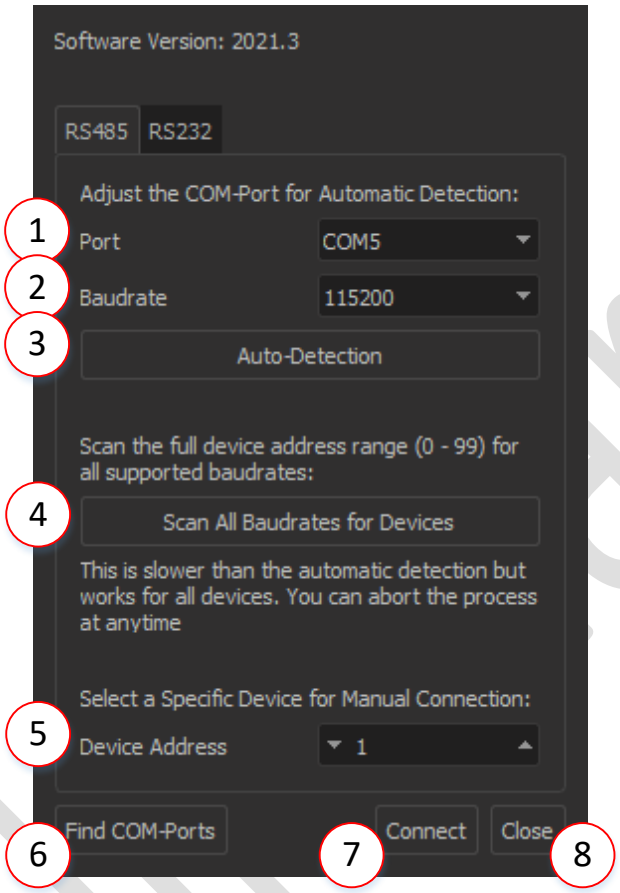

Figure 2 – Device connection process, RS232

#	Description
1	COM-Port to which the device is connected.
2	Selects the connection baudrate.
3	Searches for all available cameras connected to a selected port with a given baudrate.
4	Scans the given port for each device address (range 0 to 99) at all supported baudrates, in order to find all available cameras
5	Attempts to connect to a device with the specific ID address, in the selected port with the given baudrate
6	Scan for all available COM-Port and add them to the Port list.
7	Connects to the device which is specified through the above mentioned settings.
8	Closes the Connection Dialog.

Table 3 – Connection screen GUI legend

4.3 Multi-Camera Mode

Connection of multiple cameras is available only when using RS485. After identifying and connecting more than one camera the Multi-Camera-Mode can be set-up. The dialog will appear in the toolbar (at the top-right corner of the interface, by default):

Figure 3 – Multi camera mode connection

#	Description
1	Selects a device from a list of all identified devices.
2	When enabled, commands are sent to all cameras. Otherwise, commands are only sent to the selected camera from the drop-down list in point 1.
3	Synchronizes all devices' settings with the same configurations of the selected device (only in multi-camera-mode).

Table 4 – Connection screen GUI legend

Notes:

The Serial Interface settings cannot be changed in Multi-Camera-Mode as this would result in address collisions. If a device's name is changed, all devices will have the same name.

5 General Navigation

5.1 Toolbar

After the connection was established, the main window will open. It has toolbar for general options and a sidebar to navigate through the sub pages of the GUI.

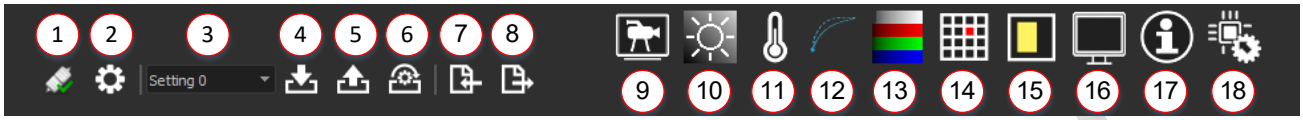

Figure 4 – GUI Toolbar and Sidebar

#	Description
1	Opens the connection dialog
2	Opens the system settings dialog
3	A list of user-defined settings (up to 8 pre-sets) [1]
4	Loads previously saved user set settings. (GUI will be updated accordingly)
5	Saves selected user setting with current camera configurations to camera's non-volatile memory
6	Selects the default user setting which will be applied on camera power-up. Only previously saved user settings can be set as default [1]
7	Exports the current camera settings to a file [2]
8	Imports and applies camera configurations from a file [2]
9	In-Out Tab: Configure exposure settings, video output and timecode features.
10	Black Level Tab: Configures black levels and flare compensation.
11	White Balance Tab: Configures white balance settings.
12	Knee Function Tab: Configures the knee function.
13	Lookup Table Tab: Configures the gamma correction lookup table.
14	Defect Pixel Correction Tab: Sets up the automatic defect pixel correction and create a defect pixel table.
15	Statistics ROI Tab: Defines the region of interest for automatic compensation algorithms.
16	SDI Output Tab: Configures the RGB to YcbCr matrix and fine tune the SDI output range.
17	Info Tab: Display device and software status information
18	Firmware Update Tab: Performs device updates.

Table 5 – GUI Toolbar and Sidebar legend

Notes:

1. If no user set is selected, the camera will be loaded at factory settings. To reset the device back to its factory settings, the "Reset Settings to Defaults" located in the "System Settings Dialog" can be applied.
2. Camera save-parameter files are generated with a custom .kyscp file extension.

5.2 System Setting Dialog

The settings dialog is used to configure general device and GUI settings.

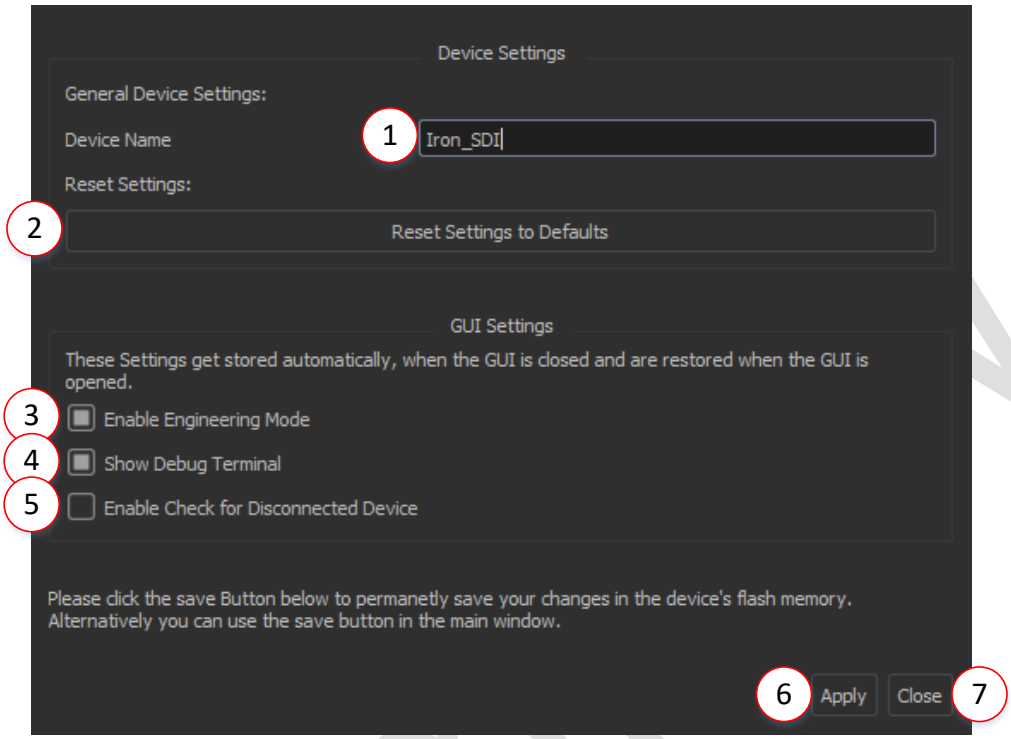

Figure 5 – System Setting

#	Description
1	Use this field to enter a new device name. Only printable characters are allowed and without any spaces.
2	Use this to reset all settings to factory defaults. Please note that this will drop any current camera configurations! Current setting should be saved separately before performing a full reset, in order to be re-used later.
3	Enable the engineering mode to display additional GUI features.
4	Enable the Debug Terminal (see section 5.3).
5	Enable a periodic connection check. If enabled the GUI will ping the connected device every 2 seconds. If device connection is lost, a dialog will be displayed.
6	Apply all configured settings
7	Close the settings dialog

Table 6 – GUI System Setting legend

5.3 Debug Terminal

The Debug Terminal shows all commands which are send by the GUI. It can also be used to manually send commands to the device. By default the Debug Terminal opens as a docked widget of the main window. You can turn it into a stand-alone window by grabbing it and dragging it away from the main window.

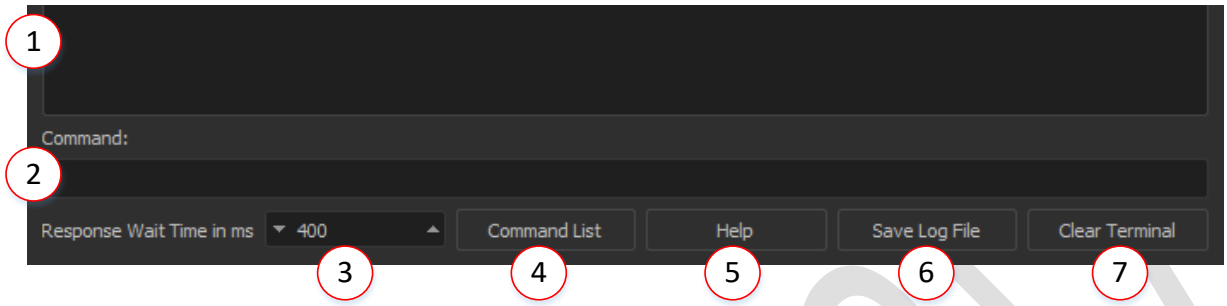

Figure 6 – Debug Terminal

#	Description
1	History of send / received commands.
2	The command line can be used to enter commands. [1]
3	Specify a maximal timeout for command response (the default is 400 ms) [2]
4	Displays a full list of supported camera commands
5	Shows the in-application help of the Debug Terminal.
6	Saves the current content of the Debug Terminal to a text file.
7	Clears the content of the Debug Terminal. Does not delete the command history.

Table 7 – Debug Terminal legend

Notes:

1. The command line features a command history which can be accessed by pressing the Up and Down keys while the command line is active. Copying and pasting a list of commands is also possible. Please make sure that an appropriate command response wait time has been selected (see point 3)
2. For most commands the default of 400ms is sufficient. For long commands like storing the DPCC table or enabling Genlock the wait time must be increased or the device's answer won't be seen. If a script with multiple commands is run by pasting it into the command line a wait time which is long enough for the most time consuming command in the script is needed.

6 Features Toolset

Each tab focuses on a certain feature set of the device. Below is a list of all tabs currently available in the GUI.

6.1 In-Out Tab

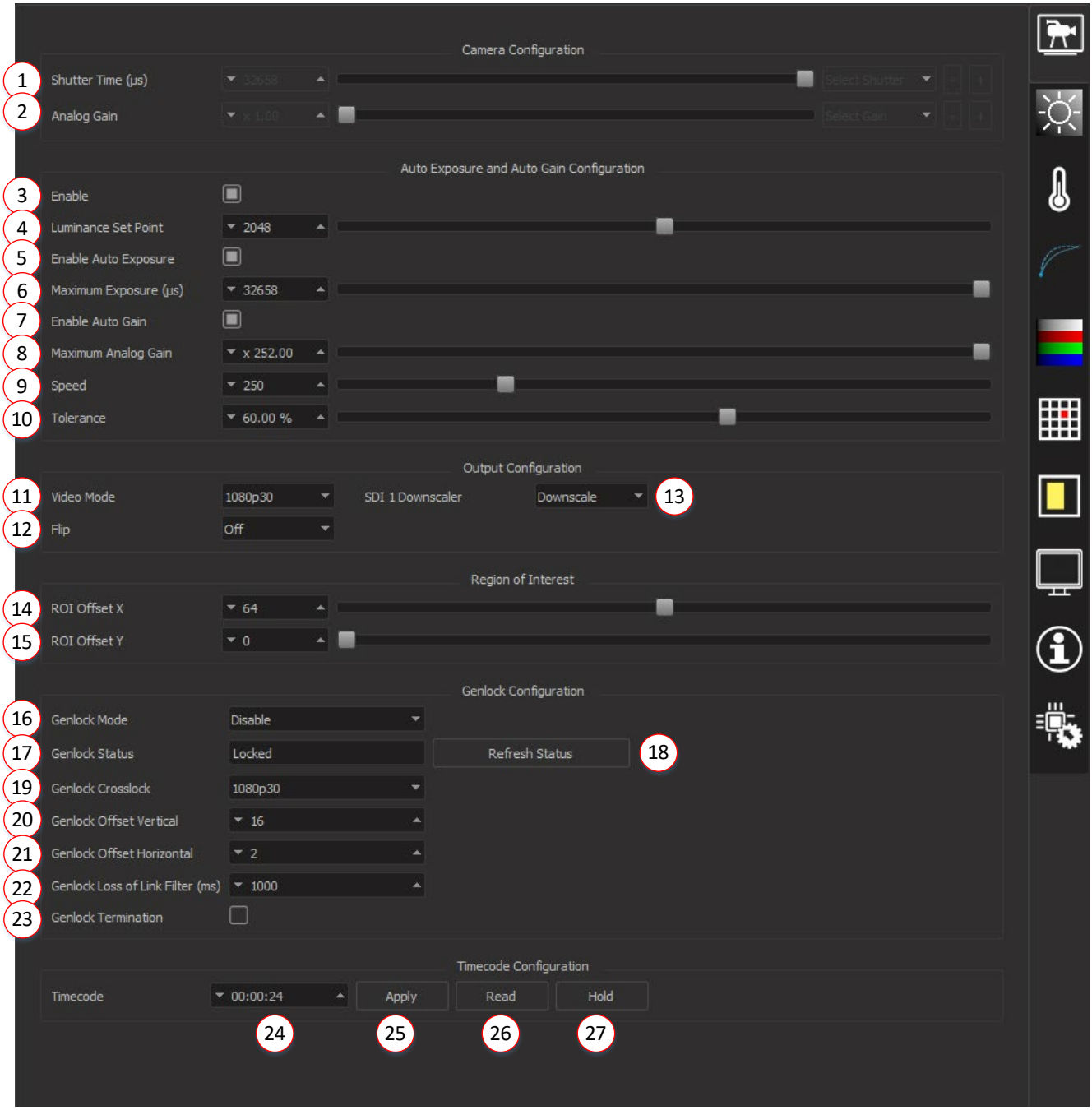

Figure 7 – In-Out tab

#	Description
1	Manually set the shutter time in microseconds. Can only be adjusted if auto exposure is disabled. The Combo Box and the "+" and "-" buttons to the right of the slider can be used to switch between common exposure time presets.
2	Manually set the sensor gain. High values will lead to a brighter image but also add more noise (i.e grainy image). Can only be adjusted if the auto-gain feature is disabled. The Combo Box and the "+" and "-" buttons to the right of the slider can be used to switch between common gain presets.

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3	Enables auto exposure. This will automatically adjust shutter time and sensor gain. Can be turned off to use manual settings. Elements 4 to 10 will be available if enabled.
4	The target luminance is set by the setPoint, this will determine the target average image value. A higher setPoint results in a brighter exposed image.
5	Enables auto exposure. The algorithm calculates the average picture intensiveness inside the defined ROI and tries to adjust it to desired luminance level by adjusting the exposure.
6	Sets the maximal exposure time in microseconds.
7	Enables auto gain. The algorithm calculates the average picture intensiveness inside the defined ROI and tries to adjust it to desired luminance level by adjusting the gain.
8	Sets the maximal analog gain.
9	Sets the reaction time of the algorithm to changes. Acts as a low pass filter on the luminance update.
10	Sets the relative weight of the peak-brightness in setPoint calculation.
11	Sets the video mode (image resolution and video rate).
12	Sets the flip mode to mirror the image vertically, horizontally or both (rotate 180°).
13	Enables 4K to 2K downscaler for the first SDI output. This option is only available for 4K cameras, see the cameras reference manual for more details.
14	Sets the absolute image ROI offset position across the sensor on the X axis.
15	Sets the absolute image ROI offset position across the sensor on the Y axis.
16	The genlock mechanism is used to synchronize multiple cameras video signals. The combo box allows to choose between genlock available modes.
17	Displays the current genlock status of the device.
18	Updates current genlock status.
19	Enable lock to other input tri-level signals.
20	Adjust the vertical position offset which are added to the reference sync signal.
21	Adjust the horizontal position offset which are added to the reference sync signal.
22	The loss-of-link (lol) timeout can be configured to prevent glitches in the unstable genlock signal.
23	Termination of the genlock in/out.
24	Specifies new initial timecode value.
25	Synchronizes and apply the new timecode.
26	Reads the current timecode value.
27	Holds the timecode at the same value which will result in image output with the last registered timecode. The timecode will continue to increase in the background. When hold is pressed again the new images' timecode will skip to the currently calculated timecode.

Table 8 – In-Out tab legend

6.2 Black Level Tab

Figure 8 – Black Level tab

#	Description
1	Sensor black for all colors (only visible when “Engineering Mode” is enabled).
2	Sensor black for each component separate (only visible when “Engineering Mode” is enabled).
3	Flare compensation (defog) for all colors.
4	Flare compensation (defog) for each component separate.
5	Master black for all colors.
6	Master black for each component separate.

Table 9 – Black Level tab legend

6.3 White Balance Tab

Figure 9 – White Balance tab

#	Description
1	White balance presets for different luminance scenes.
2	Enables continuous auto white balance.
3	Adds threshold maximum value configuration (0-4095) when the white balance compensation algorithm counts. Assists in calculation to omit over saturated pixels
4	Manual red, green blue gain.
5	Post processing: Hue, Saturation, Brightness, Contrast

Table 10 – White Balance tab legend

6.4 Knee Function Tab

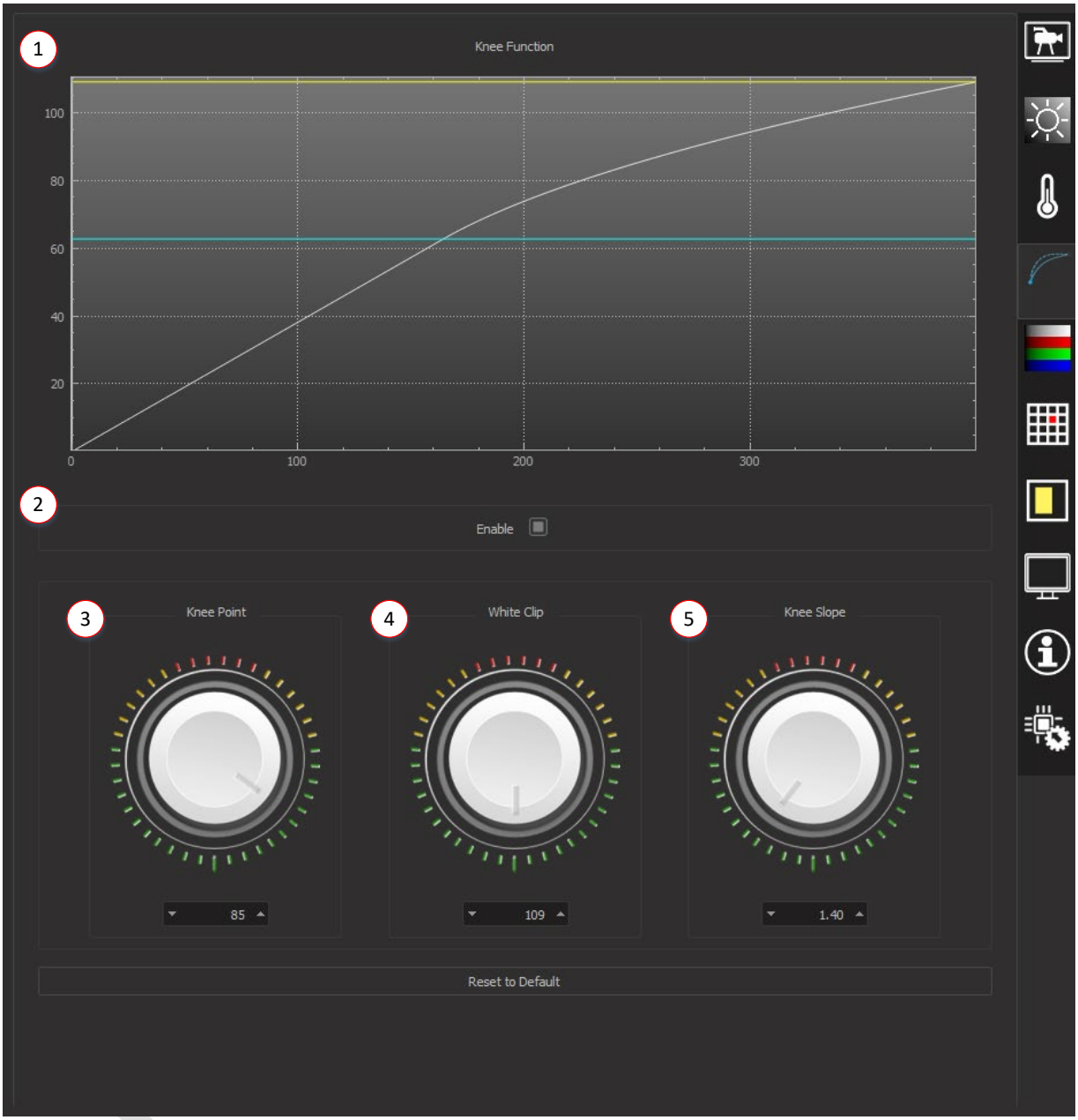

Figure 10 – Knee Function tab

#	Description
1	Graphical view of current knee settings.
2	Enable knee function.
3	Knee Point setting (point where the curve bends, indicated by the blue line in the plot).
4	White Clipping Point setting (maximum value of the knee function, indicated by the yellow line in the plot).
5	Knee Slope setting (angle of the first part of the knee function till the knee point).

Table 11 – Knee Function tab legend

6.5 Lookup Table Tab

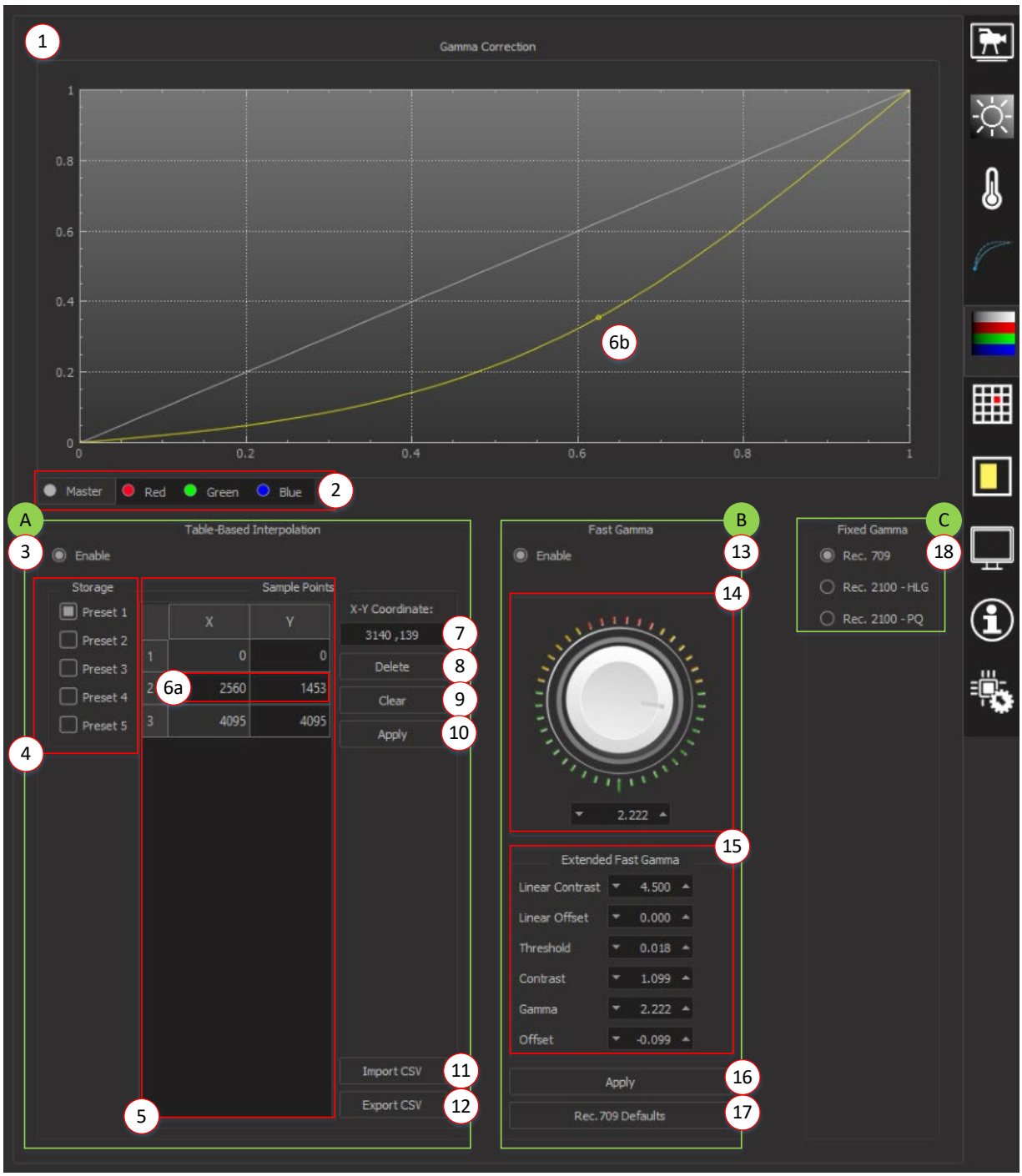

Figure 11 – Lookup Table tab

There are three modes for lookup table configurations:

(A) – "Table Based Interpolation"
(B) – "Fast Gamma"
(C) – "Fixed Gamma"

Only one mode can be used at any given moment: selecting one will disable the others.

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#		Description
1	A	Graphical representation of current gamma curve. In “Table-Based Interpolation”, adding a new sample point is done by clicking on the plot (up to 48 points). In “Fast Gamma” and “Fixed Gamma” modes the plot will become an un-editable preview of the gamma curve.
2		Gamma channel selection. The RGB curves represent the LUT points for each color, while the master channel represent the combined points of all the colors. RGB channels are only available in “Table Based Interpolation”: In “Fast Gamma” and “Fixed Gamma” only the Master is shown.
3		Enables “Table-Based Interpolation” which allows for a fine adjustment of the gamma curve, but is not ideal for real-time gamma changes.
4		Stores up to 5 different tables of sample points. The storage selector can be used to switch between them.
5		Table of all sample points for the selected curve and preset. Entries can be edited by double clicking a value.
6a/ 6b		Clicking a point of the gamma curve plot with the courser will add its coordinates to the sample point table, and adjust the gamma curve accordingly.
7		Shows the current coordinates of the courser’s location, on the gamma plot.
8		Deletes the currently selected entry out of the table.
9		Clears all sample points from the table. This will create a linear de-gamma function for the currently selected curve and preset.
10		Applies the new gamma curve to the camera.
11		Loads a gamma curve from a file.
12		Saves the current gamma curve to file.
13	B	Enables the “Fast Gamma” mode where the user only specifies the desired gamma value. Can be used for gamma changes during runtime.
14		Changes the gamma value.
15		Fine tunes the parameters to generate a custom de-gamma curve. By default the parameters in this box are set to generate a standard REC.709 de-gamma curve.
16		Calculates the de-gamma curve based on the given parameters for the currently selected curve and preset. This will also apply the curve on the device.
17		Resets the REC.709 parameters to their defaults to restore the standard REC.709 de-gamma curve.
18	C	Enables “Fixed Gamma” mode where the gamma curve is set to a fixed preset. REC.709, REC.2100 PQ or REC.2100 HLG can be selected. PQ and HLG gamma curves are specified in ITU-R BY.2100 and can be used for HDR content.

Table 12 – Lookup Table tab legend

6.6 Defect Pixel Correction Tab

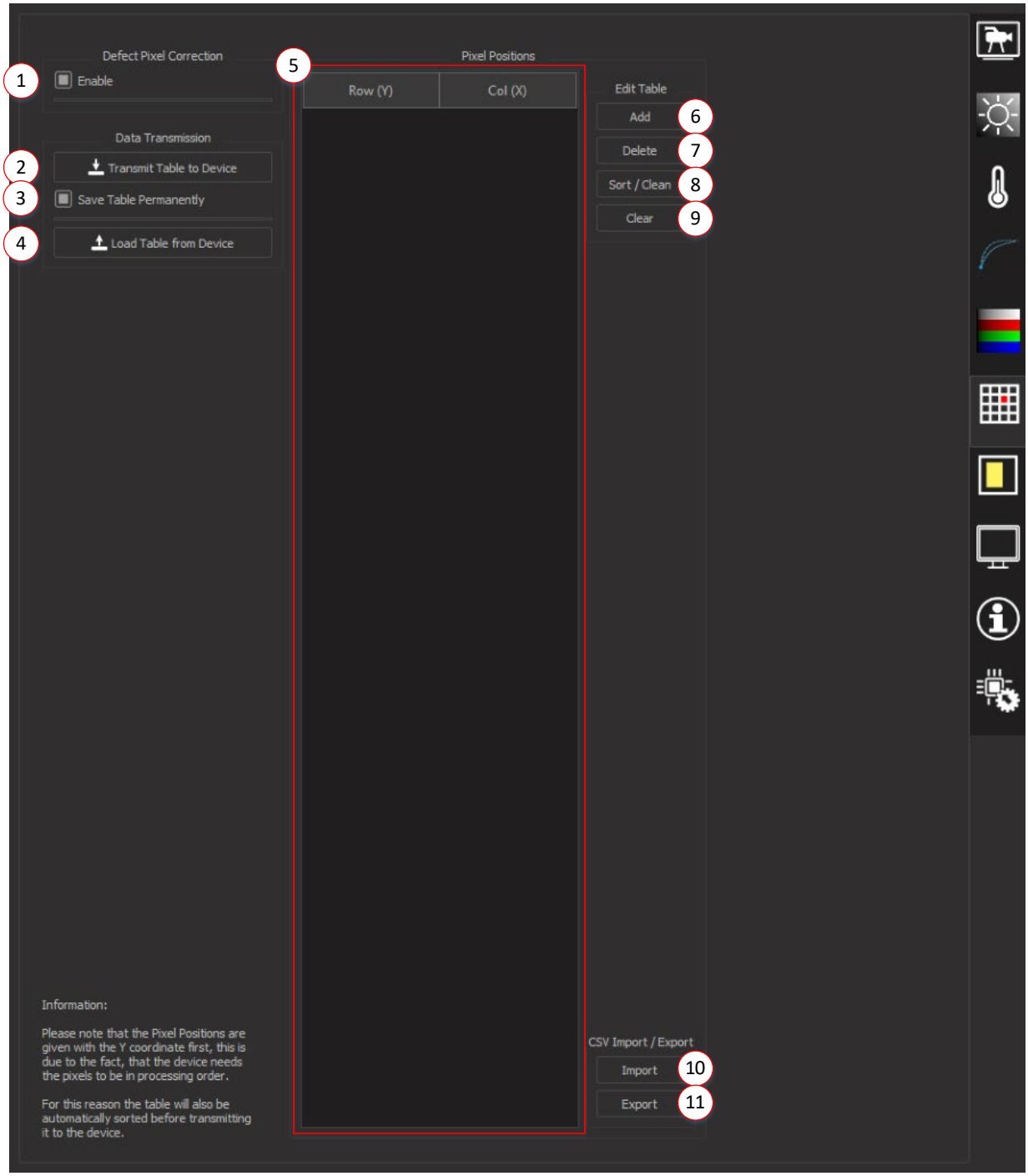

Figure 12 – Defect Pixel Correction tab (full version)

#	Description
1	Enables the defect pixel correction module.
2	Transmits the pixels entered in the table to the device. Pressing the button is necessary to apply changes to the table.
3	Stores the table in the permanent memory and will restore it after a power cycle. If the box is not checked the table will only be stored in the non-permanent memory and will be reset after a power cycle.
4	Loads the table from the device. This will always load from the permanent device memory!
5	Table of defect pixel positions. Double clicking a value will enable editing.
6	Adds a coordinate representing a dead pixel entry to the table.

7	Deletes the selected position from the table.
8	Sorts the table and remove duplicates.
9	Deletes all positions from the table.
10	Imports a CSV file with the defect pixel table.
11	Exports a CSV file with the defect pixel table.

Table 13 – Defect Pixel Correction tab legend (full version)

6.7 Statistics ROI Tab

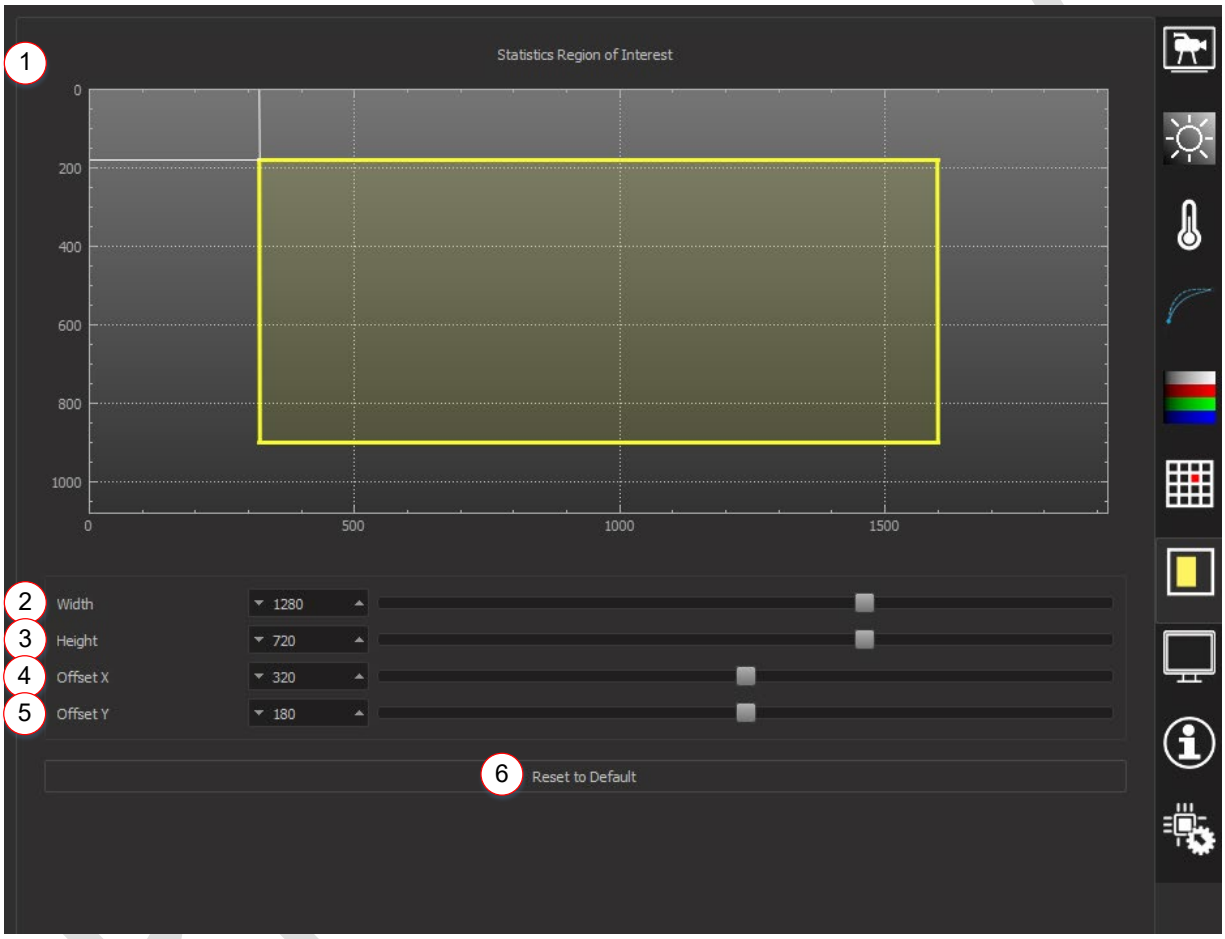

Figure 13 – Output tab

#	Description
1	Visually represents the selected statistics ROI in relation to the full visible output image.
2	Sets the width, in pixels, of the statistics ROI.
3	Sets the height, in rows, of the statistics ROI.
4	Sets the offsetX, in pixels, representing the offset between the output image X axis origin and the beginning of the statistics ROI.
5	Sets the offsetY, in lines, representing the offset between the output image Y axis origin and the beginning of the statistics ROI.
6	Resets the statistics ROI to full resolution of current visible output image.

Figure 14 – ROI tab legend

6.8 SDI Output Tab

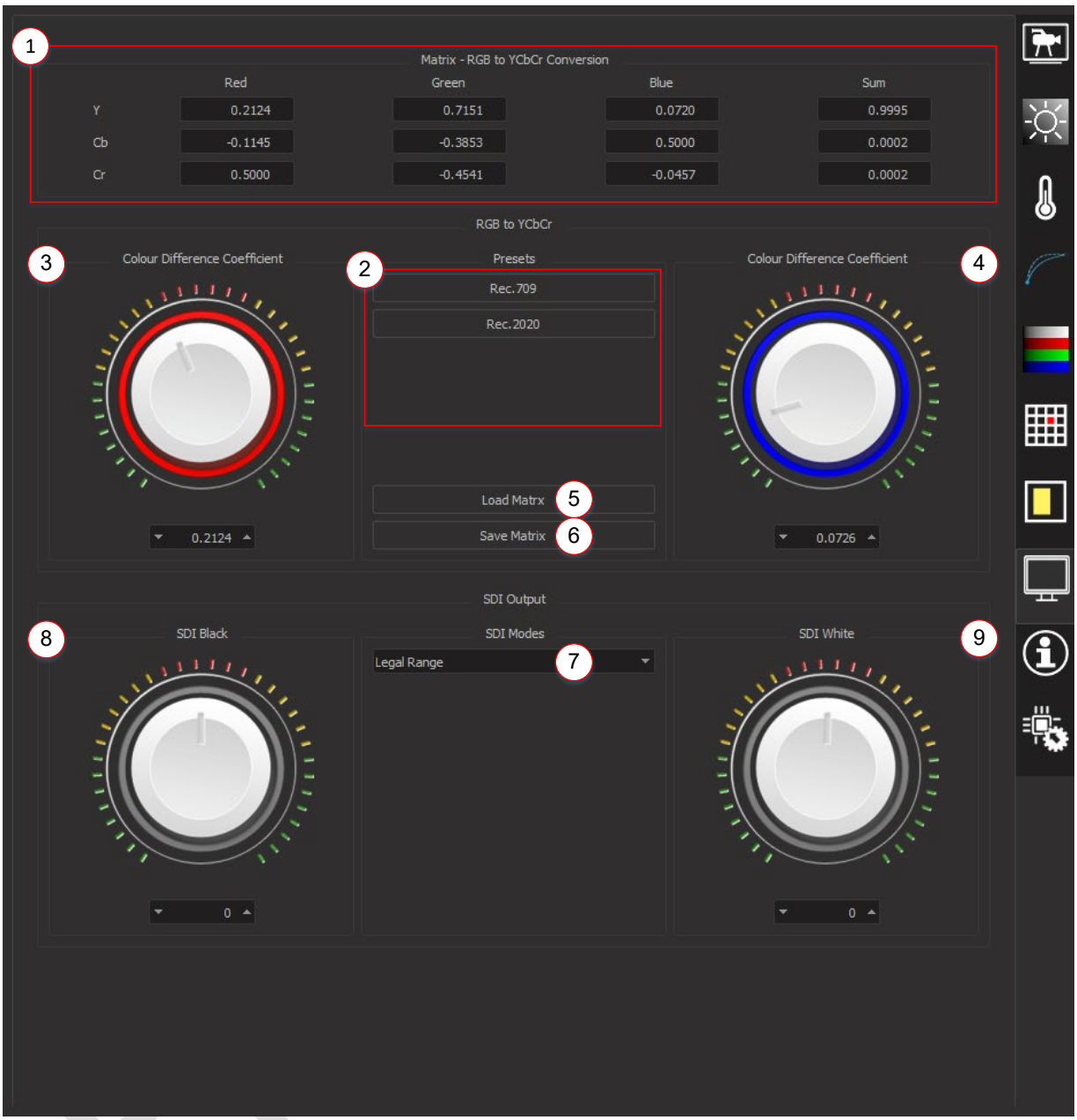

Figure 15 – Output tab

#	Description
1	Shows the values of current color conversion matrix. (engineering mode only)
2	Lists presets for color conversion. Default is Rec.709, Rec.2020 is usually used for UHD video\ HDR content. (eng. mode)
3	Fine tunes the matrix red balance. (engineering mode only)
4	Fine tunes the matrix blue balance. (engineering mode only)
5	Loads the color conversion matrix from a file. (engineering mode only)
6	Saves the color conversion matrix to a file.
7	Sets SDI output range to legal or extended. In legal range mode, the black and white levels can be fine-tuned (see below).
8	Sets SDI black level (extend dynamic).
9	Sets SDI while level (extend dynamic).

Table 14 – Output tab legend

6.9 Info Tab

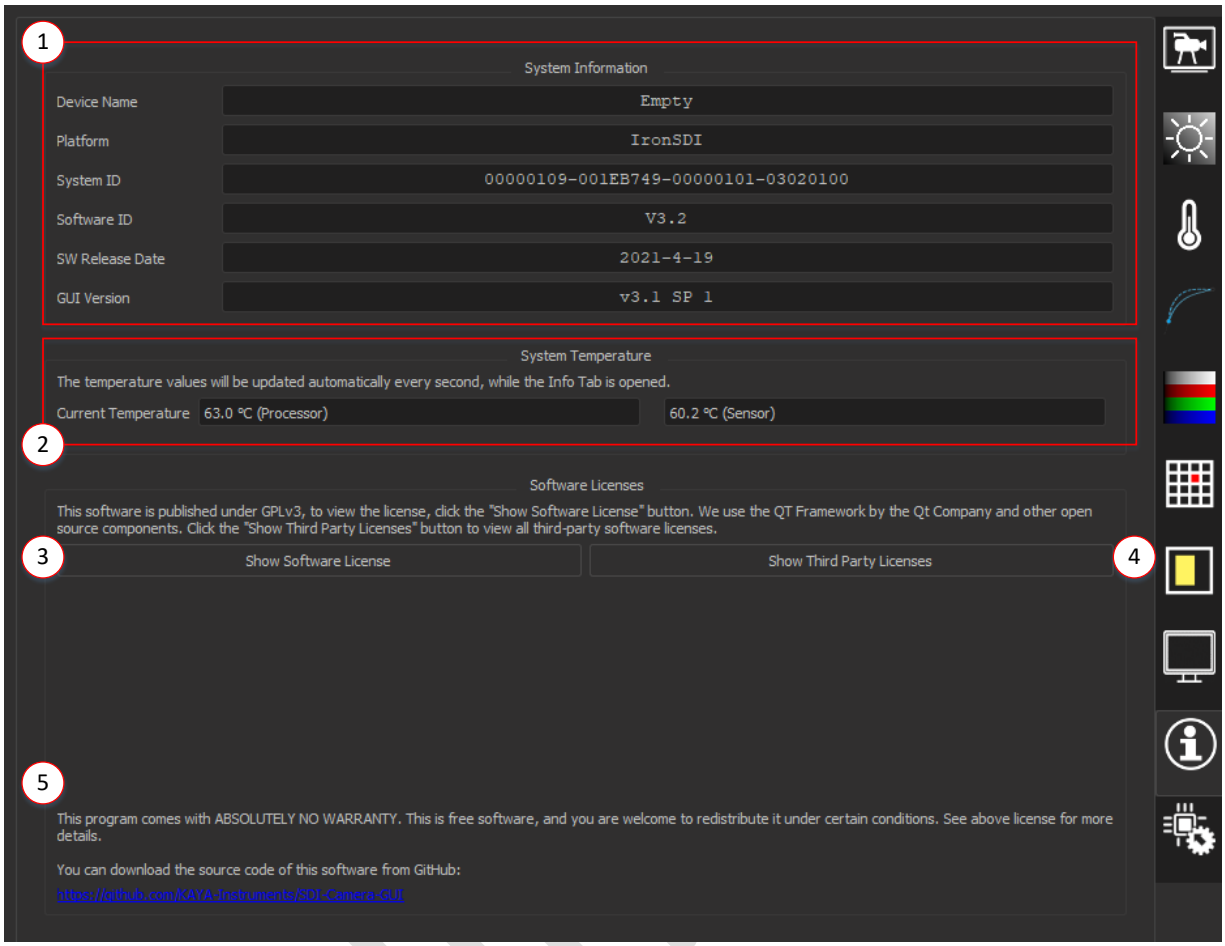

Figure 16 – Info tab

#	Description
1	General information about the connected device is shown in the system information box.
2	Information about the operating temperature of the device.
3	Shows the open source software license of the GUI software.
4	Shows the open source software licenses of third party software, which is used in the GUI.
5	Opens the GitHub page of the GUI.

Table 15 – Info tab legend

6.10 Firmware Update Tab

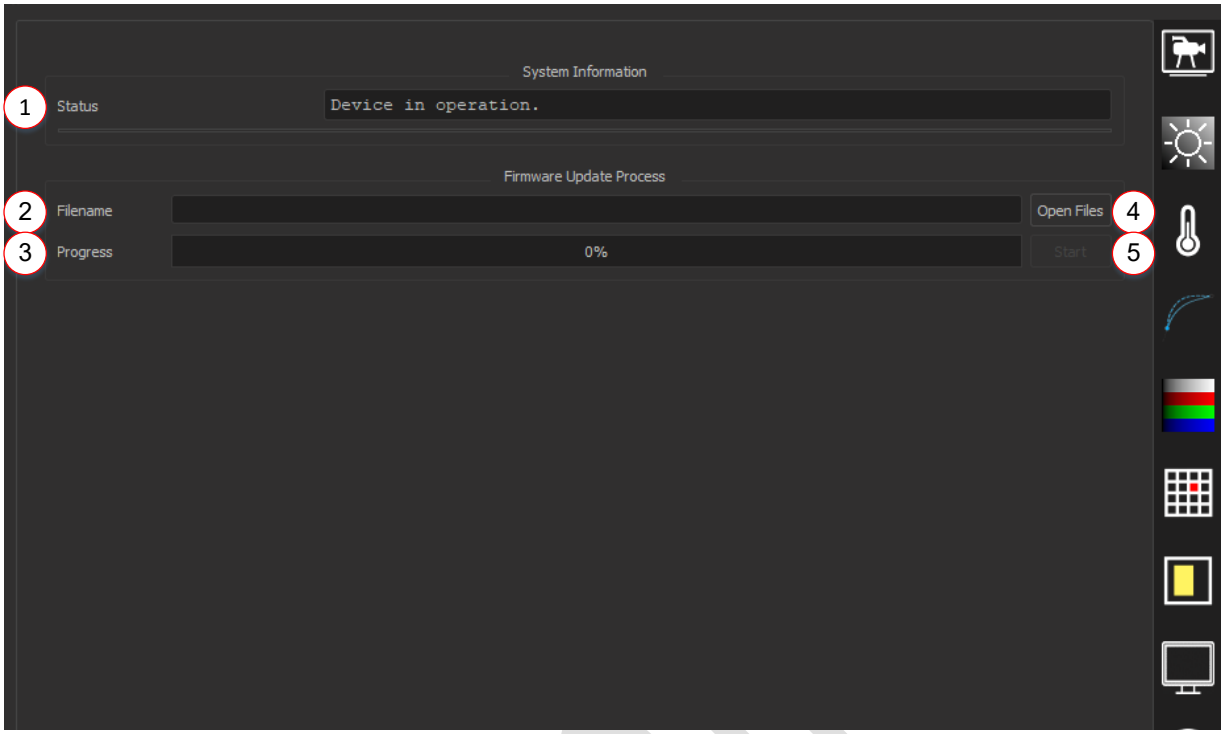

Figure 17 – Firmware Update tab

#	Description
1	Shows the current status of the device.
2	Shows information about the file which is currently being flashed to the device.
3	Shows the progress of the firmware update operation.
4	Choose a firmware update file. Make sure to use an official firmware update .bin file provided by KAYA Instruments, for the specific camera device.
5	Initiates the update process

Table 16 – Firmware Update tab legend