datavideo

4K MULTICAMERA PROCESSOR
KMU-100
Instruction manual

www.datavideo.com

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FCC Compliance Statement

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

Warnings and Precautions

1. Read all of these warnings and save them for later reference.
2. Follow all warnings and instructions marked on this unit.
3. Unplug this unit from the wall outlet before cleaning. Do not use liquid or aerosol cleaners. Use a damp cloth for cleaning.
4. Do not use this unit in or near water.
5. Do not place this unit on an unstable cart, stand, or table. The unit may fall, causing serious damage.
6. Slots and openings on the cabinet top, back, and bottom are provided for ventilation. To ensure safe and reliable operation of this unit, and to protect it from overheating, do not block or cover these openings. Do not place this unit on a bed, sofa, rug, or similar surface, as the ventilation openings on the bottom of the cabinet will be blocked. This unit should never be placed near or over a heat register or radiator. This unit should not be placed in a built-in installation unless proper ventilation is provided.
7. This product should only be operated from the type of power source indicated on the marking label of the AC adapter. If you are not sure of the type of power available, consult your Datavideo dealer or your local power company.
8. Do not allow anything to rest on the power cord. Do not locate this unit where the power cord will be walked on, rolled over, or otherwise stressed.
9. If an extension cord must be used with this unit, make sure that the total of the ampere ratings on the products plugged into the extension cord do not exceed the extension cord rating.
10. Make sure that the total amperes of all the units that are plugged into a single wall outlet do not exceed 15 amperes.
11. Never push objects of any kind into this unit through the cabinet ventilation slots, as they may touch dangerous voltage points or short out parts that could result in risk of fire or electric shock. Never spill liquid of any kind onto or into this unit.
12. Except as specifically explained elsewhere in this manual, do not attempt to service this product yourself. Opening or removing covers that are marked "Do Not Remove" may expose you to dangerous voltage points or other risks, and will void your warranty. Refer all service issues to qualified service personnel.
13. Unplug this product from the wall outlet and refer to qualified service personnel under the following conditions:
    a. When the power cord is damaged or frayed;
    b. When liquid has spilled into the unit;
    c. When the product has been exposed to rain or water;
    d. When the product does not operate normally under normal operating conditions. Adjust only those controls that are covered by the operating instructions in this manual; improper adjustment of other controls may result in damage to the unit and

may often require extensive work by a qualified technician to restore the unit to normal operation;

e. When the product has been dropped or the cabinet has been damaged;

f. When the product exhibits a distinct change in performance, indicating a need for service.

Warranty

Standard Warranty

- Datavideo equipment are guaranteed against any manufacturing defects for one year from the date of purchase.
- The original purchase invoice or other documentary evidence should be supplied at the time of any request for repair under warranty.
- The product warranty period beings on the purchase date. If the purchase date is unknown, the product warranty period begins on the thirtieth day after shipment from a Datavideo office.
- Damage caused by accident, misuse, unauthorized repairs, sand, grit or water is not covered under warranty.
- Viruses and malware infections on the computer systems are not covered under warranty.
- Any errors that are caused by unauthorized third-party software installations, which are not required by our computer systems, are not covered under warranty.
- All mail or transportation costs including insurance are at the expense of the owner.
- All other claims of any nature are not covered.
- Cables and batteries are not covered under warranty.
- Warranty only valid in the country or region of purchase.
- Your statutory rights are not affected.

Three Year Warranty

- All Datavideo products purchased after July 1st, 2017 are qualified for a free two years extension to the standard warranty, providing the product is registered with Datavideo within 30 days of purchase.

- Certain parts with limited lifetime expectancy such as LCD panels, DVD drives, Hard Drive, Solid State Drive, SD Card, USB Thumb Drive, Lighting, Camera module, PCIe Card are covered for 1 year.
- The three-year warranty must be registered on Datavideo's official website or with your local Datavideo office or one of its authorized distributors within 30 days of purchase.

Disposal
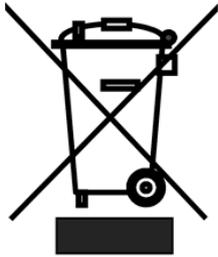
For EU Customers only - WEEE Marking

This symbol on the product or on its packaging indicates that this product must not be disposed of with your other household waste. Instead, it is your responsibility to dispose of your waste equipment by handing it over to a designated collection point for the recycling of waste electrical and electronic equipment. The separate collection and recycling of your waste equipment at the time of disposal will help to conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment. For more information about where you can drop off your waste equipment for recycling, please contact your local city office, your household waste disposal service or the shop where you purchased the product.

CE Marking is the symbol as shown on the left of this page. The letters "**CE**" are the abbreviation of French phrase "Conformité Européene" which literally means "European Conformity". The term initially used was "EC Mark" and it was officially replaced by "CE Marking" in the Directive 93/68/EEC in 1993. "CE Marking" is now used in all EU official documents.

1. Introduction

KMU-100 is an advanced video converter allowing conversion of **UHD** input signals into 4 different streams with resolution up to **Full HD**. Each device has two **UHD** inputs which work simultaneously and interchangeably.

You can define 4 output windows (Frame 1/2/3/4/) for each **UHD** source signal. The resolution of the **Frame 1 window** can be up to **3860x2160**, while **Frames 2, 3 and 4** support resolution of up to **1920x1080 pixels**. Every frame window can be animated. Animation is created by defining the Start and End positions of the frame window, along with their motion mode **(single, loop, ping-pong).** The frame window can change its size while it is animated, featuring the virtual **digital zoom.**

1.1 Functions and Features

The **KMU-100** is an advanced video converter that allows processing and conversion of **UHD signals** with the resolution of 3840x2160 (**12G SDI** or **HDMI 2.0**) into four or eight different high-quality streams at resolutions up to **Full HD**.

The KMU-100 offers the user two independent conversion channels. The device allows simultaneous and parallel processing of two **UHD** signal sources (**3840x2160**). The input signals are converted into **8 3G SDI outputs**, which can be additionally synchronized to a **Genlock** input.

This solution is ideal for professionals who deal with production and broadcasting of video materials adopting a variety of sources and signal types. It is a perfect solution for various program scenes and live coverage of events.

In addition, the **KMU-100 converter** is really easy to use. The device comes with a complete software package, and the control over all of its functions and parameters is exercised on a LAN connected computer on which the application is installed. The device portability due to its small size, a user-friendly interface, and the **DV Link platform** will give the user a very pleasant experience with the **KMU-100**.

1.2 KMU-100 Operations

KMU-100 is able to simultaneously convert signals from two video inputs with resolutions up to **UHD (3840x2160)** into eight different output video streams. It supports a variety of video formats and allows the connection of **SDI and HDMI** signal sources including **12G SDI** and **HDMI 2.0** technologies.

As many as **8 channels** of output signals can be generated. Each channel outputs an active area of the input signals defined by the user. To define these areas, a software application is installed on a computer which is connected to the **KMU-100** via a LAN interface.

The definition of the area, which will determine the output content, is nothing more than a simple positioning of a frame rectangle in the MultiViewer preview for a given channel. Each of the frame rectangles is marked with a different border color. For one of the frames you can scale the signal from full **4K** resolution to **Full HD**, and there is also up and down scaling **(zoom)** possible for all other outputs. The output area (position of each frame rectangle) may be a function of a variable, which means the output can be in constant motion. For each frame rectangle, there are simple animations available. The user just needs to select one of the available **Motion** modes. The start and end positions of the frame rectangle as well as all other related settings are configured on a user friendly interface of the application software installed.

The areas defined by the frame rectangles create **8 SDI outputs (2 x 4 or 1 x 8)**.

Two **multiviewer (HDMI)** outputs are used for preview and device configuration.

The **KMU-100** can be used in different various applications for multiple purposes as this device is capable of generating a variety of effects that will satisfy every professional engaged in production, TV broadcast and event live coverage with the use of audiovisual materials.

2.   Product Applications

The **KMU-100** is basically a bridge interfacing **4K** technologies with current video systems solutions. This device has a very wide range of applications in virtually every area where the high quality image viewing is required such as sporting events, industrial automation, visual effects used during all kinds of live events or in postproduction.

You can find several applications shown in the diagrams below. These are examples of possible uses of our device.

2.1   Video Production and Postproduction
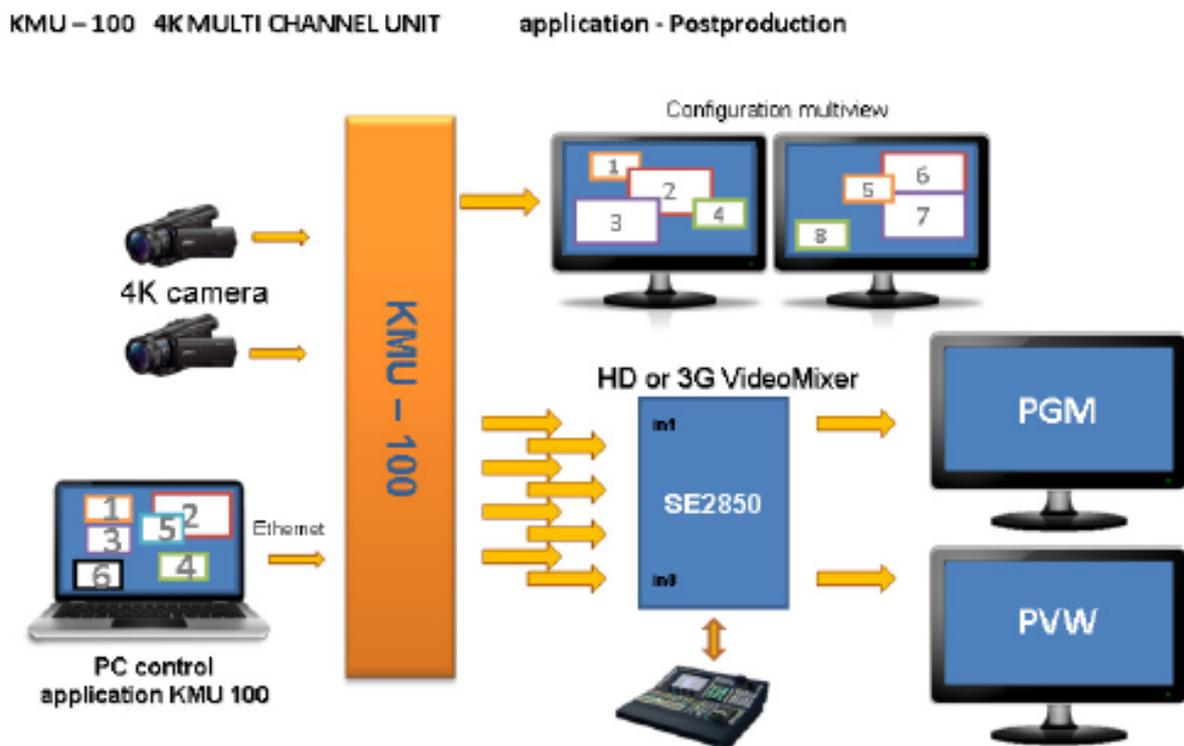
The **KMU-100** capabilities are perfect for video postproduction compared to other similar products on the market. The video material is recorded with one or two video cameras at **4k** resolution.

With the **KMU-100**, you can not only change the composition, but also the shots. The end result will resemble the use of several cameras. With the switcher connected, the transitions between the output images will then be smooth and natural. At the same time, this solution allows the material to be realized by a single camera operator, thus reducing the production cost while keeping the resulting material at a high quality and **Full HD** resolution. The final effect will be as if it were realized by several operators.

2.2   High Quality Security Systems

KMU – 100   4K MULTI CHANNEL UNIT   application - 8K Hi security system
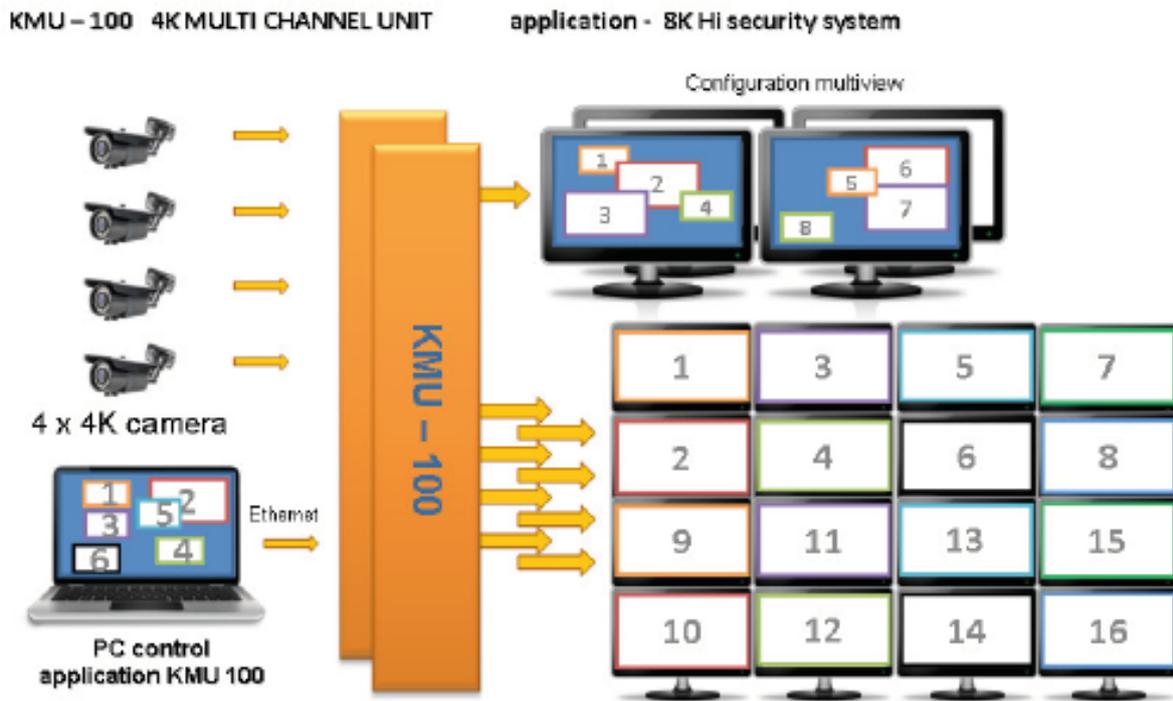
The **KMU-100** is an invaluable tool in creating a top-notch security system. It allows you to get obtain **3G HD** outputs from a single **4K** camera.

As the **KMU-100** processes the signal in real time, you obtain the effect of **8 high-quality mobile video cameras** but without their actual movement.

In this way, the converter provides new opportunities and possibilities to cut down the costs by reducing the number of video cameras and the cables used, and at the same time increases precision and quality in capturing all important details.

3. Connection to the KMU-100 – DV Link

A platform that unites all!

The **DV Link** platform is a very simple and useful software developed for configuration, diagnostics and control of multiple devices (for example four **KMU-100** converters) communicating through a common **DVIP** protocol.

A camera operator or operators can easily change the functions of each of the visible devices or a group by triggering the pre-defined presets, without the need to use the main **KMU-100** management application. **DV Link** application thus allows quick reconfiguration of the equipment for a specific task.

The **DV Link** platform connects multiple devices to control them on a single application.

We invite all the **KMU-100** users to download the **DV Link** application for free.

The technical specifications, manual and the download link can be found on the product page.

3.1 Hardware Connection

Prior to the use of the KMU-100, you must first set up the hardware system and configure the IP settings between the PC and the KMU-100. The subsections below will guide you through the connection process step by step.
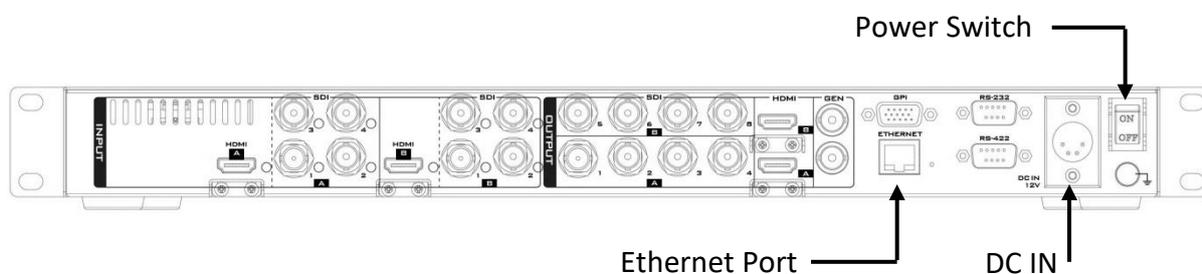
1. First of all, connect the DC 12V power to the KMU-100 device.

2. Turn ON the power switch to enter the device into standby mode.

3. Connect the PC to the KMU-100 device via an Ethernet cable.

4. Lightly touch the power switch button on the front panel for 2-3 seconds to switch ON the KMU-100 device.

5. The default IP address of the KMU-100 device is 192.168.1.10.

6. The PC IP address and the subnet mask are respectively configured to 192.168.1.5 and 255.255.255.0.
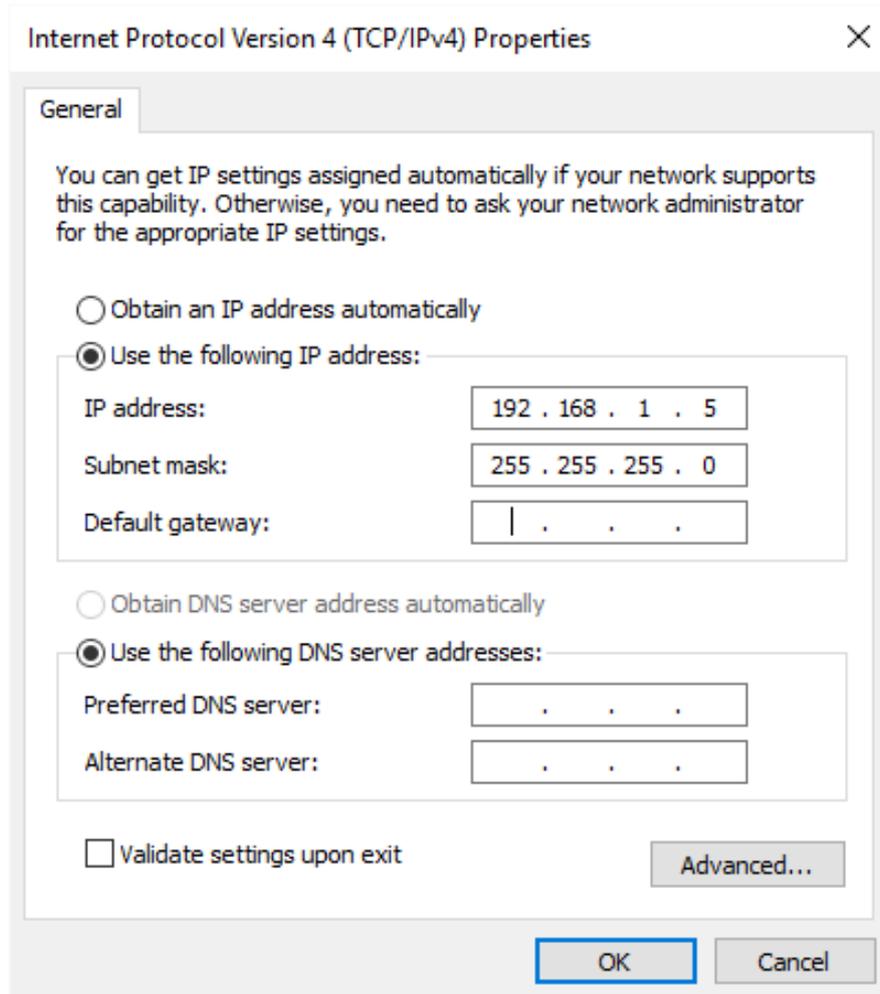
7. After the network connection is configured, you can then start the DV Link application to establish the connection between the KMU-100 and the PC.

3.2 Launching DV Link application

After the **DV Link** application is downloaded and installed on your computer, simply click the **DV Link** desktop icon to open the application.

While **DV Link** application is loading, a screen with a progress bar at the bottom will be displayed as shown in the diagram below.

After the **DV Link** application is loaded, you can see the **DV Link start screen** as shown in the diagram below. The **DV Link** application window can be divided into 4 areas listed as follows:

1. **Tool Bar**
2. **Available Networks**
3. **Available Devices**
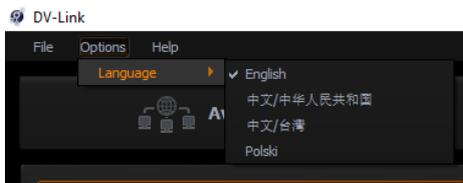4. Single device **Control Area (KMU-100)**
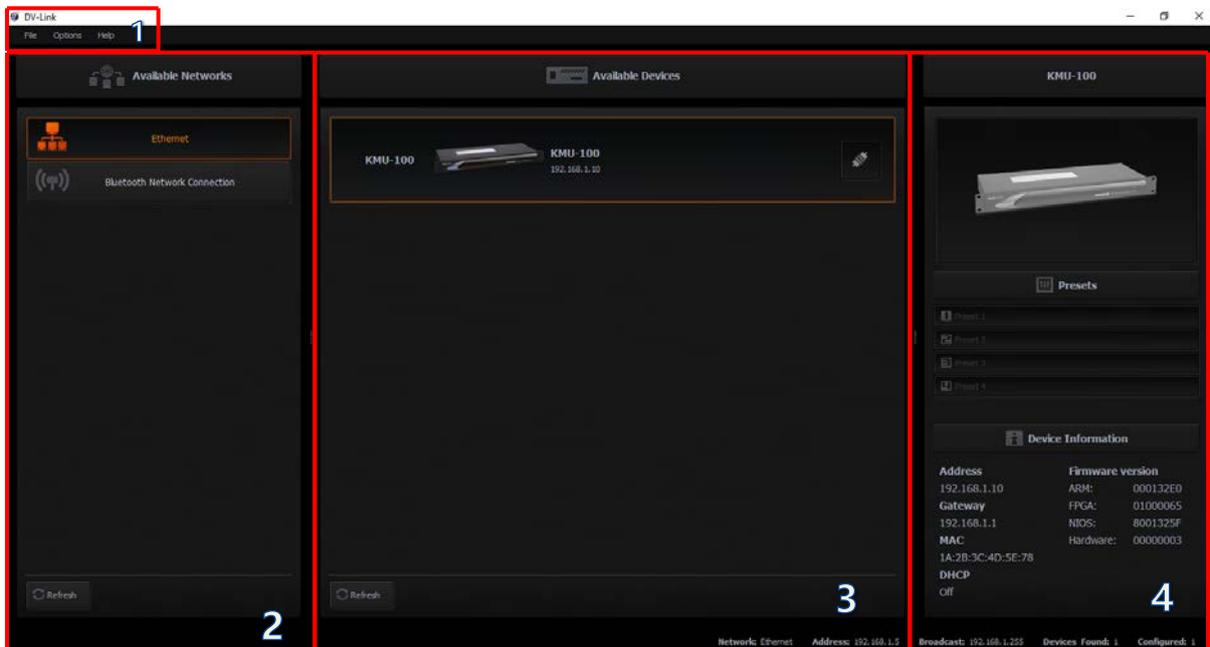
Tool Bar

A **Tool Bar** is located at the upper left corner of the screen where you will be able to find three main options, **File, Options** and **Help**.
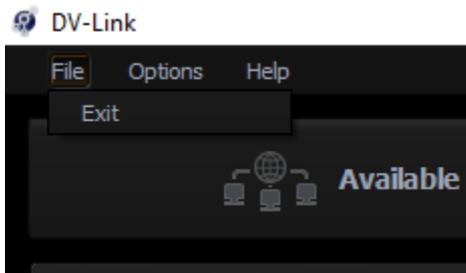
File – Click **Exit** to quit the application;

Options – this option contains the following sub-options:

Language – allows you to select the language of the application.

- **English**
- **Chinese / PRC**
- **Chinese / Taiwan**
- **Polski**

Help – this option contains the following sub-options:

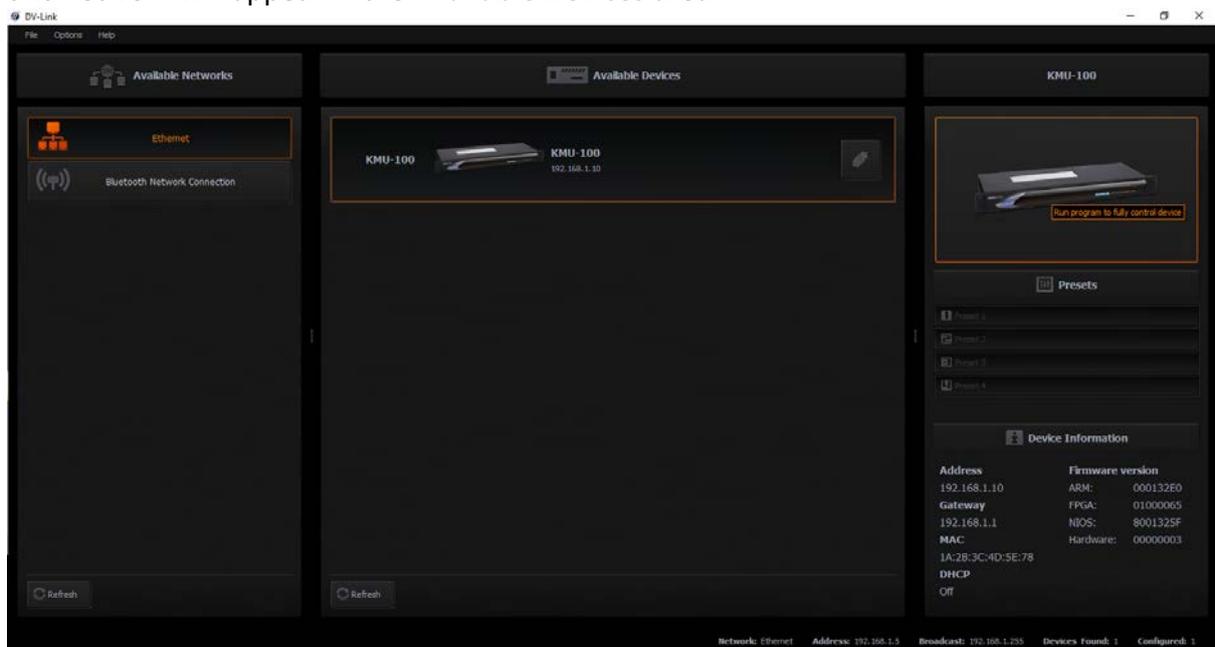**About** – End User License Agreement (EULA), Version.

QR Code – Provides the link to the KMU-100 product page.

Available Networks area

In this area, the available networks are displayed as shown in the diagram below.
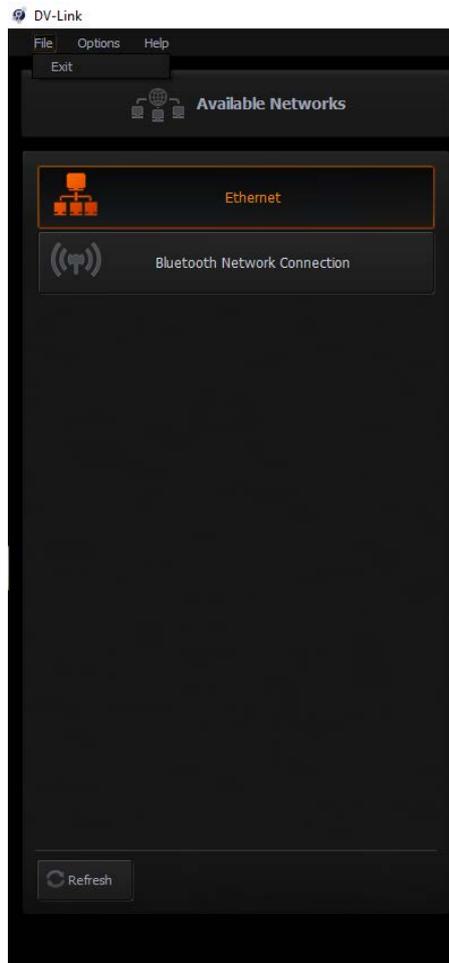
After moving the cursor over and clicking on a given network icon, the available devices in this network will appear in the **Available Devices** area.

After adding a couple of devices, you can easily switch between them in the **Available Devices** area. In order to better identify the devices, you can also rename the connected KMU-100 devices.

After moving the cursor over and click the **KMU-100** device icon in the **Available Devices** area and the device will appear as visible in the **control area**, along with its IP address as shown in the diagram below.
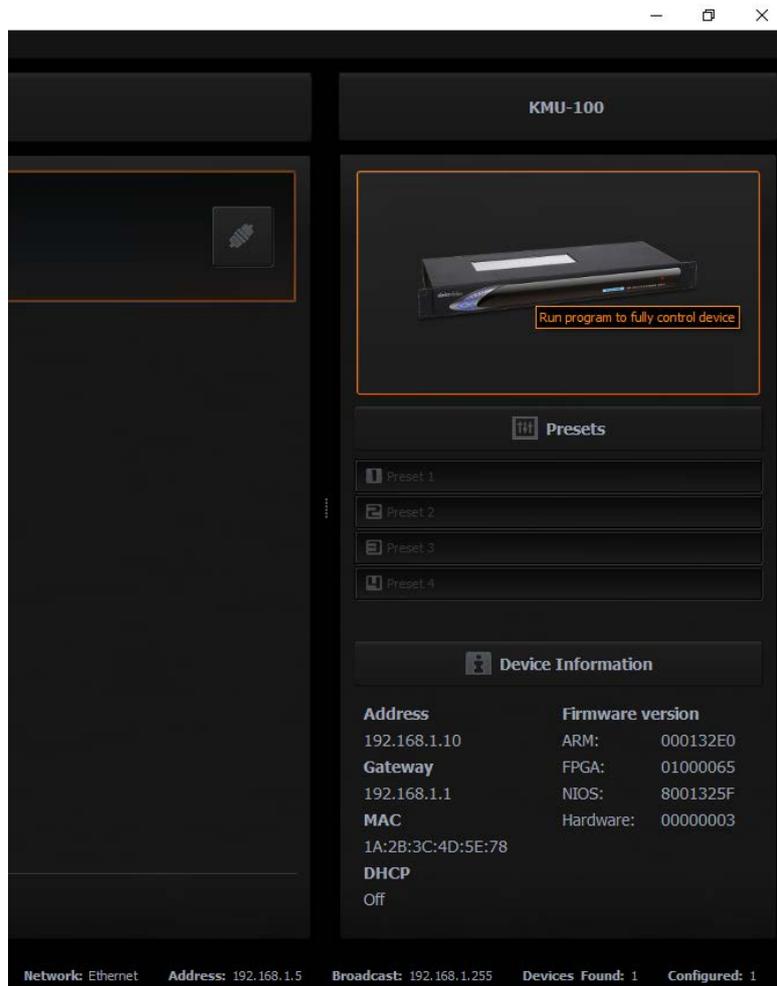
For the selected **KMU-100** device, you can load the presets with user settings from one of **four Preset slots**. You can double click the **KMU-100** device icon in the **control area** (the rightmost KMU-100 column) to open the **KMU-100 Control Interface** as shown in the diagram below.
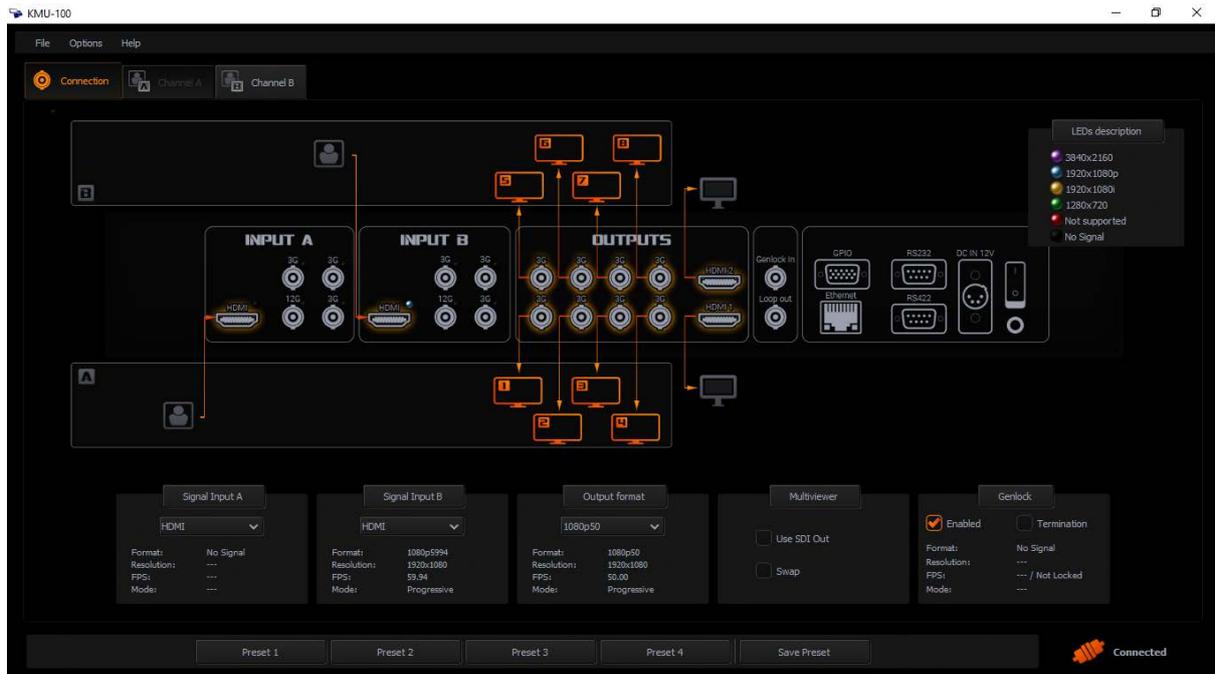
In summary, at the **DV Link** application level, you will be able to search for **KMU-100** devices in the network, establish connection with them, select the presets and finally launch the **KMU-100 Control Interface** and operate thereon.

Good luck!

4.   Control Application

The Control Application allows you to configure the device and saves presets in the device internal memory. While the **KMU-100** control application is loading, a screen with a progress bar at the bottom will be displayed.

4.1   App Window Descriptions: Connection Tab

The Connection tab allows you to define input signals connected to **Channel A** and **Channel B**. It is also possible to use the signal from **Input A** to process in **Channel B**, and vice versa, i.e. processing of **Input B** in **Channel A.**

After clicking the Connection tab, you will see a diagram with visualization of necessary cable connections. The **Connection screen** window can be divided into 3 areas as shown in the diagram below.
1. Menu area
2. Connection Graphics area
3. Input/Output Signals area
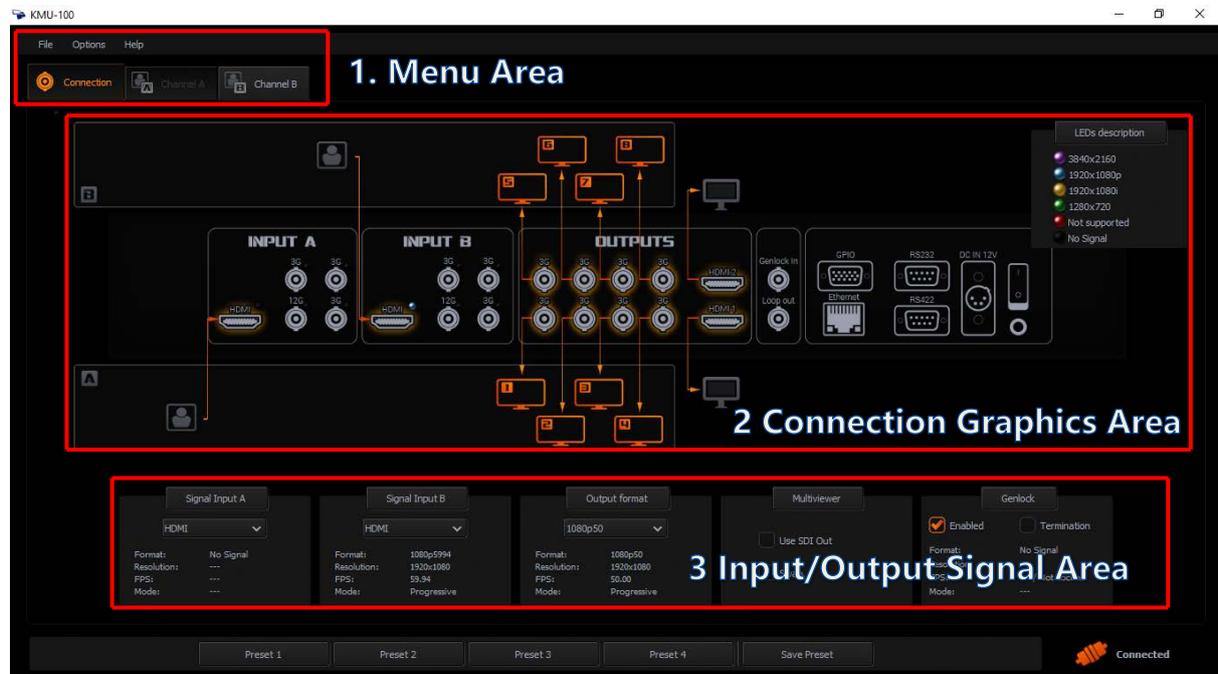
1. **Menu area** – When the **Connection** tab turns orange, it indicates that you are working on this particular screen. Pressing the **Channel A** or **Channel B** tabs will switch your display from **Connection** mode to **Channel A** or **Channel B** setting (processing) mode. Detailed explanations of the **Menu area** is in later parts of the manual.

2. **Connection Graphics area** – The Connection Graphics Area is basically a graphical visualization of the rear panel of the **KMU-100** device with all its available **inputs and outputs**. The active status and the introduced changes to the inputs and outputs are graphically shown on the screen in the form of arrows / orange icons.
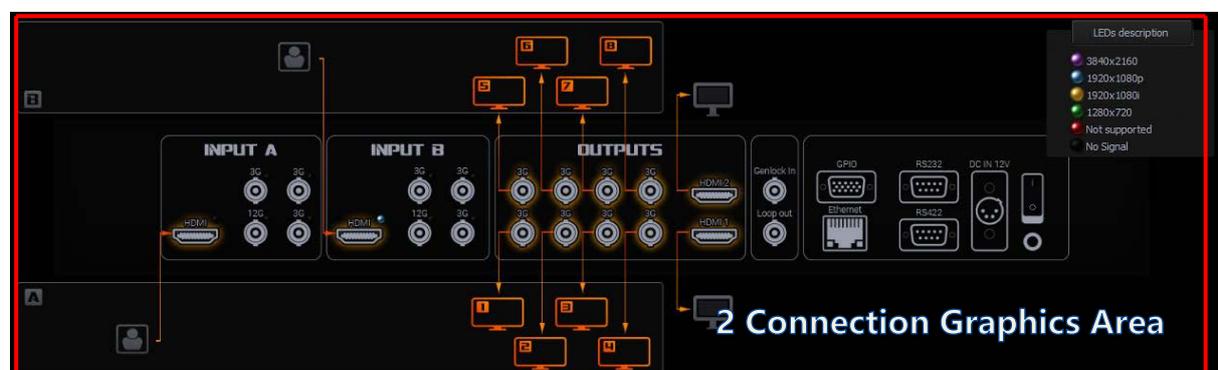
In fact, the active **inputs / outputs** on the rear panel of the **KMU-100** device are indicated by glowing **LEDs** at each **input / output port**. Color of the diode represents the signal resolution. The LED lights up when a signal is detected at the input.

You can see the **screenshot of the KMU-100 rear panel** as shown in the diagram below. **One of the LED locations is indicated by a red arrow**.
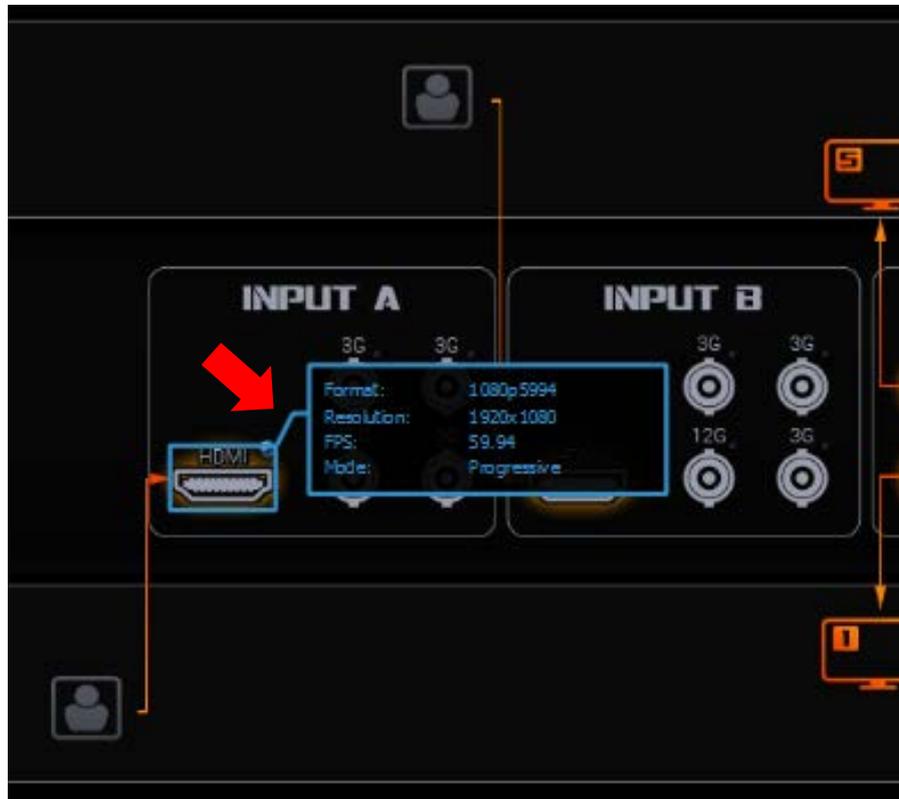
The **LED** colors indicating current signal format are displayed on the screen in the top right corner of the **graphics area**. **The diagram below depicts the LEDs description.**
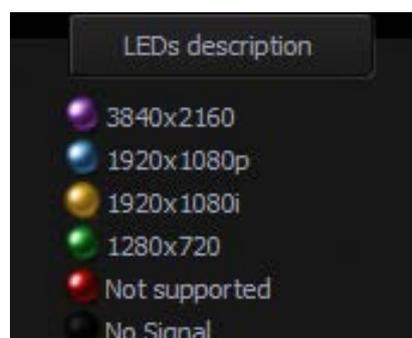
When you move the cursor over the **input port icon**, a preview of the detected format is displayed in a nearby window. In this window, properties such as **Format, Resolution, FPS** and **Mode** are displayed as illustrated in the diagram above.

The other ports shown in the **Connection Graphics Area** are listed as follows:
- **Port: 2 x HDMI Video Output (HDMI type A) supporting 1080p60** allows connection of two monitors displaying Channel A and Channel B images as MultiViewer.

- **Port: Sync Input (Genlock)** allows the specification of the reference signal for synchronization of output channels.
- **Port: Ethernet RJ45** for control, configuration and firmware updates.
- **Port: RS-422** input connects the RMC-185 keyboard controller designed specifically for the KMU-100. The RS-422 port also allows you to control the KMU-100 via the VISCA Control Protocol. Please see **Section 5** for details.
- **Port: RS-232** input is currently unused.
- **DC power supply socket.**
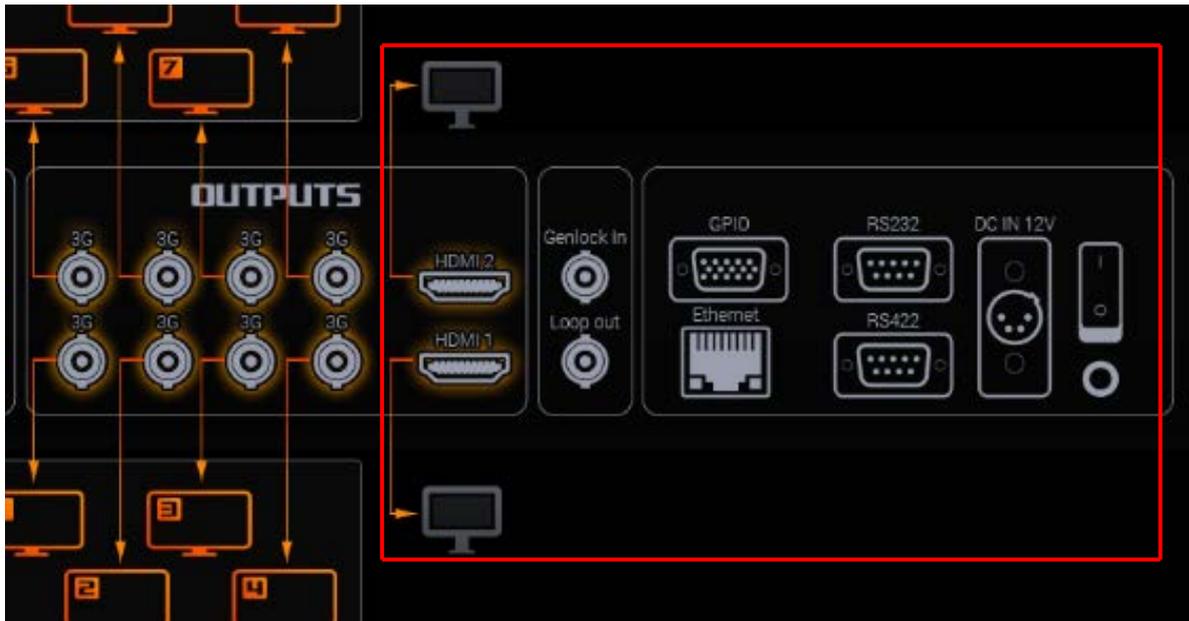
3. **Input/Output Signals area** allows you to configure the **KMU-100** device I/O.
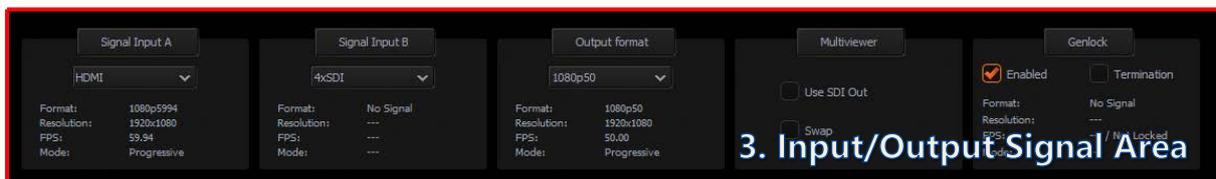
Input Signal Configuration

You can select an input signal option from the **Signal Input A** drop-down list as shown below as well as the **Signal Input B** drop-down list.

There are 4 input signal options in the **Signal Input A** drop-down list:
- **4xSDI**
- **1xSDI**
- **HDMI**
- **Input Signal B**

When you select the **4xSDI** option, the four SDI ports in the Input A area will then be highlighted by four orange arrows as illustrated in the diagram below.
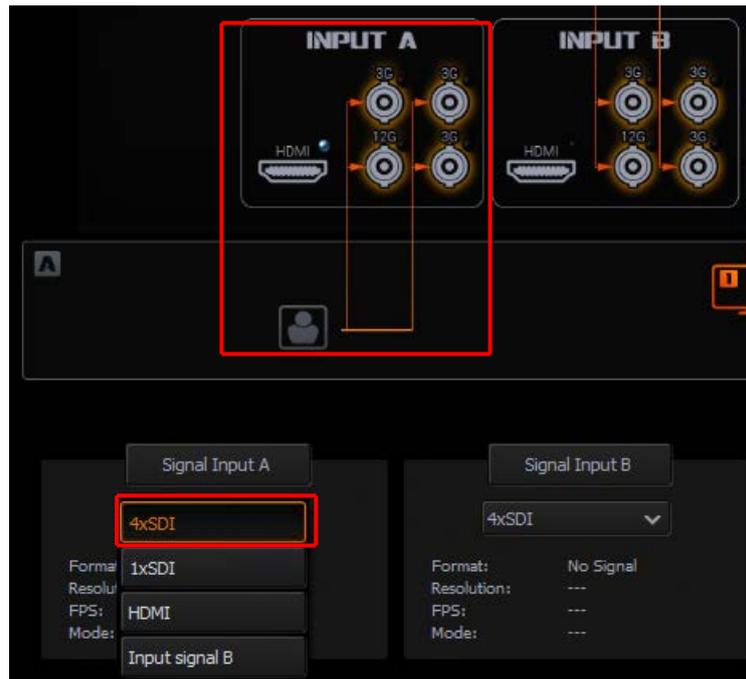
After configuring **Signal Input A**, you can do the same with **Signal Input B**. There are **4 options in the Signal Input B drop-down list:**
- **4xSDI**
- **1xSDI**
- **HDMI**
- **Input Signal A**

It is also possible that **Input B** is not connected any signals, however, rather connecting **Input Signal A** to **Input B**, and then reconfigure the whole device, you can use a copy of the signal from **Input A** as **Signal Input B**. This option of setting the signal from the other input is also available for **Input A**. With this feature, you will thus be able to double the number of frame windows on the same image, i.e. 8 frame windows instead of 4.
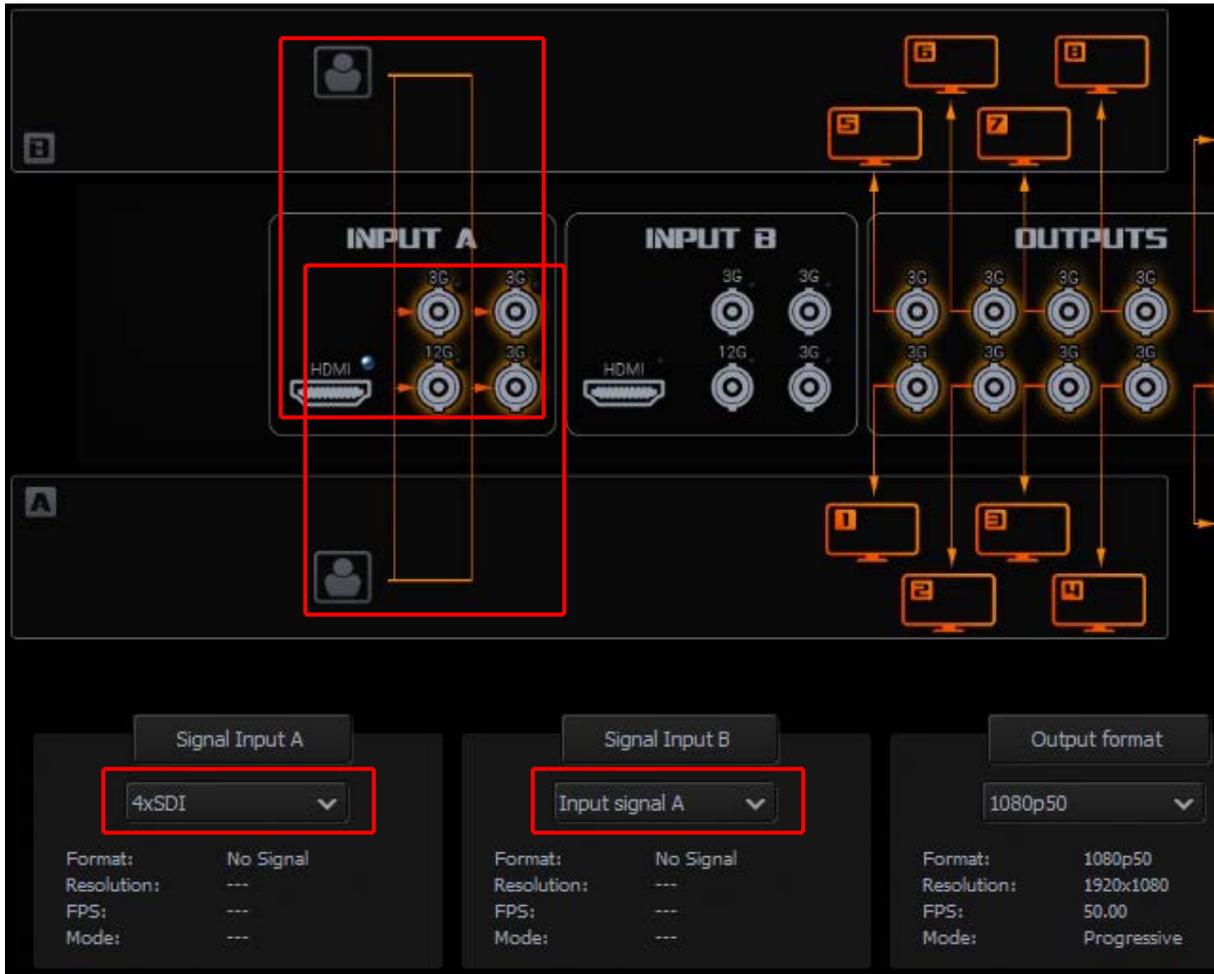
Output Signal Configuration

There are several output signal format options in the **Output Format** drop-down list. The available formats are:

- SD PAL/NTSC
- SD 16:9 PAL/NTSC
- 720p 50/59.94/60
- 1080i 50/59.94/60
- 1080p 25/29.97/60
- 1080p 50/50.94/60

4.2   App Window Descriptions: Channel A and Channel B

The **Channel A** and **Channel B** tabs are used for defining the way the input signal is divided into 4 different outputs. It is done by placing 4 different **frame windows (1, 2, 3 and 4)**. Content of the area bordered by each frame rectangle will be send to a corresponding output channel.

The **Channel A (B)** screen window can be divided into 4 areas as illustrated in the diagram below:

1. Menu Area
2. Central Work Area
3. Frame 1, 2, 3 and 4 Setting (Control) Area
4. Multiviewer – Preview on the Monitor
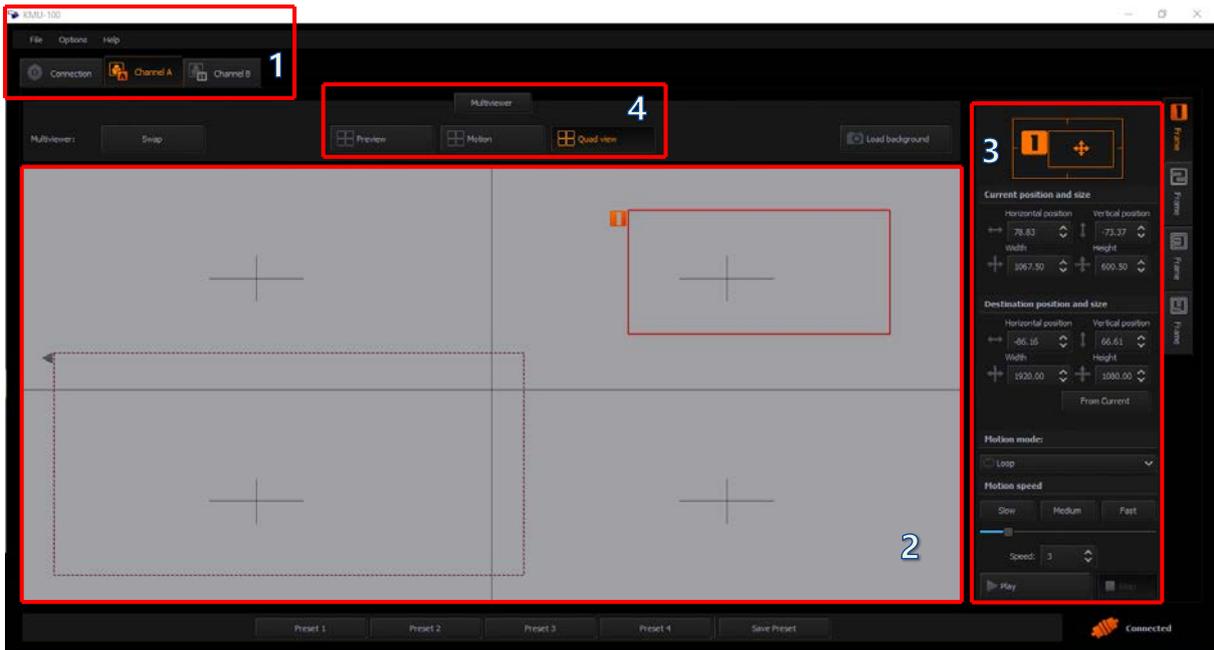
1. **Menu Area** – **Channel A (B)** tab turns orange, indicating that the work is being done on this screen window. Clicking the **Channel B** tab will switch to the **Channel B** screen window.

2. **Central Work Area** – In this area, the frame windows are defined and sent to the corresponding outputs.

To improve UI clarity, every output is configured in a separate tab, **Frames 1/2/3/4**. **Frame window size and position** can be set with mouse clicks (**on central work area**) or by entering the exact **size/position values** in the **Frame Setting Area** on the right of the **Channel A (B)** screen window.

Frame Window Size – This can be configured on the **central work area** by clicking on any corner or edge of the frame window with the mouse cursor. The window proportions are always retained as the rectangle is in **16:9** aspect ratio. Size of **Frame Window 1** is unrestricted as you can configure it up to the input format, **even 4K**. See the diagram below (current position and size).
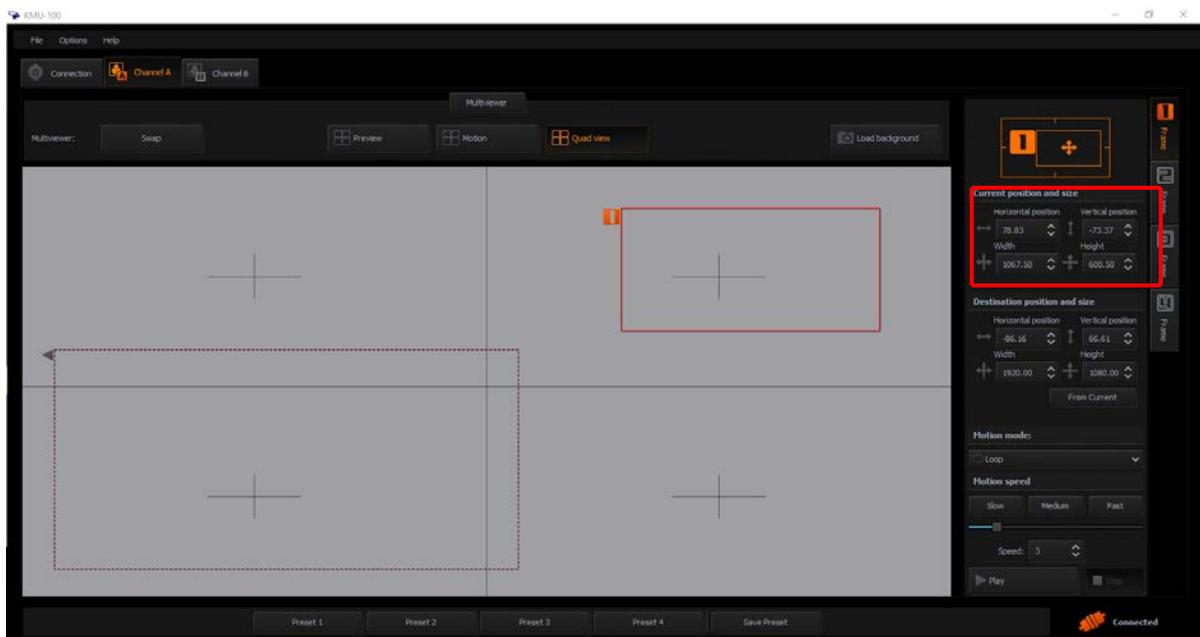
Frame Windows 2, 3 and 4 support resolution up to **1080p** and the application restricts them from extending further.

A double click on the edited window will switch it to the max available size and the second double click will restore it to its previous size. Aspect ratio is defined by the output resolution and automatically applied to frame window definition.

You can set a graphical background for the gray workspace of the **Central Work Area**, and the graphical background should help you better position the frame windows. The graphics file (**JPG, PNG**) can be loaded by selecting an image file from the hard drive.

3. **Frame 1, 2, 3 and 4 Setting (Control) Area**
Frame Window selection – Click the appropriate **Frame 1, 2, 3 or 4** tab on the rightmost side of the work space to start configuring selected **Frame Window**. The selected **Frame** is indicated by an orange tab **as shown in the diagram below.**
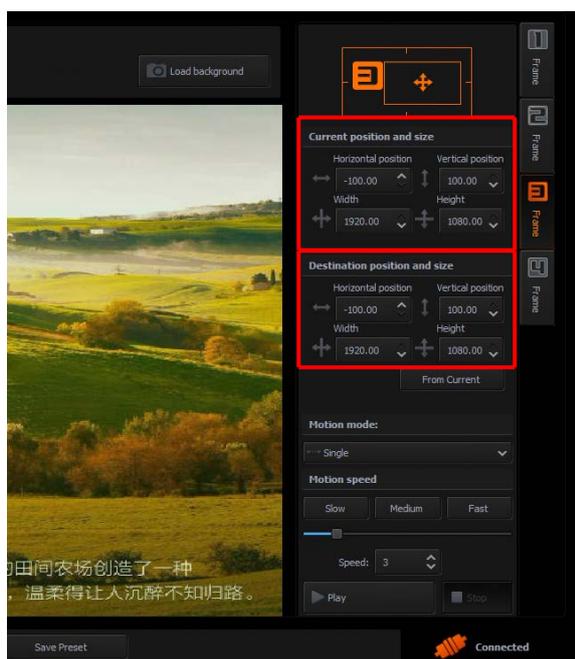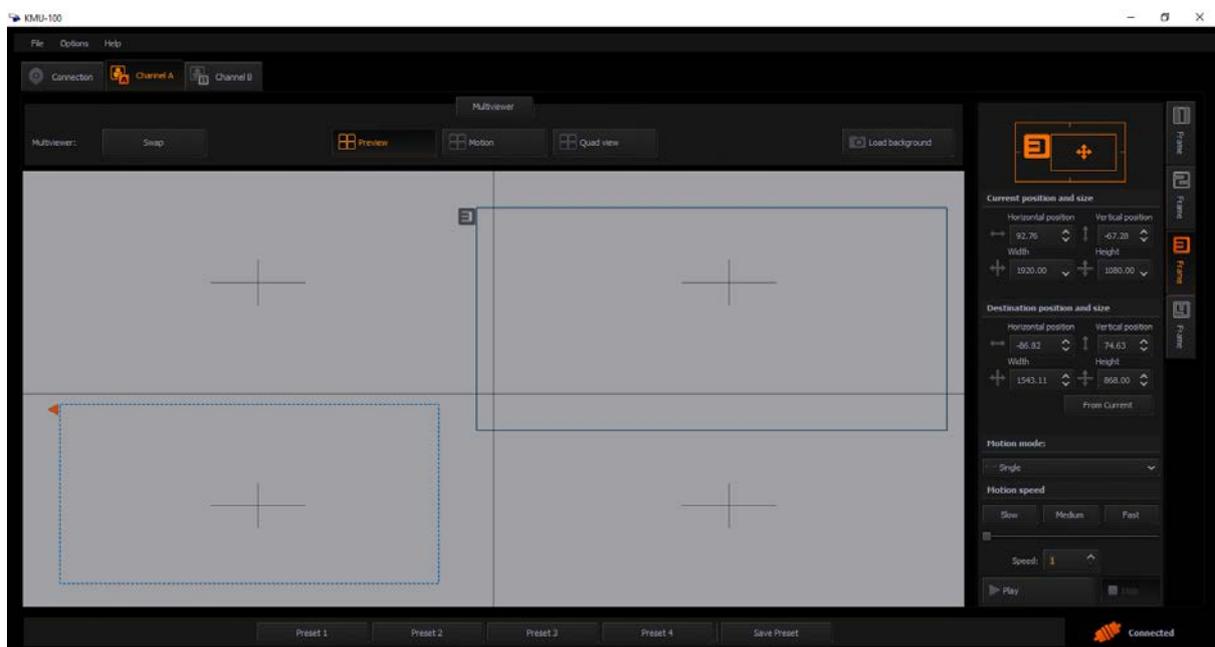
So far we've covered **frame windows 1, 2, 3 and 4** defined as **fixed (stationary)** in their **Start** positions. However, every **frame window can be animated**.

To animate the **Frame Window**, all you need to do is to select the size and position of the **Start rectangle** and **Stop rectangle.** The position and the size of the Start and Stop rectangles can be defined using the mouse cursor or by entering the position coordinates in the **Frame Setting Area** (**Current position and size** and **Destination position and size**).

If you want to set the **final window** position exactly in the place where the **start window** is,

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you can simply click the **From Current** button. After the **From Current** button is clicked, you should be able to see **the Start window overlapping the Stop window** (in identical positions).

Stop rectangle is drawn in dash mode. In the picture below, you can see that the **Start rectangle** is indicated by a short arrow and the **Stop rectangle** is indicated by a longer arrow.
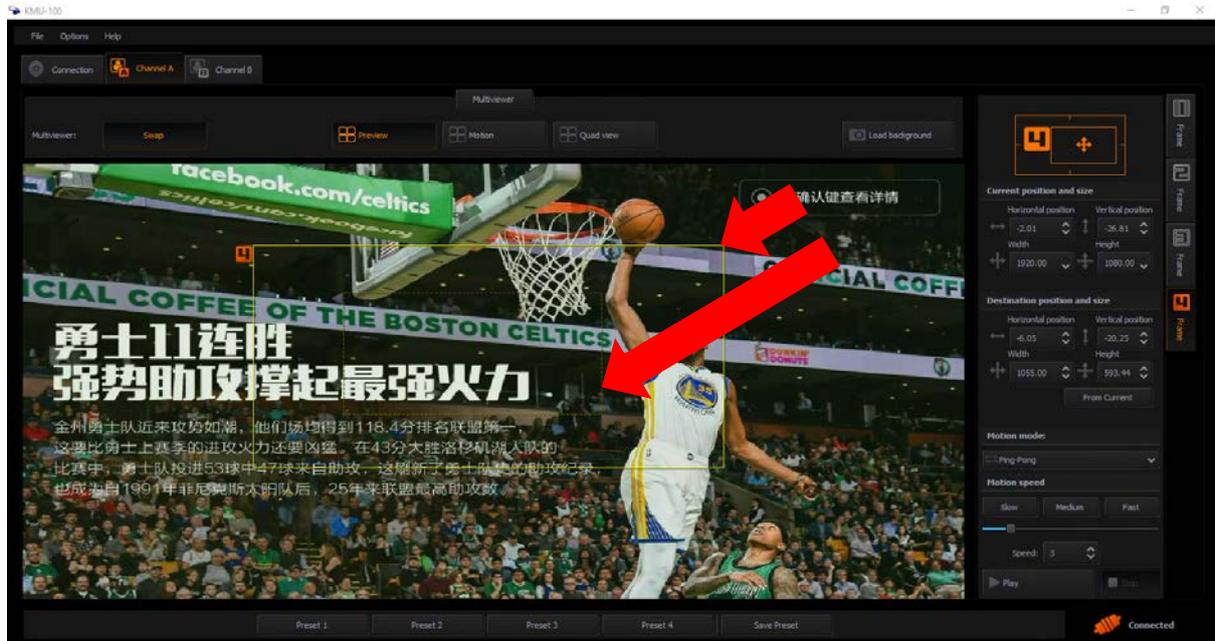
Motion Mode – You can select the motion mode in the **Frame Setting Area**. The available options are:

Off – No animation (default).
Single – Single movement from Start to Stop.
Ping-Pong – Swing cyclical movement, i.e. Start-Stop, Stop-Start, Start-Stop and so on (pendulum swing motion).
Loop – Cyclical movement, i.e. Start-Stop, Start-Stop and so on.

You will see the animation as virtual movement of the camera shot.

In addition to changing the window position, you can define its size as well, thereby effectively realizing a **virtual zoom function**. As shown in the diagram below, the **Stop window** is much smaller size than the **Start window**.
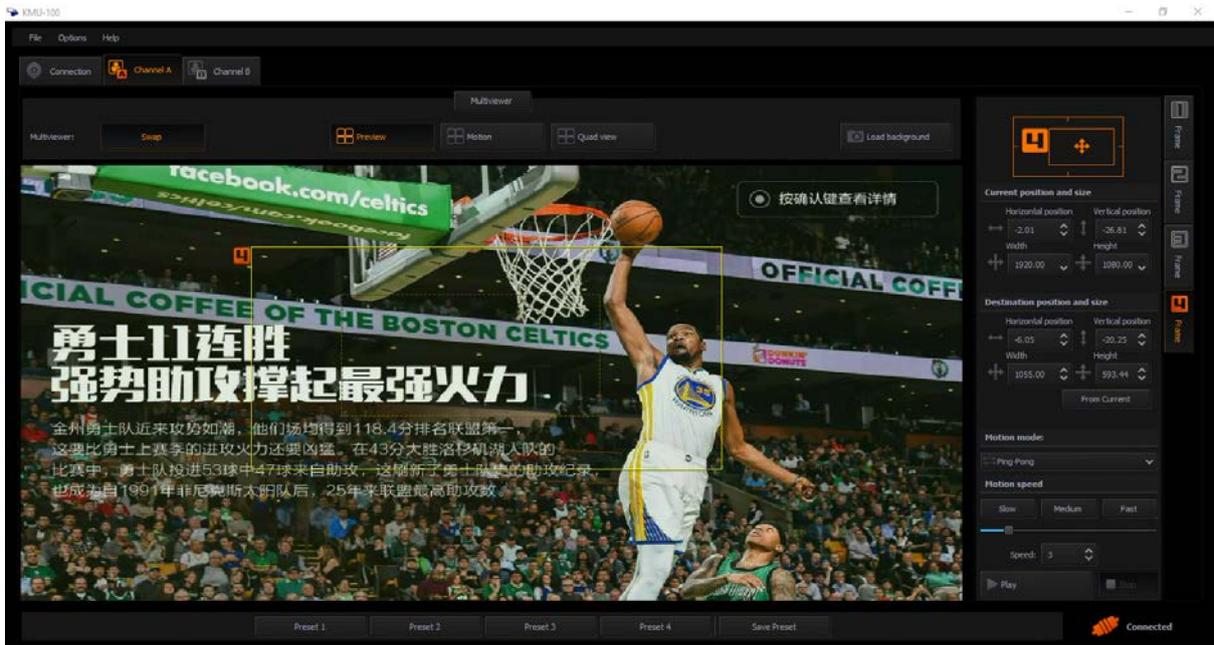
After selection of the motion mode, you are then allowed to select one of the three speed modes (**slow**, **medium**, or **fast**) as shown in the diagram below.
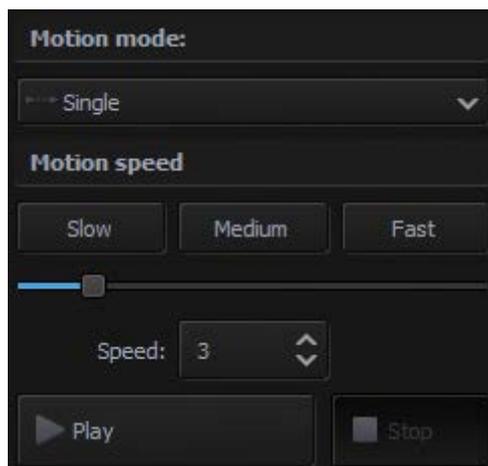
After the size and position of **start and stop windows**, **motion** type and **speed mode** are configured, you can start the animation by clicking **Play** button.

4. Multiviewer – Preview on the Monitor

You are allowed to select a Multiviewer mode to preview on the monitor. The three available modes are **Preview, Motion, and Quad View**.

Preview of the live input is only possible on the **Multiviewer** out. The three modes of the **Multiviewer** output are described as follows.

Preview – Four rectangles at their respective **Start positions** are visible on the live input. **In the diagram below, frame window 1 covers the entire screen**.

Motion preview – The **Start, Current** and **Stop** rectangles of the selected Frame tab are visible on the live input. The diagram below depicts the **rectangles of frame window 1**.

Quad view – In the Quad View mode, preview of contents of the four outputs is displayed on the monitor as shown in the diagram below.

After configuring the properties of frame windows such as position, motion mode, and etc., they can be saved directly to one of the **4 preset slots**.
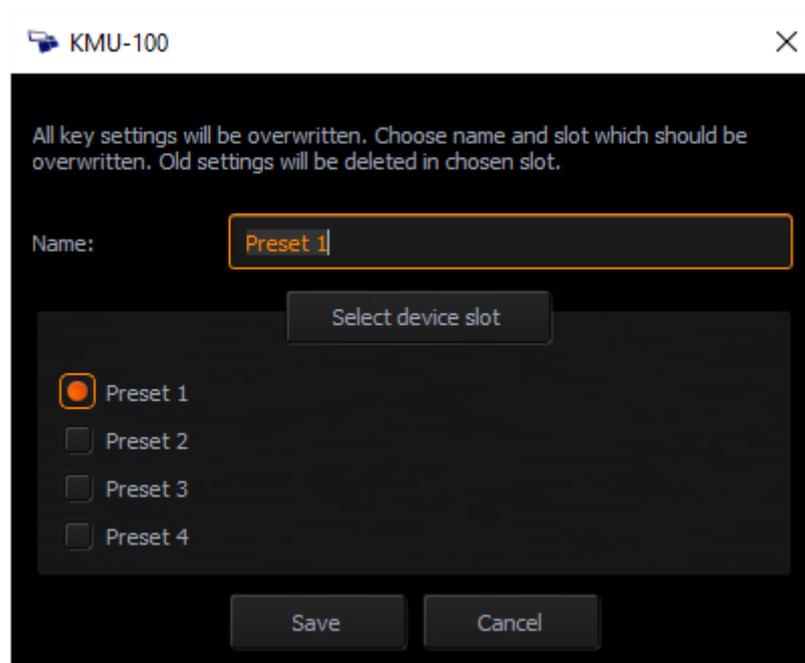
4.3   Tool Bar

There is a **Menu bar** in the top left corner of your screen. You can find three main options which are **File, Options,** and **Help**. The table below shows the sub-options that pop up when you click on the respective main options.

File	Exit	Quit the application
Options	**Language**	Select the language English Chinese/PRC Chinese/Taiwan Polski
	Configuration	Additional application settings Information about the device SDI 3G output type Firmware Network configuration Triggers Temperatures
Help	**About**	About KMU-100: End User License Agreement (EULA), Device, Version.
		A link to the KMU-100 product page.

5. VISCA Control Protocol

5.1 Hardware Specifications

Serial Port	
Items	**Descriptions**
Data Rate	38,400
Word Size	1 start bit + 8 data bits + 1 stop bit
Parity	None
Communications	RS-422
Connector	9 PIN DSub

5.2 Communication Protocol

The KMU-100 serves as a peripheral device in VISCA. The address of the controller is fixed at 1. No daisy-chain is supported.

VISCA Packet Structure

The basic unit of VISCA communication is called a packet. The first byte of the packet is called the header and comprises the sender's and receiver's addresses. The header of the packet sent to the KMU-100 assigned address 1 from the controller (address 0) is hexadecimal 0x81. The header of the reply packet from the KMU-100 assigned address 1 is 0x90.

Command and inquiry

- Command
Sends operational commands to the KMU-100.

- Inquiry
Used for inquiring about the current state of the KMU-100.

	Command Packet	Note
Inquiry	8x qq rr … FF	qq1) = Command/Inquiry, rr2) = category code
1) qq = 01 (Command), 09 (Inquiry) 2) rr = 00 (Interface), 04 (Camera 1), 06 (Pan/Tilter) x = 1: KMU-100 address		

Responses for commands and inquiries

- ACK message
Returned by the KMU-100 when it receives a command. No ACK message is returned for inquiries.

- Completion message
Returned by the KMU-100 when execution of commands or inquiries is completed. In the case of inquiry commands, it will contain reply data for the inquiry after the 3rd byte of the packet. If the ACK message is omitted, the socket number will contain a 0.

	Reply Packet	Note
Ack	x0 4y FF	y = socket number
Completion (Commands)	x0 5y FF	
Completion (Inquiries)	x0 5y … FF	
x = 9: KMU-100 address + 8		

- Error message

When a command or inquiry command could not be executed or failed, an error message is returned.

Error Packet	Description
x0 6y 01 FF	Message length error
x0 6y 02 FF	Syntax error
x0 6y 03 FF	Command buffer full
x0 6y 04 FF	Command cancelled
x0 6y 05 FF	No socket (to be cancelled)
x0 6y 41 FF	Command not executable
x = 9: KMU-100 address + 8, y = socket number Socket number = 1 (normal)	

VISCA Camera-Issued Messages

- ACK/Completion Messages

Command	Command Message	Comments
ACK	x0 4y FF (y: Socket No.)	Returned when the command is accepted
Completion	x0 5y FF (y: Socket No.)	Returned when the command has been executed
x = 9: KMU-100 address + 8		

- Error Messages

Command	Command Messages	Comments
Syntax Error	z0 60 02 FF	Returned when the command format is different or when a command with illegal command parameters is accepted.
Command Buffer Full	z0 60 03 FF	Indicates that two sockets are already being used (executing two commands) and the command could not be accepted when received.
No Socket	z0 6y 05 FF (y: Socket No.)	Returned when no command is executed in a socket specified by the cancel command, or when an invalid socket number is specified.
Command Not Executable	z0 6y 41 FF (y: Socket No.)	Returned when a command cannot be executed due to current

			conditions. For example, when commands controlling the focus manually are received during auto focus.

Command List

Command Set	Command	Command Packet	Comments
CAM_Zoom	Stop	8x 01 04 07 00 FF	p (=0:Slow to 7:Fast) changes current frame dimensions
	Tele (Variable)	8x 01 04 07 2p FF	
	Wide (Variable)	8x 01 04 07 3p FF	
Pan-tilt Drive	Up	8x 01 06 01 VV WW 03 01 FF	PanSpeed VV (=01:Slow to 18h:Fast) TiltSpeed WW (=01:Slow to 18h:Fast) changes current frame position
	Down	8x 01 06 01 VV WW 03 02 FF	
	Left	8x 01 06 01 VV WW 01 03 FF	
	Right	8x 01 06 01 VV WW 02 03 FF	
	UpLeft	8x 01 06 01 VV WW 01 01 FF	
	UpRight	8x 01 06 01 VV WW 02 01 FF	
	DownLeft	8x 01 06 01 VV WW 01 02 FF	
	DownRight	8x 01 06 01 VV WW 02 02 FF	
	Stop	8x 01 06 01 VV WW 03 03 FF	
KMU Active frame	Set active frame	8x 01 78 01 0p 0q FF	Animation No. p (0-7) Frame q (0:First, 1:Last)
KMU Animation	Play / Pause	8x 01 78 02 0p 00 FF	Animation No. p (0-7)
	Stop	8x 01 78 02 0p 01 FF	
KMU Animation Speed	Set absolute speed	8x 01 78 03 0p 0q FF	Animation No. p (0-7) Speed q (1-15)
	Increase speed	8x 01 78 03 0p 10 FF	
	Decrease speed	8x 01 78 03 0p 11 FF	
KMU Animation Mode	Set animation mode	8x 01 78 04 0p 0q FF	Animation No. p (0-7) Mode q (0-7)
KMU Multiviewer Mode	Set preview mode	8x 01 78 05 0p 00 FF	Multiviewer No. p (0-1)
	Set animation mode	8x 01 78 05 0p 01 FF	
	Set quad mode	8x 01 78 05 0p 02 FF	
KMU Presets	Save preset	8x 01 78 06 0p 00 FF	Preset No. p (0-3)
	Load preset	8x 01 78 06 0p 01 FF	
KMU Format Set	Set output format	8x 01 78 07 pp FF	pp: KMU format code (refer to the KMU

			format codes table)
KMU Input Source Set	Set input source	8x 01 78 08 0p qq FF	p: input no. qq: input source Values: 0 – SDI single 3 – SDI quad 4 – HDMI 5 – DP (Only for input 1) 10 – Clone Another values are reserved.
KMU Multiviewer Swap Set	Multiviewer swap on	8x 01 78 09 01 FF	
	Multiviewer swap off	8x 01 78 09 00 FF	
KMU Multiviewer to SDI Set	SDI multiviewer on	8x 01 78 0A 01 FF	
	SDI multiviewer off	8x 01 78 0A 00 FF	
KMU Genlock Config Set	Set genlock configuration	8x 01 78 0B pq FF	p: genlock (0: disable, 1: enable); q: termination (0: disable, 1: enable)
KMU 3G SDI Type Set	Set type A	8x 01 78 0C 00 FF	Set SDI signal type for 3G formats
	Set type B	8x 01 78 0C 01 FF	Set SDI signal type for 3G formats
KMU Trigger Set	Set falling edge trigger mode	8x 01 78 0D 0p 00 FF	p: animation no.
	Set rising edge trigger mode	8x 01 78 0D 0p 01 FF	

Inquiry List

Inquiry Command	Command Packet	Inquiry Packet	Comments
CAM_PowerInq	8x 09 04 00 FF	y0 50 02 FF	On
CAM_VersionInq	8x 09 00 02 FF	y0 50 aa bb cc dd ee ff gg hh ii jj kk ll mm FF	aabb: vendor ccdd: mb version eeff: rs rom version gghhii: fpga version jjkkllmm: motor version
PTC150 Status	8x 09 7E 7E 70 FF	y0 50 aa bb cc dd ee ff gg hh ii jj kk ll FF	
KMU Status	8x 09 78 00 00 FF	y0 50 ab cd ee ee fg FF	a: active animation no. b: active frame (0-first, 1-last) c: active frame speed

			d: active frame mode eeee: animation state bits mask (2 - bits per animation) (0: animation active, 1: animation stopped, 2: animation paused, 3: reserved) f: multiviewer 1 mode g: multiviewer 0 mode
KMU Output Format Get	8x 09 78 07 00 FF	y0 50 aa FF	aa: output format code (refer to KMU format codes table)
KMU Input Source Get	8x 09 78 08 0a FF	y0 50 bb FF	0a: input no. bb: input source Values (hexadecimal): 0 – SDI single 3 – SDI quad 4 – HDMI 5 – DP (Only for input 1) 10 – Clone Another values are reserved.
KMU Multiviewer Swap Get	8x 09 78 09 00 FF	y0 50 01 FF	Multiviewer swap on.
		y0 50 00 FF	Multiviewer swap off.
KMU Multiviewer SDI Get	8x 09 78 0A 00 FF	y0 50 01 FF	SDI multiviewer on.
		y0 50 00 FF	SDI multiviewer off.
KMU Genlock Config Get	8x 09 78 0B 00 FF	y0 50 ab FF	a: genlock (0: disable, 1: enable); b: termination (0: disable, 1: enable)
KMU 3G SDI Type Get	8x 09 78 0C 00 FF	y0 50 00 FF	SDI 3G type A
		y0 50 01 FF	SDI 3G type B
KMU Trigger Get	8x 09 78 0D 0a FF	y0 50 00 FF	Falling edge trigger mode. a: animation no.
		y0 50 01 FF	Rising edge trigger mode. a: animation no.
KMU Hardware Version	8x 09 78 00 01	y0 50 aa aa aa aa bb FF	a: 32-bits FPGA firmware version b: 8-bits hardware ID
KMU Software Version	8x 09 78 00 02	y0 50 aa aa aa aa bb bb bb bb FF	a: 32-bits NIOS firmware version

			b: 32-bits ARM firmware version
KMU Temperature	8x 09 78 00 03	y0 50 aa bb FF	aa: FPGA chip temperature bb: PCB temperature
KMU Genlock Status	8x 09 78 00 04	y0 50 ab cc FF	a: reference signal present (0: not present, 1: present) b: reference signal status (0: unlocked, 1: locked) cc: reference format (refer to KMU format codes table)

KMU Format Codes	
Hexadecimal Value	Format
00	PAL
01	NTSC
02	reserved
03	PAL 16:9
04	NTSC 16:9
05	720p50
06	720p59
07	720p60
08	1080i50
09	1080i59
0A	1080i60
0B	1080p25
0C	1080p29
0D	1080p30
0E	1080p59
0F	1080p60
10 – 7E	reserved
7F	UNKNOWN
80	UNSUPPORTED
81 - FF	reserved

6.   Frequently-Asked Questions

This section describes problems that you may encounter while using the KMU-100. If you have any questions, please refer to related sections and follow all suggested solutions. If problem still exists, please contact your distributor or the service center.

No.	Problems	Solutions
1.	**The DV LINK APP fails to connect.**	Sometimes the DV LINK APP will be disconnected.
2.	**The PC fails to communicate with the KMU-100**	You might be using non-compliant cables which will cause signal failure after connected to the KMU-100.

7. Dimensions
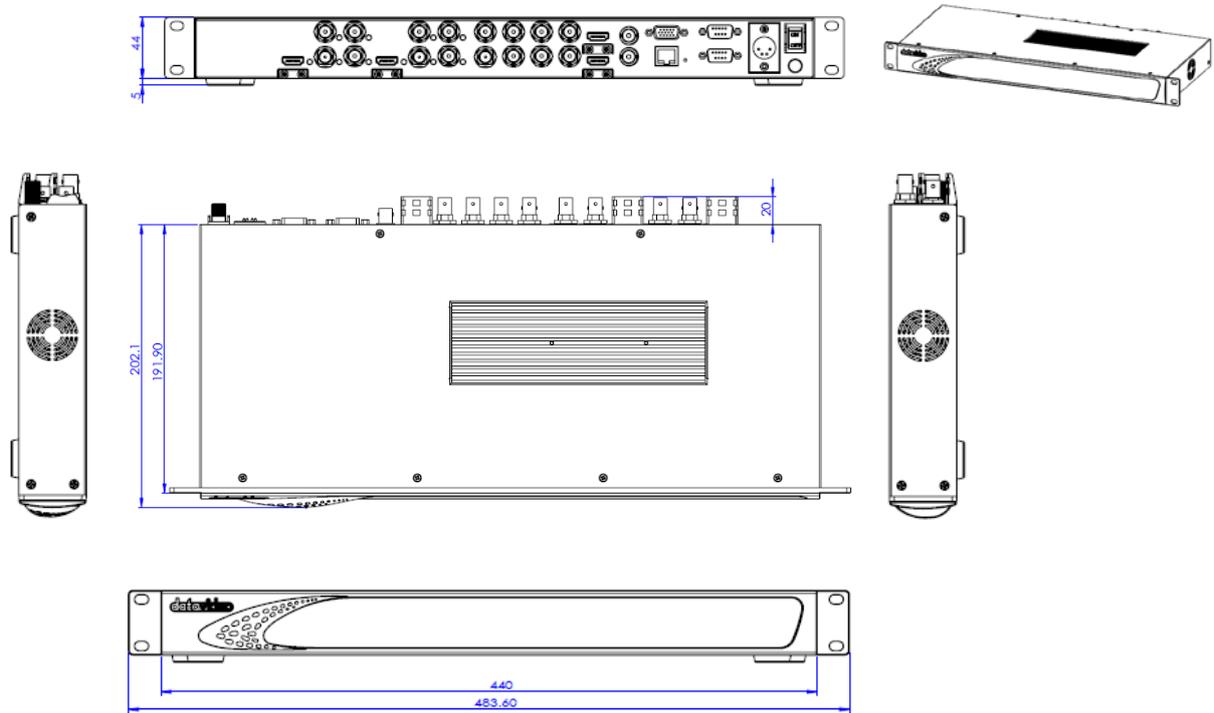
All measurements in millimeters (mm)

8. Specifications

KMU-100 is an advanced video converter which allows the conversion of 2 independent UHD input signals into 2 x 4 or 1 x 8 different streams with resolutions up to FullHD.

Connections	
SDI Video Input	2 x (1) - 10 bit HD, 3G levels A and B, 12G UHD switchable
	6 x (2,3,4) - 10 bit HD, 3G levels A and B switchable; Usable as Quad SDI; 4x3G SDI input for UHD
HDMI Video Input	2x HDMI type A connector with support for 2160p60
SDI Video Output	8 x – 10 bit SD, HD, 3G levels A and B switchable
HDMI Multiviewer Video Output	2x HDMI type A connector with support for 1080p50/59.94/60
SDI Audio Input	16 channels in HD, 3G HD, and UHD
SDI Audio Output	16 channels in HD, 3G HD, and UHD
Multi Rate Support	SDI connections are switchable between standard definition, high definition and UltraHD
Sync Input (Genlock)	Blackburst or TriSync
Computer Interface	Ethernet RJ45 for control, configuration and updates RS-232 x 1 input for controlling configuration
Software	
Software Control	A dedicated software control utility application for changing settings via Windows 7, Windows 8, and Windows 10 is included free of charge.
Power Requirements	
Power Supply	Included external 12V / 5A power supply
Environmental Specifications	
Operating Temperature	5° to 50 ° C (41° to 122° F)
Storage Temperature	-20° to 45°C (-4° to 113°F)
Relative Humidity	0% to 90% non-condensing
Processing – Two independent channels	
Outputs Definition	Each channel has a definition of four rectangles indicating the way the input signal is divided into 4 different outputs. The content bordered by each frame window will be sent to a corresponding output.
Windows Animation	Animation is possible for every frame window. User selects the size and position of Start and Stop rectangles. Motion modes available: **Single** – Single movement from Start to Stop. **Ping-Pong** – Swing cyclical movement, i.e. Start-Stop, Stop-Start, Start-Stop and so on (pendulum swing motion). **Loop** – Cyclical movement, i.e. Start-Stop, Start-Stop and so on.
Multiview Output	Preview of the outputs:

	Preview – Four rectangles at their respective **Start positions** are visible on the live input. **Motion preview** – The **Start, Current** and **Stop** rectangles of the selected Frame tab are visible on the live input. **Quad view** – Preview of the content of four outputs.
Standards	
SD Format	Support
1.5 Gb/s HD Format Support	720p50 720p59.94 1080p25 1080p29.97 1080i50 1080i59.94
3 Gb/s HD Format Support	1080p50, 1080p59.94 and 1080p60 levels A and B
Ultra HD Format Support	2160p25, 2160p29.97, 2160p50, 2160p59.94
SDI Compliance	SMPTE 259M, SMPTE 292M, SMPTE 296M, SMPTE 372M, SMPTE 425M, SMPTE2082-1
Audio Sampling	Television standard sample rate of 48kHz and 24-bit HD, 20-bit SD
Video Sampling	4:2:2
Color Precision	10-bit
Color Space	REC 601, REC 709

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