datavideo

4 CHANNEL HD/SD
HDBaseT PORTABLE
VIDEO STREAMING STUDIO

HS-1600T

Instruction Manual

www.datavideo.com

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Disclaimer of Product & Services

The information offered in this instruction manual is intended as a guide only. At all times, Datavideo Technologies will try to give correct, complete and suitable information. However, Datavideo Technologies cannot exclude that some information in this manual, from time to time, may not be correct or may be incomplete. This manual may contain typing errors, omissions or incorrect information. Datavideo Technologies always recommend that you double check the information in this document for accuracy before making any purchase decision or using the product. Datavideo Technologies is not responsible for any omissions or errors, or for any subsequent loss or damage caused by using the information contained within this manual. Further advice on the content of this manual or on the product can be obtained by contacting your local Datavideo Office or dealer.

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

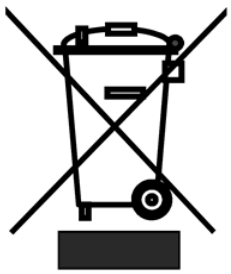
Standard Warranty

- 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 begins 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.
- All non-Datavideo manufactured products (product without Datavideo logo) have only one year warranty from the date of purchase.
- 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.
- All accessories including headphones, 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.

Chapter 1 Introduction

Datavideo's HS-1600T Hand-carry Mobile Switcher, the cutting-edge technology that supports **Full HD 1080P**, is designed for broadcast of live events and TV programs with a need for mixing a wide variety of video and audio sources. The HS-1600T is a highly valuable solution for **religion, education and AV markets**.

With its built-in **HDBaseT technology**, the HS-1600T is able to accept the Full HD 1080p video format from three PTC-150T HDBaseT PTZ Cameras through three individual CAT-6 cables. Each cable runs up to **100 meters**. While shooting in the field, the **PoE** feature serves to power the three PTC-150T devices. The PoE feature can also be used in the field where long-distance transmission is required.

The HS-1600T also features an **audio mixer** with balance XLR inputs and unbalance RCA audio inputs; more features include **PIP**, **WIPE Generator** and **Tally**.

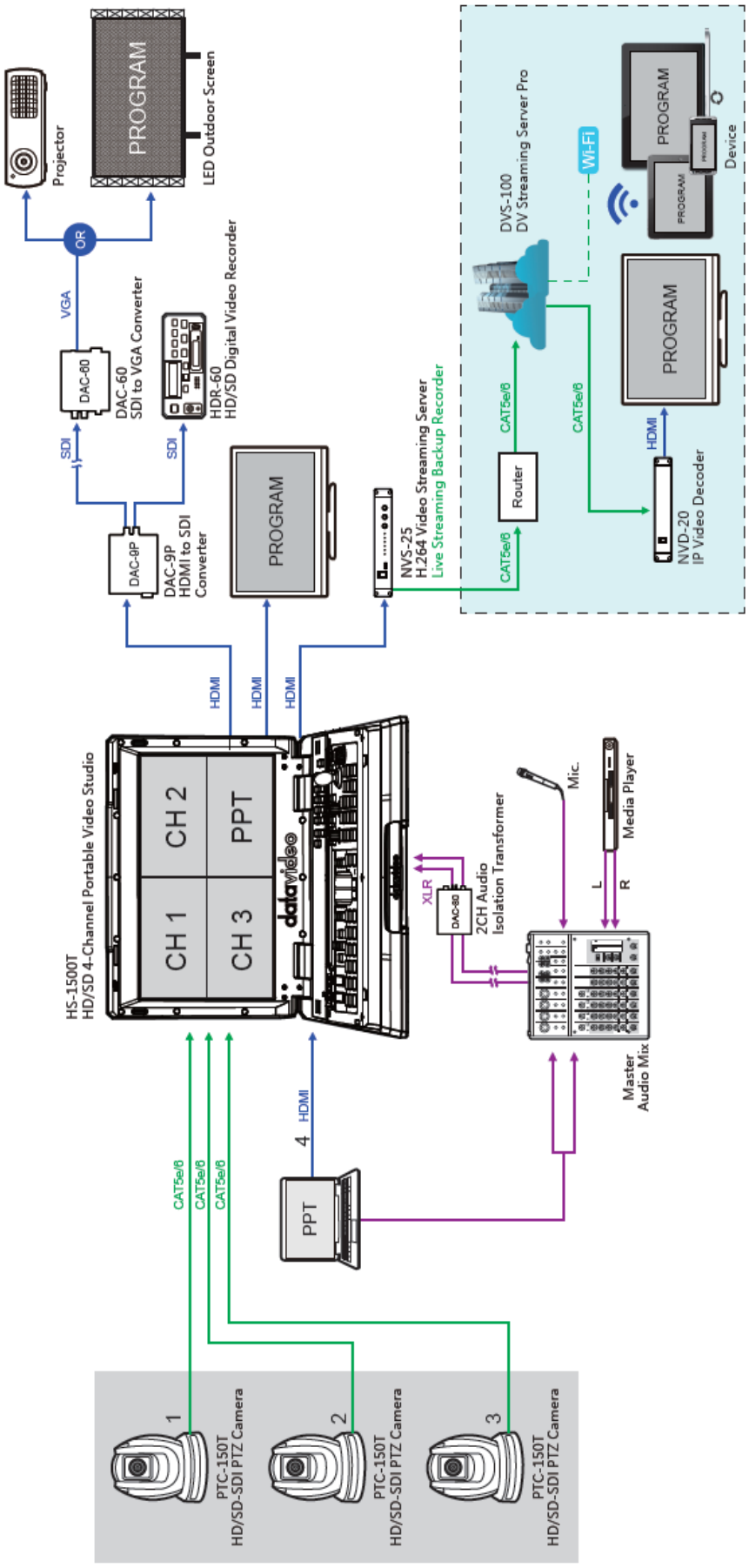
The HS-1600T has a **Joystick** that allows the user to **Pan**, **Tilt** and **Zoom** the PTC-150T camera. In addition, the HS-1600T also allows the user to adjust the PTC-150T's **Focus**, **IRIS** and **other settings**.

HS-1600T also features an easy-to-use video **streaming** and **recording** device for professional video producers who need to simultaneously stream a live event and record the master quality version for post-event editing.

1.1 Features

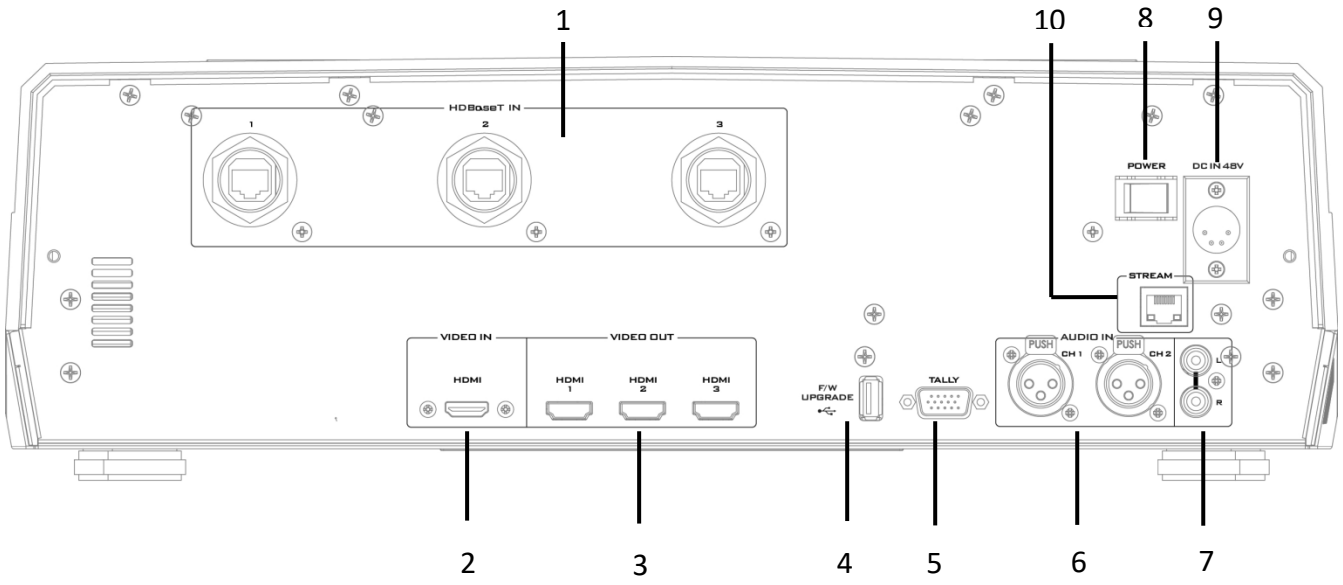
- Full HD 1080P Video Format
- Built-in HDBaseT technology to connect three PTC-150T HDBaseT PTZ Cameras through three CAT-6 (or higher) cables with each cable running up to 100 meters.
- PoE technology to Power the PTC-150Ts
- Joystick Pan, Tilt and Zoom with speed control
- Iris, Focus, and Gain Control as well as other PTC-150T camera functions
- Simultaneous Live Streaming & Recording
- Broadcast quality HD / SD H.264 network streaming
- Support different bitrates for recording and streaming
- 4 Video Inputs (RJ-45 x 3 + HDMI x 1)
- 3 Video Outputs (HDMI x 3)
- Audio inputs: XLR Analogue x 2 + RCA Analogue (L/R) x 2
- Versatile Mix Effects: PIP, WIPE, Mix and Fades
- Tally Output
- One 17.3-inch monitor with a resolution of 1920x1080

1.2 System Diagram

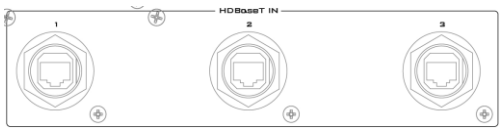


Chapter 2 Connections and Controls

2.1 Rear Panel



1	HDBaseT Port x 3	6	MIC IN – CH1/CH2
2	HDMI Video IN	7	Audio Input – Stereo RCA (Left/Right)
3	HDMI Video OUT x 3	8	DC IN
4	USB F/W Upgrade Port	9	Power Switch
5	TALLY Output Port	10	Stream Port



1. HDBaseT IN
The HDBaseT ports connect three HDBaseT cameras via three CAT-6 Ethernet cables. The camera videos will be displayed on the respective Multiview quadrants.

Note: The HDBaseT port is a specially designed port with an outer fastening ring allowing the user to secure the Ethernet cable connection. In the product package, three Ethernet cable connectors are provided for the user to customize your cable connection in your application environment.

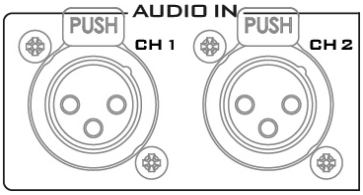
2. HDMI Video Input
The HDMI Video Input port connects an additional video source device and the video will be displayed on the fourth quadrant.

3. HDMI Video Output 1 – 3
Connect to a monitor for Program OUT display or other HDMI destination devices.

4. USB F/W Upgrade Port
USB port for firmware upgrade. Please refer to the Firmware Upgrade section for details.

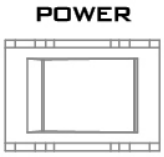
5. TALLY Output Port
Sends **Red** and **Green** tally signals to each channel.

Red indicates On-Air, and **Green** indicates next camera source. Tally output port can connect other Datavideo peripheral devices such as ITC-100, ITC-200, AM-100 or other monitor models, allowing the peripheral device to communicate with the HS-1600T or send tally signal to be displayed on the monitor.

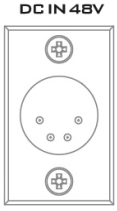


6. Audio Input – XLR Balanced (CH1/CH2)
Two channels of XLR Balanced Audio Input.

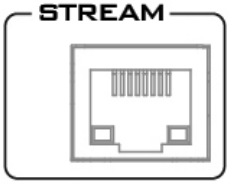
7. Audio Input – Stereo RCA (Left/Right)
Connects unbalanced analog audio source (stereo).



8. Power Switch
Power switch ON/OFF



9. DC IN
DC in socket connects the supplied 48V / 190W PSU. The connection can be secured by screwing the outer fastening ring of the DC In plug to the socket.

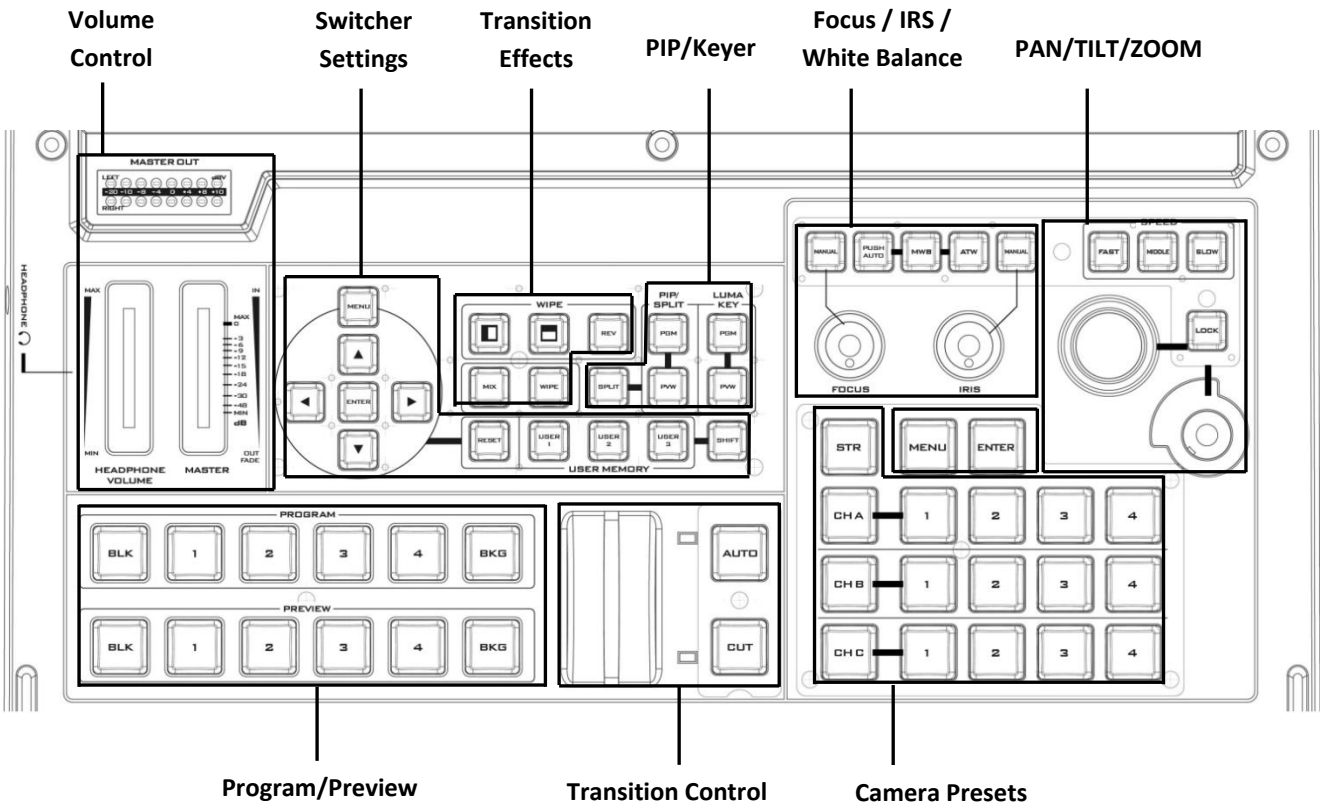


10. Stream Port

The stream port allows the user to establish direct connection between the notebook computer and the HS-1600T in order to access the built-in NVS-31 or connect the NVS-31 to any local area network.

Note: See the chapter on Video Streaming for device configuration.

2.2 Switcher Keyboard Panel



Switcher Settings	Volume Control
Menu browsing buttons	Volume adjustment sliders
RESET button	Headphone jack
User Memory	Audio meter
Shift button	Headphone volume control knob
Transition Effects	**Camera Presets**
WIPE transition effect selection	Channel Selection Buttons
MIX Enable/Disable button	Preset Buttons
WIPE transition effect Enable/Disable	STR Button
PIP/Keyer	**FOCUS / IRIS / White Balance**
Enable/Disable buttons for PIP Keyer	Focus Adjustment
Luma Keyer Enable/Disable buttons	IRIS Adjustment
Split Activation button	White Balance
Transition Control	**PAN / TILT / ZOOM**
T-Bar (manual transition)	Speed Selection Buttons

CUT button
AUTO transition button

Program/Preview

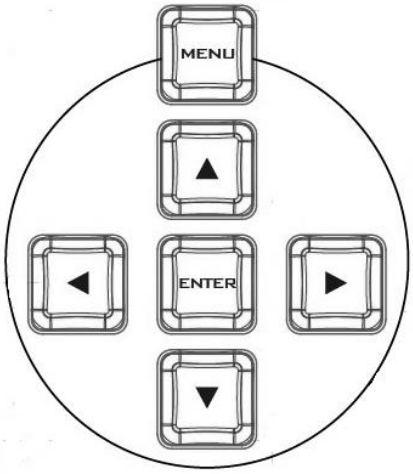
Program row
Preview row

Joystick – PAN/TILT
VR Knob – ZOOM
LOCK Button

Camera MENU Control

MENU Button
ENTER Button

Switcher Settings



Menu browsing buttons

Press the **MENU** button to gain access to the menu; use the up/down/left/right **arrow buttons** to browse through the menu and press **ENTER** button to select an option or **MENU** button again to exit.

Reset Button

Mode 1 – When in Menu Select mode (left hand column of the OSD menu), pressing the 'Reset' button will reset all current menu items to their factory defaults.

Mode 2 – When in a Sub-Menu, pressing the 'Reset' button will reset the current menu line only.

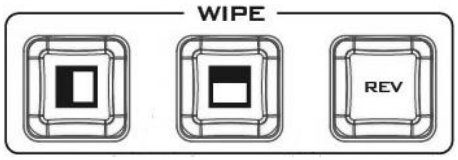
User Memory

User Memory buttons 1-3 allow the user to quickly recall and load previously saved switcher settings with a single button press. This includes PIP and Keyer settings. See the User Memory section for more information.

Shift Button

Pressing the **Shift** button will switch USER 1-3 buttons to USER 4-6 buttons

Transition Effects



WIPE Transition Effect Selection
Each Wipe button consists of black and white colors. The white represents the current **Program** image and the black represents the **WIPE-IN** image. The HS-1600T provides 3 WIPE presets with the **Horizontal** and **Vertical** WIPEs selectable on the control panel. The **Center** WIPE can be selected from the menu (Start).

Pressing the **REV** button reverses the direction of the **WIPE**.

MIX Enable/Disable Button
A **MIX**, also known as a dissolve, is a transition wherein the Program video is replaced by the Preview video at a smooth rate, and at the same time. Pressing the **MIX** button enables the **MIX** transition effect and automatically disables the **WIPE** button. To trigger the **MIX** effect, simply press the **AUTO** button or move the **T-Bar**.

WIPE Transition Effect Enable/Disable Button
Pressing the **WIPE** button enables the **WIPE** transition effect after which the **WIPE** transition effect can be selected. To trigger the **WIPE** transition effect, simply press the **AUTO** button or move the **T-Bar**.

Wipe Transition Effect, **Border** and **Position** settings can be found in the OSD menu (Start).

PIP / Keyer

Enable/Disable Buttons for PIP Keyer
Picture in Picture puts the selected Sub Video Source in a window on the Main Program view, with control over window size and placement. For PIP configuration, please refer to the PIP section.

PIP PGM: Shows the configured PIP on the PGM output after transition, however, the PIP cannot be previewed on the QUAD split view display.

PIP PVW: Sets the configured PIP on the next transition. Holding down this button allows selection of the PIP source from the Preview Source row. The selected source button will flash.

Luma Keyer Enable/Disable Buttons

Luma Key PGM: Shows the luma key source on the PGM output and enables the luma key effect, however, the luma key effect cannot be previewed on the QUAD split view display.

Luma Key PVW: Enables luma key source for the PGM output on the next transition. Holding down this button allows selection of the luma key source from the Preview Source row. The selected source button will flash.

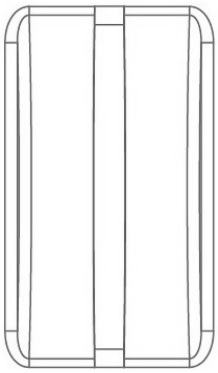
Please refer to Section 3.4, the Luma Key section, for luma key configurations.

Split Activation Button

After activating the PIP window, pressing the **Split** button will split the PROGRAM output display into two with the program out view on the left and the PIP view on the right.

To select the Split source, i.e. the program out view, please see Section 3.2.5.

Transition Control



T-Bar (Manual Transition)

T-Bar is used for manual transition. The **T-Bar** can be either all the way up, all the way down or anywhere in between. When the T-Bar is pushed to halfway between the topmost position and the bottommost position, the keyboard functions will be disabled.

PVW and **PGM** views can be transitioned at your preferred speed. To include the transition effect, simply press the **WIPE** or **MIX** button, after which the **Transition Effect** will be triggered as you move the **T-Bar**.

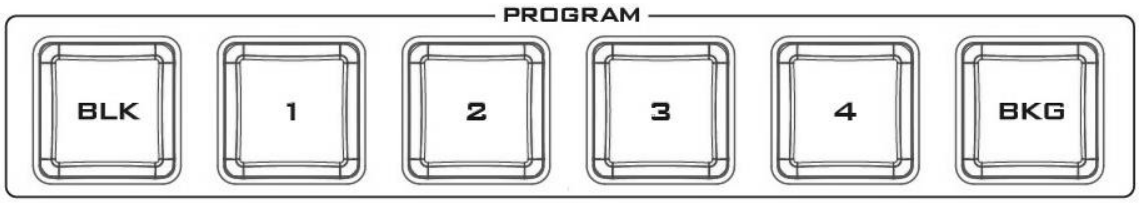
CUT Button

Pressing the **Cut** button performs **i**mmediate manual switch between PVW and PGM views without the transition effect.

AUTO Button

Pressing the **Auto** button automatically transitions **PVW** and **PGM** views according to the selected speed and the configured transition effect.

Program Output



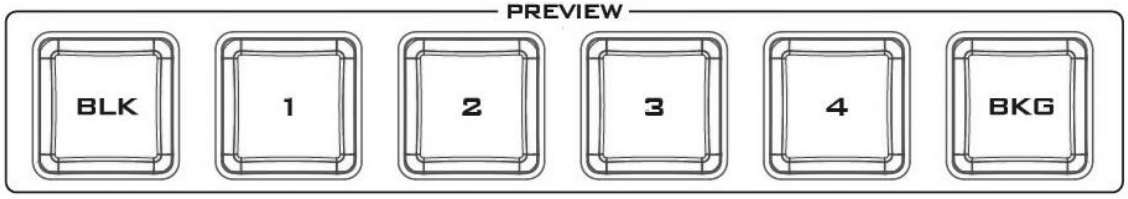
Program Source Row
Pressing the number buttons along the **PROGRAM** row selects a video source for the **PGM** view.

BKG button: Pressing the **BKG** button will switch the background to a **Matte** background. The BKG color can be configured on the OSD MENU and the available color options are listed as follows:

- White
- Yellow
- Cyan
- Green
- Magenta
- Red
- Blue
- Black

BLK button: Pressing the **BLK** button places a black screen on the **PROGRAM** view.

Preview Output



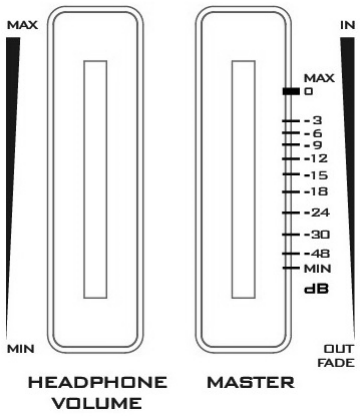
Preview Source Row
Pressing the number buttons along the **PREVIEW** row selects a video source.

BKG button: Pressing the **BKG** button will set the Preview OUT to a **Matte** background, which will be displayed on the **Program OUT** monitor upon the next transition. The BKG color can be configured on the OSD MENU and the available color options are listed as follows:

- White
- Yellow
- Cyan
- Green
- Magenta
- Red
- Blue
- Black

BLK button: Pressing the **BLK** button sets the **Preview** OUT to a black screen.

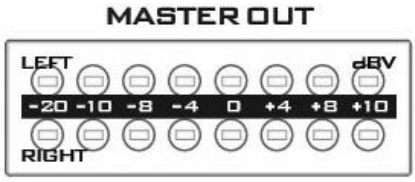
Volume Control



Volume Adjustment Sliders
Sliders to control audio levels for the Main audio mixer.

Headphone Volume: Audio volume of the connected headphone.
Master: Main audio output volume.

Headphone Jack
Headphone jack accepts the mini jack plug of the stereo headphone type. The headphone volume is controlled by the Headphone volume adjustment slider.



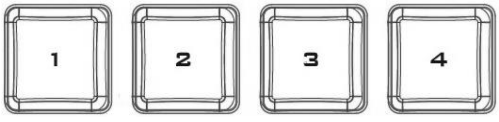
MASTER OUT Meter
The LED style meters show the audio signal strength at the Main Program Audio Output. The signal strength is determined by the level set with the Master OUT slider. The LEDs turn red at +10 dB to indicate clipping distortion.

Audio Volume (dBV)	-20		-10		-8		-4		0		+4		+8		+10
LED Color	G		G		G		G		G		Y		Y		R
Range (dBV)	-20	-12	-11	-9.5	-8.5	-6.5	-5.5	-3	-2	1	2	5.5	6.5	8	9+

G: Green Y: Yellow R: Red

Camera Presets

Channel Selection Buttons
To control or set up a connected camera, first select it by pressing these buttons. The selected channel button will be turned ON.



Preset Buttons
These buttons may be used to store up to four camera positions for each camera. Each button corresponds to one stored camera position. The button LED will be turned ON when selected.

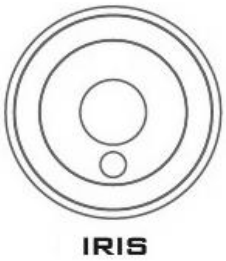
STR Button
Pressing this button enters the HS-1600T into **STORE MODE**. When activated, this allows the current camera position to be stored in a chosen Channel Preset Button. Press again to exit **STORE MODE**.

FOCUS / IRIS / White Balance

Focus Adjustment
To manually control the **FOCUS** setting, first press the **MANUAL** button to enter the manual mode. The button LED will be turned ON to indicate that the manual mode is enabled.

The **FOCUS** dial can then be rotated to set the focus.

If the **MANUAL** button is disabled (OFF), the camera will be in **AUTO FOCUS** mode.



IRIS Adjustment
To manually control the **IRIS** setting, first press the **MANUAL** button to enter the manual mode. The button LED will be turned ON to indicate that the manual mode is enabled.

The **IRIS** dial can then be rotated to set the exposure.

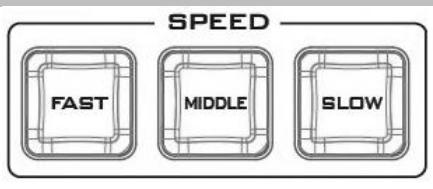
If the **MANUAL** button is disabled (OFF), the camera will be in **AUTO IRIS** mode.

White Balance
Push Auto
Push once to automatically adjust the camera white balance setting.

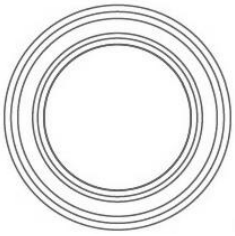
MWB (Manual White Balance)
Push to enable manual white balance setting.

ATW (Force Automatic White Balance)
Push to enable automatic white balance setting.

PAN / TILT / ZOOM



Speed Selection Buttons
The speed at which the selected camera moves can be chosen by pressing one of the three speed buttons.

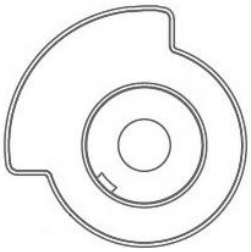


Joystick – PAN / TILT

PAN – Move the joystick left or right to pan the selected PTZ camera from left to right or vice versa.

TILT – Move the joystick up or down to tilt the selected PTZ camera up or down.

Note: Before attempting to use the joystick to PAN or TILT a selected camera, first make sure the **LOCK** button is not enabled. If the **LOCK** button LED is ON, the joystick is locked; press the **LOCK** button to unlock the joystick.



VR Knob – ZOOM

ZOOM – Twist the joystick clockwise (to the right) or anti-clockwise (to the left) to have the selected PTZ camera zoom in or out.

Note: Make sure the **LOCK** button is not enabled. If the **LOCK** button LED is ON, the joystick is locked; press the **LOCK** button to unlock the joystick.

LOCK Button

When enabled, the joystick will be in the lock state. To resume its functional status, simply press the button once to unlock the joystick.

Camera MENU Control

MENU Button

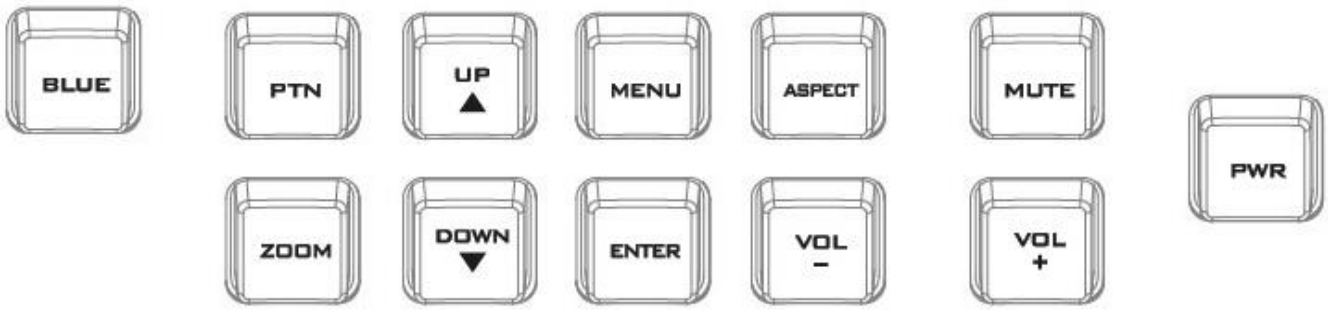
Press once to open the **OSD MENU** of the connected PTC-150T on the monitor screen. Use the **P/T** joystick to move between options. To select, simply press the **ENTER** button. Please see the **PTC-150T instruction manual** for details of the menu operation.

Note: Pressing the menu button again will not exit the **OSD MENU**. Select the **ESCAPE** option on the **OSD MENU** to exit.

ENTER Button

Press this button to select a menu option after the camera OSD menu is opened.

2.3 Monitor Control Panel



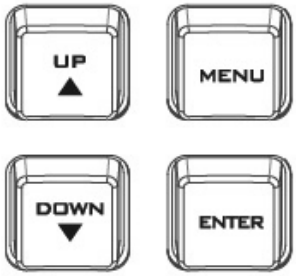
Power
Switches the HS-1600T Monitor Power ON / OFF

BLUE
Press this button to eliminate the red and green component of input signals. Only the blue component of an input is displayed on the screen. This allows adjustments of chroma and phase. (Phase adjustment is effective with NTSC signals).

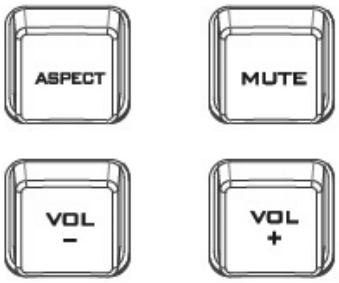
PTN
When pressed displays internally generated SMPTE 75% Colour Bars. Press again to return to the previously selected video input.

ZOOM
This feature is designed for use with HD-SDI and HDMI sources above 720p resolution. Press this button to zoom in to the video on the display. This is strictly a zooming function and does not alter the native aspect ratio of the source pixels to fill the screen.

The **ZOOM** button allows you to toggle the Pixel Zoom feature between **zoom x1, x2, x4** and **x8**.



Menu Navigation Buttons
Display and navigate the setup menus. *See Monitor Menu Options for more details.*

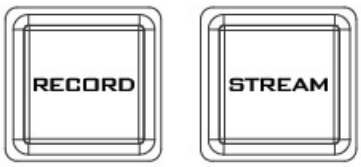


Aspect Ratio Button
Sets the Aspect Ratio to 16:9 / 4:3

Volume Control
Adjusts the speaker / headphone volume up / down.

MUTE
Mutes the audio from the internal speakers or headphone socket.

2.4 Streaming Control Panel



RECORD Button
Press **RECORD** button to start recording.

STREAM Button
Press **STREAM** button to start streaming.

SD Card Slot
Insert the SD card to the slot for recording.

Note: During recording, please do not remove the SD card as it may cause file corruption.

Chapter 3 Switcher OSD Menu

The switcher's OSD menu allows the user to perform several configurations of video effects, such as picture-in-picture, luma key and etc. The user can also configure the audio settings in the Audio option. In addition, in the setup option, the user is allowed to set video output resolution, reset to factory default, and selects the interface language.

3.1 Start

Option	Parameters	Parameter Value or Range	Default Value
Start	**Transition Type**	MIX WIPE	Mix
	Transition Speed	1-200 frames	60 frames; the duration in second depends on the Program OUT resolution.
	WIPE Effect	1. Horizontal 2. Vertical 3. Center	1
	WIPE Border Size	OFF Small Middle Large	Small
	WIPE Border Color	White Yellow Cyan Green Magenta Red Blue Black	Red
	BKG Color	White Yellow Cyan Green Magenta Red Blue Black	White

3.1.1 Transition Type

The HS-1600T provides two types of transition effect, which are cross dissolve (MIX) and WIPE. The default setting is **MIX**.

3.1.2 Transition Speed

The **Transition Speed** allows the user to set the **MIX** or **WIPE** effect duration, in frames. If the **Transition Speed** is set to a value of 60 then the transition will take effect over a period of 1 second if the progressive video is chosen and 2 seconds if the interlaced video is chosen. When the **AUTO button** is pressed, the transition will take the current **Transition Speed** defined by the user.

Note: Pressing the left or right arrow button on the control panel allows the user to either decrement or increment Position X by 1. To change the parameter value at an accelerated rate, simply press and hold the left or right arrow button.

3.1.3 Wipe Effect

On the HS-1600T, there are three wipe effects available for the user to choose. The three wipe effects are **HORIZONTAL**, **VERTICAL** and **CENTER**. The default is Horizontal.

3.1.4 WIPE Border Size

The **WIPE Border Size** generally allows the user to select an appropriate border width. Setting the **WIPE Border Size** to OFF turns the border off. Setting this parameter to small selects a thin border; middle will yield a medium size width; large is the maximum wipe border width.

3.1.5 WIPE Border Color

In this option, you will be allowed to select a color for your wipe border. The available colors are listed as follows:

- White
- Yellow
- Cyan
- Green
- Magenta
- Red
- Blue
- Black

3.1.6 BKG Color

In this option, you will be allowed to assign a color to the **BKG** button. The available colors are listed as follows:

- White
- Yellow
- Cyan
- Green
- Magenta
- Red
- Blue
- Black

3.2 PIP / Split

Picture-In-Picture (P-In-P) places a sub window on the **PGM** or **Multiview** screen. This option (**PIP/Split**) allows you to configure various parameters of the PIP window.

Note: When PIP and Lumakey features are enabled at the same time, the lumakey source will be the upper layer and the PIP source will be the lower layer. The layer order cannot be changed.

Option	Parameters	Parameter Value or Range	Default Value
PIP/Split	PIP Source	Black	Input 2

		Input 1 Input 2 Input 3 **Input 4*** Background Color Bar	
	PIP Size	1-100%	30%
	Position X	-50% - +50%	20%
	Position Y	-50% - +50%	10%
	Split Source	Black Input 1 Input 2 Input 3 **Input 4*** Background Color Bar	Input 2
	Border Size	OFF Small Middle Large	Small
	Border Color	White Yellow Cyan Green Magenta Red Blue Black	Red

3.2.1 PIP Source

In this option, the user will be allowed to assign the PIP source; the available sources are listed as follows:

- Black
- Input 1
- Input 2
- Input 3
- **Input 4***
- Background
- Color Bar

Tip: To quickly assign the PIP source, simply press and hold the PIP PGM button and then select a source from the Program BUS.

3.2.2 PIP Size (PIP Window Size)

The PIP Size parameter ranges from 1 to 100 with 1% being the smallest and 100 being the largest. Therefore 50% would represent a PIP window which is half the size of the background image. 100% would see the PIP window totally cover the background image unless offset to one side.

3.2.3 Position X

Adjusting **Position X** parameter moves the PIP window horizontally. Pressing the left or right arrow button on the control panel allows the user to either decrement or increment **Position X** by 1. To change the parameter value at an accelerated rate, simply press and hold the left or right arrow button.

3.2.4 Position Y

Adjusting **Position Y** parameter moves the PIP window vertically. Pressing the up or down arrow button allows the user to either increment or decrement **Position Y** by 10. Press and hold the up and down arrow buttons to change the parameter value at an accelerated rate.

3.2.5 Split Source

After the PIP window is activated, pressing the Split button will split the PROGRAM output display into two with the program out view on the left and the PIP view on the right. The Split source, i.e. the program out view, can be selected in this option. The available split sources are listed as follows:

- Black
- Input 1
- Input 2
- Input 3
- **Input 4***
- Background
- Color Bar

3.2.6 Border Size

The **Border Size** generally allows the user to select an appropriate PIP border width. Setting the **Border Size** to OFF turns the PIP border off. Setting this parameter to small selects a thin border; middle will yield a medium size width; large is the maximum PIP border width.

3.2.7 Border Color

The user is allowed to assign a PIP border color. The available colors are listed as follows:

- White
- Yellow
- Cyan
- Green
- Magenta
- Red
- Blue
- Black

Note: Select Input 4 if you would like to use the video source connected to the HDMI input.

3.3 PIP Crop

The PIP Crop basically adjusts the PIP window borders. You can adjust each side individually (Left / Right / Top / Bottom) or all four sides at the same time (Size).

Option	Parameters	Parameter Value or Range	Default Value
PIP Crop	Size	0 – 100%	0
	Left	0 – 100%	0
	Right	0 – 100%	0
	Top	0 – 100%	0
	Bottom	0 – 100%	0

The effects of all parameters are described below:

- **Left** – Adjusts the position of the left edge of the PIP window.
- **Right** – Adjusts the position of the right edge of the PIP window.
- **Size** – Adjusts the PIP image crop size.
- **Top** – Adjusts the position of the top edge of the PIP window.
- **Bot** – Adjusts the position of the bottom edge of the PIP window.

3.4 Lumakey

Keyer of the HS-1600T provides the user with the capability of luma keying.

Note: When PIP and Lumakey features are enabled at the same time, the lumakey source will be the upper layer and the PIP source will be the lower layer. The layer order cannot be changed.

Option	Parameters	Parameter Value or Range	Default Value
Lumakey	Lumakey Source	Black Input 1 Input 2 Input 3 **Input 4*** Background Color Bar	Input 2
	Mode	Black White	Black
	Cleanup Level	0 – 100	20
	Transparency	0 – 64	64

3.4.1 Lumakey Source

Lumakey source is where you can select the image for luma keying. The available sources are listed as follows:

- Black
- Input 1
- Input 2
- Input 3
- **Input 4***
- Background
- Color Bar

3.4.2 Mode

There are two modes available on the Luma Keyer. Select Black if the image is on a black background and white if the image is on a white background.

3.4.3 Cleanup Level

The **Cleanup Level** allows the user to fine tune the effect of the luma key. The default value is 20.

3.4.4 Transparency

In this option, you will be able to adjust the transparency of the overall foreground key image.

Note: Select Input 4 if you would like to use the video source connected to the HDMI input.

3.5 Audio

This option allows the user to configure various audio settings such as muting HDMI output audio, set the audio type, selecting your tally type and etc.

Option	Parameters	Parameter Value or Range	Default Value
Audio	Mute	OFF/ON	Off
	HDMI Input	Input 1-4 / Follow	Follow
	HDMI Group	Channel 1/2 Channel 3/4 Channel 5/6 Channel 7/8	Channel 1/2
	Level	Auto / SMPTE / EBU	Auto
	Tally Mode	Normal / Audio Mixer	Normal

3.5.1 Mute

The **Mute** allows you to turn ON/OFF the embedded audio component at the **HDMI-in**. The default is OFF.

3.5.2 HDMI Input

In this option, you can select the audio source. Selection of input 1-4 allows the HS-1600T to play the enabled audio source. If "**Follow**" is selected, the audio will enter Audio follow Video mode, i.e. playback of the audio of the output video.

3.5.3 HDMI Group

The HDMI Group allows the user to assign the HDMI audio channel. The default audio channel is Channel 1/2. Any audio channel pair of the four audio channel pairs can be selected.

3.5.4 Level

There are two different audio standards available for selection. The user can either select the EBU or SMPTE standard. By selecting AUTO allows the device to automatically detect the audio standard. When the image is 50 Hz, the audio follows EBU standard and when the image is 59.94/60 Hz, the audio follows SMPTE standard.

3.5.5 Tally Mode

Tally output port generally sends two tally signals to each channel. In Datavideo products, **Red** indicates On-Air, and **Green** indicates next camera source.

The HS-1600T provides **two tally modes**:

Normal: If in normal mode, tally lights of all camera sources displayed on the PGM monitor will be turned ON (Red). These sources include PGM, PIP and Key sources. While transition is in progress, the next video will be seen on the PGM monitor, tally light of the PVW source camera will thus also be turned ON (**Red**).

Audio Mixer: If Audio Mixer mode is selected, tally light of the PGM source camera selected on the keyboard panel will be turned ON (Red). While transition is in progress, the tally light color will remain unchanged. The tally light color will only change (red/green) after the transition of PGM and PVW views is complete.

3.6 User Mems

In "**User Mems**", the user is allowed to **load** previously saved settings and **save** the currently configured settings.

Option	Parameters	Parameter Value or Range	Default Value
User Mems	Load Memory	User 1-6	
	Load		
	Save Memory	User 1-6	
	Save		

3.6.1 Load Memory

Use the up/down arrow to select the desired memory location and load the saved setting by selecting "**Load**".

Tip: The user can also press one of the USER memory shortcut buttons (1-3) on the control panel as a quick way of loading those previously saved User configurations. Use the **SHIFT** button to switch between **USER MEMORY 1-3** and **USER MEMORY 4-6**.

3.6.2 Save Memory

Use the up/down arrow to select the desired memory location and save the current setting by selecting "**Save**".

3.7 Setup

In the "Setup" menu, the user can change the **output resolution**, reset the HS-1600T to its **Factory Default** values, choose the preferred OSD menu **language**, **upgrade firmware** and view the **current firmware versions** (Mainboard and Keyboard).

Option	Parameters	Parameter Value or Range	Default Value
Setup	PGM Out Res.	1080p/60 1080p/59.94 1080p/50	

		1080i/60 1080i/59.94 1080i/50 720p/60 720p/59.94 720p/50 576i 480i	
	MV Out Res.	1080p/60 1080p/59.94 1080p/50 1080i/60 1080i/59.94 1080i/50 720p/60 720p/59.94 720p/50	
	Save Setup	[Save]	
	Factory Default	[Reset]	
	Language	English Simplified Chinese Traditional Chinese	
	MB Software	Version	
	KBD Software	Version	

3.7.1 PGM Out Res.

In **PGM Out RES.**, the user is allowed to select an appropriate PROGRAM output resolution. The available resolutions are listed as follows:

- 1080p/60
- 1080p/59.94
- 1080p/50
- 1080i/60
- 1080i/59.94
- 1080i/50
- 720p/60
- 720p/59.94
- 720p/50
- 576i
- 480i

Once done, simply go to "**Save Setup**" to confirm the selected output resolution.

Note: Please make sure the output resolution is same as the input resolution to prevent unexpected issues.

3.7.2 MV Out Res.

In **MV Out RES.**, the user is allowed to select an appropriate MULTIVIEW output resolution. The available resolutions are listed as follows:

- 1080p/60
- 1080p/59.94
- 1080p/50
- 1080i/60
- 1080i/59.94
- 1080i/50
- 720p/60
- 720p/59.94
- 720p/50

Once done, simply go to "**Save Setup**" to confirm the selected output resolution.

Note: The new resolution will be effective once selected. If you have selected a resolution that is not supported by the monitor, you will not be able to view the OSD menu. In this case, please reboot your machine to restore the default resolution previously configured in the "Save Setup" option.

3.7.3 Save Setup

In this option, select "**Save**" to save the current configuration.

3.7.4 Factory Default

Reset: Once selected, the factory default settings will be restored. The device will start the factory reset process in 2 to 3 seconds after "**Reset**" is selected.

3.7.5 Language

The available OSD menu languages are **English**, **Traditional Chinese** and **Simplified Chinese**.

3.7.6 MB and KBD Software

The **MB** and **KBD** software versions will be respectively displayed.

3.8 Camera

In the "**Camera**" menu, the user will be able to change the camera name, view camera information and perform some basic camera settings. The basic camera settings include the video format, mirror mode, PAN/TILT direction and etc.

Option	Sub-options		Parameters	Parameter Value or Range
Camera	Camera CH. Setup		Yes/No	
	[PTC-150T-01/02/03]	Camera Info	Camera Name	
			Vendor ID	
			MB Version	
			FPGA Version	
			Motor Version	
		Video	Video Format	1080i/60 1080i/50 1080p/29.97 1080p/25 720p/59.94

				720p/50 1080p/59.94 1080p/50
			Mirror Mode	Off V H H+V
			Joystick Pan	Normal Reverse
			Joystick Tilt	Normal Reverse
			Memory Speed	1-16
		Operator	Power	On/Off
			R-Gain	0-255
			B-Gain	0-255
			Tally LED	Off Red Green

3.8.1 Camera CH. Setup

By selecting this sub-option, you will be able to enable/disable the camera setup.

3.8.2 PTC-150T-01/02/03

The PTC-150T-01/02/03 options will allow you to configure basic settings of the respective cameras.

Camera Info

Selecting the "**Camera Name**" will open up a keyboard on which you will be able to rename the selected camera. Other parameters right below are simply information display such as **Vendor ID**, **MB Version**, **FPGA Version**, and **Motor Version**.

Video

In the "Video" sub-option, you will be able to configure the **Video Format**, **Mirror Mode**, **Joystick Direction** and **Joystick Speed**.

The available resolutions in the **Video Format** parameter are listed as follows:

- 1080i/60
- 1080i/50
- 1080p/29.97
- 1080p/25
- 720p/59.94
- 720p/50
- 1080p/59.94
- 1080p/50

In "**Mirror Mode**", there are three types of modes available:

- V: Vertical mirroring
- H: Horizontal mirroring

- H+V: Horizontal and Vertical mirroring

In **Joystick Pan/Tilt**, you can either select the normal PAN/TILT direction or reverse the PAN/TILT direction. The PAN/TILT speed can be configured in **Memory Speed**, which ranges from 1-16.

Operator

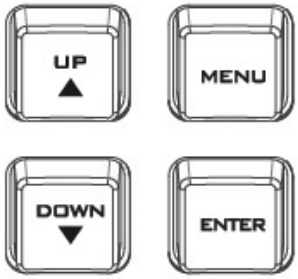
The **Operator** sub-option offers the user basic camera operation functions. Parameters of this sub-option are described below:

"**Power**" basically turns ON/OFF the selected camera.

R-Gain/B-Gain: The red and blue components can be adjusted, ranging from 0 to 255.

Tally LED: You can either turn the tally light off or enable the red or green tally light.

Chapter 4 Monitor



The HS-1600T Monitor can be configured via an on screen menu. When the **MENU** button is pressed the Main Menu list is displayed on the monitor.

This section covers the Menu options in the order that they appear on the monitor. These settings may also appear in more detail elsewhere in this instruction manual. Options may vary depending on the firmware version in use.

Once the chosen setting has been confirmed with the **ENTER** button, it is stored within the switcher's non-volatile memory.

4.1 MENU Options

Main Options	Sub Options	Parameters	Parameters
MAIN ADJUST	BRIGHTNESS	0~100	
	CONTRAST	0~100	
	SHARPNESS	0~100	
	SATURATION	0~100	
	TINT	0~100	
	BACKLIGHT	0~100	
	NR	HIGH / MID / LOW / OFF	
	DLC	ENABLE / DISABLE	
	VOLUME	0~100	
	EXIT		
COLOR	6500		
	9300		
	7500		
	USER COLOR	RED	0~100
		GREEN	0~100
		BLUE	0~100
	EXIT		
SCAN SETTING	UNDER SCAN	Full Image	
	OVER SCAN	Cropped Image	
INFORMATION	H. FREQUENCY		
	V. FREQUENCY		
	RESOLUTION		
	VER.		
LANGUAGE	English [default]		
	Francis		
	Deutsch		
	Español		
	Italiano		
	Dutch		
	Português		
	Russian		
	EXIT		
SPECIAL FUNCTION	OSD TIMOUT	5-120 SEC	

	FRAME RATIO	80 / 90 / 0FF	
	4:3 MARK LINE	ON / OFF	
	CENTRAL MARK	ON / OFF	
	CINEMA ZONE MARK	ON / OFF	
	AUDIO CHANNEL L*		
	AUDIO CHANNEL R*		
	EXIT		
FACTORY RESET			
EXIT			

*** Selectable on PGM only; external HDMI and MV are allowed on 1 and 2 ONLY.**

4.1.1 MAIN ADJUST

After pressing the **MENU** button on the monitor control panel, the first menu option highlighted is the **MAIN ADJUST** option.

Press **ENTER** to access the **MAIN ADJUST** Menu and the **Brightness** option will be highlighted.

To adjust the **Brightness**, press **Enter** again. Use the **Up / Down** buttons to change the value and then press **Enter** to store the new value and return to the main menu.

To configure other settings such as **Contrast**, **Saturation**, **Sharpness**, **TINT** and etc, use the **Up** / **Down** buttons to select the desired option. Follow the above procedure to set the new value.

4.1.2 COLOR

Press **ENTER** to access the **COLOR** menu and the first option will be highlighted.

Press **ENTER** to select the first color option.

Use the **Up** / **Down** buttons to navigate the available color options listed as follows.

- **7500**
- **9300**
- **6500**
- **USER COLOR**

4.1.3 Information

The **System Information** displays **Horizontal Frequency**, **Vertical Frequency**, **Resolution** and the Firmware Version (**Ver.**) of the monitor.

Once selected, the information below will be displayed.

- **H. FREQUENCY**: 33.7KHZ
- **V. FREQUENCY**: 60.0HZ
- **RESOLUTION**: 1920X1080I
- **VER.**: 0.11

4.1.4 Special Function

In the **Special Function**, you will be able to configure **OSD TIMEOUT**, **Frame Ratio, 4:3 MARK LINE**, **Central Mark**, **Cinema Zone Mark** and **Audio Channel L & R**.

Use the **Up** / **Down** buttons to navigate the available options listed as follows. Press **ENTER** to access a particular option.

OSD TIMEOUT	5-120 SEC
FRAME RATIO	90 / 80 / 0FF
4:3 MARK LINE	ON / OFF
CENTRAL MARK	ON / OFF
CINEMA ZONE MARK	ON / OFF
AUDIO CHANNEL L*	1/2/3/4
AUDIO CHANNEL R*	1/2/3/4

4.1.5 Factory Reset

The monitor menu offers a **Factory Reset** option, which will return all the monitor settings to the factory defaults

To reset the monitor, press the **MENU** button and then use the **UP** / **Down** buttons to navigate to the **FACTORY RESET** option. Press **ENTER** again to reset the monitor. After a few seconds, the monitor settings will return to factory defaults.

4.2 Firmware Update Procedure (Monitor)

From time to time Datavideo may release new firmware to either add new features or to fix reported bugs in the current **HS-1600T** Monitor firmware. Customers can update the firmware themselves if they wish or they can contact their local dealer or reseller for assistance should they prefer this method.

This section describes the firmware update process and it should take ***approximately 15 minutes total time to complete***. Once started ***the update process should not be interrupted in any way*** as this could result in a non-responsive unit.

To update the HS-1600T Monitor, you will need:

- The latest firmware update for the **HS-1600T Monitor**.
  This firmware file can be obtained from your local Datavideo office or dealer.
- USB 2.0 pen drive with a USB A connector.

How to update the firmware

1. Unzip / extract the supplied zipped archive or rar folder.
2. Wipe the contents of the USB 2.0 pen drive so it is empty.
3. Transfer / copy the unzipped / extracted file to the USB 2.0 pen drive; make sure the file name is renamed to **MSTFLASH.bin**.
4. Plug the USB 2.0 pen drive into the USB 2.0 port labelled MONITOR F/W UPGRADE on the front of the monitor button panel.
5. Reboot **HS-1600T** and the update will start automatically.
6. The **HS-1600T Monitor** will reboot itself at the end of the process.

Note: The USB port can also be used to power the connected USB LED light.

Chapter 5 Applications

5.1 Placing a logo on the video using the lumakey function

The HS-1600T allows the user to place a logo on the video using the lumakey function. First of all, create a 1920x1080 (16:9) logo against a black or white background on a laptop. Once the logo is created, please follow the steps outlined as follows to insert the logo layer.

Note: If the logo is dark, choose a white background; if the logo consists primarily of bright colors, choose a black background.

1. Connect the laptop to the switcher's **HDMI Input Port**.
2. Press the **MENU** button to open the OSD Menu on the four-quadrant Multiview display.
3. In the **Lumakey** option, set the "**Lumakey Source**" to **Input 4**.
4. In this example, the logo is against a black background so **Black Mode** is chosen.
5. Set the "**Cleanup Level**" to 10 if the background is in total black.
6. "**Transparency**" is set to 64 if an opaque logo is desired. **Opaque** logo can be created by setting the "**Transparency**" parameter to 64. **Semi-transparency** effect can be generated by setting the "**Transparency**" parameter to a value between 0 and 64.
7. Exit the menu after the Logo is properly configured.
8. Press the **Luma Key PGM** button to place the logo on the Program screen or the **Luma Key PVW** button to place the logo on the Preview screen.

5.2 Connecting PTC-150T Cameras

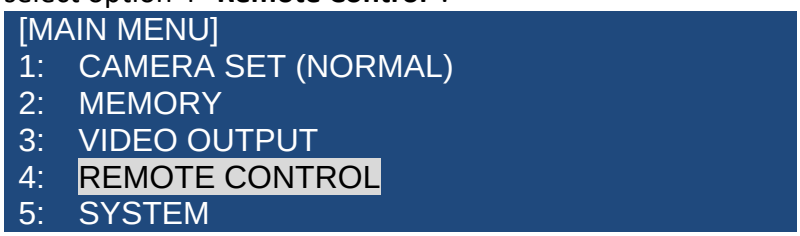
DVIP is a communication interface that allows the user to control multiple PTC-150T cameras remotely. Follow the steps outlined below to set up your PTC-150T cameras with the HS-1600T.

1. Locate the DIP switch at the bottom of the PTC-150T camera

2. Set DIP Switch positions 1 and 4 to ON

3. Power **ON** the PTC-150T PTZ Camera.

4. Open the main menu by pressing the **MENU** button on the HS-1600T's keyboard panel and select option 4 "**Remote Control**".



```
6:  CAMERA SET (ADVANCE)
7:  RESET P/T/Z
8:  ESCAPE
```

5. Select "**SET DVIP**" to configure the DVIP port

```
[REMOTE CONTROL]
1:  PAN/TILT REVERSE: P+T
2:  REMOTE SOURCE: DVIP, SW
3:  SET RS422
4:  SET DVIP
5:  SET IR
6:  PTZ INFO. OUTPUT: OFF
7:  ESCAPE
```

6. Set the **DVIP baud** to 115200

```
[SET DVIP]
1:  DVIP BAUDRATE: 115200
2:  ESCAPE
```

7. Connect the PTC-150T to the HS-1600T, which should automatically assign an IP to the PTC-150T.

Chapter 6 Video Streaming

The HS-1600T Portable Video Studio includes a built-in Video Streaming Server (NVS-31) allowing the user to stream and record your program at the same time. From any HDMI input source, the Datavideo NVS-31 generates an H.264 encoded stream compliant with RTSP or RTMP protocols. While encoding the video at bit rates appropriate for live streaming, the Datavideo NVS-31 concurrently records a high-quality MP4 file to an SD card.

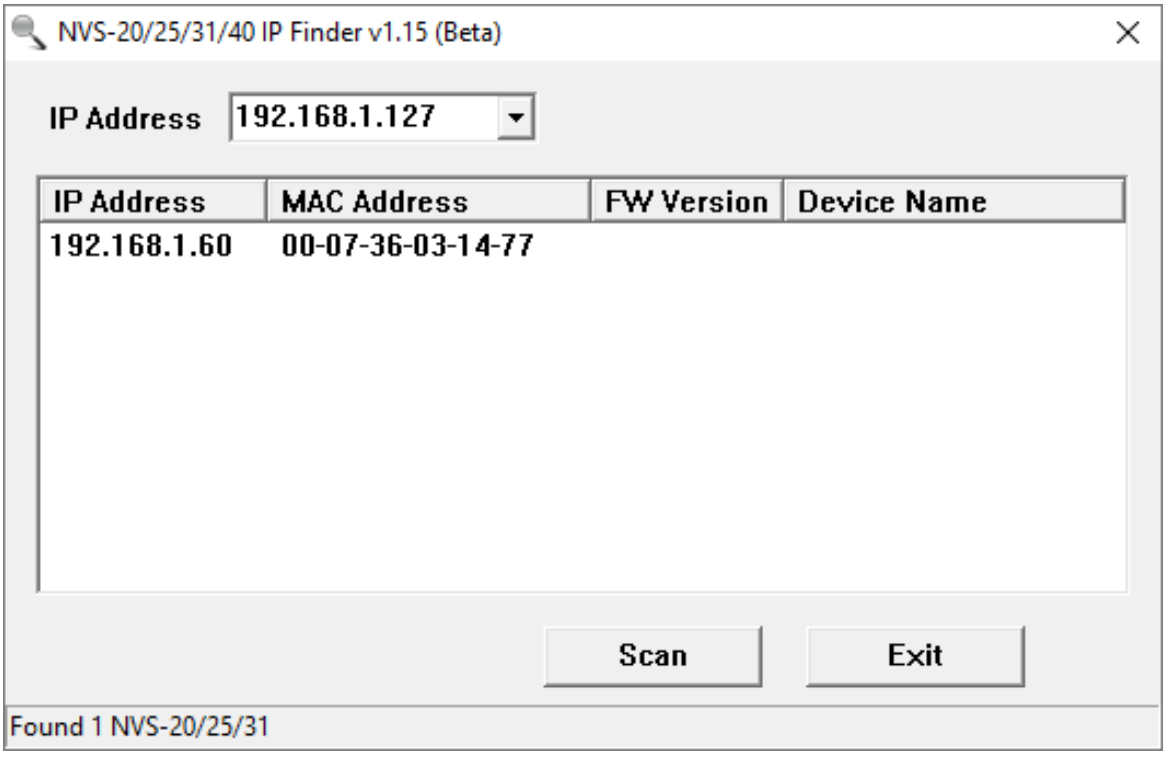
6.1 Streaming Network Connection and Setup

This section details how to connect the NVS-31 to a network with or without a DHCP server, and describes how to acquire the NVS-31 IP address.

Finding the NVS-31's current IP address

You must first know your NVS-31 device's IP address to access the Web User Interface. Datavideo provides a free Windows based utility called IP Finder to search for devices connected on the same network.

On the computer connected to the NVS-31, first download the utility from the product page of HS-1600T. Once downloaded, locate and double click the icon on the left to open the utility shown in the diagram below.



Please note that in order for your computer to communicate with the NVS-31, your computer's IP address must be in the same network range as your NVS-31's IP address. In the above example, change your computer's IP address and subnet mask to the following:

- **IP address** 192.168.1.X
- **Subnet mask** 255.255.0.0

There are basically two ways to establish connection between the NVS-31 and your computer:

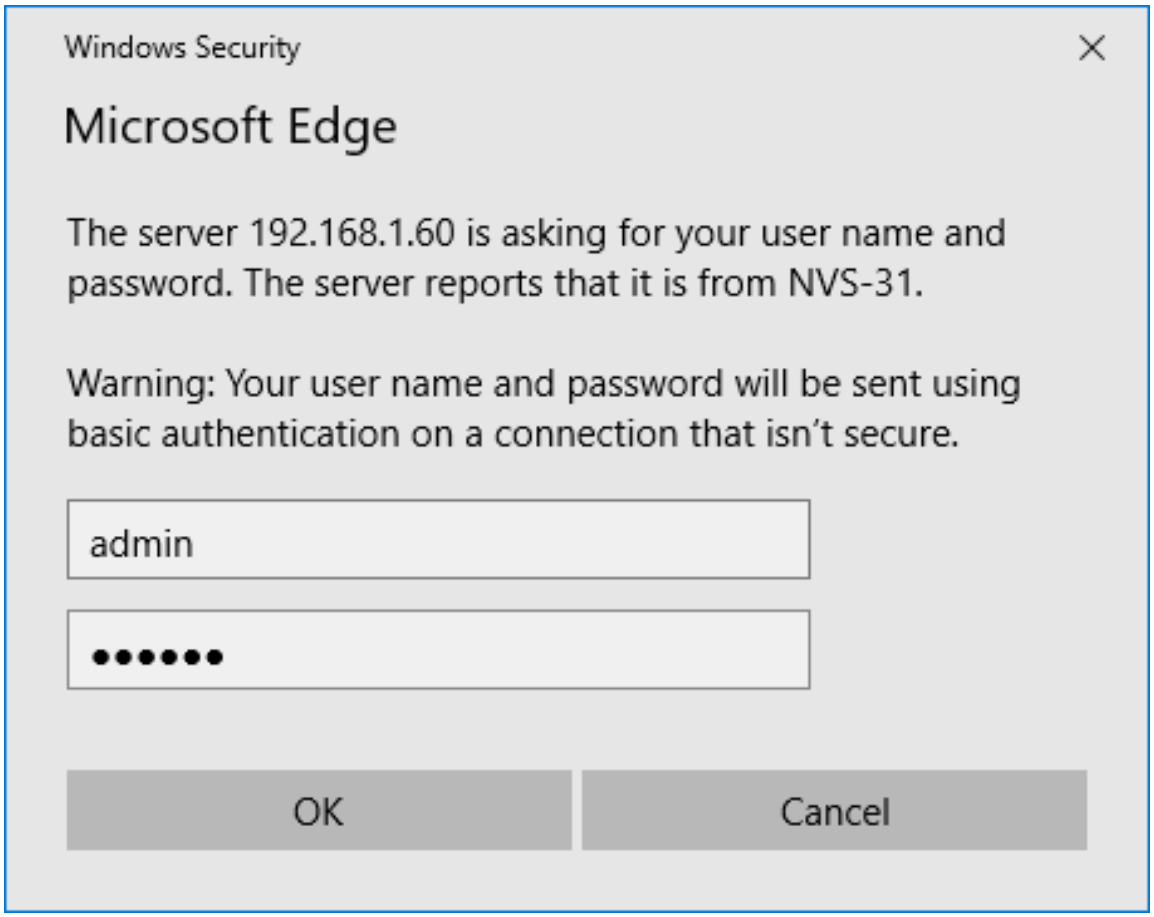
- Connect an Ethernet cable from the NVS-31's LAN port directly to your computer's Ethernet port.
- Connect an Ethernet cable from the NVS-31's LAN port to the same network switch as your computer.

Note: If the first method is chosen, make sure to manually assign an IP address to your PC before making attempts to connect to the NVS-31.

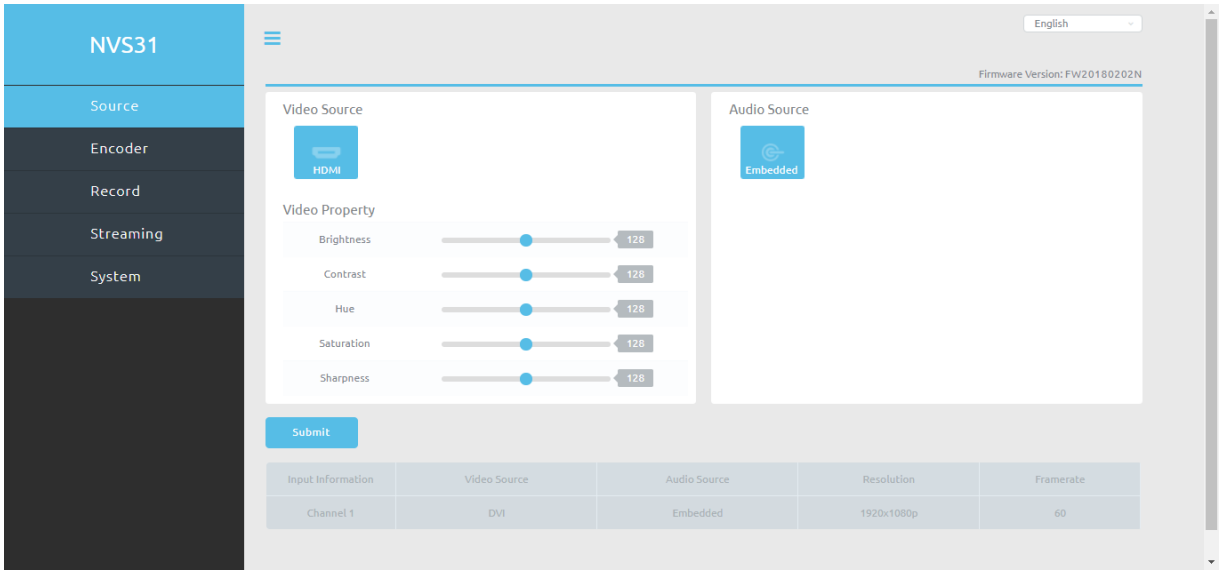
6.2 Web User Interface

By now, we have obtained the IP addresses of the computer and the NVS-31. Type the NVS-31's IP address into the address bar of a browser and then hit the **ENTER** button. Login by entering the user name as well as the password into a pop-up dialogue box as shown below.

User Name: admin **Password: 000000**



Click **OK** button to login and you will be directed to the **Source** Page as shown below.

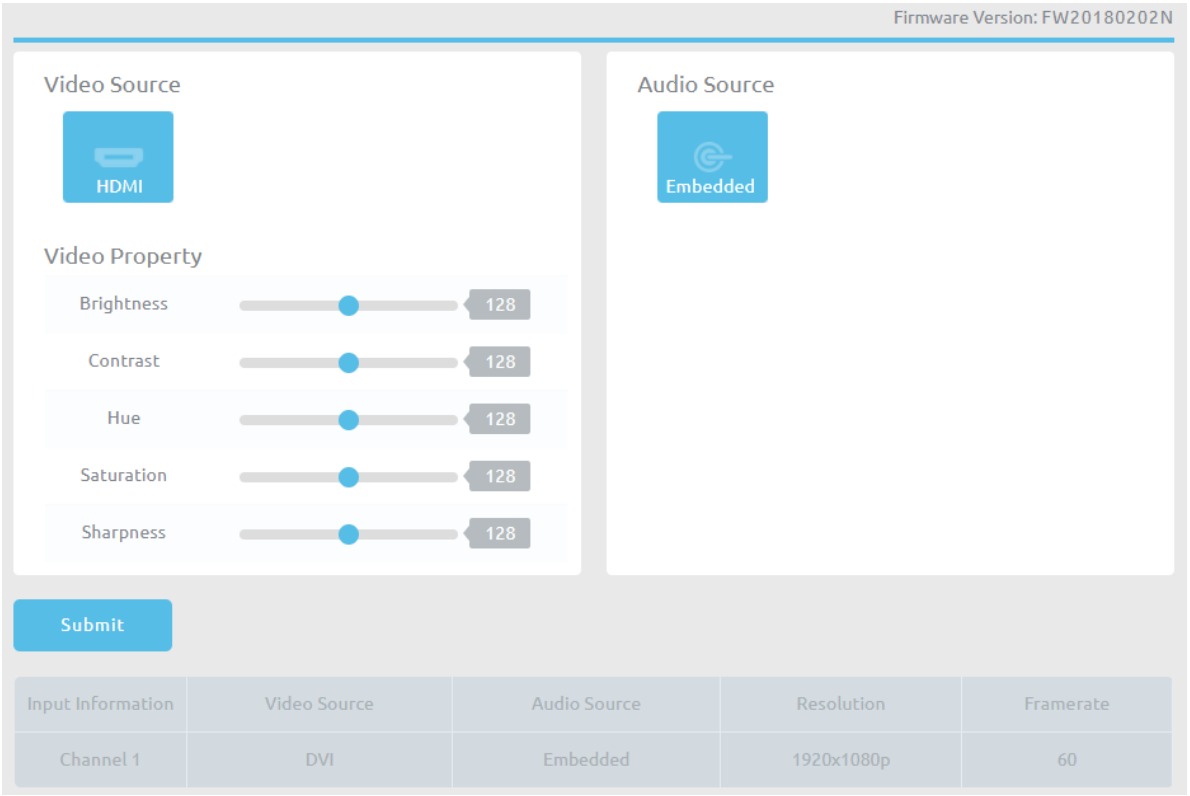


Source

The video source is fixed onto PGM View only. In the **Video Source** column, you will be allowed to adjust video properties such as **Brightness**, **Contrast**, **Hue**, **Saturation** and **Sharpness**. These parameters range from **0** to **255**.

The **Audio Source** column currently indicates that the audio is embedded into HDMI video and is **NOT** reserved for future development.

The **SOURCE** information (Channel No., Video Source, Audio Source, Resolution and Frame Rate) will be displayed in a table at the bottom of the page.



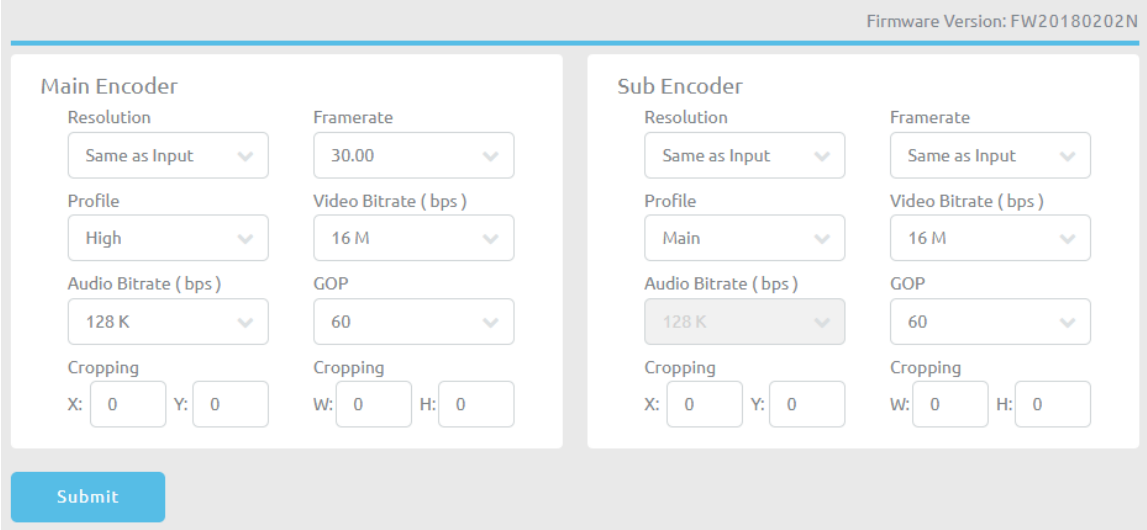
Encoder

An NVS-31 video encoder enables video compression for digital video which will then be used for streaming and recording. However, when choosing your encoding settings for streaming, you should first check your available upload bandwidth. A good rule of thumb is for the bitrate of your stream to use no more than 50% of your available upload bandwidth capacity on a **DEDICATED** line. For example, if the result you get from a speed test shows that you have 2Mbps of upload speed available, your combined audio and video bitrate should not exceed 1Mbps.

The NVS-31 provides the user with two encoders so that you can stream and record videos with different encode settings simultaneously. The Main Encoder and Sub Encoder can be used for recording and streaming in four different combinations as shown in the table below:

Recorder	Streaming Server
Main Encoder	Main Encoder
Main Encoder	Sub Encoder
Sub Encoder	Main Encoder
Sub Encoder	Sub Encoder

Clicking the Encoder tab in the left column will open the Encoder Configuration page on the right as shown in the diagram below.



The encoder parameters are described below:

Resolution

The first step of encoder setup is to adjust the image size. It is best to either match your original video source or scale it down. For example, capture at HD 720 and stream at HD 720. Or capture at HD 720 and stream at 540 (high).

You should never be scaling up and streaming at a higher resolution than your original video source. For example, it does not make sense to capture at 720 and stream at 1080. Note that you will also have no gain in quality and you are using more bandwidth than is necessary for your viewers.

You should also be aware that higher resolutions require greater processing power to encode the stream. Attempting too high of a resolution on too little processing power can result in degraded image quality and corrupted or interrupted streams or recordings.

Available resolutions on the NVS-31 are listed in the table below.

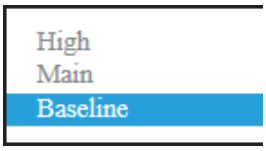
- 1920 x 1080
- 1280 x 720
- 960 x 540
- 720 x 576
- 720 x 480
- 640 x 480
- 320 x 240
- 160 x 128

Frame Rate

Select the Frame Rate after the resolution is selected. Note that frame rates should always match the frame rate of the video source.

- Same as Input
- 60.00
- 50.00
- 30.00
- 25.00
- 20.00
- 15.00
- 10.00
- 5.00
- 1.00

Profile



Profile sets the H.264 encoding profile for your stream. The available options are **Baseline**, **Main**, and **High**. Typically, **High** profile provides the best image quality and is suitable in most instances. However, depending on the decoder used when viewing the stream, such as with mobiles devices, a Main or Baseline profile may be required.

Video Bitrate (bps)

The bitrate of the video specifies the amount of information stored in the video. The higher the bitrate is, the clearer the video is.

The bitrate ranges from 256K to 16M as shown in the table below.

- 16 M
- 12 M
- 8 M
- 6 M
- 4 M
- 3 M
- 2.5 M
- 2 M
- 1.5 M

- 1 M
- 512 K
- 256 K

Usually high bitrate means good image quality; however, there are also exceptions. For example, SD video may appear acceptable at 1000 Kbps (1M) but HD video is unacceptable at 1000 Kbps. Therefore we recommend the following settings for your video bitrate:

- When NVS-31 is in record-only mode, the recommended video bitrate is 16 Mbps.
- When NVS-31 is in stream-only mode, the recommended video bitrate is 10 Mbps.
- When NVS-31 streams and records simultaneously, sum of the stream and record video bitrates should not exceed 12Mbps.

When streaming, the NVS-31 converts video into data, which are sent across an IP network. High bitrates consume more bandwidth across the IP network. In a gigabit office LAN, high bitrate may not be a concern and Speed/Bandwidth is therefore not the limitation in a NVS-31 application environment.

If your available bandwidth is limited, you should reduce both your resolution and your bitrate accordingly. A good rule of thumb is for the bitrate of your stream to use no more than 50% of your available upload bandwidth capacity on a dedicated line. For example, if the result you get from a speed test shows that you have 2Mbps of upload speed available, your combined audio and video bitrate should not exceed 1Mbps.

Audio Bitrate (bps)
The audio bits consume much less of the overall bandwidth than the video bitrate, usually a negligible amount compared to the video. The NVS-31 offers the user the following audio bitrates at which you may want to stream or record the audio. It is recommended to select 128Kbps or higher.

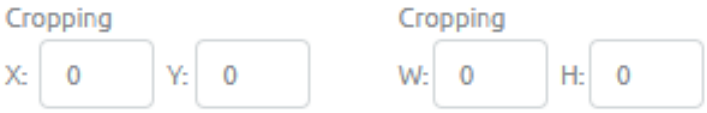
- 384 K
- 256 K
- 128 K
- 64 K
- 32 K

GOP
GOP pattern with longer GOP length encodes video very efficiently. Shorter GOP lengths usually work better with video that has quick movements, but they do not compress the data rate as much. On the NVS-31, there are 16 GOP sizes available for the user, ranging from 1 to 180.

- 180
- 160
- 140
- 120
- 100
- 60
- 50

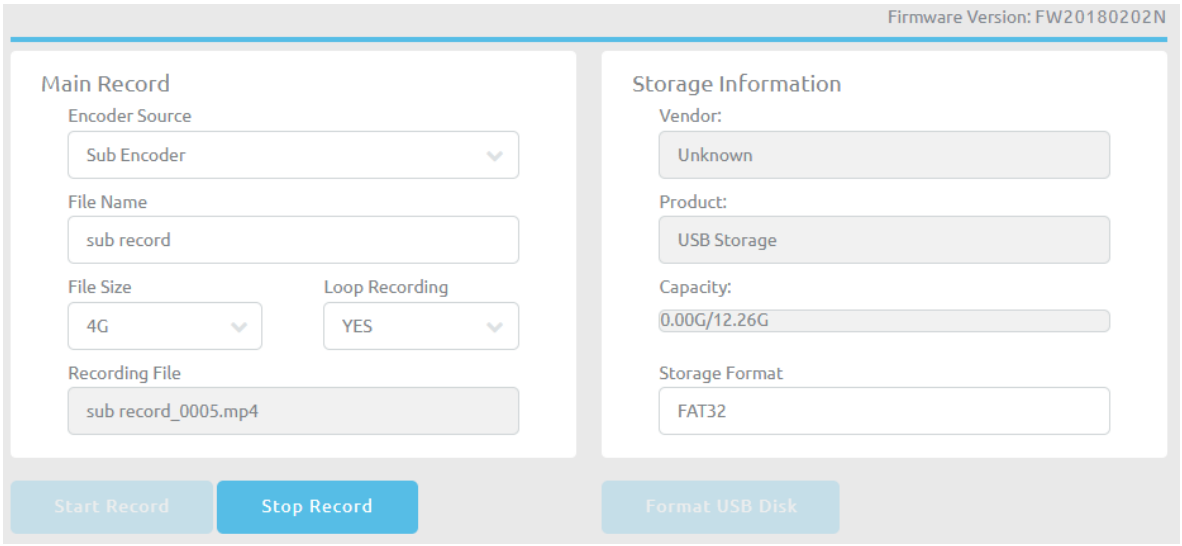
- 30
- 25
- 20
- 15
- 10
- 5
- 3
- 2
- 1

Cropping
The cropping feature allows the user to select a confined area of the camera video. X and Y parameters select the center of the video crop. After that, the user can then set W and H values to select the size of the crop.



Record

The **Record Settings** page of the Web User Interface allows you to set the record settings for the NVS-31 device.



The parameters on the **Record** page are described as follows:

Main Record Column

The **Main Record** column contains settings for the recorder.

Encoder Source
Select the encoder for your recorder; there are MAIN and SUB encoders.

File Name
In the text bar, enter the file name of the recorded video.

File Size
Select the maximum record file size

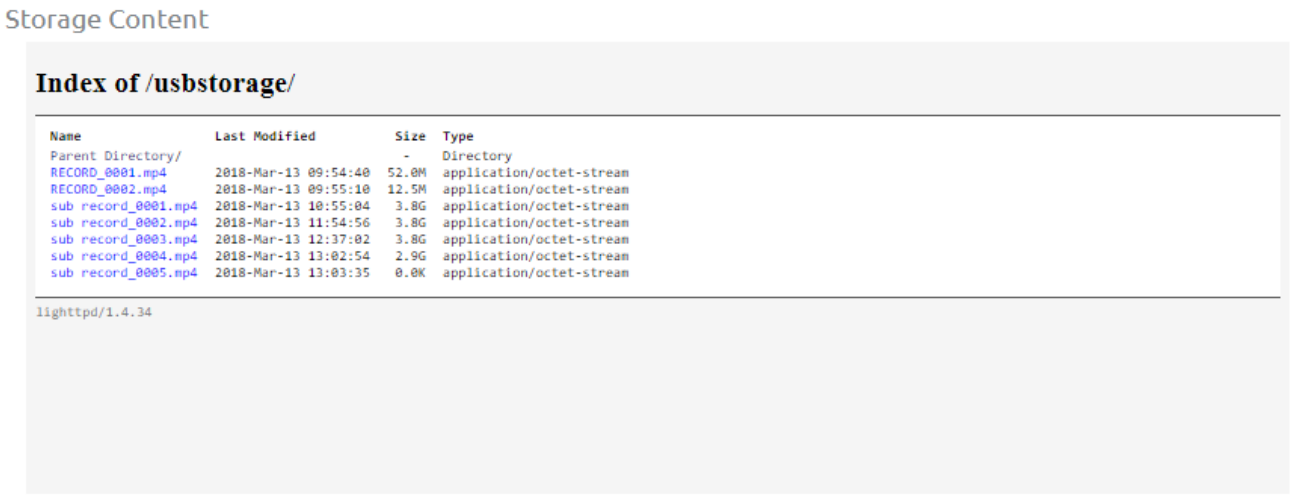
Loop Recording
Loop recording allows the user record continuously to the disk. Select YES to enable loop recording and NO to disable.

Recording File
This text box displays the recording file name.

Storage Information Column
In this column, the user will be able to view the USB drive information such as the **Vendor Name**, **Product Type**, **Disk Capacity** and **Disk Format Type**.

Note: The SD Card will be formatted immediately as soon as the Format USB Disk button is clicked.

Storage Content
Disk contents are displayed here, **providing** an overview of different directories and files.

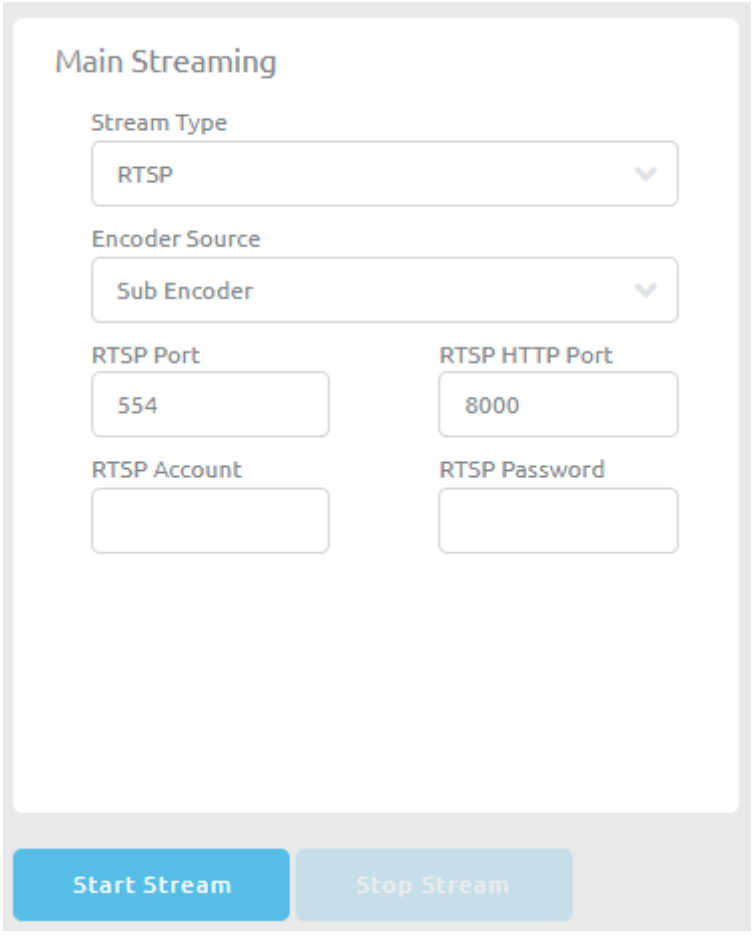


Streaming

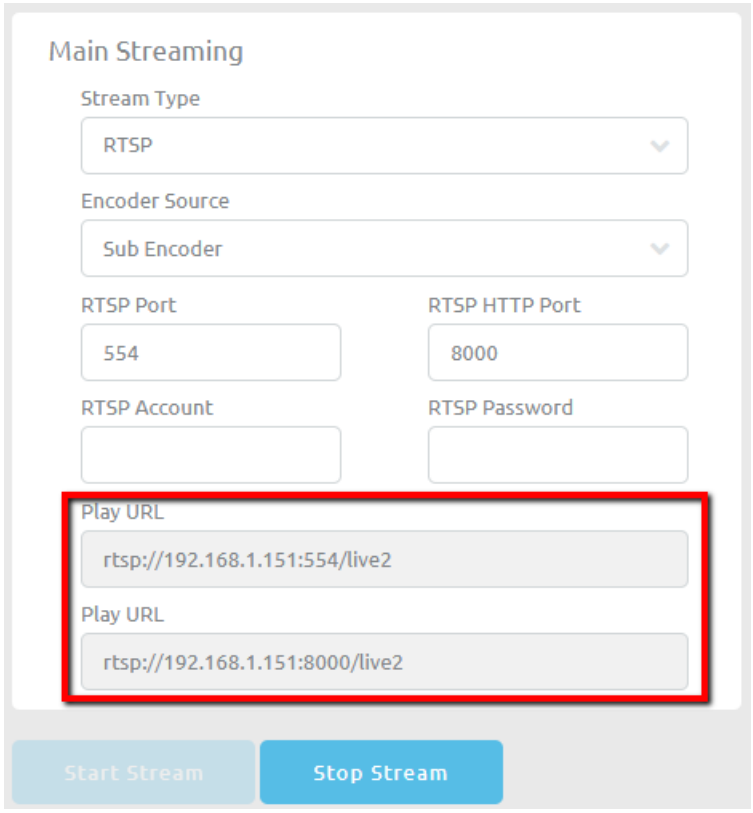
The NVS-31 provides RTSP and RTMP streaming protocols for use on Adobe Media Servers, Wowza Media Servers, software video players such as QuickTime and VLC, or any of the popular Content Delivery Networks (CDNs), such as YouTube Live and Ustream.

RTSP Mode
In RTSP mode, the NVS-31 acts as a streaming server to which clients can connect via a media server, software video player, or CDN that supports the RTSP streaming protocol. If you want to stream to more than a handful of clients, we recommend using a dedicated media server to send streams to clients.

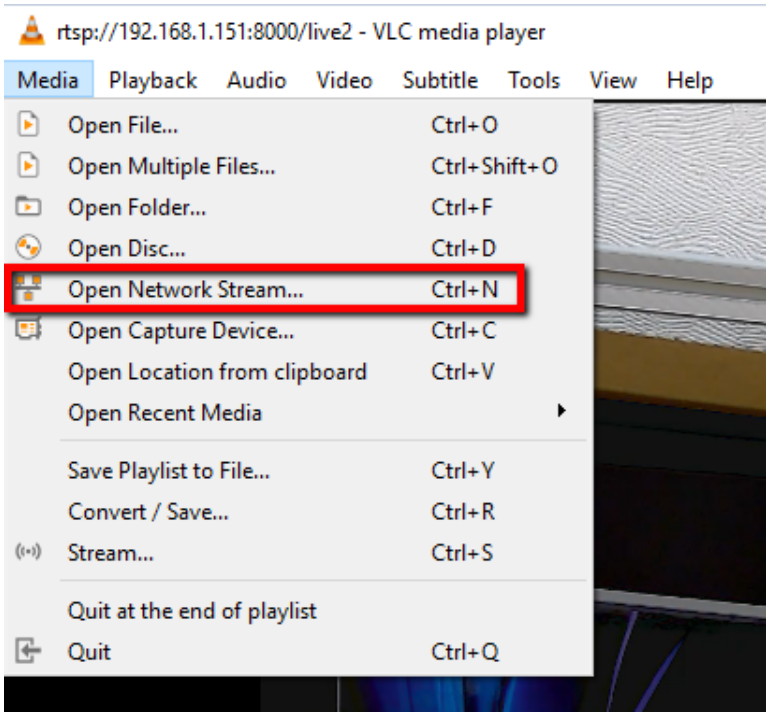
To configure the RTSP stream server, select the **Encoder Source** first and then enter the respective port numbers. To start streaming, simply click the "**Start Stream**" button after the server is configured.



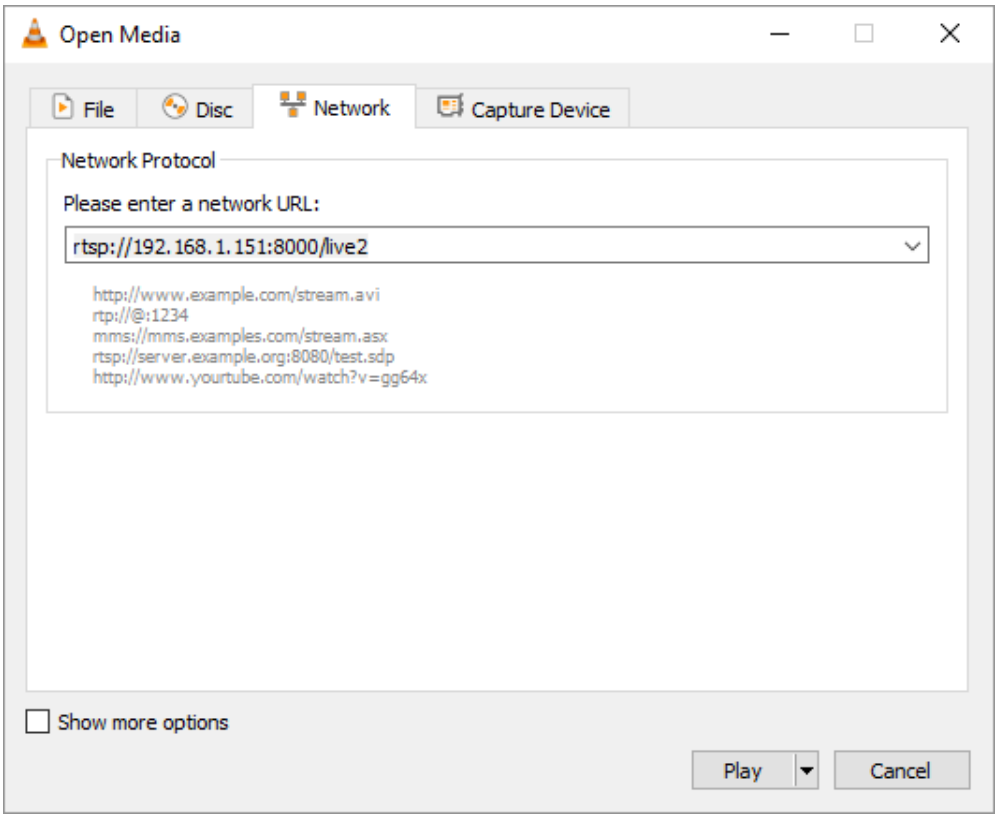
As soon as the stream is started successfully, you will be able to see the RTSP view link (**Play URL**) displayed as shown in the diagram below. To view the stream, open the **Play URL** in VLC Video Player.



Open VLC Media Player and click “**Open Network Stream**.”



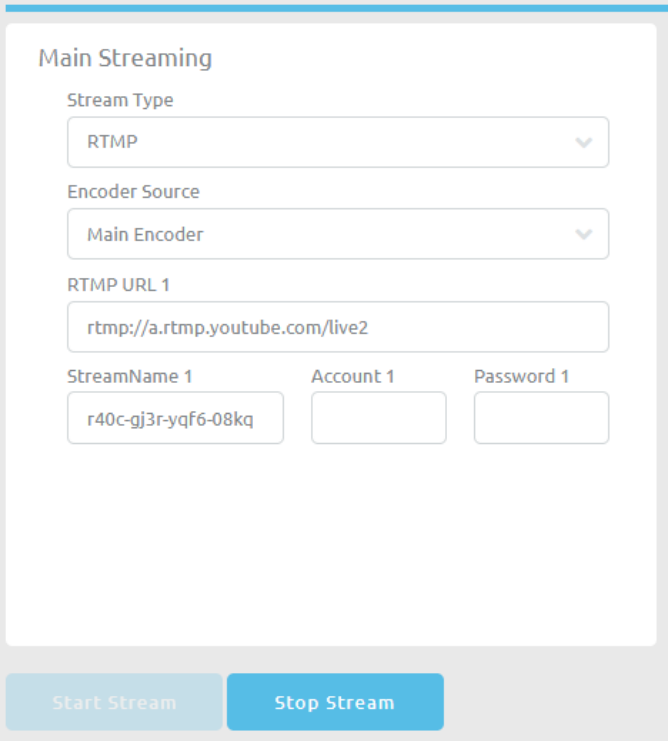
On the Open Media window, enter the Play URL “rtsp://192.168.1.151:8000/live” and then click the **Play** button to open the view window.



RTMP Mode

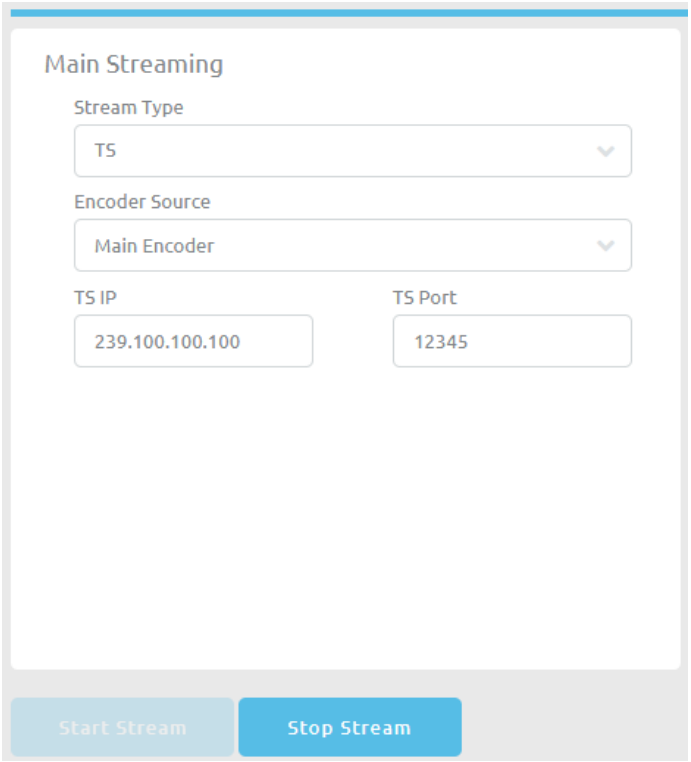
In RTMP mode, the NVS-31 can only send one data stream to one CDN or media server that supports the RTMP streaming protocol. On the streaming setup page, select the **Encoder Source** first and then

enter the respective RTMP stream information. To start streaming, simply click the "**Start Stream**" button after the **RTMP mode** is configured.



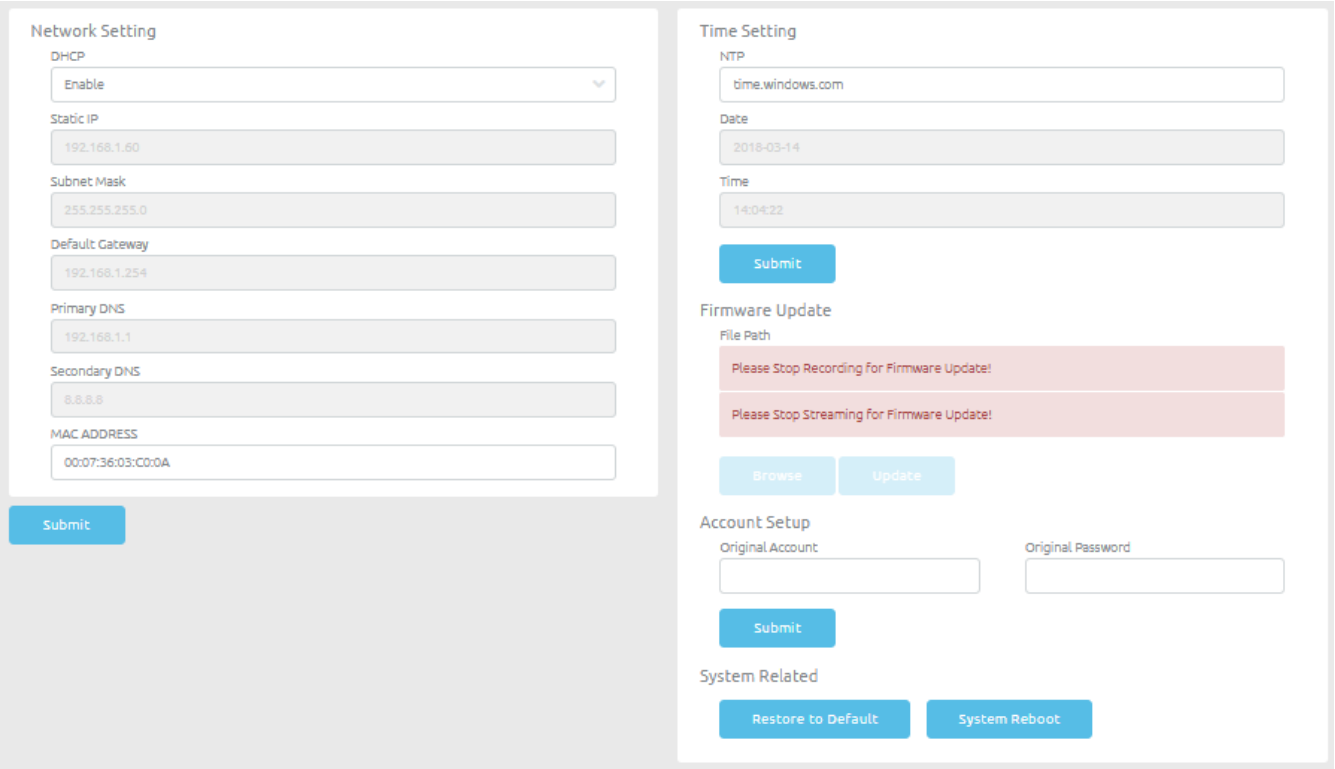
TS Mode

In MPEG transport stream mode, the NVS-31 can send stream data directly to the viewer. On the streaming setup page, select the **Encoder Source** first and then enter the TS IP address and the TS port number. To start streaming, simply click the "**Start Stream**" button after the **TS mode** is configured.



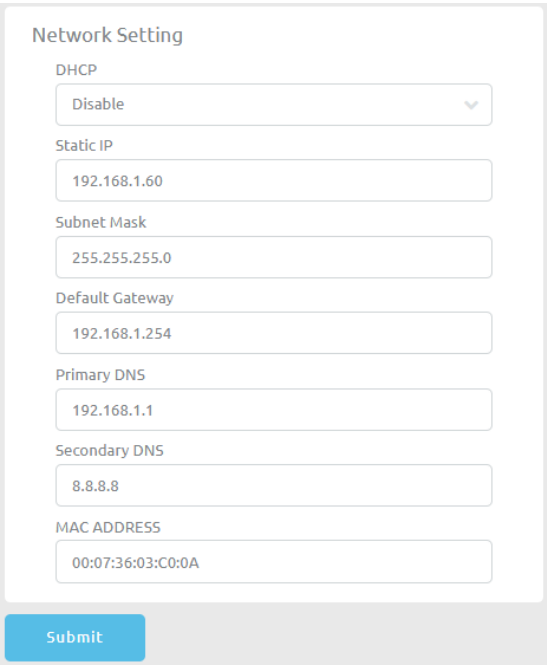
System

The NVS-31 also allows the user to configure the system's network settings, set account login credentials, update the device firmware, select the time, restore the factory defaults and reboot the system.



Network Setting

You are allowed to connect the NVS-31 to a network in DHCP or Static IP mode. Disable DHCP server if you want to connect to the NVS-31 on a fixed IP. An example of Static IP mode configuration is provided below:



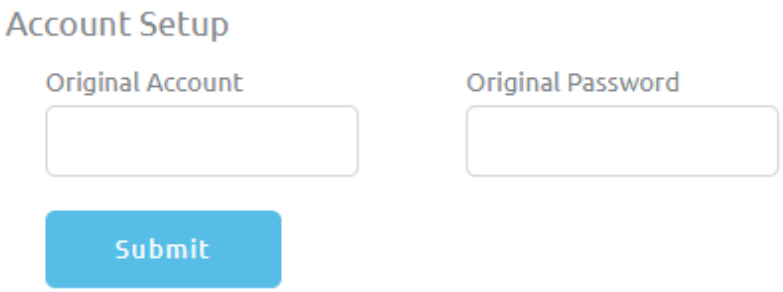
- Static IP: 192.168.1.60
- Subnet Mask: 255.255.255.0
- Default Gateway: 192.168.1.254
- Primary DNS: 192.168.1.1
- Secondary DNS: 8.8.8.8

Note: If you do not remember the IP address assigned to the device, follow the steps below to reset the network settings:

- Turn off the machine.
- Press the **RECORD** and **STREAM** buttons simultaneously and switch ON the device.
- Wait for 5 seconds approximately and release the button push as soon as the two buttons light up.
- The default IP address is **192.168.1.60**.

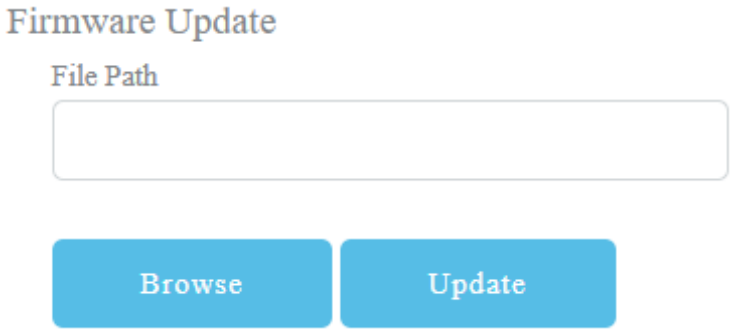
Account Setup

Change the password in the Account Setup.



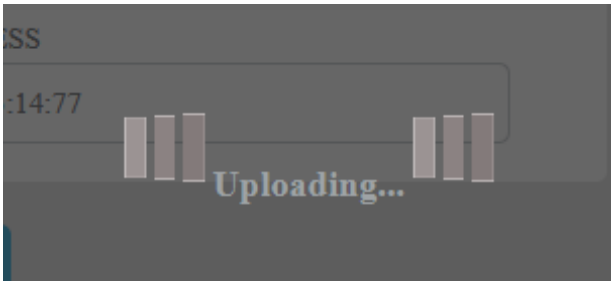
Firmware Update

From time to time Datavideo may release new firmware to either add new features or to fix reported bugs in the current NVS-31 firmware. To update the firmware, you must first click the Browse button to search for the firmware file on the disk.

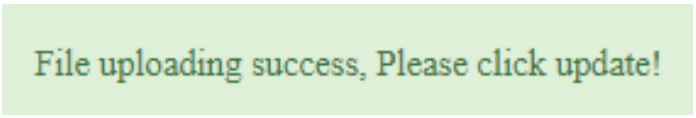


Please note that if the device is recording or streaming, you have to turn the features off in order to perform the firmware update.

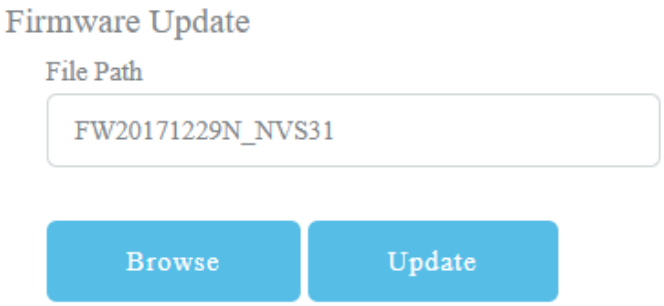
Once the firmware file is selected, you will see the prompt display as shown below indicating that the file is being uploaded.



You will see the message shown below after the file upload is complete.



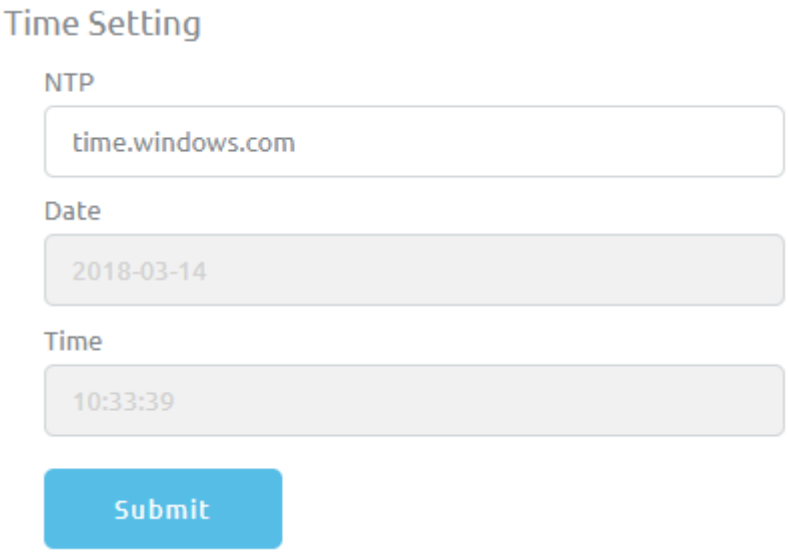
Once the file is uploaded successfully, click the **Update** button to start the update.



The device will reboot itself after the firmware is successfully updated.

Time Setting

Enter the device's time setting for recording purpose. Specify your time server in the **NTP** field.

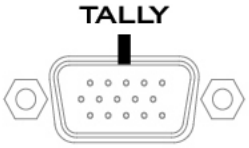


System Related

Click the **Restore to Default** button to reset the NVS-31 to factory defaults. To reboot the NVS-31, simply click the **System Reboot** button.

Chapter 7 Appendices

Appendix 1 Tally Outputs



The HS-1600T has a D-sub 15 pin female tally output port. These connections provide bi-colour tally information to a number of other Datavideo products, such as the ITC-100 eight channel talkback system and the TLM range of LCD Monitors. The ports are open collector ports and as such do not provide power to tally light circuits.

The pin outputs are defined as follows:

PIN No.	Signal Name	Input/Output	Description of Signal
1	Program 1	Open collector output	Tally output of input video Program 1
2	--	--	No Function
3	Preview 1	Open collector output	Tally output of input video Preview 1
4	RCOM (GND)	Ground	Ground
5	Program 4	Open collector output	Tally output of input video Program 4
6	Program 2	Open collector output	Tally output of input video Program 2
7	--	--	No Function
8	Preview 2	Open collector output	Tally output of input video Preview 2
9	GND	Ground	Ground
10	--	--	No Function
11	Program 3	Open collector output	Tally output of input video Program 3
12	--	--	No Function
13	Preview 3	Open collector output	Tally output of input video Preview 3
14	YCOM (GND)	Ground	Ground
15	Preview 4	Open collector output	Tally output of input video Preview 4

Appendix 2 Firmware Upgrade (Keyboard / Mainboard)

Datavideo usually releases new firmware containing new features or reported bug fixes from time to time. Customers can either download the HS-1600T firmware as they wish or contact their local dealer or reseller for assistance.

This section outlines the firmware upgrade process which should take ***approximately 10 minutes to complete***. The existing HS-1600T settings should persist through the ***firmware upgrade process, which should not be interrupted once started*** as this could result in a non-responsive unit.

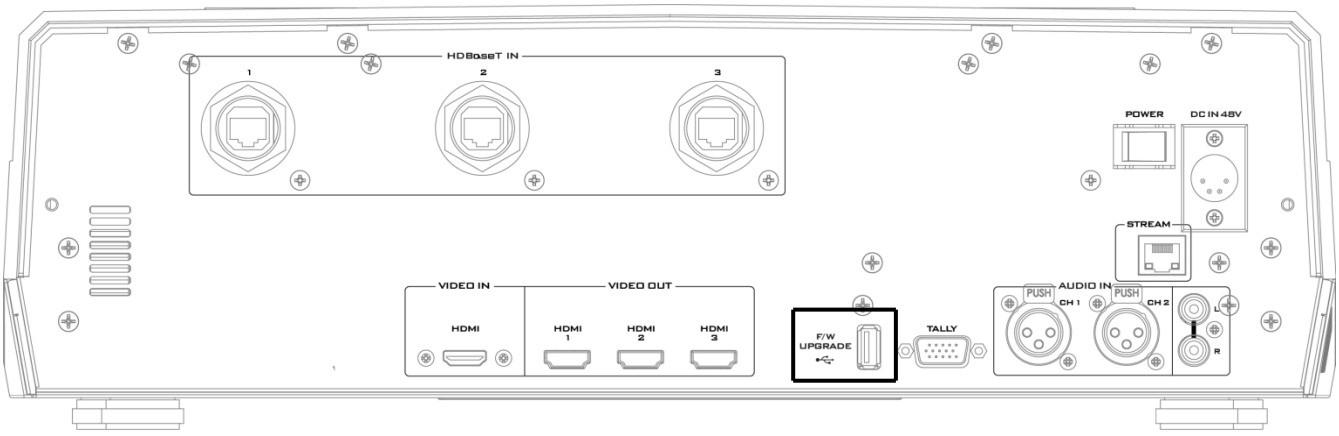
Successful firmware upgrade on HS-1600T requires:

- HS-1600T x 1
- 48V Power adapter x 1
- USB thumb drive x 1
- USB Cable x 1

Update Procedure

1. On the PC, copy the two HS-1600T firmware binary files to the root directory of a USB thumb drive. After the files are successfully copied, safely remove the USB thumb drive from the PC.
   - **HS-1600T.bin**: The HS-1600T Keyboard (KB) Firmware is approximately 27KB and usually with a version number of V1.X.
   - **HS-1600TM.bin**: The firmware file for the HS-1600T Mainboard (MB) and OSD MENU fonts is approximately 2-3 MB (Example of the firmware display is V1.16 for the mainboard and V1.02 for OSD fonts).

2. Connect the USB thumb drive to the F/W Upgrade USB port located on the back of the HS-1600T device.



3. Turn on the HS-1600T power.

4. Approximately after 5 seconds, the keyboard firmware will be updated and the update status will be indicated by the LED color of the program row buttons.
   - **Same version number** detected: The firmware will **NOT** be updated and all six buttons will be illuminated red.
   - **Different version number** detected: The BLK button flashes red twice and the firmware will be updated. All six program row buttons will be illuminated red while the firmware is being updated. As soon as the program row buttons are turned off and then turned back on (red)

again, the firmware update is complete. The HS-1600T automatically reboots itself after the keyboard firmware is updated.

5. The Mainboard firmware is automatically updated after the Step 4 is executed and the update status will be indicated by the LED color (green) of the preview row buttons. Approximately 5 seconds after the HS-1600T is rebooted, you will see a startup screen on the monitor with old mainboard version (V1.5) displayed at the bottom right corner. At this point, the BLK button will start flashing green. The mainboard firmware update will start approximately 10 seconds after the mainboard finishes booting.
   The startup screen on the monitor disappears and the firmware update will be in progress as the preview row buttons are turned on one at a time from left to right until all buttons are illuminated constant green after approximately **ONE minute**. At this point, the firmware update is complete and the mainboard will reboot itself. After the HS-1600T finishes booting, the new version number (V1.6) will be displayed at the bottom right corner of the HS-1600T startup screen.

6. The OSD fonts will be automatically updated after the Step 5 is executed and the update status will be indicated by the LED color (green) of the preview row buttons. The machine reboots itself after the mainboard is updated, and the BLK button will start flashing green after the reboot. The OSD fonts update will start approximately 10 seconds after the mainboard finishes booting.
   The startup screen on the monitor disappears and the firmware update will be in progress as the preview row buttons are turned on one at a time from left to right until all buttons are illuminated constant green after approximately **SIX minutes**. At this point, the monitor will display a four-quadrant Multiview display and this indicates that the OSD fonts update is complete.

7. The update is finished when all six buttons of the program and preview rows are illuminated constant red and green respectively. Remove the USB thumb drive and reboot the HS-1600T.

8. After the machine finishes booting and as soon as you see the Multiview screen, press the MENU button to open the OSD menu to check the MB, OSD and KB versions:
   Use the Up/Down arrow buttons to move to the Setup option and check if the firmware is successfully updated:
   - MB Software: V1.16.1.02
   - KBD Software: V1.2 (HS-1600T)

Note 1: The device will not be damaged if the USB cable or power is accidentally disconnected while the firmware is being updated; plug the USB thumb drive back in and reboot the device to resume the update process.

Note 2: The USB disk drive system supports FAT / FAT32 formats.

Note 3: There is no guarantee that the HS-1600T supports all USB disks. When you see all buttons of the program and preview rows are illuminated pink or greenish pink, this indicates that the disk file read error has occurred. Please try using other USB flash drive brands.

Appendix 3 Frequently-Asked Questions

This section describes problems that you may encounter while using HS-1600T. 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.	Audio is switched only after the transition is complete.	It is normal that audio is switched after the transition is complete regardless of the transition method (T-Bar or Auto) used.
2.	Jitter is seen on moving images.	Please make sure the input and output are set to the same resolution and frame rate.

Appendix 4 Tips for Establishing an HDBaseT Compliance Environment and Ethernet Cable Selection

Tips for Establishing an HDBaseT Compliance Environment

HDBaseT alliance defines the maximum number of cables in a bundle use case to be six cables per bundle. Table below defines the maximum number of cables in a bundle as a function of cable type & the overlapping length.

HDBaseT Cabling-Permissible Number of Cables in a Bundle

Type	30m	50m	70m	100m
CAT5e/6	6	4	2	1
CAT6a/7	6	6	6	6

The following installation practices can help to withstand the external interference when using CAT5e/6 cables:

A) Do not “comb” or “pinstripe” cables in the first 20 meters.

B) Use separate patch and equipment cords in the first 20 meters.

C) Avoid use of tie-wraps.

D) Use horizontal wire management techniques. For example, route odd ports to upper management and even ports to lower management.

E) Loosely place cables in vertical wire management.

F) Reduce maximum conduit fill density to 40%.

G) It is recommended to roll the cable around a fixed radius drum in an orderly manner. This is shown on the left hand side of below. When the turns are ordered, the electromagnetic coupling between the various sections that occurs in a randomly rolled cable is reduced. The FEXT impairment level measured when rolling an Ethernet cable around a 70 cm fixed diameter plastic drum is only slightly higher than that of a fully stretched cable.

Tips for Establishing an HDBaseT Compliance Environment Outdoors/for the Strong Interference Environment

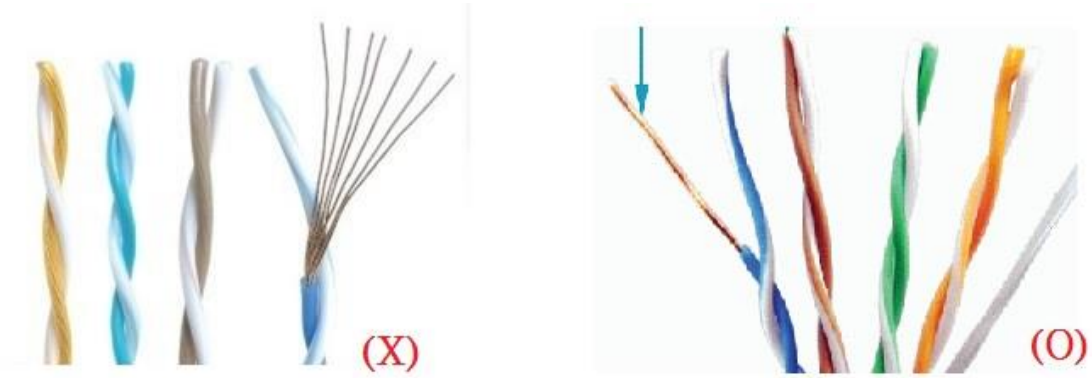
1. If customers want to establish an HDBaseT compliance environment outdoors, it is recommended that customers can use the UV resistant Ethernet cable to make sure that the Ethernet cable achieves its best connection quality. Generally speaking, the outdoor UV resistant Ethernet cable is coated with the black PE skin.

2. If there is any interference source at the customer side such as the radio interference, it is highly recommended to adopt the SFTP* to prevent the Ethernet cable from interference.

*SFTP: The SFTP(**S**hielded and **F**oiled **T**wisted **P**air) is an Ethernet cable with foil shielding around the individual twisted wires and an overall shield which can be a flexible braid. This provides highest protection for the Ethernet cable to prevent it from interference.

Tips for the Ethernet Cable Selection for the HDBaseT System & Camera Connection

1. Please use the solid conductors rather than the stranded conductors for the HDBaseT system network connection due to that the solid conductors have better electrical performance than the stranded conductors.



2. Please Do NOT use the flat ethernet cable due to following reasons.

A) There is no twisted paired inside the flat ethernet cable to offset the interference.

B) There is no cross-spacer between the cables inside the flat ethernet cable.

C) The diameter of each core cannot meet the AWG standard due to cut corners.

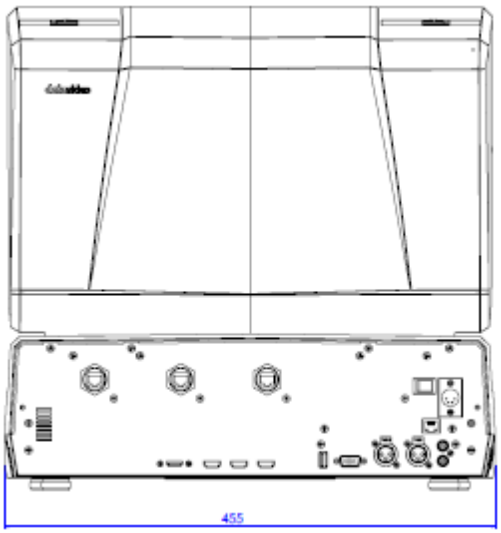
- For the CAT5e cable, the diameter for most of the flat Ethernet cables cannot meet the 24AWG (0.49~0.51mm) standard and the bandwidth cannot meet the 125MHz standard.
- For the CAT6/CAT6a cable, the diameter for most of the flat Ethernet cables cannot meet the 23AWG standard and the bandwidth cannot meet the 250MHz standard.
- For the CAT7 cable, the diameter for most of the flat Ethernet cables cannot meet the 22AWG standard and the bandwidth cannot meet the 600MHz standard.

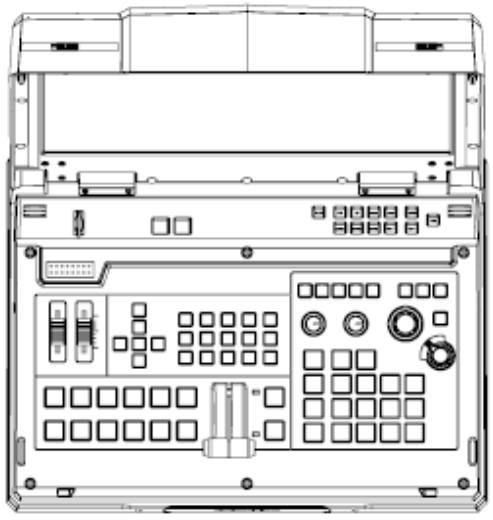
D) For many of the multicore Ethernet cables, the solid conductor for each core is made by the aluminum wire, copper-clad aluminum wire or copper-clad steel wire rather than the anaerobic copper wire.

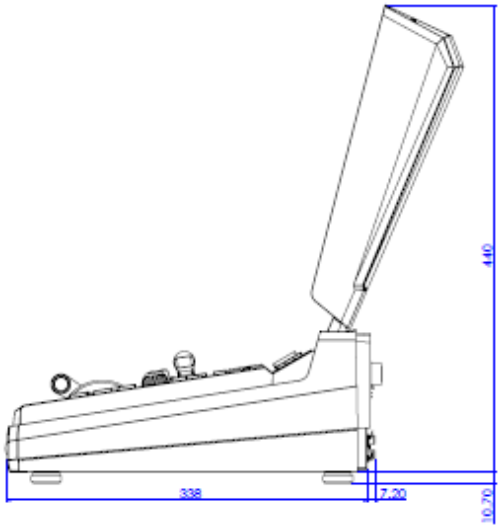
3. Please visit the website “http://hdbaset.org/hdbaset-recommended-cables/” for the ethernet cable providers that are verified by the HDBaseT alliance.

4. For more information about how to establish the HDBaseT environment and details of usage, please visit and register on the website “http://hdbaset.org/installers/” to get the free membership.

Appendix 5 Dimensions







All measurements in millimeters (mm)

Appendix 6 Specifications

Model Name	HS-1600T
Product Name	4-Channel HD/SD HDBaseT Portable Video Streaming Studio
Video Standard	HD & SD
Video Format	1080p 50/59.94/60Hz 1080i 50/59.94/60Hz 720p 50/59.94/60Hz 576i/p 50Hz 480i/p 59.94Hz
Input Routable / Crosspoint	N/A
Video Input	3 x HDBaseT 1 x HDMI
Computer Graphical Interface	1 via HDMI
Down-Converted Output	Yes
Video Output	3 x HDMI PGM 1 x STREAM (RJ-45)
Audio Input	2 x Balanced XLR 1 x Stereo RCA (L/R) De-embedded Digital Audio
Audio Output	1x Stereo headphone
Embedded Audio Support	2 CH Audio embedded
Audio Delay Calibration	N/A
A+V Switching	N/A
USK	1x USK Lumakey support
DSK	N/A
Picture in Picture	1
Logo Insertion	N/A
Built-in Audio Mixer	Yes
Built-in Monitor Display	17.3” HD TFT LED backlit, 1920x1080 pixels
Built-in Intercom & Tally	N/A
Streaming Video Encode	H.264 / AVC, Main/ High Profile Configurable Bit-rate up to 10Mbps

Streaming Audio Encode	AAC-LC Configurable bit rate ranging from 32Kbps to 384Kbps Sample rate: 48KHz, 16bit
Streaming Protocol	TS over TCP/UDP (unicast & multicast) RTSP over HTTP/TCP/UDP (RTSP Elementary Streaming) RTMP (Publish)
Streaming Control	Web browser UI for configuration and control Socket commands
Recording File System	FAT, exFAT, NTFS
Recording File Format	MP4
Recording Setting Control	Web UI for system configuration and control
Dimensions (LxWxH)	455 x 355 x 134 mm
Weight	17.2 Lbs (7.8 Kg), Reinforce Plastic Case
Accessory	CB-60/61/62

Service & Support

It is our goal to make owning and using Datavideo products a satisfying experience. Our support staff is available to assist you to set up and operate your system. Contact your local office for specific support requests. Plus, please visit www.datavideo.com to access our FAQ section.

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www.datavideo.com/product/HS-1600T

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