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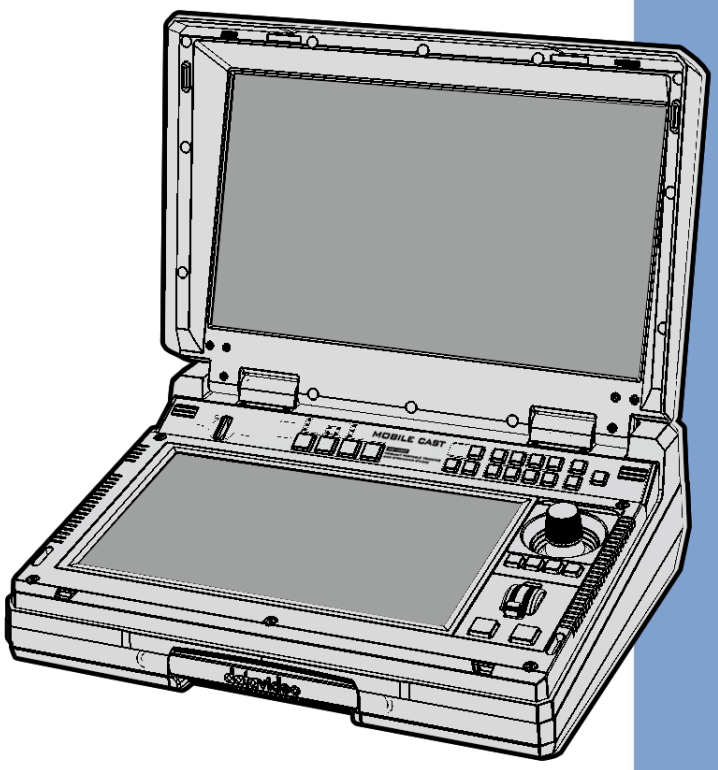

HDBASET PORTABLE TRACKING AND STREAMING STUDIO

HS-1650T

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

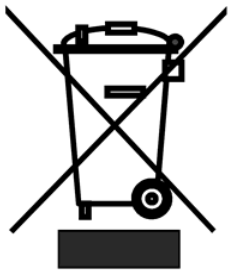
- Datavideo equipment is guaranteed against manufacturing defects for **one (1) year** from the date of purchase.
- A valid purchase invoice or other proof of purchase must be provided when requesting warranty service.
- The warranty period begins on the actual purchase date. If the purchase date cannot be verified, the warranty period will begin **thirty (30) days after shipment** from a Datavideo office.
- Non-Datavideo branded products (products without the Datavideo logo) are covered by a **one-year warranty** from the date of purchase.
- Damage caused by accident, misuse, unauthorized repair, or exposure to sand, grit, or water is **not covered** under warranty.
- Virus or malware infections on computer systems are **not covered** under warranty.
- Any issues caused by unauthorized third-party software installations that are not required by Datavideo systems are **not covered** under warranty.
- All shipping, mailing, or transportation costs, including insurance, are the responsibility of the owner unless otherwise stated.
- **Teleprompter glass is not covered** under warranty.
- Accessories, including **headphones, cables, batteries, metal parts, housings, protective cases, cable reels, and consumable items**, are **not covered** under warranty.
- Warranty is valid only in the country or region of purchase.
- All other claims **not explicitly stated** are not covered.
- Your statutory rights remain unaffected.

Five Year Warranty

- Starting January 1, 2026, all Datavideo products that are successfully registered on the Datavideo official website are eligible for a **free four-year extended warranty**, in addition to the standard one-year warranty, for a total of **five years of coverage**.
- **Only registrations completed through the Datavideo official website qualify** for the five-year warranty. Registrations completed through local Datavideo offices, resellers, or authorized distributors **are not eligible**.

- Certain parts with limited service life — including **LCD panels, DVD drives, hard drives, solid-state drives, SD cards, USB thumb drives, lighting equipment, non-PCIe cards, and third-party PC components** — are covered by a **one-year warranty only** and are **not eligible** for the extended warranty.
- **Camera modules** are covered by a **three-year warranty from the date 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

The **HS-1650T** is a compact, portable video switcher that supports Full HD 1080p and is designed for live event broadcasting and television production. It's an ideal all-in-one solution for the religious, educational, and AV markets, where a wide variety of video and audio sources must be mixed and managed efficiently.

Equipped with built-in **HDBaseT technology**, the HS-1650T can receive Full HD 1080p signals from up to **three PTC-150T PTZ cameras** via individual **CAT-6 cables**, each supporting runs up to **100 meters**. Its integrated **PoE (Power over Ethernet)** feature powers the cameras directly through the same cables , making it ideal for remote or field production environments.

The HS-1650T includes a versatile **audio mixer** with both **balanced XLR** and **unbalanced RCA** inputs. Additional professional features include **Picture-in-Picture (PIP)**, a **Wipe Generator**, and **Tally output** for seamless studio or live production.

A built-in **joystick** allows precise **pan, tilt, and zoom** control of PTC-150T cameras, along with on-the-fly adjustments to **focus, iris**, and other key camera settings.

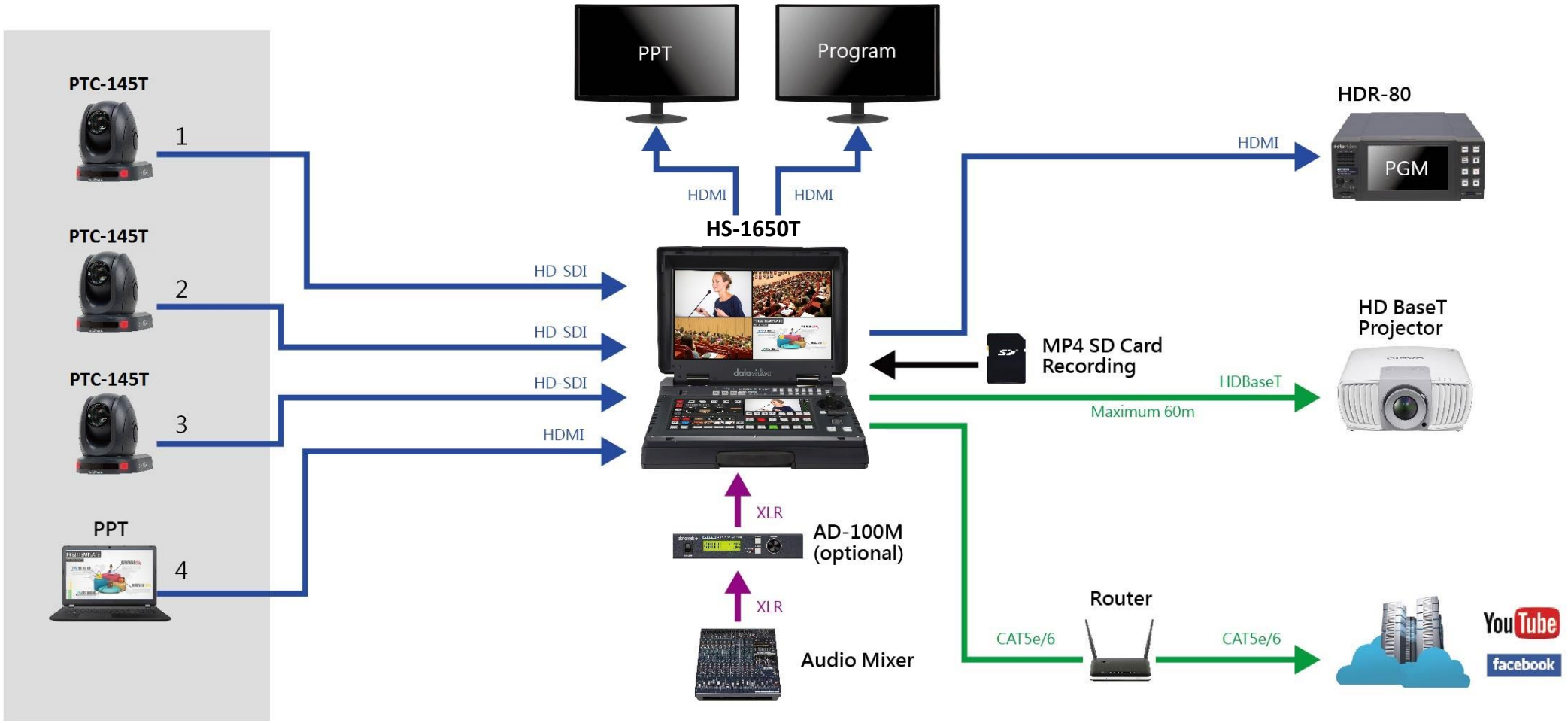
At the heart of the HS-1650T is its **intuitive touchscreen interface**, which gives users fast and easy access to all major switching, camera control, and system settings. The touchscreen streamlines the workflow, making live production setup and operation both faster and more user-friendly, even for single operators.

Finally, the HS-1650T features an integrated **streaming and recording system**, enabling simultaneous **live streaming** and **master-quality recording**, perfect for both real-time delivery and post-event editing.

1.1 Features

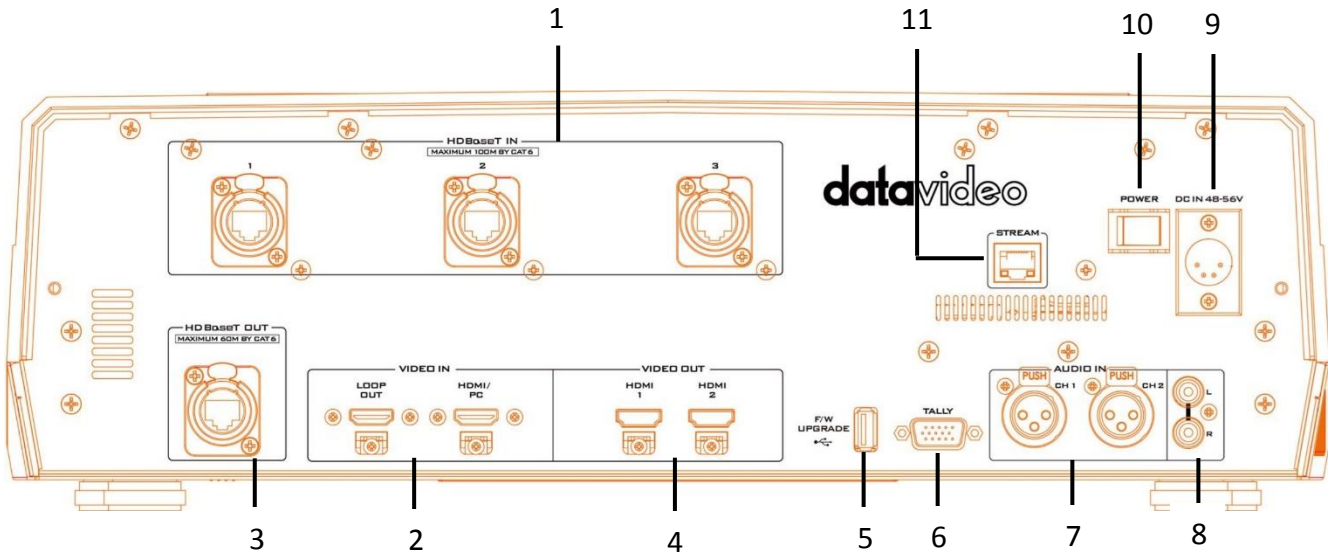
- Full 1080p 4-Channel All-in-One Production Studio
- 14 Inch Touch Screen and Intuitive Operation using the Touchscreen UI
- Made with HDBaseT technology for long distance transmission.
- Built-in PoE technology
- Camera Auto Tracking features
- Built-in camera control of Pan, Tilt and Zoom by Joystick
- One HDBaseT output up to 60 meters
- Simultaneous Live Streaming & Recording
- 4 Video inputs (HDBaseT x 3 + HDMI x 1)
- Video outputs: 2 x HDMI (PGM), 1x HDMI Loop out, 1x HDBaseT
- 17.3-inch monitor with a resolution of 1920x1080
- Audio Mixing
- Audio Inputs: XLR Analogue x 2 + RCA Analogue (L/R) x 2
- Flexible Transition Effects: PIP, WIPE, Mix
- Tally Output

1.2 System Diagram



Chapter 2 Connections and Controls

2.1 Rear Panel



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

1. HDBaseT IN

The HDBaseT ports are used to connect up to three HDBaseT cameras via CAT-6 Ethernet cables. These correspond to input channels 1, 2, and 3, which can be selected using buttons 1, 2, and 3 on the program or preview row.

Important: The baud rate for these ports is fixed at 38400 and cannot be modified by the user. To ensure proper communication, each connected camera must be set to this same baud rate. Refer to ***Section 5.2*** for instructions on how to configure the baud rate on your cameras.

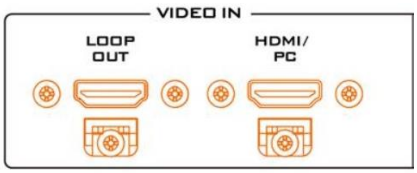
If the camera's baud rate is pre-set to 38400 with the corresponding input channel selected on the program row, the camera video will appear in the program view as soon as it is connected to the HDBaseT port.

In addition to connecting to cameras, the HS-1650T can also receive videos sent from

Datavideo's HBT-5 and HBT-10 transmitters. It supports resolutions up to 1080p60, with a maximum transmission distance of 100 meters.

If you encounter any issues during setup, please contact your local Datavideo sales office or authorized distributor for assistance.

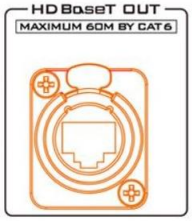
Note: ***The HDBaseT ports use Neutrik's etherCON A Series connectors, which are designed for professional audio and video networking applications. To connect properly to the HS-1650T, you will need an Ethernet cable terminated with an etherCON A Series connector.*** For more purchase information, please visit Neutrik's official website: www.neutrik.com.



2. HDMI Video IN

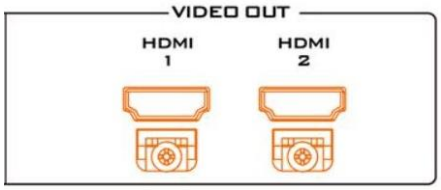
The **HDMI/PC** input allows you to connect an additional HDMI source or a PC. It serves as the fourth input channel and can be selected using button 4 on the program or preview row.

The HDMI Loop OUT port outputs the HDMI input video or PC screen to an external display, allowing for separate viewing or monitoring.



3. HDBaseT OUT

The **HDBaseT OUT** port allows you to deliver video directly to HDBaseT devices such as the HBT-11 HDBaseT Receiver Box (Contact your local Datavideo office or visit our official website for more information). Note that the maximum video transmission distance is **60 meters**.



4. HDMI Video OUT 1/2

The HDMI Video Out 1/2 output Program video only. Connect these two ports to HDMI monitors or other HDMI destination devices.

5. USB F/W Upgrade Port

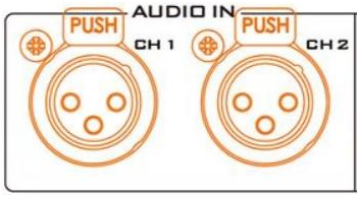
USB port for firmware upgrade. Please refer to the ***Firmware Upgrade*** section for details.

6. 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-1650T or send tally signal to be displayed on the monitor.

See ***Appendix 1*** for physical pin connections and ***Section 3.2*** for ***Tally Mode*** selection.



7. Audio Input – XLR Balanced (CH1/CH2)

Two channels of XLR Balanced Audio Input. Refer to the ***Audio*** section to adjust the volume level.

8. Audio Input – Stereo RCA (Left/Right)

Connects unbalanced analog audio source (stereo). Refer to the ***Audio*** section to adjust the volume level.

9. Power Switch

Power switch ON/OFF.

Note: After pressing the power switch to turn off the device, a confirmation prompt will appear on the touchscreen interface to verify shutdown.

10. DC IN

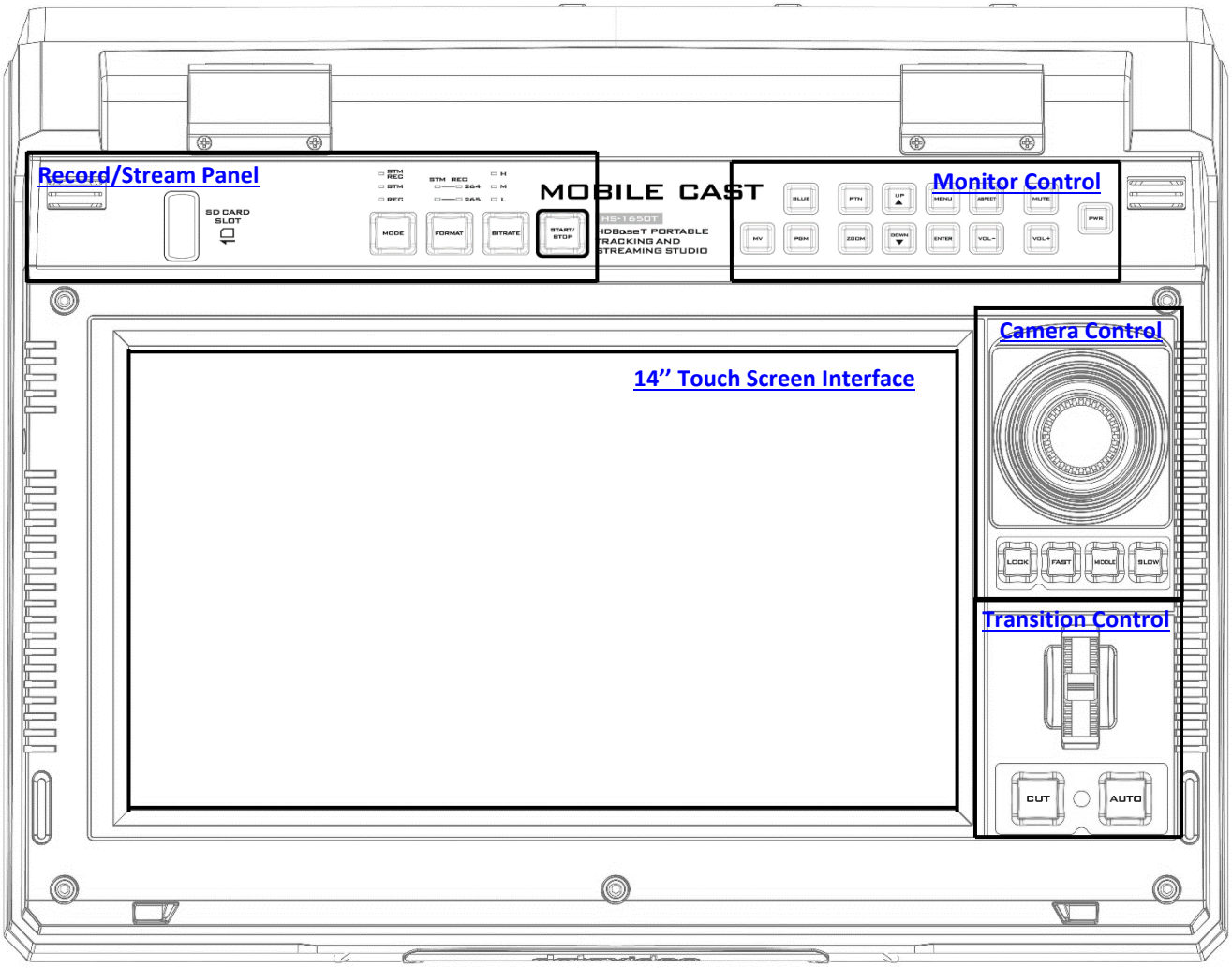
DC in socket connects the supplied **56V / 250W** PSU.

11. Stream Port

The stream port allows the user to establish direct connection between the notebook computer and the HS-1650T in order to access the built-in NVS-31 Mark II or connect the NVS-31 Mark II to any local area network.

Note: See *Chapter 6 Video Streaming and Recording* for device configuration and operations.

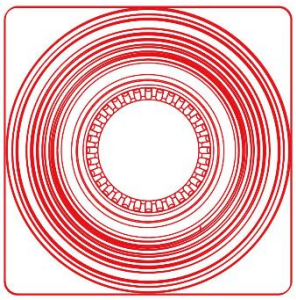
2.2 Switcher Keyboard Panel



Camera Control

Use the joystick to control pan, tilt, and zoom functions on the connected PTZ cameras. Adjust the camera movement speed using the Speed buttons. Before using these features, select a connected camera using the CAM buttons described in the ***Camera Selection Buttons*** section.

Joystick



PAN – Move the joystick left or right to pan the selected PTZ camera laterally.

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

ZOOM –Rotate the joystick clockwise (right) to zoom in, or counterclockwise (left) to zoom out with the selected PTZ camera.

Note: Before operating the joystick, ensure the **LOCK** button is disabled. If the LOCK button LED is ON, the joystick is locked. Press the **LOCK** button to unlock it.

Speed Buttons

You can choose the movement speed of the selected camera by pressing one of the three speed buttons:

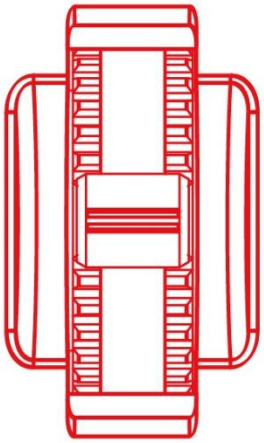
Fast: Moves the camera quickly across pan, tilt, or zoom operations.

Middle: Provides a balanced speed for general use.

Slow: Enables precise control, useful for fine adjustments.

Transition Control

Transitions can be controlled manually with the **T-Bar** or automatically using the **Auto** button.



Push the **T-Bar** up or down to manually transition from the current Program source to the selected Preview source. The transition effect selected in the ***Start*** menu, wipe or mix, will be applied. The transition is complete when the T-Bar reaches the end of its travel.

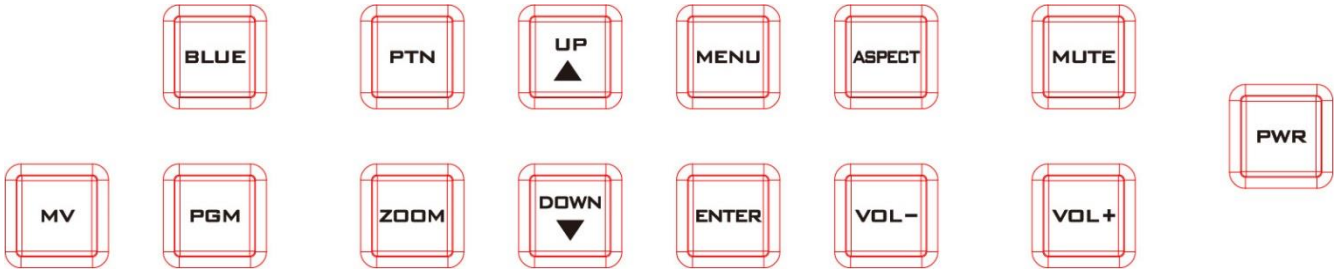
Note: The T-Bar is bi-directional and can be moved in either direction to perform the transition.

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

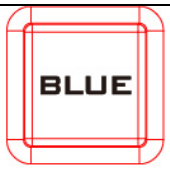
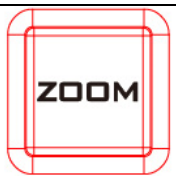
Pressing the Auto button triggers a transition between the PVW and PGM views using the selected transition effect and speed. The transition speed can be configured in the ***Start*** menu. The transition effect can also be selected there.

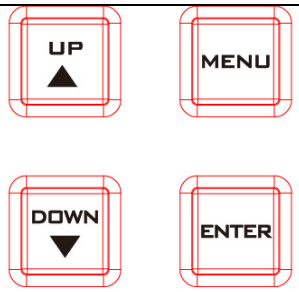
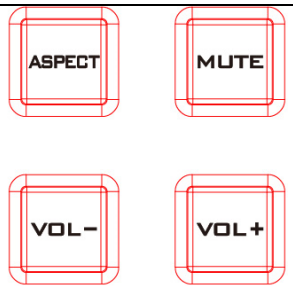
Monitor Control Panel

This panel contains physical control buttons for the built-in monitor. These buttons allow users to select the display mode (MV or PGM), modify the aspect ratio, set the zoom ratio, and adjust the audio volume. The **MENU** button provides access to the monitor's OSD (On-Screen Display) menu, which is discussed in detail in ***Chapter 4***.

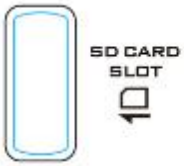


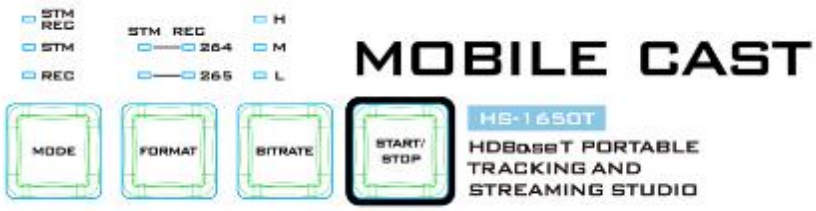
Buttons	Descriptions
	**Power** Switches the HS-1650T Monitor Power ON / OFF
	**PGM** Press to display the PGM view on the built-in monitor. Select the PGM resolution in ***PGM Out Res.*** of the ***Setup*** menu. **Note:** Use the buttons on the **Program row** to select the Program video source.
	**MV** Press to display Multiview screen on the built-in monitor. Select the PGM resolution in ***MV Out Res.*** of the ***Setup*** menu. The Multi Image Preview or Multiview displayed on the built-in monitor is supplied from the three HDBaseT inputs and one HDMI input. The Multiview will also display basic tally information on the respective screens by highlighting the live source image (program view image) with a red border, and the cued/next source image with a green border. If PIP is enabled, the sub video source will always be highlighted with a red border.

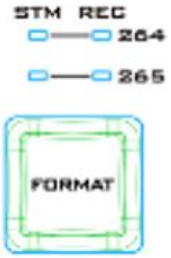
	 **Note:** Use the buttons on the **Program row** to select the Program video source, and the buttons on the **Preview row** to select the Preview video source.
	**Blue Button (Blue Only Mode)** Press to activate Blue Only mode. This disables the red and green channels, displaying only the blue channel, which appears as a grayscale image. Use this mode for: • **Camera iris adjustment** • **Chroma (saturation) calibration** • **Phase (hue) calibration** Press again to exit Blue Only mode.
	**PTN Button (Pattern)** Press to set the screen to the SMPTE 75% color bars pattern. Use this function to calibrate the monitor's color. Press again to return to the previous 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**.

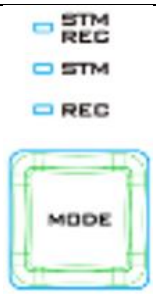
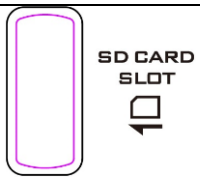
	**Menu Navigation Buttons** Display and navigate the setup menus. *See **Menu Options** in **Chapter 4** for more details.*
	**Aspect Ratio Button** Sets the Aspect Ratio to 16:9 / 4:3 **Volume Control** Adjusts the speaker / headphone volume up / down. **MUTE** Mutes the audio from the internal speakers or headphone socket.

Record/Stream Panel





Buttons	Descriptions
	**Start/Stop Button** Press and hold the **Start/Stop** button for at least 2 seconds to enable/disable live streaming or recording depending on the operation mode selected.
	**BITRATE Button** Press the **BITRATE** button to switch between **high (H)**, **moderate (M)**, and **low (L)** bitrates for the selected operation mode: **RECORD only**, **STREAM only**, or the **RECORD and STREAM hybrid** mode. See **Encoder Mode** in the ***Stream Mode*** or ***Record Mode*** section and ***Section 6.4*** for details.
	**FORMAT Button** Press the **FORMAT** button to toggle between H.264 and H.265 for streaming and recording. The LED indicators indicate the selected format. See ***Section 6.4*** for details.

	**MODE** Press the **MODE** button to select the operating mode of the video streaming server. The available modes are as follows: **STM+REC:** Stream and record simultaneously **STM:** Stream only **REC:** Record only The LED indicator for the selected operating mode will turn on. See ***Section 6.4*** for details.
	**SD Card Slot** Insert an SD card into the SD card slot for video recording. **Note that you should only use Class 10 SD card or above. See the Appendix, *Recommended SD Cards*, for a list of SD cards recommended by Datavideo.** **Note: Do not remove the SD card while it is being written as doing so may result in corrupted video files. Also ensure the SD card has a capacity well above 2 GB during recording. Video recording will stop if the SD card capacity falls below 2 GB.**

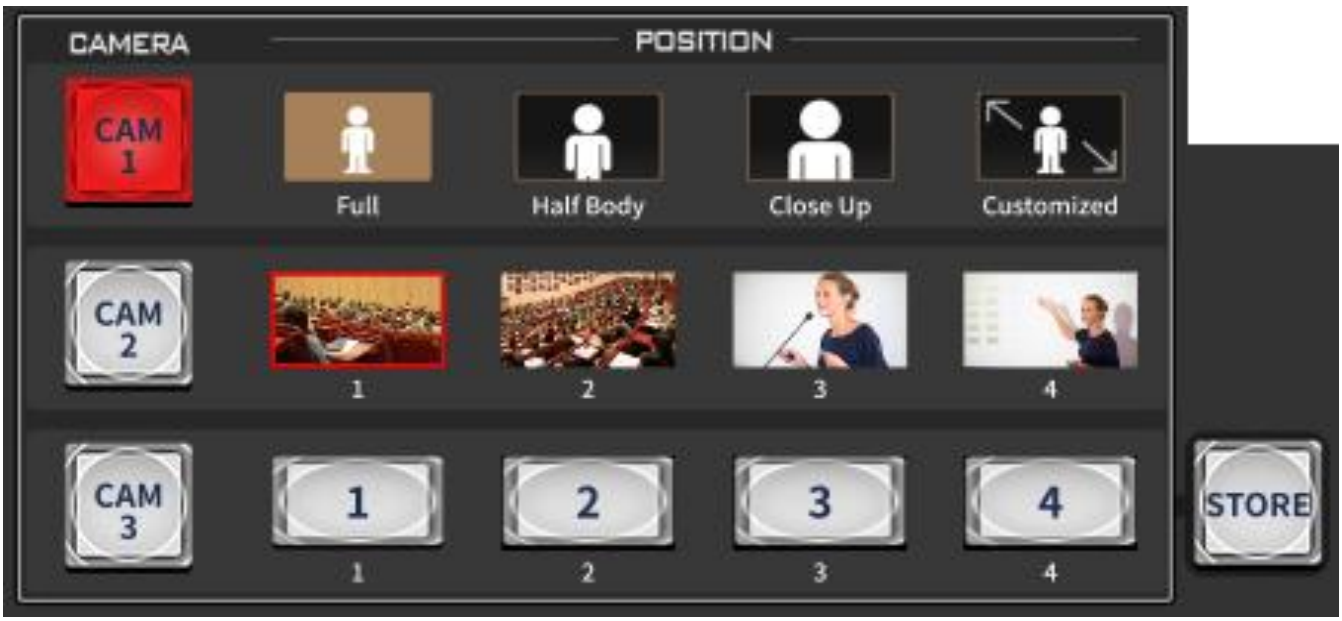
2.3 Touch Screen Interface

The touchscreen interface is shown below. When the **lock** button in the center is enabled, all interface controls are disabled to prevent unintended operation. Please note that the Datavideo logo will appear on the Program (PGM) view if the selected PGM source is an interlace video (576i, 480i or 1080i@50/59.94/60).

Camera Control

This section explains how to effectively use the different camera control functions.

Camera Presets



Camera Selection Buttons

To access the presets of a connected camera, begin by pressing the corresponding **CAM** button. Once selected, the CAM button will **illuminate in red** to indicate it is active.

Note: Pressing the CAM buttons also enables PTZ control via the joystick.

Camera Preset Buttons

Each camera supports up to four preset positions. These are accessed using the preset buttons to the right of the CAM button, with each button representing one stored camera position. The icon on each preset button shows the corresponding live camera view. When selected, the button is highlighted with a red rectangular outline.

Note: As shown in the diagram above, when auto tracking is enabled for Camera 1, its preset button row **is replaced with** four **figure size** buttons. These allow you to choose between **Full**, **Half Body**, **Close Up**, or **Customized** views of the presenter for auto tracking.

STORE Button

To store a new camera position, press the **STORE MODE** button. This activates store mode, allowing you to save the current camera position to a specific preset by pressing the corresponding preset button. Press the STORE MODE button again to exit.

Note: If you are storing a key image, make sure to select the camera source on the Program row first before activating store mode.

FOCUS / IRIS / White Balance

First, select a connected camera using the CAM buttons, then proceed to configuring the camera's focus, iris and white balance settings.

White Balance

Certain light conditions can cause discoloration of your image. White balance allows you to adjust the color balance in order to produce the best image quality.

Auto (Automatic White Balance)

Tap the **Auto** button to enable automatic white balance adjustment.

One Push

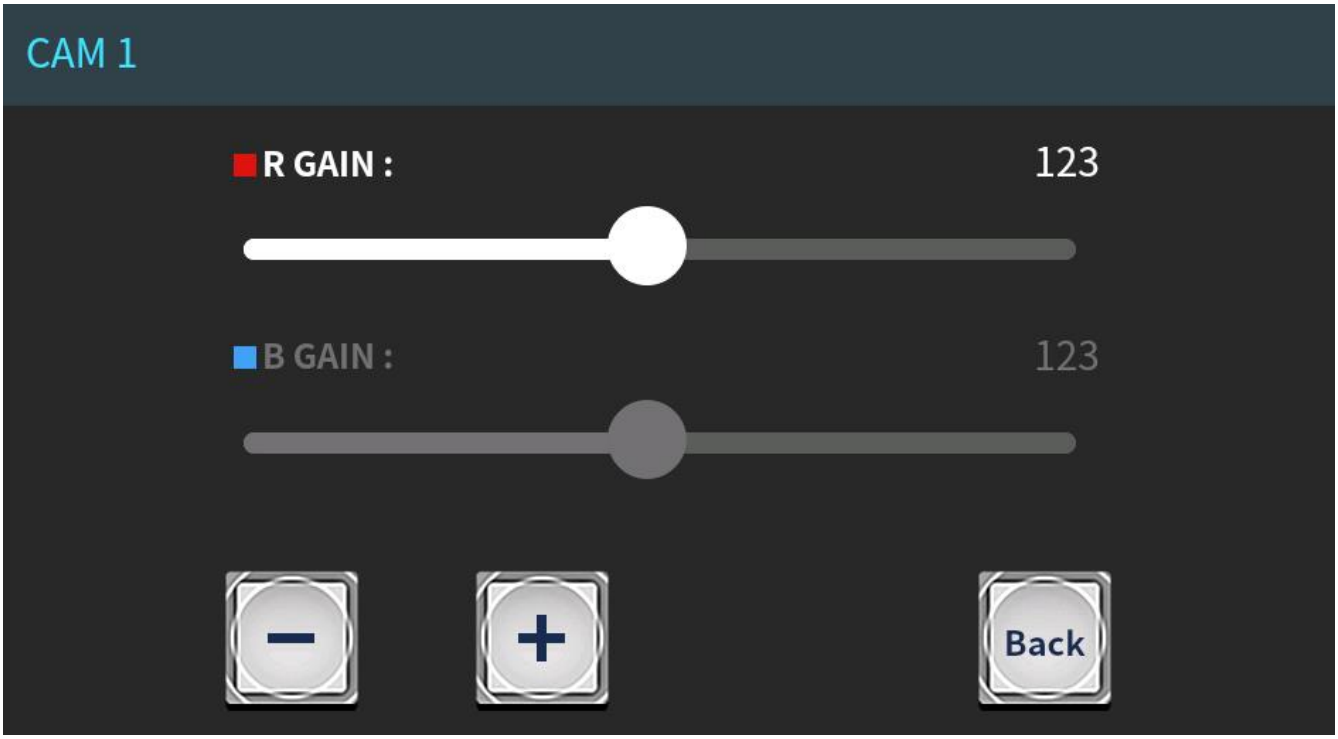
The **One Push White Balance** mode is a temporary white balance setting that is automatically adjusted when the user activates it. The setting is not retained after the power is turned off. In other words, turning off the system resets the One Push White Balance.

The One Push White Balance mode can also be used for white balance calibration. To do this, zoom the camera lens in on a white object, such as a piece of paper, to serve as a reference for what is considered white. Then, tap the **ONE PUSH** button to adjust the other colors accordingly.

Note: If you are using the HS-1650T in conjunction with the PTC-140T, wait for approximately 5 to 6 seconds after tapping the **ONE PUSH** button while the camera automatically adjusts the white balance. Once complete, you may proceed to the next step.

Manual

Tap the **Manual** button to access manual white balance adjustment as shown below.



Focus

To manually control the **FOCUS** setting, first tap the **MANUAL** button to enter manual mode. The button's LED will turn ON to indicate that manual mode is enabled.

Tap the **+** or **–** buttons to adjust the focus manually.

To switch to **AUTO FOCUS** mode, simply tap the **AUTO** button.

IRIS

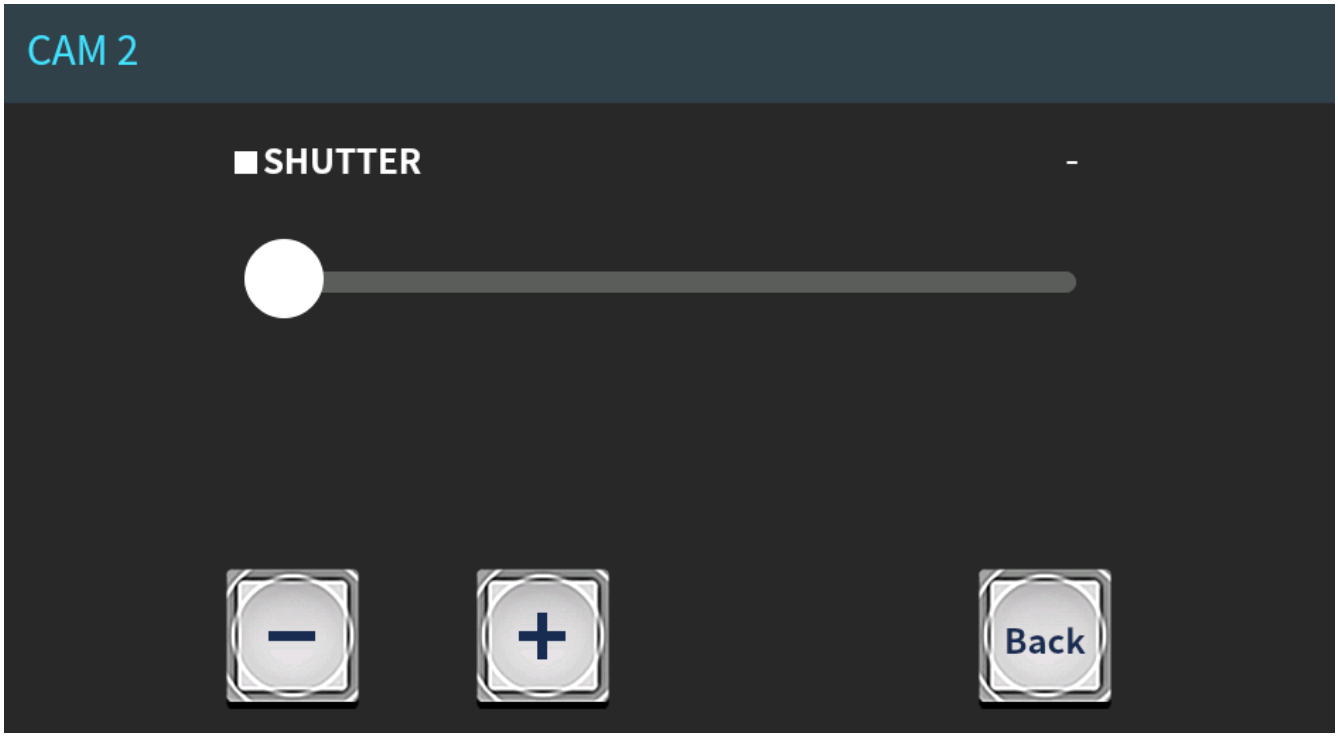
To manually control the **IRIS** setting, first tap the **MANUAL** button to enter the manual mode. The button's LED will turn ON to indicate that manual mode is enabled.

Tap the **+** or **–** buttons to adjust the iris manually.

To switch to **AUTO IRIS** mode, simply tap the **AUTO** button.

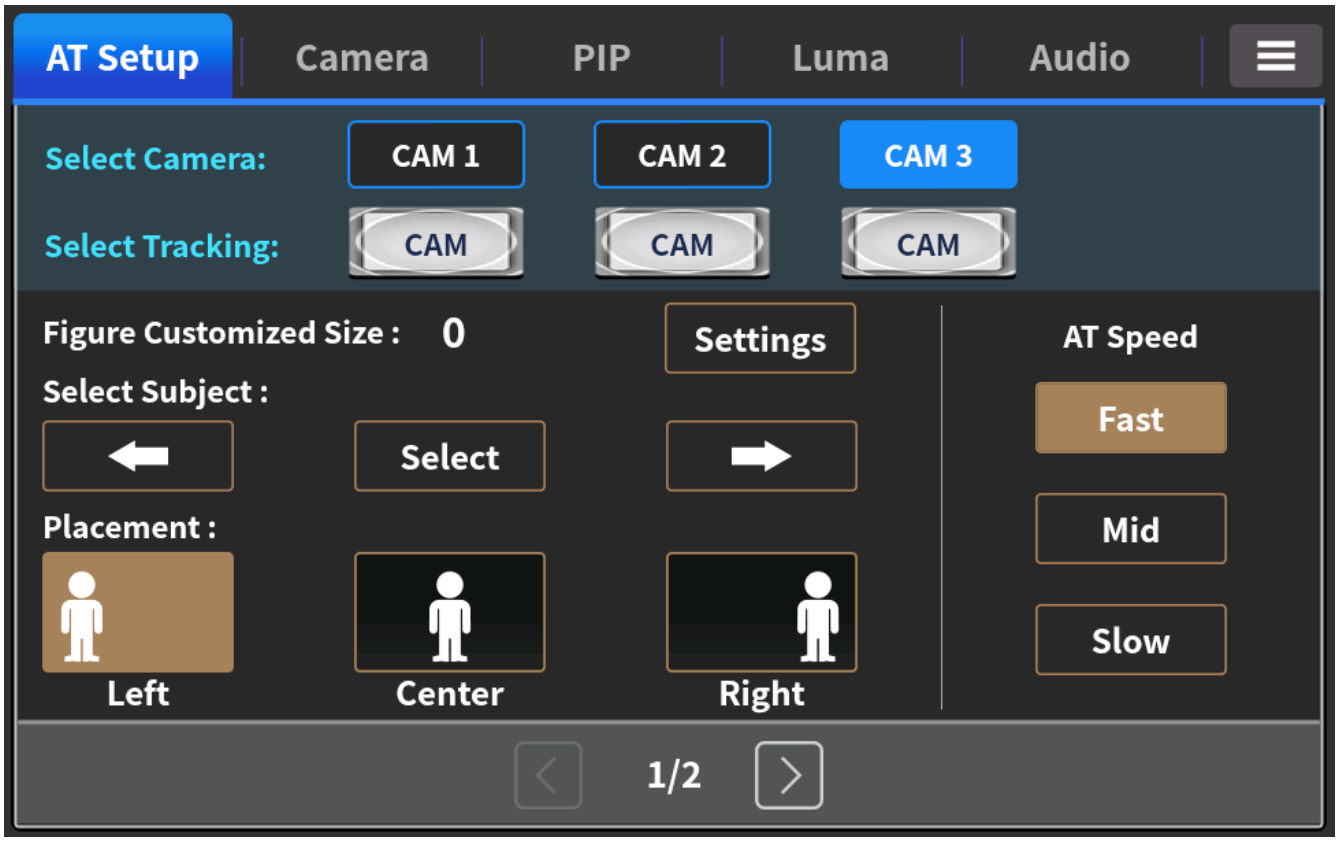
Shutter Speed

Tap the **Shutter** button to access the shutter speed slider, which allows you to adjust the shutter speed setting.

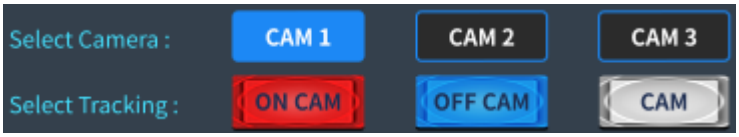


Auto Tracking

Details of the auto tracking settings will be provided in this section.



Camera Selection Buttons



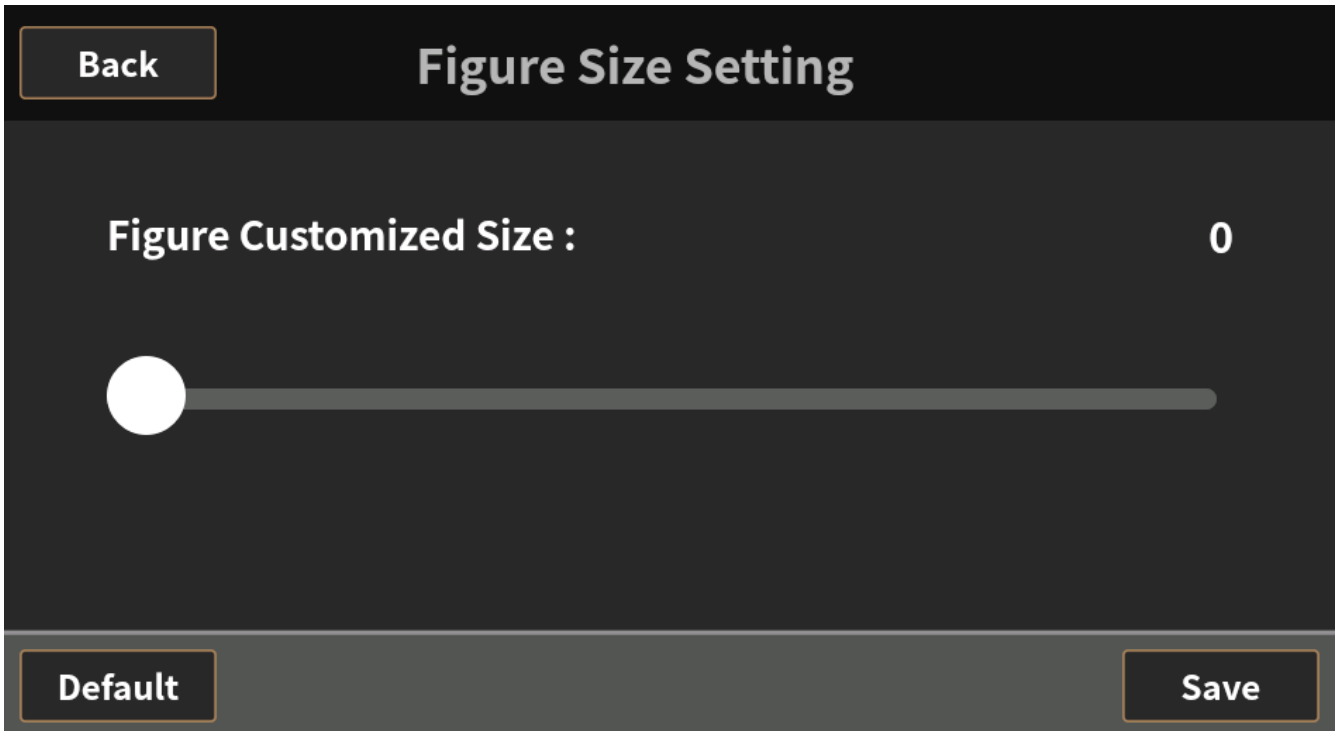
To set up a connected auto tracking camera, begin by pressing the corresponding CAM button. Once selected, the CAM button should illuminate in blue.

You can initiate auto tracking by pressing the **ON/OFF** button right below. If the button illuminates in red, the camera's auto tracking function has been enabled; if it illuminates in blue, the function is disabled. The auto tracking function is not available when the button illuminates in white.

Figure Customized Size

When auto tracking is activated, camera presets 1, 2, 3 and 4 buttons should allow you to respectively select a full, half body, close up or customized view of the presenter. If you would like to track the entire presenter in the view, select "**Full**". Choose "**Half Body**" to track the presenter with a closer view, covering approximately 60% of the body. Opt for "**Close Up**" to track only the upper body of the presenter.

To customize the tracking profile, select "**Customized**" and tap the "**Settings**" button. On the **Figure Size Setting** page, use the **Size** slider to adjust between 80 and 350 to change the view size. Choose a smaller value for a closer view and a larger value for a wider view. Finally, click "**Save**" to confirm your settings.



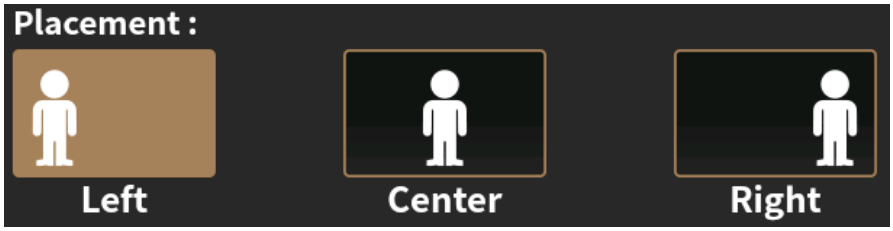
To reset, simply click the "**Default**" button.

Select Subject

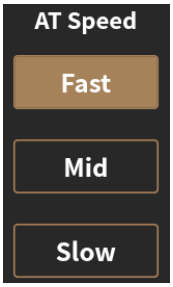
When there are multiple targets, you can use the right and left arrow keys to switch between them. Tap the **Select** button to confirm selection of the target.

Placement

As shown in the diagram below, you can keep the target to the left, in the center or to the right of the image while the camera tracks it.



Speed Selection Buttons

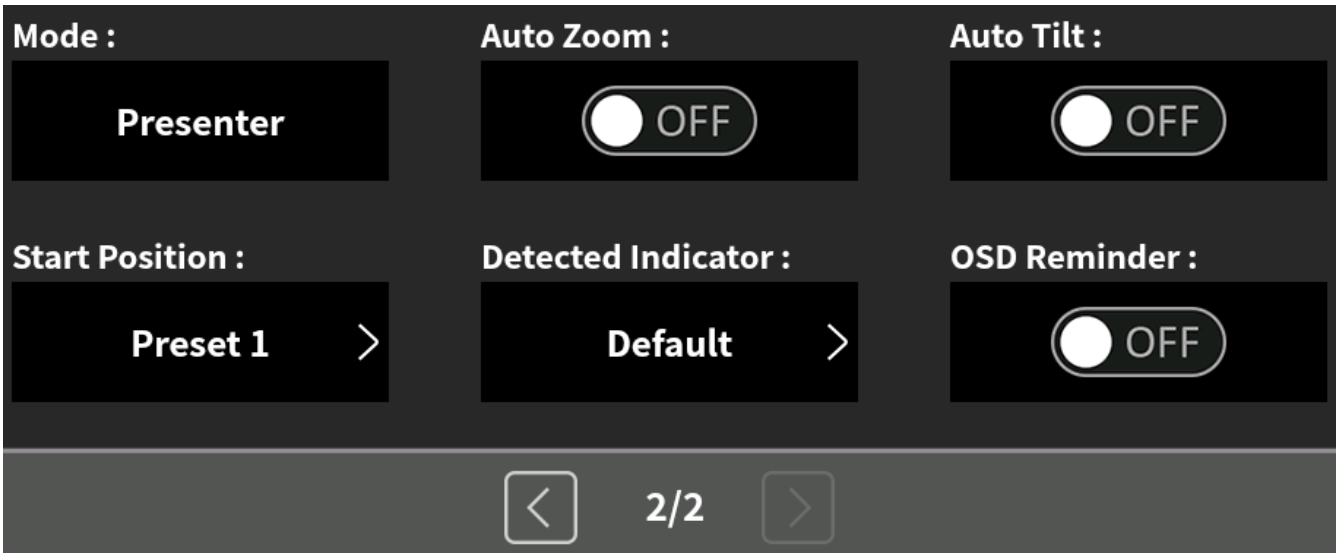


Use the speed selection buttons to select the auto-tracking speed. The numerical values of the available speed modes are listed as follows:

FAST: 60 degrees per second
MID: 40 degrees per second
SLOW: 20 degrees per second

Mode

In Presenter mode, the camera will start tracking as soon as a presenter is on the stage or in the camera view and stops when the presenter leaves the stage.



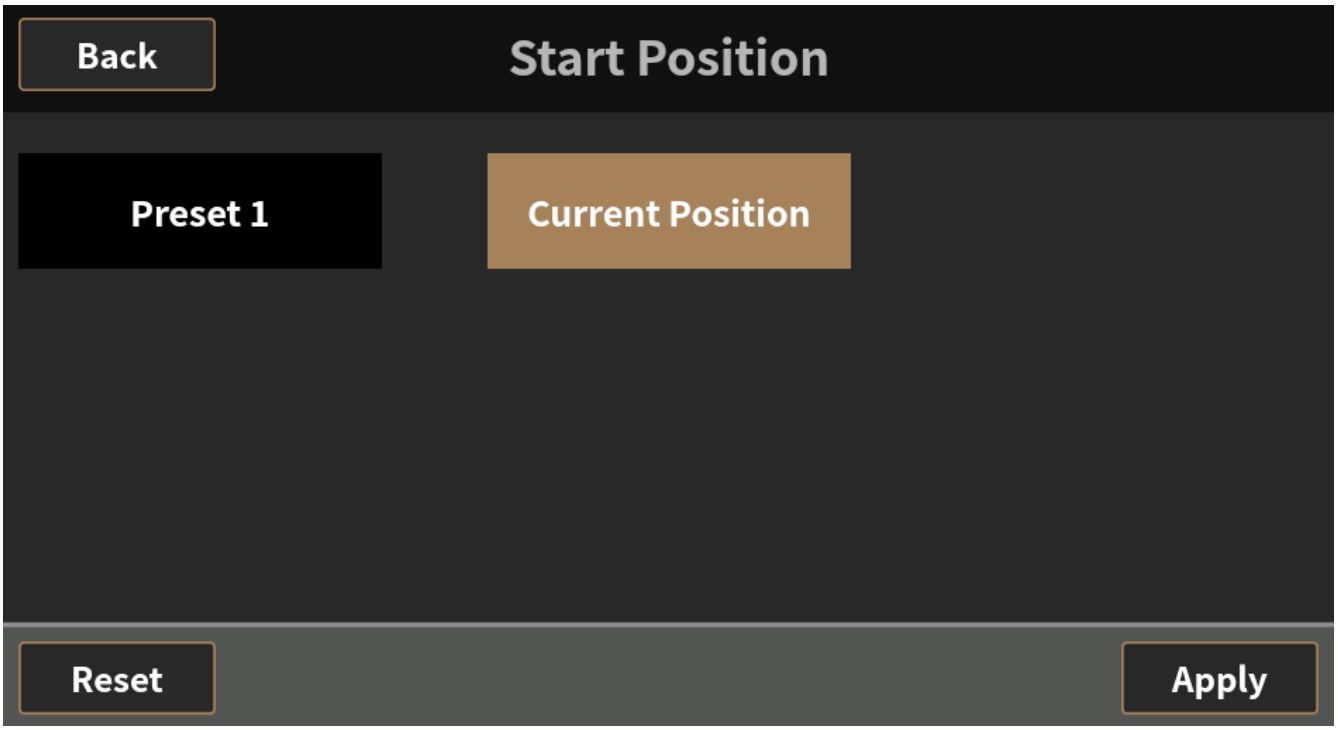
Auto Zoom

Enable auto zoom so that the camera zooms in/out automatically when the presenter is tracked.

Auto Tilt

Enable auto tilt so that the camera tilts automatically when the presenter is tracked.

Start Position



This sets the initial tracking position. Use the keyboard's ***Camera Control*** panel to move the camera view to where you would like the tracking to begin, then select **Current Position**. You can also select **Preset 1** which is a pre-saved location.

Detected Indicator

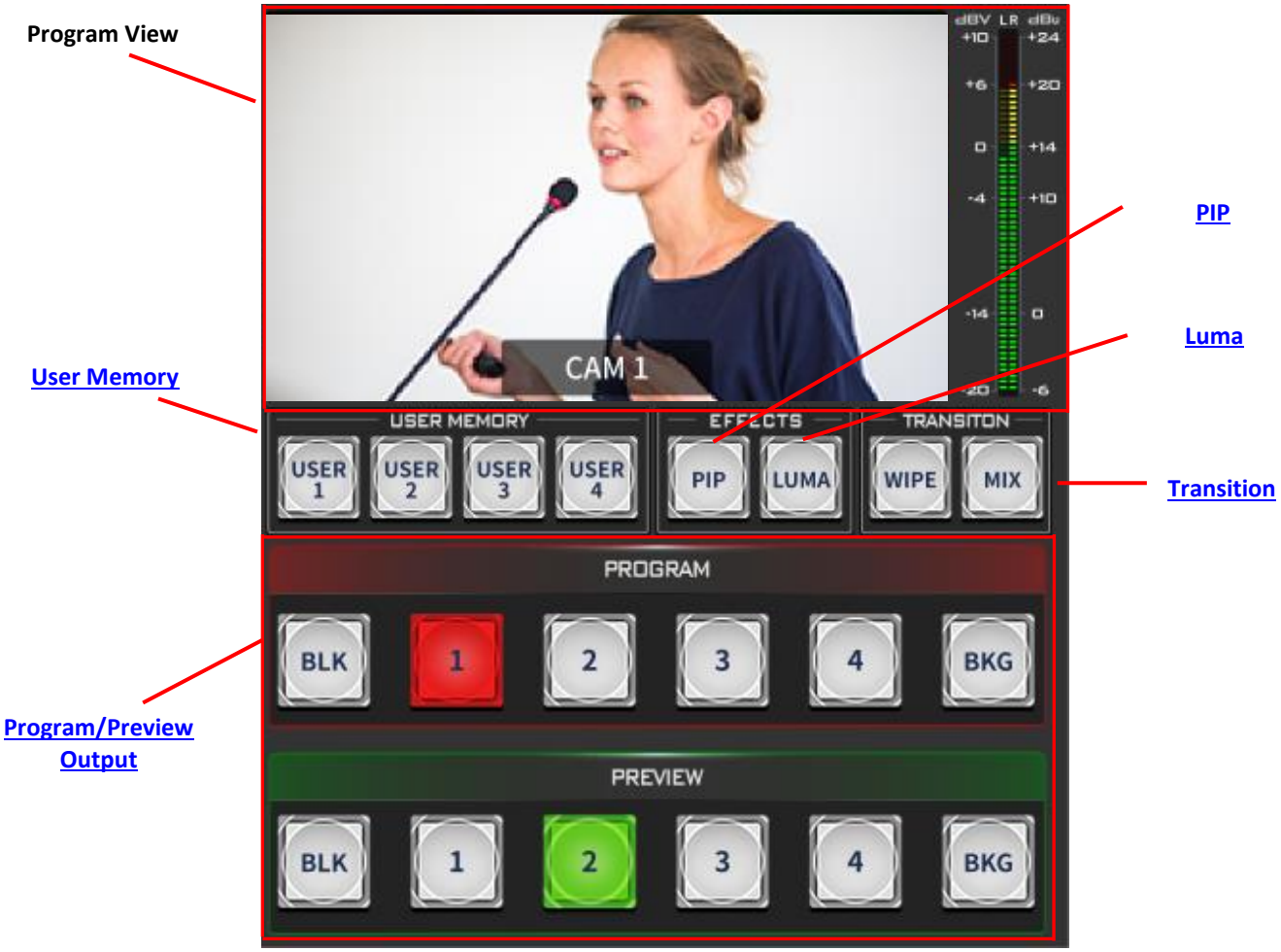
When enabled, the camera will automatically pan, tilt, and zoom to track the targeted object once the presenter is detected.

OSD Reminder

When the OSD Reminder is enabled, a message will appear on the camera's video output indicating that auto tracking is active. This prompt helps confirm that auto tracking has been successfully turned ON.

Switcher Control

This section of the touch panel UI is dedicated to switcher control, providing access to source selection and transition functions for live switching operations.



Program/Preview Output

Pressing the number buttons along the PROGRAM/PREVIEW row selects the video sources for the respective outputs. The program video is displayed in the program window, which also shows an audio level bar. This indicates that the analogue XLR audio input is being received and embedded into the selected Program output. Refer to the ***Audio*** section to adjust the volume levels for various audio inputs and outputs.

BKG button: Pressing the **BKG** button switches to a **Matte** view. The BKG color can be configured in the Main MENU (***Start*** → ***BKG Color***). 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/PREVIEW** outputs.

User Memory Buttons

Use the User Memory buttons 1 to 4 to directly recall previously saved switcher configurations, including PIP and Luma Keyer settings. Refer to the ***User Memory*** section for setup details.

PIP

Picture in Picture (PIP) places the selected **Sub Video Source** into a window over the **Main Program** view, with adjustable window size and position. Tap the **PIP** button to display the configured PIP on the **PGM** output.

Note: The PIP cannot be previewed in the **QUAD** split view display.

Note: When both **PIP** and **Luma Key** features are enabled, the Luma Key layer is rendered above the PIP layer. The layer order is fixed and cannot be changed.

To configure PIP settings, tap the **PIP** tab to open the PIP settings panel shown below.

This panel allows users to configure the **Picture in Picture (PIP)** window, including source selection, position, size, border, and cropping options.

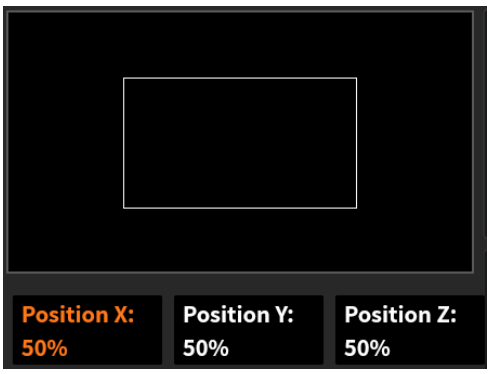
PIP Source

Use this pane to assign an image source to the PIP window. The available sources are listed below:

- BLK: Black
- Input 1: HDBaseT 1
- Input 2: HDBaseT 2
- Input 3: HDBaseT 3
- Input 4: HDMI/PC
- BKG: Background
- Bars: Color Bars

Note: The active source button is highlighted in red.

Position and Size



The preview area displays a real-time representation of the PIP window overlaid on the program output.

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

Adjusting **Position X** moves the PIP window horizontally. Adjusting **Position Y** moves the PIP window vertically.

Use the arrow buttons or the slider to fine-tune the PIP's position as well as the window size.

Each tap of the arrow buttons increments or decrements the setting value by 1. Tap and hold the arrow button to adjust the value at an accelerated speed.

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 the border size to small selects a thin border; middle will yield a medium size width; large is the maximum PIP border width.

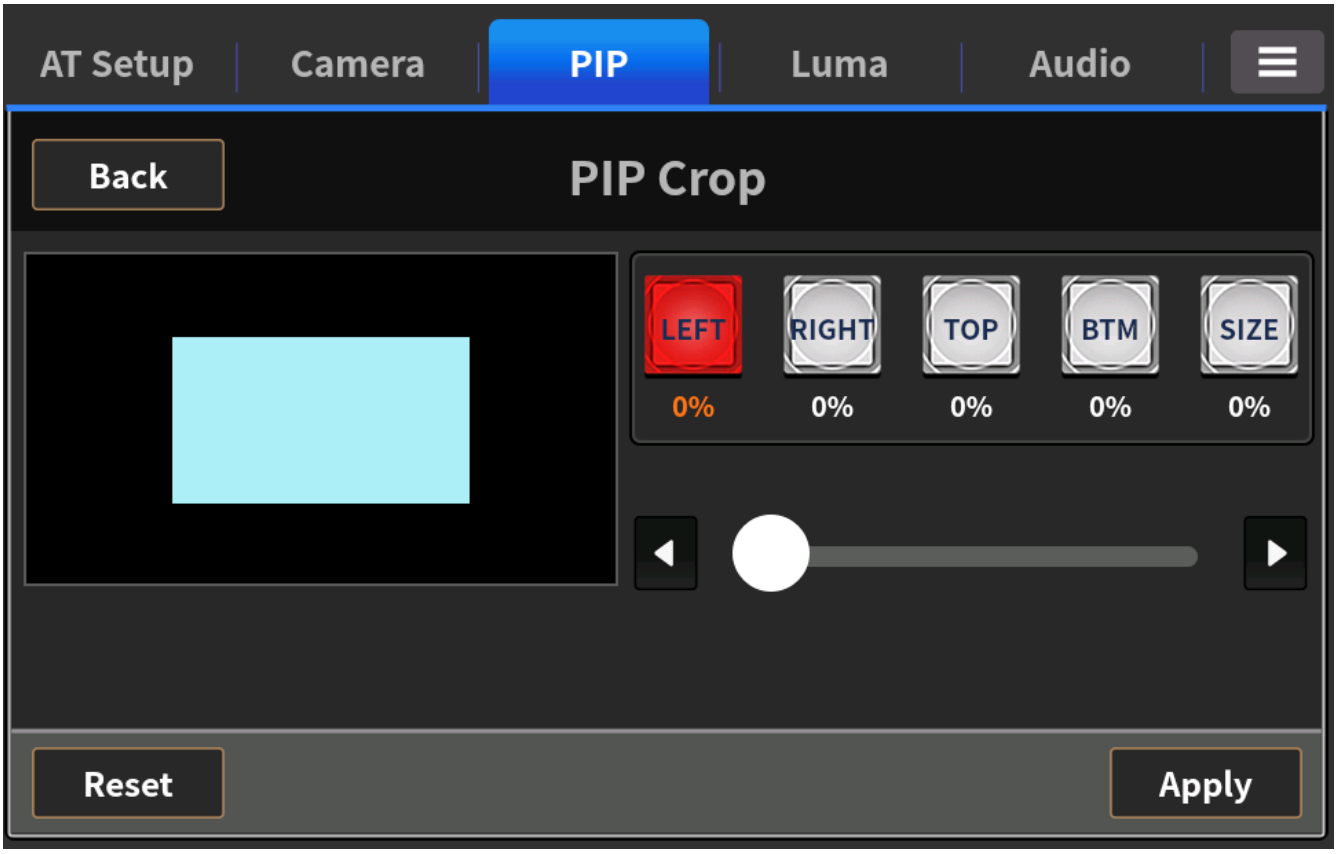
Border Color

The user is allowed to apply a color to the PIP border. The available colors are listed below:

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

PIP Crop

Tap the PIP Crop button to open the PIP Crop panel, which allows precise cropping of the selected PIP source by trimming the image from any of the four sides.



The interface elements are described below:

Preview Area: Displays a visual representation of the cropped PIP output in real time.

Crop Controls: Select the side you want to crop: **LEFT**, **RIGHT**, **TOP**, or **BTM** (bottom). The active button is highlighted in red. Use the slider or arrow buttons to increase or decrease the crop value for the selected side. The percentage value below each button indicates how much of that side is currently being cropped. Tap the **Size** button then simultaneously adjust the overall crop scale proportionally on all sides, based on the current crop values.

Reset Button: Restores all crop values to their defaults.

Apply Button: Confirms and applies the current crop settings.

Reset

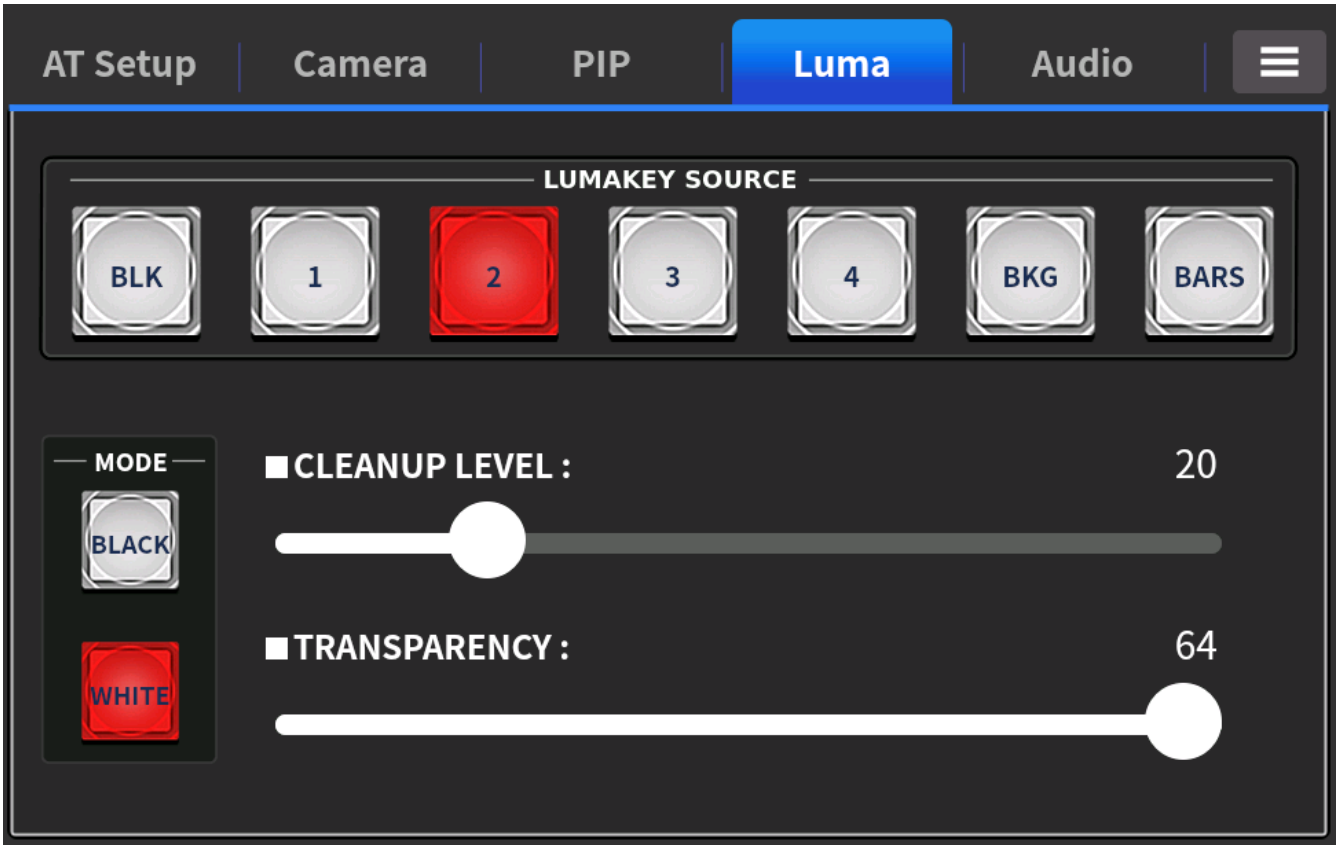
Restores all PIP settings to their default values.

Luma

Tapping the **Luma** button applies the luma key effect to the selected video source and displays the keyed result on the Program Out screen. The luma key effect cannot be previewed on the QUAD split view display.

Note: When both **PIP** and **Luma Key** features are enabled, the Luma Key source appears on the upper layer, while the PIP source is on the lower layer. The layer order is fixed and cannot be changed.

To configure luma key settings, tap the **LUMA** tab to open the luma key settings panel shown below.



Lumakey Source

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

- BLK: Black
- Input 1: HDBaseT 1
- Input 2: HDBaseT 2
- Input 3: HDBaseT 3
- Input 4: HDMI/PC
- BKG: Background
- Bars: Color Bars

Note: The active source button is highlighted in red.

Mode

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

Cleanup Level

The **Cleanup Level** allows fine-tuning of the the luma key effect. The default value is 20.

Transparency

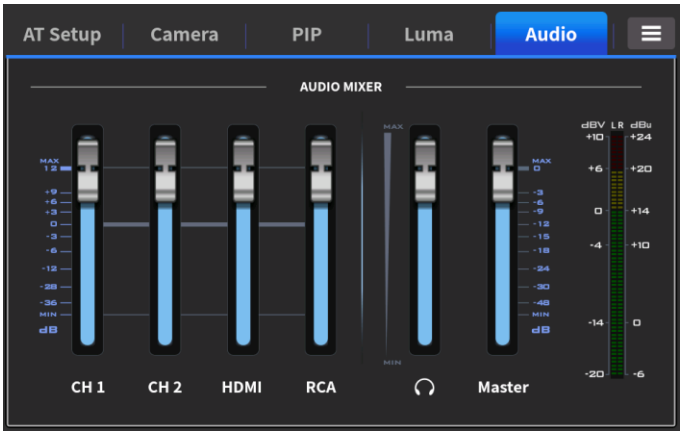
This option allows you to adjust the transparency of the overall foreground key image.

Transition Effects

Tapping the **WIPE** button selects the **WIPE** transition effect. The available options are Left-Right, Top-Bottom and Center, which can be selected in ***Wipe Effect*** drop-down menu of the ***Start*** sub menu. To trigger the **WIPE** transition effect, simply press the **AUTO** button or move the **T-Bar**.

A **MIX**, also known as a dissolve, is a transition wherein the Program video is replaced by the Preview video at a smooth rate. Tapping 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**.

Audio



To configure audio settings, tap the **Audio** tab to open the audio settings panel shown on the left.

Volume Adjustment Sliders

The sliders for adjusting the volume levels of various audio inputs and outputs are described below:

- **CH1:** XLR balanced audio input - Channel 1
- **CH1:** XLR balanced audio input - Channel 2
- **Digital:** Embedded audio from the HDMI input
- **Headphone**: Volume level for the connected headphone.
- **Master**: Main program audio output volume.

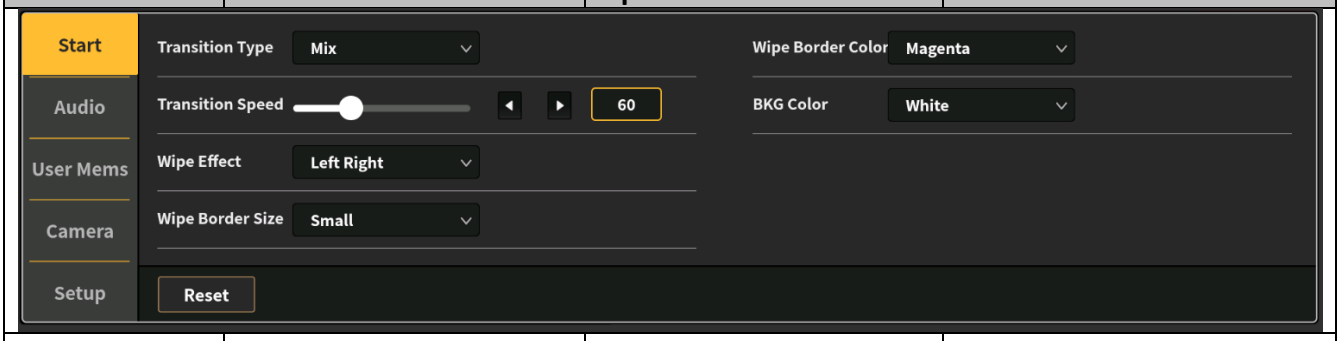
MASTER OUT Meter

The audio meter next to the Master slider shows the audio signal strength at the Main Program Audio Output. The signal strength is determined by the level set with the Master OUT slider.

Chapter 3 Main Menu

The main menu allows users to configure various video effects as well as switcher and camera settings. Audio settings can be adjusted through the Audio menu. In the Setup menu, users can select the interface language, set the video output resolution, reset the system to factory defaults, and customize the network settings.

3.1 Start

Main	Sub-Menu	Options or Values	Default Value
			
Start	**Transition Type**	MIX WIPE	Mix
	Transition Speed	1-200 frames	60 frames; time in seconds should be based on the frame rate of the Program OUT resolution.
	WIPE Effect	Left Right Top Bottom Center	Left Right
	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

Transition Type

The HS-1650T provides two types of transition effect, which are cross dissolve (MIX) and WIPE. The default setting is **MIX**.

Transition Speed

Transition Speed allows the user to set the duration of MIX or WIPE transitions in frames. For example, if the Transition Speed is set to 60, the transition will last 1 second with progressive video, or 2 seconds with interlaced video. When the **AUTO** button is pressed, the transition uses the current Transition Speed defined by the user.

Note: Use the slider to adjust the speed, or tap the left or right arrow next to the slider to increment or decrement the value by 1.

Wipe Effect

On the HS-1650T, there are three wipe effects available for the user to choose. The three wipe effects are **Left Right (HORIZONTAL)**, **Top Bottom (VERTICAL)** and **CENTER**. The default is Left Right.

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 the border size to small selects a thin border; middle will yield a medium size width; large is the maximum wipe border width.

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

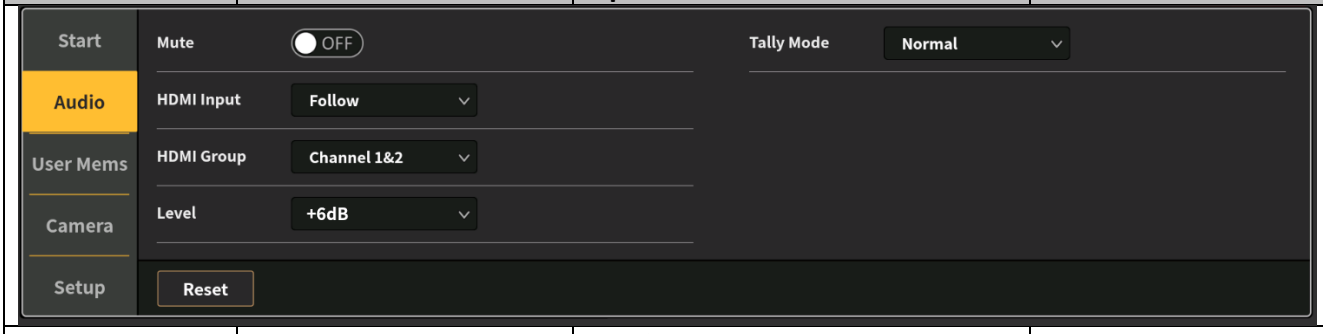
BKG Color

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 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, etc.

Main	Sub-Menu	Options or Values	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	+6dB / 0dB	+6dB
	Tally Mode	Normal / Audio Mixer	Normal

Mute

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

HDMI Input

In this option, you can select the audio source. Selection of input 1-4 allows the HS-1650T 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.

HDMI Group

The HDMI Group allows the user to assign the HDMI audio channel. The default audio channel pair is Channel 1/2. You can select any of the four audio channel pairs.

Level

This item configures the HDMI audio only. The options are **+6dB** and **0dB** which are described as follows:

+6 dB: Amplify the audio output level by 6 dB to match the SMPTE standard, commonly used in North America.
0 dB: Keep the audio output level to match the EBU standard, commonly used in Europe.

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.

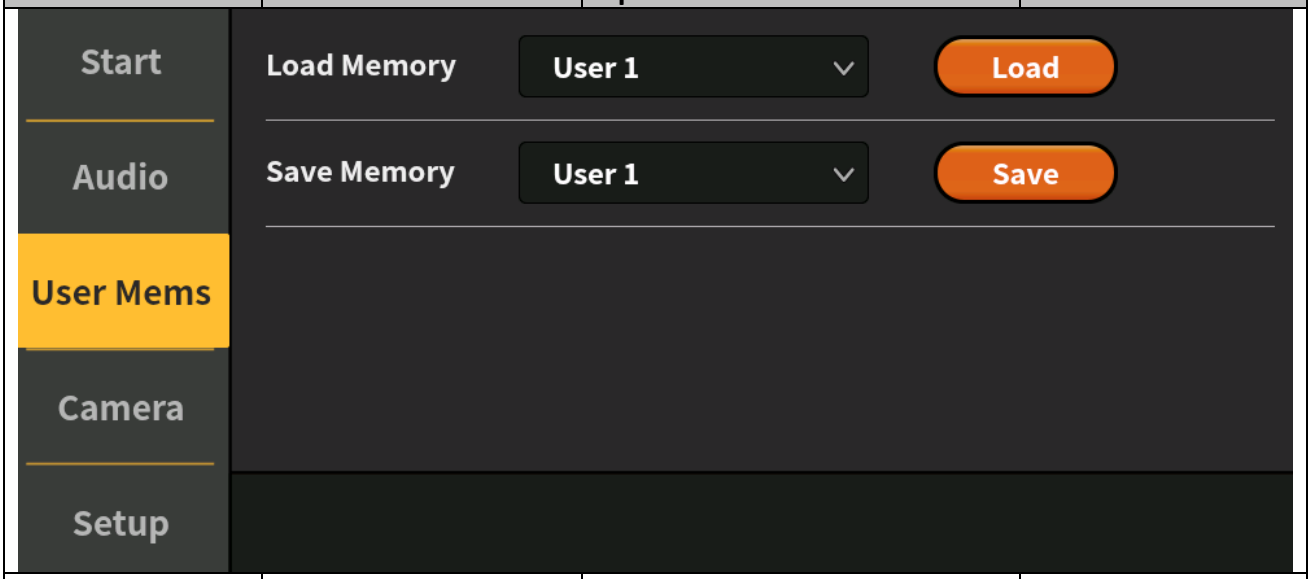
The HS-1650T provides **two tally modes**:

In Normal mode, the tally lights of all video sources currently displayed on the Program screen will illuminate red. The video sources include the main Program, PIP and luma key sources. The video source selected on the Preview button row will show a green tally light and will be displayed on the Preview screen. When a transition is initiated, the tally light colors remain unchanged during the transition. Once the transition is complete, the Program and Preview screens will switch places along with their tally light colors, i.e. red turns green and green turns red.

In Audio Mixer mode, the Program video source will show a red tally light and the Preview video source will show a green tally light. When a transition is initiated, the tally light colors remain unchanged during the transition. Once the transition is complete, the Program and Preview video sources switch places along with their tally light colors, i.e. red turns green and green turns red.

3.3 User Mems

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



Main	Sub-Menu	Options or Values	Default Value
User Mems	**Load Memory**	User 1-6	
	Load		
	Save Memory	User 1-6	
	Save		

Load Memory

Tap the drop-down menu to select the desired memory location and load the saved configuration by selecting "**Load**". The loading process takes approximately 40 to 50 seconds.

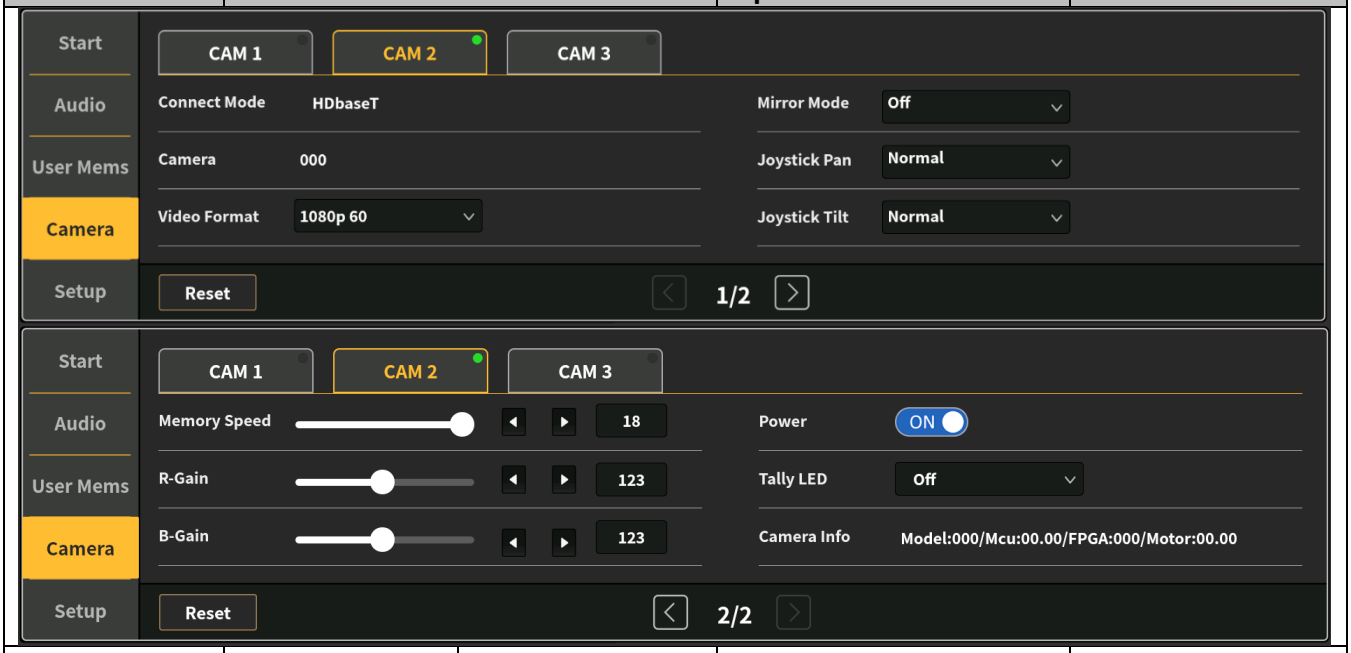
Tip: The user can also press one of the USER memory shortcut buttons (1-4) on the touch screen interface as a quick way of loading those previously saved User configurations.

Save Memory

Tap the drop-down menu to select the desired memory location and save the current configuration by selecting "**Save**".

3.4 Camera

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

Main	Sub-Menu	Options	Values
			
Camera	**[CAM-1/2/3]**	**Video Format**	1080i/59.94 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	1-18	
		R-Gain	0-255	
		B-Gain	0-255	
		Power	On/Off	
		Tally LED	Off Red Green	
		Camera Info	Model	
			MCU	
			FPGA Version	
			Motor Version	

CAM-01/02/03

CAM 01/02/03 tabs allow you to configure the basic settings for each connected camera individually.

Video Format

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

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

Mirror Mode

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

- V: Vertical mirroring
- H: Horizontal mirroring
- H+V: Horizontal and Vertical mirroring

Joystick Pan/Tilt

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 1-18.

R-Gain/B-Gain

R-Gain and **B-Gain** adjust the intensity of the red and blue color channels, respectively. Their values range from **0 to 255**, where higher values increase the corresponding color component.

Power

Select **ON** to start powering the selected camera; select **Standby** to enter the camera into power standby mode.

Tally LED

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

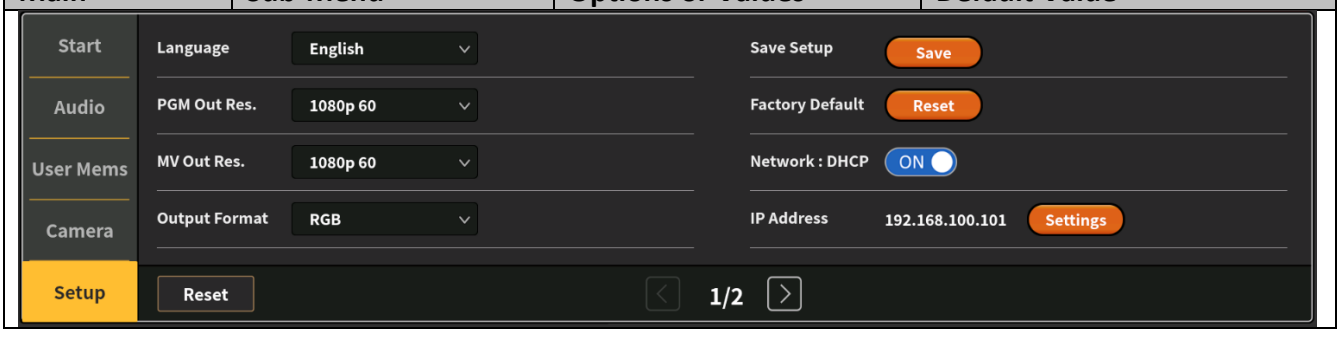
Camera Info

This field provides camera information display such as **Model No.**, **MCU**, **FPGA Version**, and **Motor Version**.

3.5 Setup

In the "Setup" menu, the user can change the **output resolution**, reset the HS-1650T to its **Factory Default** values, choose the preferred menu **language**, and view the **current firmware versions** (Mainboard and Keyboard).

Main	Sub-Menu	Options or Values	Default Value



Setup	**Language**	English Simplified Chinese Traditional Chinese	
	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	
	Output Format	RGB YUV444 YUV422	
	Save Setup	[Save]	
	Factory Default		
	Network: DHCP		
	IP Address	DHCP	ON/OFF
		IP Address	192.168.100.100
		Network Mask	255.255.255.0
		Gateway	192.168.1.1
	MB Software	V1.0.0	
	KBD Software	V1.0.8	

Language

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

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 input and output resolutions are identical to avoid unexpected errors.

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.

Output Format

Select a color encoding system for your video output. The available color formats are listed below:

- RGB
- YUV444
- YUV422

Save Setup

Select "**Save**" to save the current configuration.

Factory Default

Tap the **Reset** button to restore the machine its **Factory Default** values.

IP Address

The configured IP address will be shown. Tap the **Settings** button to modify the network settings.

The default values are shown below.

- DHCP: Off
- IP address: 192.168.100.100
- Network Mask: 255.255.255.0
- Gateway: 192.168.1.1

MB and KBD Software

The **MB** and **KBD** software fields display the respective version numbers.

Chapter 4 Monitor

Use the on-screen menu to configure the HS-1650T's built-in monitor. Press the **MENU** button to display the main menu on the monitor. Use the **Up / Down** buttons to either navigate through the menu or change the value of a selected option. Press the **ENTER** button to confirm the selection. Once the chosen settings have been confirmed, it is stored within the switcher's non-volatile memory.

This section covers the menu options in the order that they appear on the monitor. Options may vary depending on the firmware version in use.

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	
	BACK LIGHT	0 – 100	
	NR	HIGH MID LOW OFF	
	MPEG NR	HIGH LOW OFF	
	VOLUME	0 – 100	
	EXIT		
COLOR ADJUST	**6500**		
	9300		
	7500		
	Datavideo Standard		
	USER COLOR	RED	0 – 100
		GREEN	0 – 100
		BLUE	0 – 100
	EXIT		
SCAN SETTING	**UNDERSCAN**		
	OVERSCAN		
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 OFF	
	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	
	EXIT		
FACTORY RESET			
EXIT			

Main Adjust

The **MAIN ADJUST** menu allows you to adjust various screen settings. The available options are described below:

Brightness

Adjust the brightness of the screen from 0 – 100.

Contrast

Adjust the contrast of the screen from 0 – 100.

Sharpness

Adjust the sharpness of the screen from 0 – 100.

Saturation

Adjust the saturation of the screen from 0 – 100.

Tint

Adjust the tint of the screen from 0 – 100.

Backlight

Adjust the backlight level of the screen from 0 – 100.

NR

NR stands for noise reduction. The options are described below:

- **High**: Maximum noise reduction, may slightly blur fine details.
- **Mid**: Moderate noise reduction, balances clarity and image details.
- **Low**: Minimal noise reduction, preserves most detail.
- **Off**: Disables noise reduction.

MPEG NR

MPEG noise reduction reduces noise caused by MPEG video compression.

- **High:** Strong reduction of compression noise, may slightly blue fine details.
- **Low:** Mild reduction of compression noise, maintains more detail.
- **Off:** Disables MPEG noise reduction.

Volume

This sets the audio volume from 0 – 100.

Color

Select a color temperature for your screen. Available color temperatures are listed as follows:

- 6500°K (Usually for ordinary PC use)
- 7500°K
- 9300°K (TV pictures)
- Datavideo Standard (Recommended)
- User Color

Note: Select User Color mode to manually set the color temperature by adjusting the Red Gain, Green Gain, and Blue Gain.

Scan Setting

The scan setting adjusts how the image fits the screen. Select **Underscan** to display the full image with black borders. Select **Overscan** to enlarge the image to fill the screen but the edges may be cropped.

Information

The **System Information** Menu displays horizontal frequency, vertical frequency, resolution, and monitor firmware version. The information displayed is shown below:

- **H. FREQUENCY:** 67.5KHz
- **V. FREQUENCY:** 60.0Hz
- **RESOLUTION:** 1920X1080P
- **VER.:** 1.42

Language

The available menu languages are **English**, **French**, **German**, **Spanish**, **Italian**, **Dutch**, **Portuguese**, and **Russian**.

Special Function

The Special Function Sub-Menu consists of the following tools:

OSD Timeout

This sets the OSD menu's ON time by selecting a value from 5 to 120 seconds; the OSD menu will be automatically turned off after the timer times out.

Frame Ratio

Sets the safety zone display; a safety zone is a central area within which video content remains visible and uncropped on various display devices.

- **90:** Displays a 90% safety zone.
- **80:** Displays an 80% safety zone.
- **Off:** Hides the safety zone display.

4:3 Mark Line

Turns on the 4:3 aspect marker display.

Central Mark

The Central Marker, if turned on, will place a crosshair in the middle of the screen.

Cinema Zone Mark

The cinema zone marker sets the area corresponding to the standard cinema view within which video content remains visible on cinema or widescreen displays.

Audio Channel L

Select the embedded audio channel for the left output.

Audio Channel R

Select the embedded audio channel for the right output.

Factory Reset

Selecting **Factory Reset** restores all monitor settings to default values.

Chapter 5 Applications

5.1 Placing a logo on the video using the lumakey function

The HS-1650T 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 below to insert the logo layer.

Note: If your logo consists primarily of dark colors, 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. On the touch screen interface, tap the **Luma tab** to open the luma key settings panel.
3. Set the "**Lumakey Source**" to **Input 4**.
4. In this example, let's assume that 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**" to 64. **Semi-transparency** effect can be generated by setting the "**Transparency**" to a value between 0 and 64.
7. After the Logo is properly configured, tap the **Luma** button to place the logo on the Program Out 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-1650T.

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 camera's main menu and select option 4 "**Remote Control**".

```
[MAIN MENU]
1:    CAMERA SET (NORMAL)
2:    MEMORY
3:    VIDEO OUTPUT
4:    REMOTE CONTROL
```

```
5:  SYSTEM
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 38400.

```
[SET DVIP]
1:  DVIP BAUDRATE: 38400
2:  ESCAPE
```

7. Connect the PTC-150T to the HS-1650T, which should automatically assign an IP to the PTC-150T.

Chapter 6 Video Streaming and Recording

The HS-1650T 4 Channel HD/SD HDBaseT Portable Video Streaming Studio includes a built-in Video Streaming Server (NVS-31 MARK II) allowing the user to concurrently stream and record your program at the same time. From any SDI/HDMI input sources, the Datavideo's video streaming server generates an H.264 or H.265 encoded stream that is compliant with RTSP or RTMP protocols. While encoding the video at bit rates appropriate for live streaming, the Datavideo NVS-31 MARK II concurrently records a high-quality MP4 file to an SD card.

Note: The built-in video streaming server and recording device are referred to as NVS-31 MARK II.

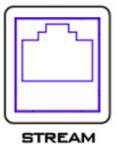
6.1 Streaming Network Connection and Device Search

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

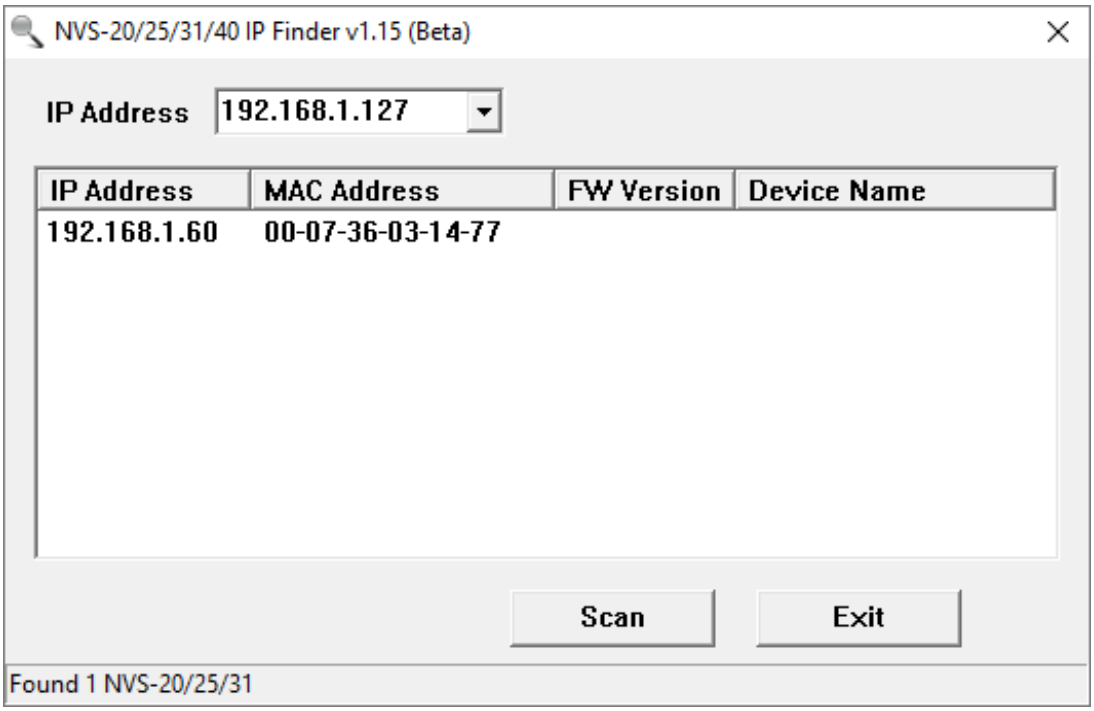
Connecting to a DHCP Network (DHCP Mode)

Follow the procedure below to scan your DHCP network for connected NVS-31 MARK II devices.

Note: The NVS-31 MARK II will be automatically assigned an IP address upon connection to the DHCP network.



1. Connect the NVS-31 MARK II's stream port to the network via an Ethernet cable.
2. Turn on the HS-1650T's power and the NVS-31 MARK II will also be turned ON in the DHCP mode by default.
3. Connect the laptop to the same network that the NVS-31 MARK II is connected to and download the free IP Finder utility program.
4. Double click the IP Finder utility program icon to open the IP Finder interface.
5. Click the **SCAN** button to start searching for connected devices.

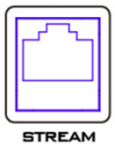


Connecting to a NON-DHCP Network (Static IP)

Upon connection to a non-DHCP network, the NVS-31 MARK II will not be assigned of any IP addresses. As such it is recommended that you manually assign a fixed IP address to the device or use the default IP address (**192.168.1.200**).

Default Fixed IP

Default Fixed IP is primarily used in point-to-point connection, such as connecting the PC to the NVS-31 MARK II directly. In a non-DHCP environment, the NVS-31 MARK II works in fixed IP mode only. To configure the NVS-31 MARK II to the **default IP**, please follow the steps outlined below:



1. Connect the NVS-31 MARK II's stream port to the network via an Ethernet cable.
2. Turn on the HS-1650T's power and the NVS-31 MARK II will also be turned ON in the DHCP mode by default.
3. Search for the NVS-31 MARK II device according to the method as detailed in the previous DHCP section. Once found, log into the user interface on the web browser.
4. Open the system page by clicking the "System" tab on the home of the user interface.
5. In the "Network Setting", disable the DHCP mode.
6. You will then be allowed to manually enter the static IP address once the DHCP mode is disabled. The static IP is 192.168.1.200 by default. The subnet mask and default gateway are 255.255.255.0 and 192.168.1.254 respectively.

Tip: If you forget or lose the IP address, do the following to reset the network settings.

- Turn off the device.
- Press the **RECORD** and **STREAM** buttons at the same time then turn ON the power of the device
- Wait for about five seconds and release the button push as soon as you see the **RECORD** and **STREAM** button LEDs light up.
- The IP address should be the default IP which is **192.168.1.200**.

Troubleshooting the Network Connection

Connect the NVS-31 MARK II to the network and open the IP Finder utility program. Scan for the device. If not found, it is possible that your network is not assigning IP addresses. Reasons of this are listed as follows:

- Router or DHCP server is not connected to the network.
- New devices are blocked by the network administrator.
- Anti-virus software or the firewall blocks the communication.

Solve the problem by attempting the following:

- Turn off the router, wait for 10 seconds then turn on the router again.
- Reset the NVS-31 MARK II to the factory default:
  - Turn off the device.
  - Push the **Record and Stream** buttons simultaneously while turning on the device's power.
  - Wait for about five seconds and release the button push as soon as you see the **RECORD** and **STREAM** button LEDs light up.

- Reboot the PC.

If the problem persists, try the following:

- Temporarily shut down the anti-virus software or firewall.
- Make sure no other devices are connected to the LAN (wired or wireless) because this may result in IP conflicts.

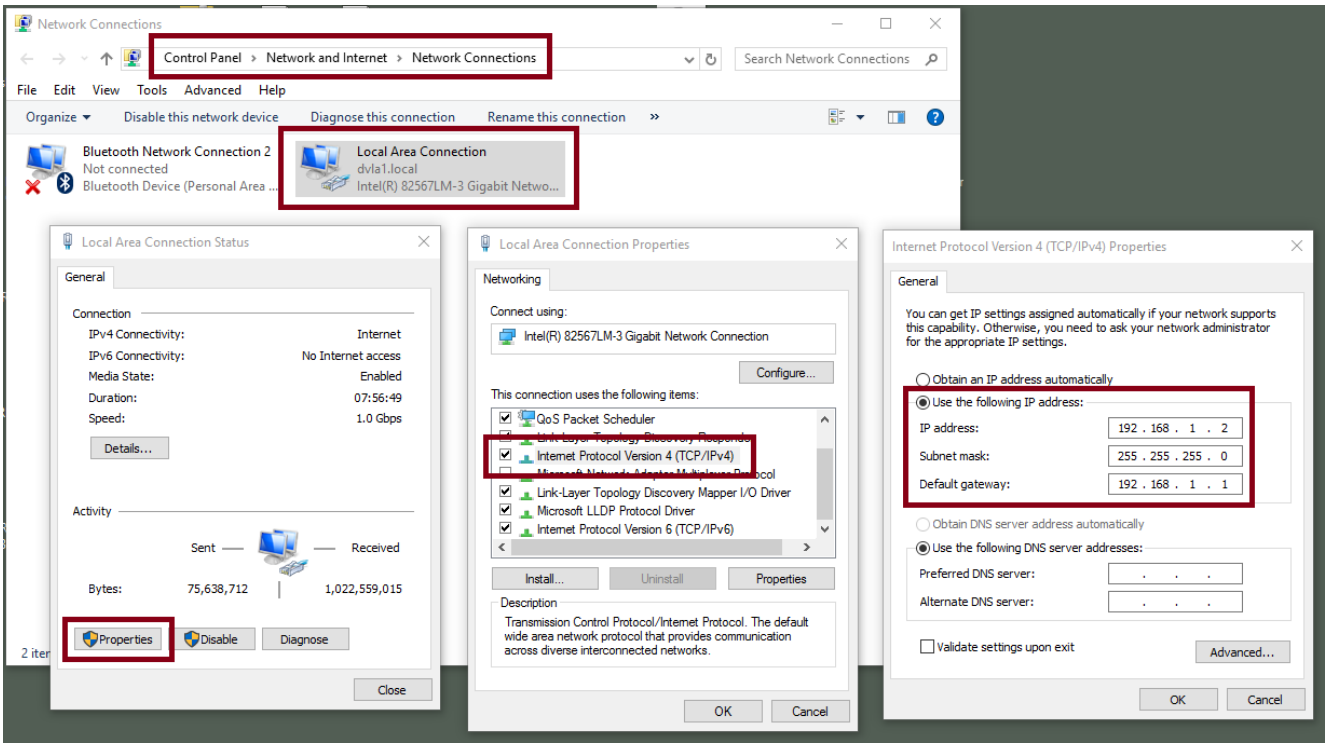
After trying all methods and if the problem is still not solved, the NVS-31 MARK II video streaming server offers the fixed IP feature that allows you to establish direct connection to the NVS-31 MARK II. The default IP address is 192.168.1.200.

This method allows you to configure the NVS device to the IP range of your network so that you do not need a DHCP server to gain access to the NVS device.

- Connect your PC to the NVS device directly using an Ethernet cable (not necessarily a crossover cable).

Next, change the network settings of your PC or laptop.

- Click **START** located at the bottom left corner of your screen.
- On the text bar, enter **Network Connections** then click the icon that appears.
- Double click the network adapter that connects your PC or laptop to the network.
- Click the "**Properties**" button.
- Select "**Internet Protocol Version 4 (TCP/IPv4)**" option and click the "**Properties**" button.
- Check the "**Obtain an IP address automatically**" option.
- Enter IPv4 settings:
  - IP Address: 192.168.1.2
  - Subnet Mask: 255.255.255.0 (System default is 255.255.255.0)
  - Default Gateway: Not required for one-to-one connection.

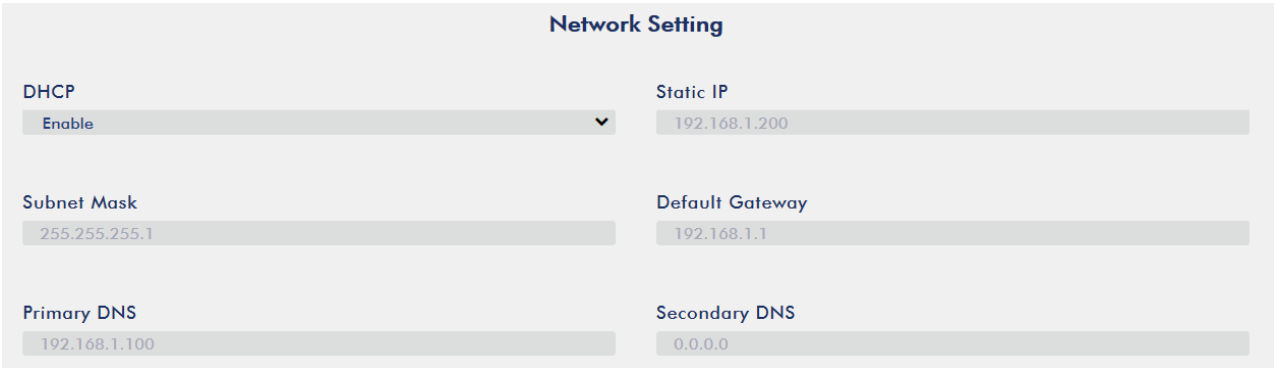


Note: Please write down the IPv4 address previously entered as it may be needed after you are done with streaming or recording.

- The NVS-31 MARK II should now be connected with an IP address of 192.168.1.200.
  If the NVS-31 MARK II still cannot connect, simply restore the NVS-31 MARK II to the factory defaults.
  - Turn off the device.
  - Push the **Record and Stream** buttons simultaneously while turning on the device's power.
  - Wait for about five seconds and release the button push as soon as you see the **RECORD** and **STREAM** button LEDs light up.
  - Make sure no other devices are connected to the LAN (wired or wireless) because this may result in IP conflicts.

- Login the NVS-31 MARK II via a web browser.
  - Default user name is **admin**
  - Default password is **000000**

- Click the "**System**" tab then on the system page, enter network settings such as static IP and default gateway. Make sure that the default gateway matches your connected network and no device shares the same IP as the NVS-31 MARK II.
  For example, if your router's default gateway IP is 10.10.1.1, then in the default gateway field, you should also enter 10.10.1.1. Then set the IP address of the NVS-31 MARK II to 10.10.1.X, which can range from 10.10.1.2 to 10.10.1.255. Pick an unused IP address.



- DHCP：Disable
- Static IP：X.X.X.Y；the first three decimal numbers must be the same as your router or switch. The number Y must be a number not used by any devices connected to the network.
- Subnet Mask：255.255.255.0
- Default Gateway：Z.Z.Z.Z；same as the gateway IP of your router or switch.

Note: Some router may require special gateway IP setting; instead of the standard 192.168.1.1. Therefore, you should check the network properties on the PC before switching to the fixed IP mode.

For example, some routers have a gateway IP of 192.168.1.254 and as a result, the default gateway and primary DNS fields on the NVS-31 MARK II must also be configured to 192.168.1.254.

- Primary DNS: Same as the default gateway IP, which, if causing issues, can be changed to 8.8.8.8 or 8.8.8.4 (Public DNS provided by Google).
- Click the "**Submit**" button to save the network settings.
- Reconnect the PC and the NVS-31 MARK II to the network.
- Restore the PC's original network settings.
- Shut down the HS-1650T; wait for approximately five seconds before turning it back ON.
- You should be able to access the NVS-31 MARK II through the fixed IP address.

Advanced Troubleshooting

If you still are unable to connect, please try the following:

- Use the ARP table to search for the encoder's MAC address; the device's MAC address is on the print label at the bottom of your HS device.
- MAC address starts with **00:07:36:03:xx:xx**.
  - Device's MAC address starts with 00:07:36:07:xx:xx
- On the command prompt (terminal on MAC OS), enter "**arp -a**" then press enter key to display an ARP list. See if the NVS-31 MARK II is successfully connected to the network.
- Execute **services.msc** , and on the right column of the "**Services"** window, locate "**DHCP Client"** then click "**Restart"**.
- On the command prompt, enter **ipconfig/flushdns** followed by **ipconfig/release and ipconfig/renew.**

6.2 Web User Interface

By now, we have obtained the IP addresses of the PC and the NVS-31 MARK II. Enter the NVS-31 MARK II's IP address into the address bar of a browser 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.

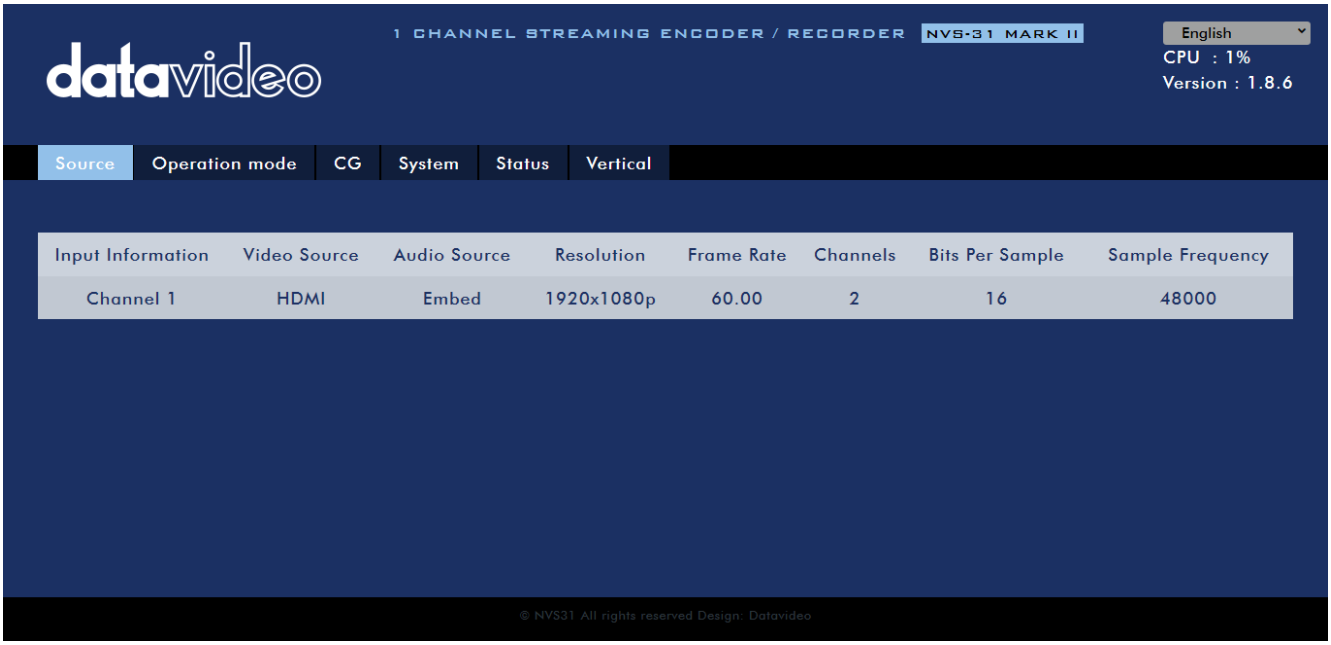
Username: admin

Password: 000000

Click **OK** to login. Once logged in, the first page that appears will be the **Source** page.

Source

You will see the ***Source*** page immediately after logging into the NVS-31 MARK II web UI. On the Source page, you will see **Input Information**, **Video Source**, **Audio Source**, **Resolution**, **Frame Rate**, **Channels, Bits Per Sample** and **Sample Frequency**.



Note: The NVS-31 MARK II web UI does not update automatically so to learn the latest device status, please refresh the page manually.

While monitoring streaming and recording, please update the page periodically regardless of how you operate the device (using the device's physical buttons only or using the device's physical buttons along with the web UI). This ensures the page is always displaying the most up-to-date information.

Operation Mode

Click the ***Operation Mode*** tab on the tool bar to open the operation mode configuration page on which the user will be allowed to customize various stream and record settings.

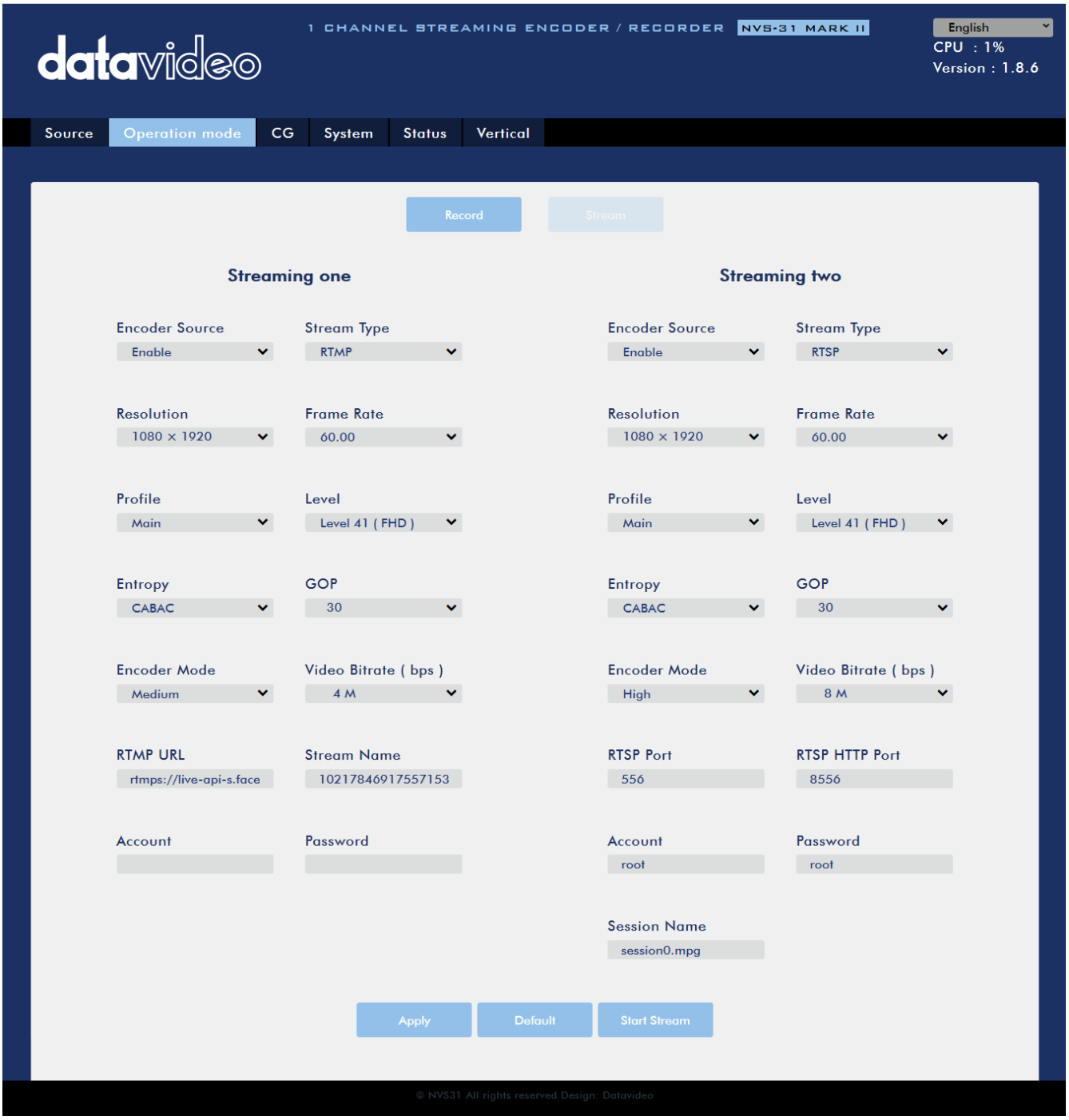
The NVS-31 MARK II offers the following operation modes:

- **Stream**
- **Record**

which will be discussed in detail in this section.

Stream Mode

The NVS-31 MARK II has two stream engines allowing you to stream to two different destinations over multiple protocols. The configurable stream settings are **Encoder Source**, **Stream Type**, **Resolution**, **Frame Rate**, **Profile**, **Level**, **Entropy**, and **Video Bitrate (bps)** which will be described later in this section.



Four streaming protocols available on the NVS-31 MARK II are **RTSP**, **RTMP**, **HLS**, and **TS**. See ***Section 6.3*** for instructions on each individual stream setup.

Note that once your video streams are set up, click **"Apply"** button to apply the new stream settings. Click **"Start Stream"** to open the stream and **"Stop Stream"** to end the stream. To reset, simply click the default button.

Next, we will discuss the stream setting options in greater detail.

Encoder Source

This option allows you to enable the stream encoder for configurations of various parameters. If the stream encoder is not needed, disable this option.

Stream Type

The NVS-31 MARK II offers the user four stream types which are **RTSP**, **RTMP**, **TS**, and **HLS**. Parameters of each individual protocol will be briefly described below.

RTSP (Real Time Streaming Protocol)

- RTSP Port: The RTSP port number ranges from 554 to 562 and is 554 by default.
- RTSP HTTP Port: The RTSP HTTP port number ranges from 8553 to 8563 and is 8554 by default.
- Account / Password: The RTSP streaming account credentials which are root/root by default.
- Session Name: The default RTSP session name is session0.mgp.

RTMP (Real-Time Messaging Protocol)

- RTMP URL: Enter an RTMP URL obtained from any live streaming platform such as Ustream. **Note: The NVS-31 MARK II supports RTMP Publish only and not RTMP Local.**
- Stream Name: Enter a stream name or key from any live streaming platform such as Ustream.
- Account / Password: Enter the account name and the password of your RTMP platform account.

TS (Transport Stream)

- TS URL: Enter a URL for your transport stream.

Please note that when streaming, the NVS-31 MARK II 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 a limitation in an NVS-31 MARK II 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 video bitrate should not exceed 1Mbps.

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.

Resolutions available for your stream encoder are listed as follows:

- 1080x1920

- 720x1280
- 576x720
- 480x720
- 480x640

Frame Rate

Select a frame rate from the drop-down menu for video streaming. Note that frame rates should always match the frame rate of the video source.

- 60.00
- 50.00
- 30.00
- 25.00
- 20.00
- 15.00

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. However, when choosing your encoder 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.

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.

Available video bitrates are listed as follows:

- 10M
- 8M
- 6M
- 4M
- 2M
- 1M
- 512K
- 256K

Encoder Mode

The Encoder Mode sets the video bitrate mode for your video stream. The available modes are listed as follows:

- High (8M)
- Medium (4M)
- Low (2M)

Tip: You can also switch between different bitrate modes by pressing the Bitrate button on the Record/Stream Panel. See *Section 6.4* for details.

Profile

Profile sets the H.264 or H.265 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.

- High
- Main
- Baseline

Level

Levels specify the size of the video a decoder must be able to handle. They specify a maximum bit-rate for the video and a maximum number of macroblocks per second. Level numbers range from 1 to 5 with intermediate steps (e.g., 1.1, 1.2, 1.3, etc). The table below provides a summary of maximum parameters supported by each H.264 (AVC) / H.265 (HEVC) level.

Level ID	Max. Video Bitrate in kbits/s	Max Frame Size in macroblocks	Max decoding speed in macroblocks per second	Resolution, Frame Rate (Max Stored Frames)
1.0	64	99	1485	128×96@30.9 (8) 176×144@15.0 (4)
1b	128	99	1485	128×96@30.9 (8) 176×144@15.0 (4)
1.1	192	396	3000	176×144@30.3 (9) 320×240@10.0 (3) 352×288@7.5 (2)
1.2	384	396	6000	320×240@20.0 (7) 352×288@15.2 (6)
1.3	768	396	11880	320×240@36.0 (7) 352×288@30.0 (6)
2.0	2000	396	11880	320×240@36.0 (7) 352×288@30.0 (6)
2.1	4000	792	19800	352×480@30.0 (7) 352×576@25.0 (6)
2.2 (SD)	4000	1620	20250	352×480@30.7 (12) 352×576@25.6 (10) 720×480@15.0 (6) 720×576@12.5 (5)
3.0	10000	1620	40500	352×480@61.4 (12) 352×576@51.1 (10) 720×480@30.0 (6) 720×576@25.0 (5)
3.1	14000	3600	108000	720×480@80.0 (13) 720×576@66.7 (11) 1,280×720@30.0 (5)
3.2 (HD)	20000	5120	216000	1,280×720@60.0 (5) 1,280×1,024@42.2 (4)
4.0	20000	8192	245760	1,280×720@68.3 (9) 1,920×1,080@30.1 (4) 2,048×1,024@30.0 (4)

Level ID	Max. Video Bitrate in kbits/s	Max Frame Size in macroblocks	Max decoding speed in macroblocks per second	Resolution, Frame Rate (Max Stored Frames)
4.1 (FHD)	50000	8192	245760	1,280×720@68.3 (9) 1,920×1,080@30.1 (4) 2,048×1,024@30.0 (4)

Entropy

There are two coding options available for generating H.264 or H.265 content:

- CAVLC (Context-Adaptive Variable Length Coding)
- CABAC (Context-based Adaptive Binary Arithmetic Coding)

CABAC encoding provides a 7-10% quality improvement over CAVLC but requires an extra 10-15% CPU. CABAC encoding is only available in the Main and High profiles of H.264 and H.265. When targeting at low-powered devices, such as older cell phones and tablets, we recommend the Baseline Profile that uses CAVLC which requires less computing power.

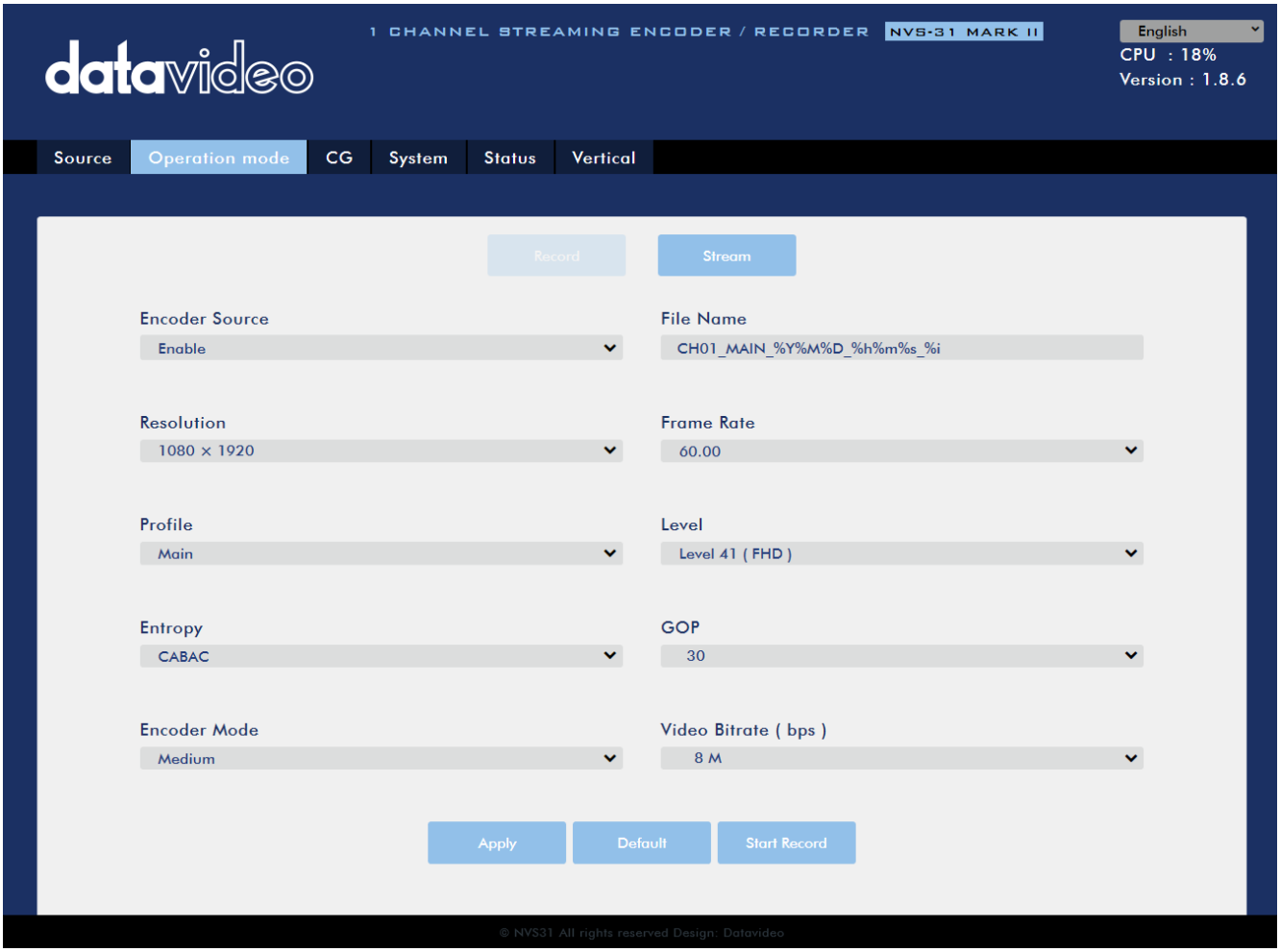
GOP

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. Depending on your applications, you can select 16 GOP sizes ranging from 1 to 255.

- 255
- 240
- 200
- 120
- 100
- 60
- 50
- 30
- 25
- 20
- 15
- 10
- 5
- 3
- 2
- 1

Record Mode

The NVS-31 MARK II's record engine allows you to record your program on the SD card. See ***Appendix 3*** for a list of recommended SD cards. The record parameters shown in the diagram below will be discussed in detail in this section.



Note that after you've configured the record settings, click **"Apply"** to apply the new record settings. Click **"Start Record"** to start recording and **"Stop Record"** to end recording. To reset, simply click the default button.

Encoder Source

This option allows you to enable the record engine for configurations of various parameters. If the recorder is not needed, disable this option.

File Name

Enter the name of your record file.

Resolution

Recording resolution is the number of pixels (dots) used to create an image. Higher resolutions use more pixels to create an image. This means that greater amounts of detail can be expressed in the image, but larger files sizes and a greater amount of storage (i.e. hard drive space) are required to save the images or video.

Resolutions available for your recorder are listed as follows:

- 1080x1920
- 720x1280
- 576x720
- 480x720
- 480x640

Frame Rate

Select a frame rate from the drop-down menu for video recording.

- 60.00
- 50.00
- 30.00
- 25.00
- 20.00
- 15.00

Frame rate greatly impacts the style and viewing experience of a video. Different frame rates yield different viewing experiences, and choosing a frame rate often means choosing between things such as how realistic you want your video to look, or whether or not you plan to use techniques such as slow motion or motion blur effects.

Below is a list of common options for different applications:

- ***24fps*** – This is the standard for movies and TV shows, and it was determined to be the minimum speed needed to capture video while still maintaining realistic motion.
- ***30fps*** – Videos with a lot of motion, such as sports, will often benefit from the extra frames per second.
- ***60+fps*** – Anything higher than 30fps is mainly used to create slow motion video or to record video game footage.

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.

Available video bitrates are listed as follows:

- 16M
- 12M
- 8M
- 6M
- 4M
- 2M
- 1M
- 512K
- 256K

Recommended video bitrates

- **720P or lower** – 8 – 10 mbps
- **1080P or higher** – 15 mbps or higher

Encoder Mode

The Encoder Mode sets the video bitrate mode for your recording. The available modes are listed as follows:

- High (8M)

- Medium (4M)
- Low (2M)

Tip: You can also switch between different bitrate modes by pressing the Bitrate button on the Record/Stream Panel. See *Section 6.4* for details.

Profile

Profile sets the H.264 or H.265 encoding profile for your recorder. 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 recording, a Main or Baseline profile may be required.

- High
- Main
- Baseline

Level

Levels specify the size of the video a decoder must be able to handle. They specify a maximum bit-rate for the video and a maximum number of macroblocks per second. Level numbers range from 1 to 5 with intermediate steps (e.g., 1.1, 1.2, 1.3, etc). The table below provides a summary of maximum parameters supported by each H.264 (AVC) / H.265 (HEVC) level.

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3.1	14000	3600	108000	720×480@80.0 (13) 720×576@66.7 (11)

Level ID	Max. Video Bitrate in kbits/s	Max Frame Size in macroblocks	Max decoding speed in macroblocks per second	Resolution, Frame Rate (Max Stored Frames)
				1,280×720@30.0 (5)
3.2 (HD)	20000	5120	216000	1,280×720@60.0 (5) 1,280×1,024@42.2 (4)
4.0	20000	8192	245760	1,280×720@68.3 (9) 1,920×1,080@30.1 (4) 2,048×1,024@30.0 (4)
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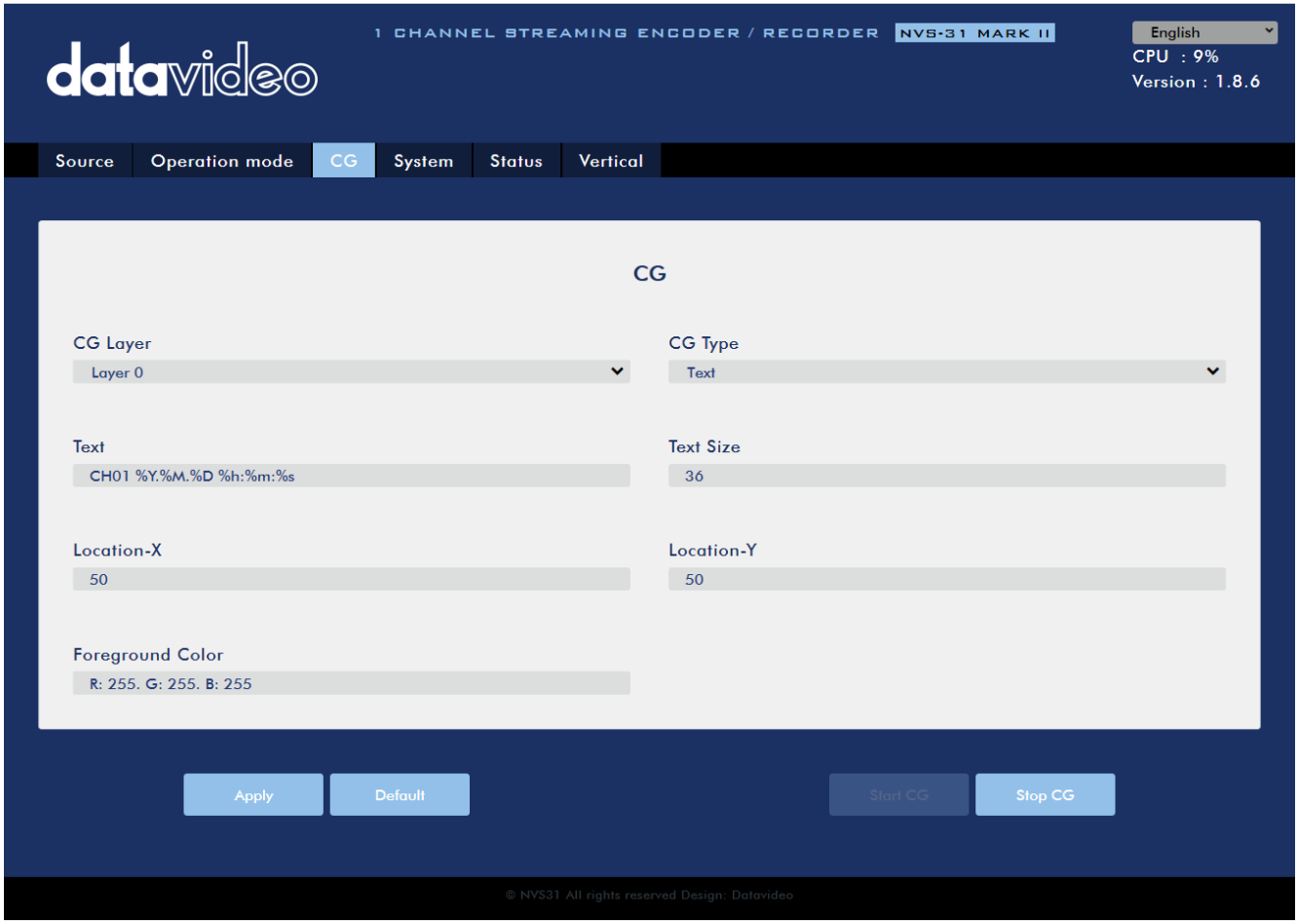
- 255
- 240
- 200
- 120
- 100
- 60
- 50
- 30
- 25
- 20
- 15
- 10
- 5
- 3
- 2
- 1

CG

The CG function allows the user to place a textual or picture layer on top of the video. The CG settings are shown in the diagram below.



CG Layer

You are allowed to toggle the CG text or picture between four layers, from layer 0 to layer 3.

CG Type

You may select to place a text (Text) or graphic (Picture) CG object on your video from the drop-down menu.

- **Text**
  After setting the CG type to **Text**, you will be allowed to enter the text that you want to place on the video.

  Enter CG text in the **Text** field and CG text font size in the **Text Size** field.

- **Picture**
  If you set the CG Type to **Picture**, you will be required to select a picture file from your local hard disk. Click **Browse** to browse the hard drive for your graphic CG file.

Location-X

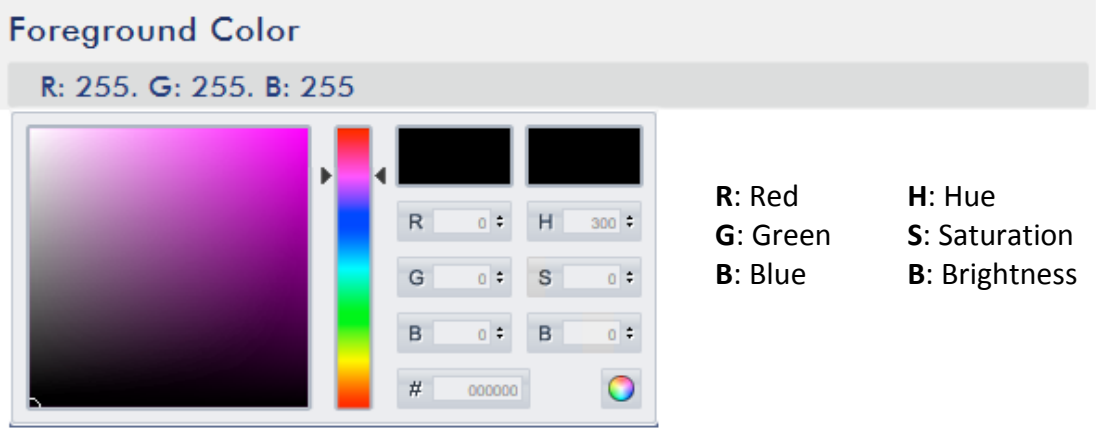
Enter the x-coordinate that determines the horizontal location of the CG object overlaid.

Location-Y

Enter the y-coordinate that determines the vertical location of the CG object overlaid.

Foreground Color

You may either enter the RGB values or select a color from the color spectrum to set the foreground color. Then fine tune the selected color by dragging the circle cursor on the palette. Click the color wheel button at the bottom right corner to confirm the selection.



R: Red
G: Green
B: Blue

H: Hue
S: Saturation
B: Brightness

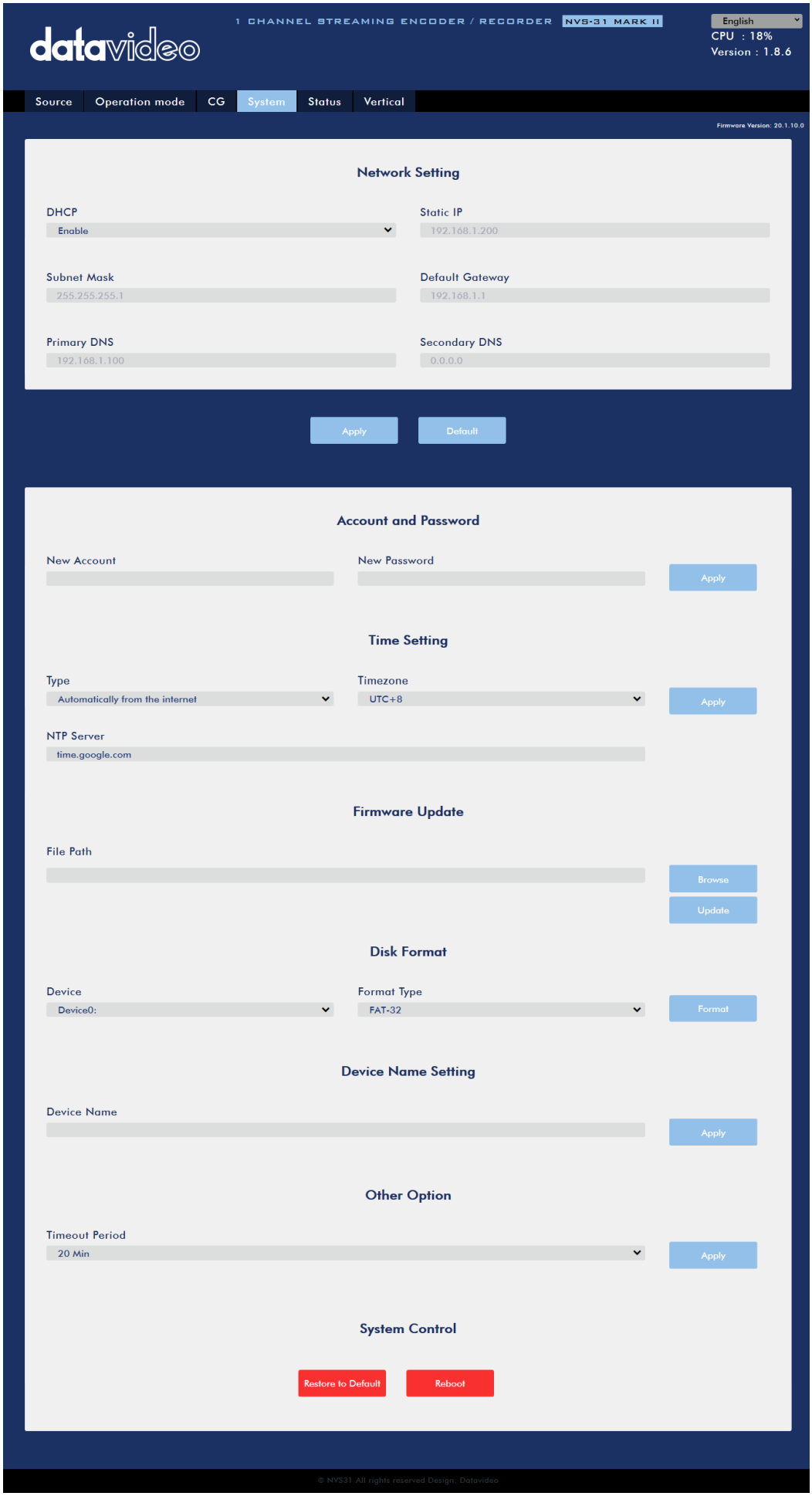
System

The system page allows the user to configure several network and system related settings.

The network settings are **DHCP enable/disable**, **static IP address**, **subnet mask**, **default gateway**, **primary and secondary DNS**, etc.

The system settings are **account credentials**, **time settings**, **firmware update**, **disk format** and **device name**.

The system page is shown in the diagram below.


datavideo
1 CHANNEL STREAMING ENCODER / RECORDER
NVS-31 MARK II
English
CPU : 18%
Version : 1.8.6
Source
Operation mode
CG
System
Status
Vertical
Firmware Version: 20.1.10.0
Network Setting
DHCP
Enable
Static IP
192.168.1.200
Subnet Mask
255.255.255.1
Default Gateway
192.168.1.1
Primary DNS
192.168.1.100
Secondary DNS
0.0.0.0
Apply
Default
Account and Password
New Account
New Password
Apply
Time Setting
Type
Automatically from the internet
Timezone
UTC+8
Apply
NTP Server
time.google.com
Firmware Update
File Path
Browse
Update
Disk Format
Device
Device0:
Format Type
FAT-32
Format
Device Name Setting
Device Name
Apply
Other Option
Timeout Period
20 Min
Apply
System Control
Restore to Default
Reboot
© NVS31 All rights reserved Design: Datavideo

Network Setting

In network settings, you can either manually enter the IP address or set the device to DHCP mode which allows the router to automatically assign the IP address to the NVS-31 MARK II.

DHCP

In DHCP mode, the router automatically assigns the IP address to the device. If you want to manually configure the network settings, disable this option.

Static IP Address

If the DHCP is disabled, the static IP field will be activated for the user to manually enter the IP address. The static IP address is 192.168.1.200 by default.

Tip: If you do not know the device's IP address, you can always use the following method to reset the network settings.

- Shut down the machine
- Turn on the machine while holding down **RECORD** and **STREAM** buttons simultaneously.
- Approximately after 5 seconds, release the **RECORD** and **STREAM** buttons as soon as the button LEDs are turned **ON**.
- The default IP address should be 192.168.1.200.

Subnet Mask

Static IP address mode requires the **subnet mask**, which is 255.255.255.0 by default.

Default Gateway

Static IP address mode requires the **default gateway**, which is 192.168.1.254 by default.

Primary DNS (Optional)

Primary DNS is required in static IP mode only but is optional.

Secondary DNS (Optional)

Secondary DNS is required in static IP mode only but is optional.

Account and Password

Set the NVS-31 MARK II's account name and password here. Click **Apply** to save the new login credentials.

Time Setting

In time setting, you are allowed to select the reference time source for the NVS-31 MARK II.

Type

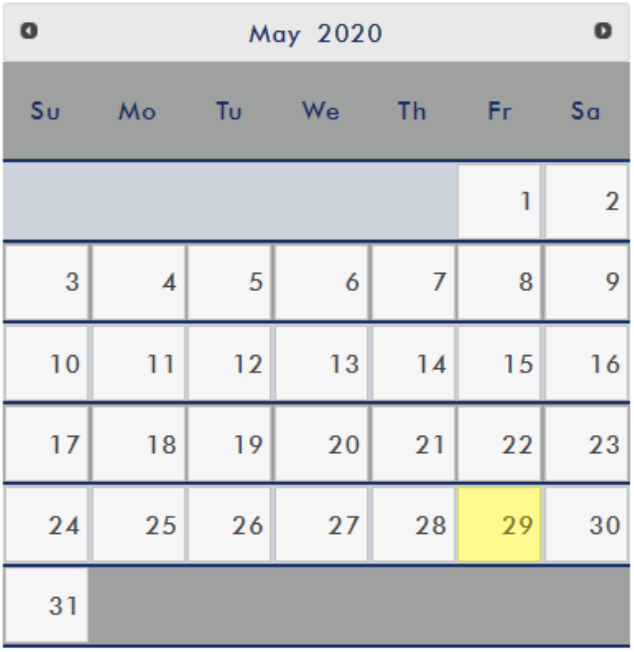
In this drop-down menu, you can either select to allow the device to retrieve the time automatically from the Network Time Protocol (NTP) server by selecting "**Automatically from the Internet**" or locally by selecting **"Manual"**.

NTP Server

If you've selected "**Automatically from the Internet**," you will need to enter the NTP server address here. An example of the NTP server address is time.google.com.

Manual

If you've selected "**Manual**", the **Date** and **Time** fields will appear showing the device's system date and time values. A calendar will appear after the **Date** field is clicked. Simply click a day to set the date. Set the time in the **Time** field.



Time Zone

Click the drop-down menu to select a time zone for your device.

After you've configured the time settings, click **Apply** to save the new settings.

Firmware Update

Click **Browse** to search for the latest firmware file saved on the PC's hard disk. After the latest firmware file is uploaded, click **Update** to start the firmware update.

Disk Format

In this pane, you will be allowed to view the SD card information and format the SD card to one of the format types listed as follows:

- FAT-32
- NTFS
- EXFAT

Click **Format** to start formatting.

Device Name Setting

Enter a name for this device and click **Apply** to save the name.

Other Option

Timeout Period

This sets the timeout period for the current login. See below for available options.

- 20 Min
- 120 Min

- 1 Day
- 7 Day
- Never

System Control

Restore to Default

Click to restore the system's default settings.

System Reboot

Click to reboot the NVS-31 MARK II.

Status

The status page shows **Record**, **Stream** and **Disk** information as depicted in the diagram below.

Note: The NVS-31 MARK II web UI does not update automatically so to learn the latest device status, please refresh the page manually.

While monitoring streaming and recording, please update the page periodically regardless of how you operate the device (using the device's physical buttons only or using the device's physical buttons along with the web UI). This ensures the page is always displaying the most up-to-date information.

Vertical

On this page, you will be able to change your stream video orientation.

- Crop: Designed for HS-1650T product series allowing 16:9 video output and left/right image crop.
- Rotate: Designed for video production; if the camera is placed upside down, this mode will reverse it.

6.3 Operations

In this section, we will discuss how you can play the video using different streaming protocols and how to place texts on your video.

Video Streaming

The NVS-31 MARK II provides the user with different video streaming options such as RTSP, TS, RTMP, and HLS.

This section discusses settings of these options and how to stream your video using these methods.

RTSP/TS/HLS

In the **RTSP/TS/HLS** modes, the **NVS-31 MARK II** is a stream server which allows any client device to connect and playback your video stream.

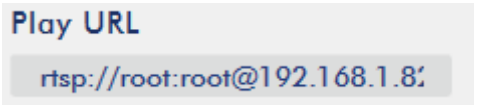
The following operation procedure uses VLC media player to playback video stream. If your PC or laptop does not have VLC media player installed, please visit VideoLAN's official homepage (https://www.videolan.org/) and download the installation file then install the program.

Follow the steps below to obtain the RTSP URL:

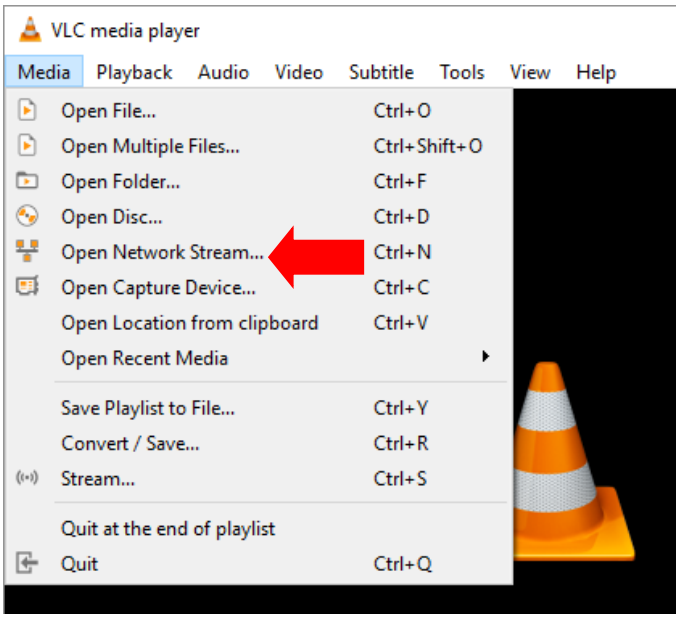
1. On the web UI, click "**Operation Mode**" → "**Stream**" to open the stream settings page.
2. Select **RTSP** from **Stream Type** drop-down menu.

3. Click the **Start Stream** button to generate the RTSP URL.

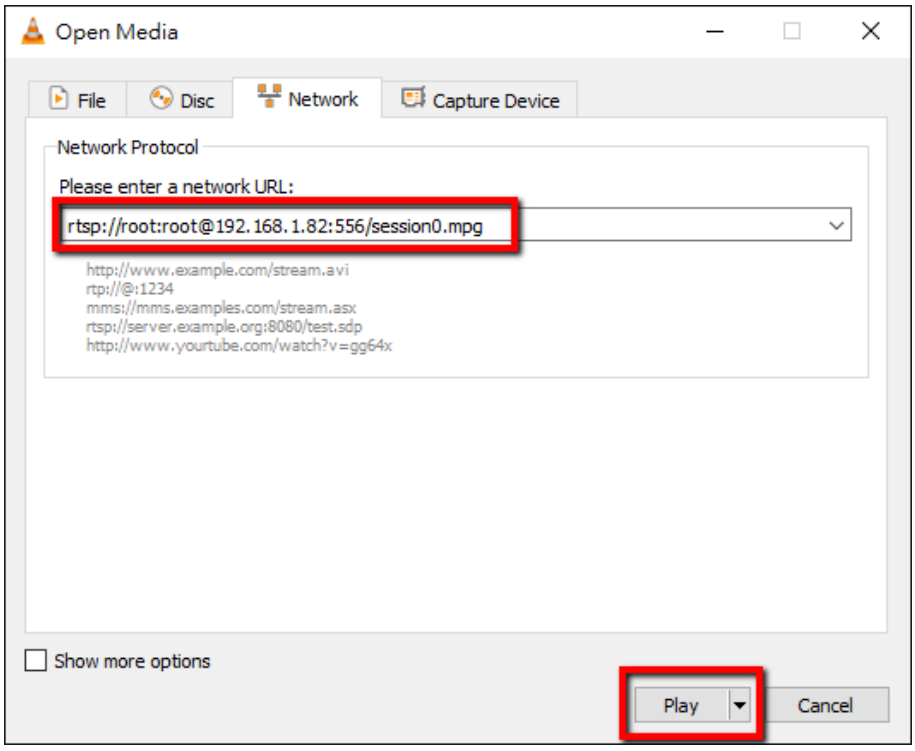
4. Based on your settings, the device will automatically generate the RTSP URL **rtsp://root:root@192.168.1.82:556/session0.mpg**.



5. To view the RTSP video stream, enter the RTSP URL into the client device.
6. Open VLC then click **Open Network Stream** (shown in the diagram below).



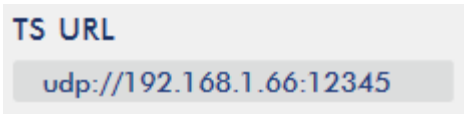
7. As shown in the diagram below, enter the stream URL then click **Play** to start streaming.



Follow the steps below to obtain the TS URL:

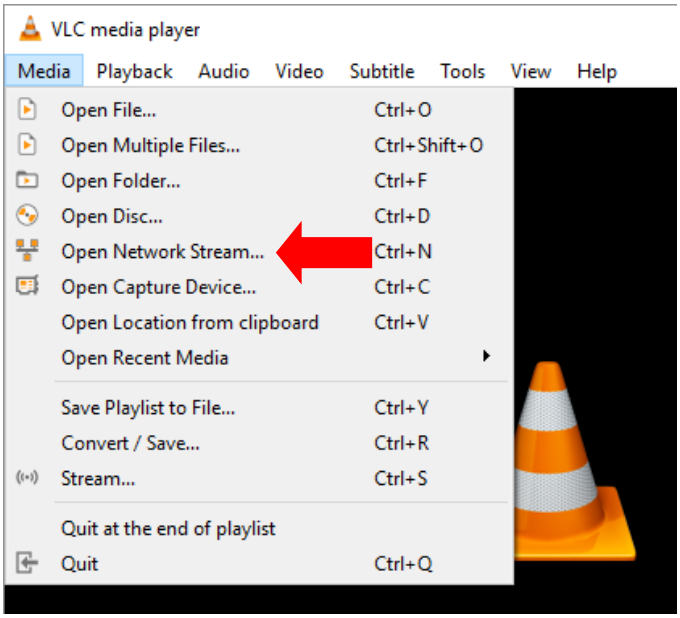
1. On the web UI, click "**Operation Mode**" → "**Stream**" to open the stream settings page.
2. Select **TS** from **Stream Type** drop-down menu.

3. Enter the TS URL. Note that the TS URL shown below is only for illustration purpose.

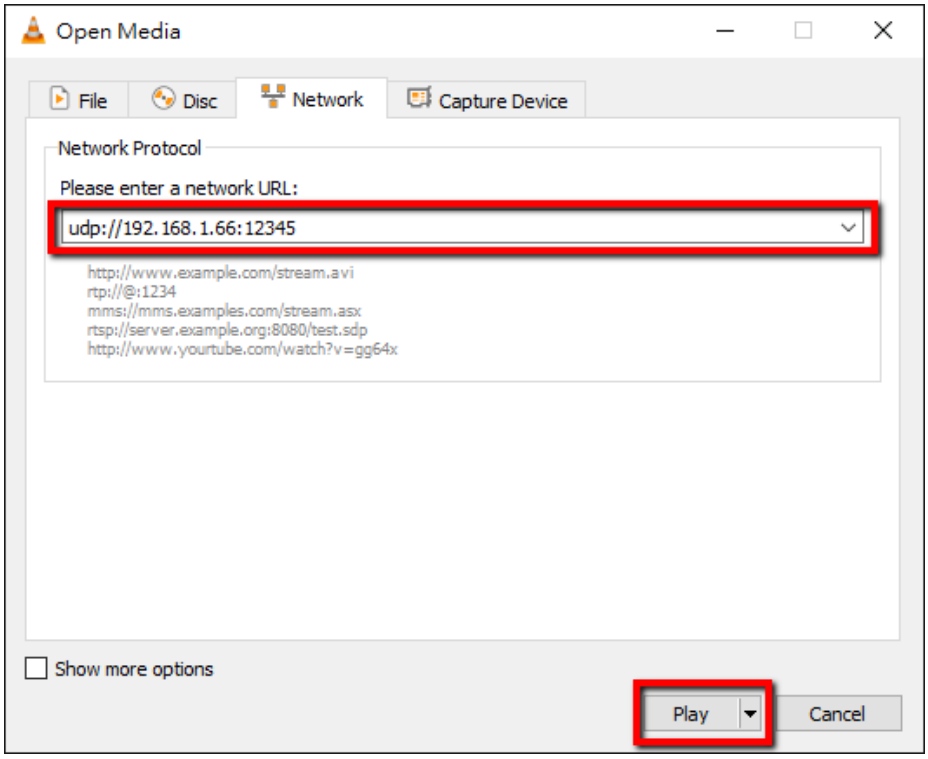


4. Click the **Start Stream** button to start the stream.

5. Enter the TS play URL into the client device to which the video stream is delivered over TS protocol.
6. On the computer, open VLC then click **Open Network Stream** (shown in the diagram below).



7. As shown in the diagram below, enter the stream URL then click **Play** to start streaming.

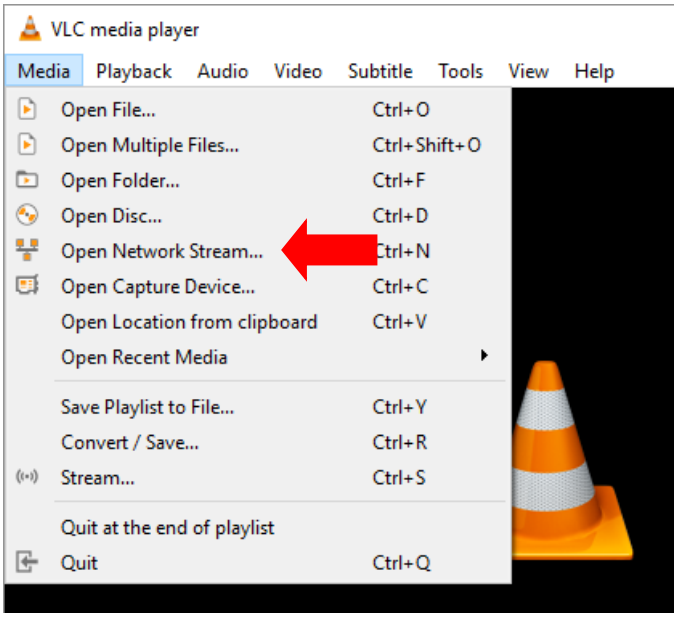


Follow the steps below to obtain the HLS URL:

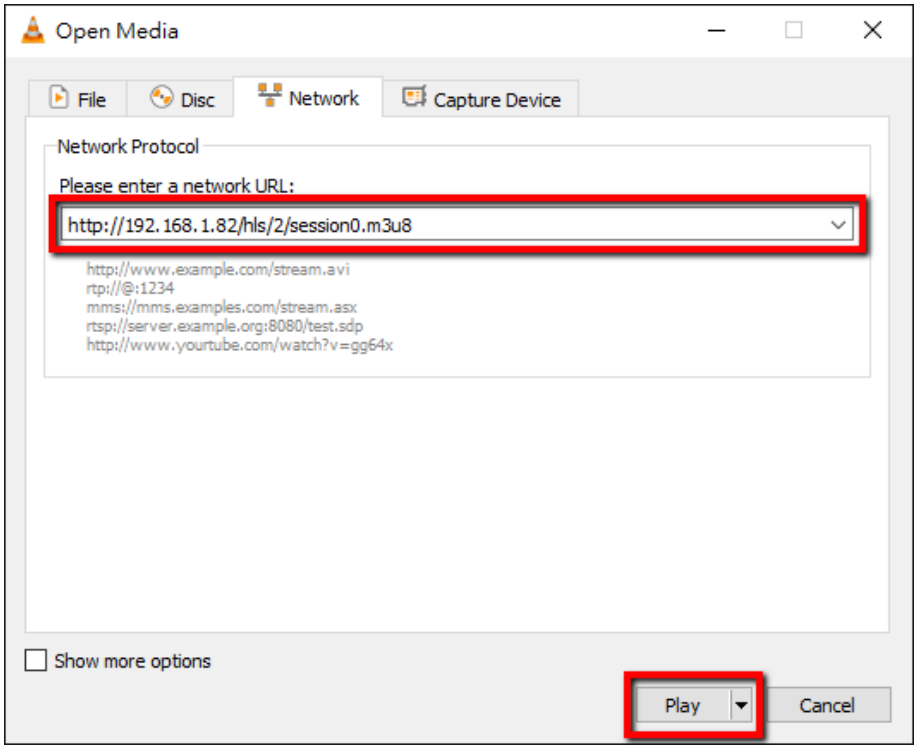
1. On the web UI, click "**Operation Mode**" → "**Stream**" to open the stream settings page.
2. Select **HLS** from **Stream Type** drop-down menu.

3. Click the **Start Stream** button to start the stream.

4. Based on your settings, the device will automatically generate a .m3u8 stream URL: http://192.168.1.82/hls/2/session0.m3u8
5. Enter the **HLS** URL into the client device.
6. Open VLC then click **Open Network Stream** (shown in the diagram below).



7. As shown in the diagram below, enter the stream URL then click **Play** to start streaming.



8. You can also play .m3u8 stream URL using the devices listed as follows:
   - iPhone, iPad and MacBook: Use Safari to open the .m3u8 stream URL.
   - Windows 10: Use Microsoft Edge to open the .m3u8 stream URL.

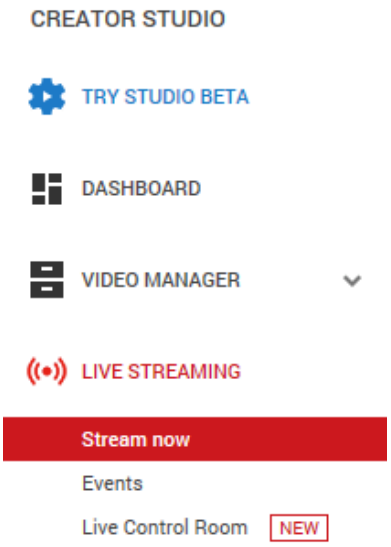
RTMP

In the **RTMP** mode, the NVS-31 MARK II can send up to two data streams to multiple CDNs or media servers that support the **Real-Time Messaging Protocol**. Examples of the **RTMP** media server are **USTREAM** and **Youtube**.

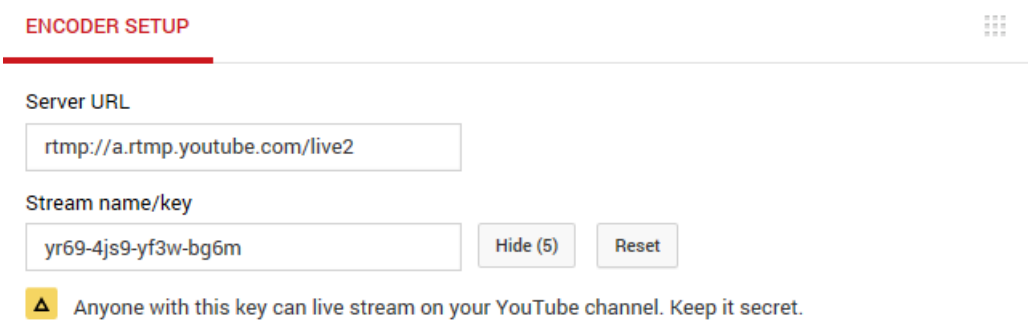
Note: The NVS-31 MARK II does not support RTMP local.

In the following section, we will show you how to set up an **RTMP** stream to **Youtube**. The step-by-step account setup is outlined as follows:

1. First, obtain the Server URL and Stream name/key from Youtube.
2. Open the Youtube Live Dashboard https://www.youtube.com/live_dashboard
3. On the left column, locate and click "**Stream now**."

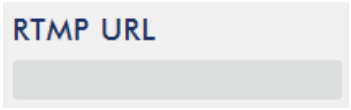


4. On the right, scroll down to the bottom where you will be able to find **Server URL** and **Stream name/key**.



5. On the NVS-31 MARK II, open the **Stream** operation mode page.
6. Select **RTMP** from the Stream Type drop-down menu.

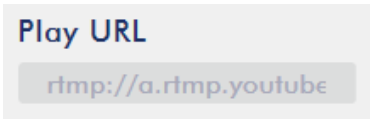
7. Enter the **Server URL (rtmp://a.rtmp.youtube.com/live2)** obtained from the **Youtube Live Streaming** page into the **RTMP URL** field.



8. Enter the **Stream name/key (yr69-4js9-yf3w-bg6m)** obtained from the **Youtube Live Streaming** page into the **StreamName** field.

9. As required by the live streaming channel, enter your Youtube account name and password into the **Account** and **Password** fields.

10. Click the **Start Stream** button to start streaming the live video to the **Youtube Live**. You should also see an **RTMP URL** generated.

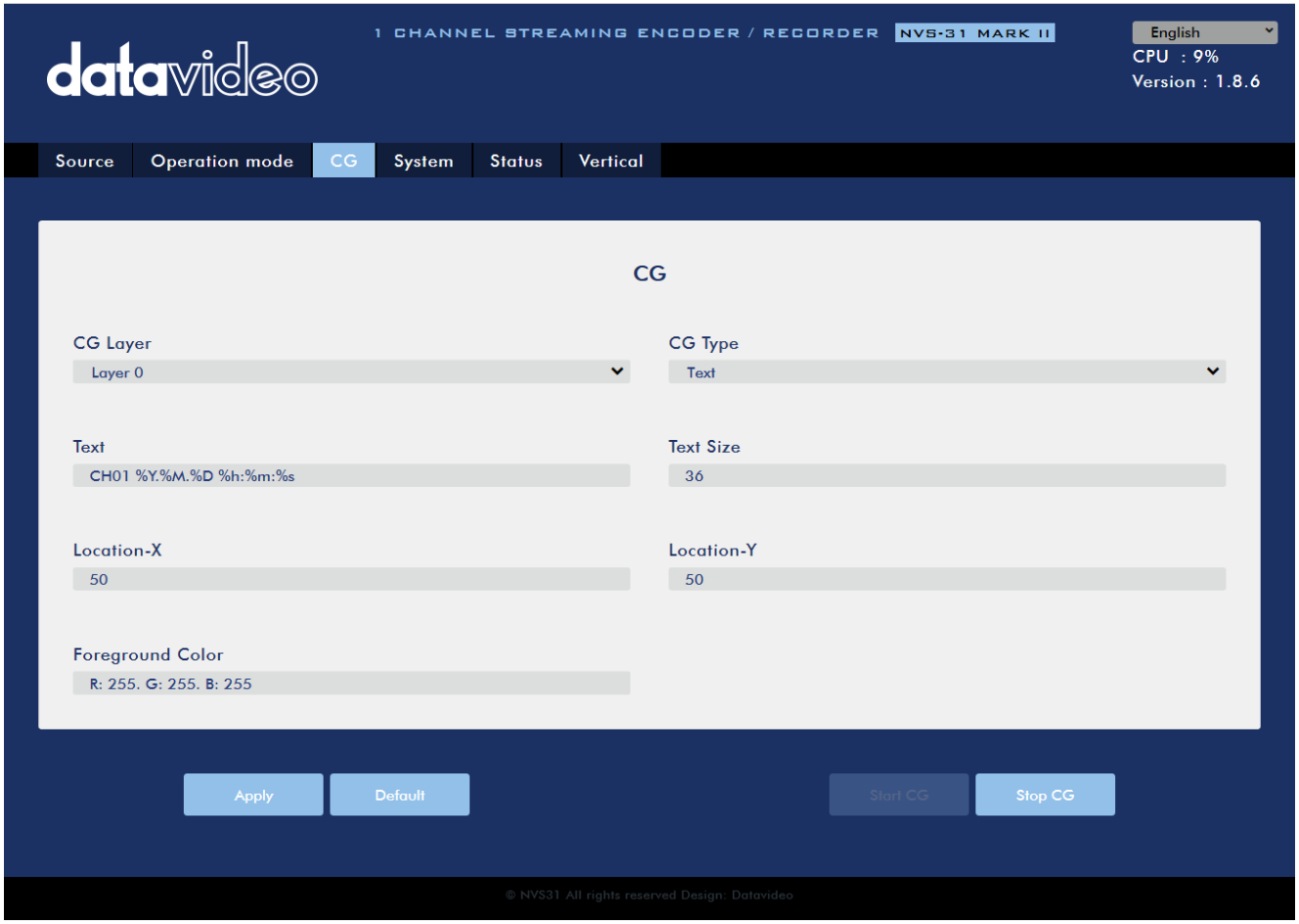


11. At this point, you should be able to view your stream video on Youtube.
12. To stop live streaming, simply click the **Stop Stream** button.

Text Overlay Video

The HS-1650T's built-in video streaming server not only allows you to stream and record your program, it also features a CG tool that is capable of overlaying text on the video currently being broadcast.

The CG settings page is shown below:



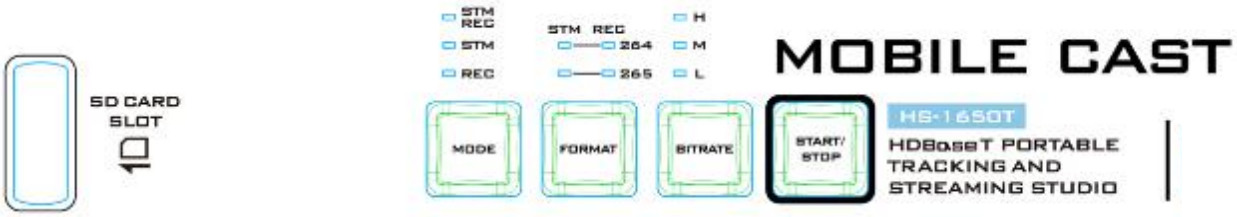
Follow the steps below to overlay text on the video:

1. Open the **CG** settings page.
2. Set the CG layer.
3. Select the CG Type.
4. If Text is selected, enter the overlay text in the **Text** field, otherwise browse for the picture file on the disk.
5. Enter the **X and Y coordinates** to set the CG object position.
6. If you have selected the picture CG, you will need to adjust the object's width and height as well.
7. Set the foreground color.
8. Click **Apply** button to save CG settings.

Note: Increasing the X coordinate moves the overlay object to the right and decreasing the X coordinate moves the overlay object to the left; increasing the Y coordinate moves the overlay object down and decreasing the Y coordinate moves the overlay object up.

6.4 Record/Stream Panel

The **START/STOP**, **BITRATE**, **FORMAT** and **MODE** buttons on the front panel of the HS-1650T give the user certain controls of the record and stream functions. In this section, we will cover operations of these four buttons in detail.



Button and LED Behavior

See the table below for button and LED behavior.

		MODE	FORMAT	BITRATE	START/STOP
LED states before button push	**Blinking White**	N/A	N/A	N/A	N/A
	Solid White	Push to switch operation mode.	Push to change resolution according to the mode selected.	Push to switch between H, M and L.	Push and hold for at least 2 seconds to start device operation.
	Blinking Red	N/A	N/A	N/A	Error
	Solid Red	Mode change in progress	Resolution change in progress	Bitrate change in progress	Push and hold for at least 2 seconds to stop device operation.

MODE Button

Press the **MODE** button to select the device's mode of operation. The available modes are listed as follows:

- **STM+REC:** Stream and record simultaneously
- **STM:** Stream only
- **REC:** Record only

The LED indicator for the selected operating mode will turn on.

FORMAT Button

Press the **FORMAT** button to toggle between H.264 and H.265 for streaming and recording. The LED indicators indicate the selected format.

BITRATE Button

Press the **BITRATE** button to select the bitrate mode for video streaming and recording. The available bitrate modes are listed as follows:

- H: High
- M: Moderate
- L: Low

Note: The default bitrate is M.

The correlated video bitrates of the encoder and the recorder in each mode are summarized in the table below:

Modes	Encoder	Recorder
Low	4 Mbps	20 Mbps
Medium	6 Mbps	30 Mbps
High	8 Mbps	40 Mbps

You can also change the video bitrate using the web user interface, see ***Video Bitrate*** for details.

START/STOP Button

Lastly, after you've configured the operation mode, press and hold the **Start/Stop** button for at least 2 seconds to enable/disable live streaming/recording.

6.5 Resetting Login Credentials

If you forget your username and/or password, follow the steps below to reset the web UI's login credentials.

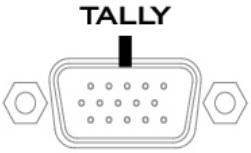
1. Press the stream control buttons in the following order:

Start/Stop → Bitrate → Format → Format → Mode → Mode → Mode

2. The **Mode** button will flash red/white colors for about 5 seconds.
3. The device will start resetting the login credentials.
4. Use admin/admin to log in next time.

Chapter 7 Appendices

Appendix 1 Tally Outputs



The HS-1650T 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

Datavideo usually releases new firmware containing new features or reported bug fixes from time to time. Customers can either download the HS-1650T 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-1650T settings should persist through the ***firmware upgrade process, which should not be interrupted once started*** as this could result in a non-responsive unit.

Switcher

Successful firmware upgrade on HS-1650T requires:

- HS-1650T x 1
- 56V Power adapter x 1
- USB thumb drive x 1
- USB Cable x 1

Update Procedure

1. Download the latest firmware files from the official product page.
2. Save the files on the USB thumb drive.
3. Insert the thumb drive into the F/W Upgrade port.
4. Restart the device. After startup, the device automatically checks for a new firmware file version. If detected, a prompt will appear on the 14-inch touchscreen asking whether you would like to proceed with the update.
5. Select 'Yes' to proceed with the update. The device will automatically restart once the process is complete.

Video Streaming Server

To update the video streaming server, you will need:

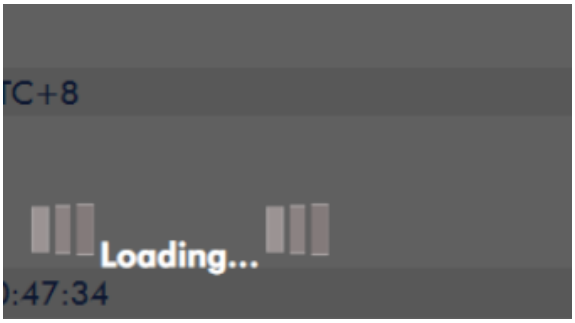
- The latest firmware for the **video streaming server**.
  This firmware file can be obtained from your local Datavideo office or dealer or product page.
- HS-1650T x 1
- 56V Power adapter x 1

Update Procedure

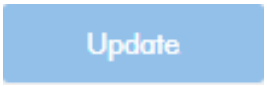
1. Visit the official product page https://www.datavideo.com/tw/product/HS-1650T where you can download the latest firmware file.
2. Login the NVS-31 Mark II web interface, then click the **System** tab to open the system configuration page.

3. Scroll down to **Firmware Update** then click the **Browse** button to search for the latest firmware file on the PC's hard disk.

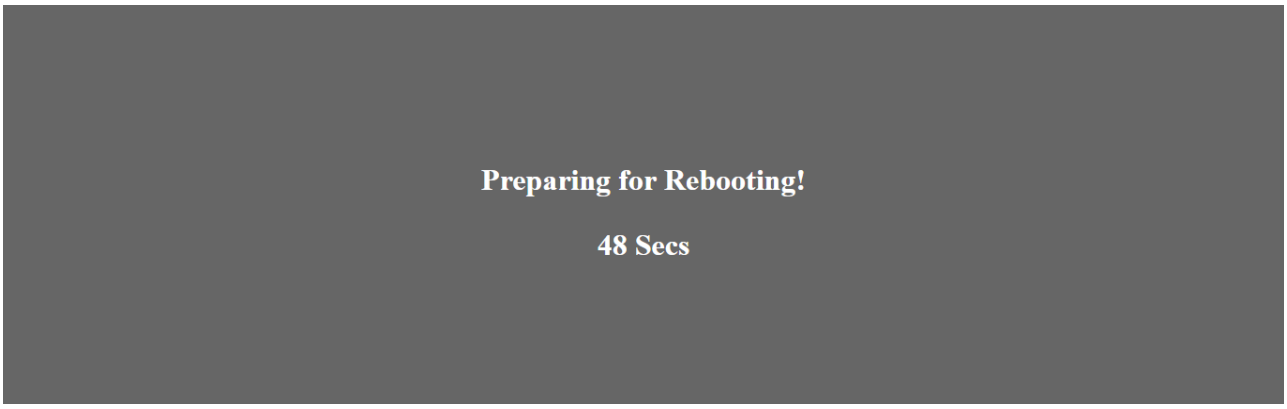
4. After double clicking the firmware file, you will see the loading prompt as shown below, indicating that the file is being uploaded to the NVS-31 Mark II.



5. After the file has been successfully uploaded, you will see a file upload success message. Click the **Update** button to start the firmware update process.



6. The device will reboot itself after it is updated successfully.



Note: If the device is recording or streaming, you must turn them off before initiating the firmware update.

Appendix 3 Recommended SD Cards

You should only use Class 10 SD card or above. In this appendix, you will find a list of SD cards recommended by Datavideo.

Recommended SD Cards			
No.	**Brand**	**Model**	**Pictures**
1	**Kingston**	SDHC I C10 16GB	
2	**SANDISK Extreme**	SDXC I C10 U3 V30 64GB	
3	**SONY**	SDXC I C10 U1 64GB	
4	**SANDISK Extreme PRO**	SDXC I C10 U3 128GB/64GB	 
5	**SONY**	SDXC I C10 U3 64GB	
6	**TOSHIBA**	SDHC C10 16GB	

Recommended SD Cards			
No.	**Brand**	**Model**	**Pictures**
7	**SANDISK Extreme**	SDHC C10 16GB	
8	**ADATA Premier Pro**	microSDXC I UHS-I U3 Class 10 with SD adapter 64GB/16GB	 
9	**SANDISK ULTRA®**	SDHC™/SDXC™ UHS-I 128GB	
10	**Transcend**	300S UHS-I SDHC 64GB/32GB	 

Appendix 4 Frequently-Asked Questions

This section describes problems that you may encounter while using HS-1650T. 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.	**What are the recommended SD card classes?**	Use any of the SD Card Classes C10/U1/V10.
3.	**What is the recommended SD card capacity?**	Ensure the SD card has a capacity well above 2 GB during recording. Video recording will stop if the SD card capacity falls below 2 GB.
4.	**a. I am using a C10 SD Card to record the video but I am still seeing delay in the recorded video.**	a. This could be due to unoptimized disk formatting. Format your disk on the NVS-31 Mark II or using the tool downloaded from the SD association's official website (https://www.sdcard.org/cht/downloads/formatter_4/index.html).
	b. In this case, why doesn't the system issue any error messages upon start of video recording?	b. The system only detects and sets write speed upon start of video recording. The system will not issue an error message if insufficient write speed is experienced while video recording is in progress.
5.	**Jitter is seen on moving images.**	Please make sure the input and output are set to the same resolution and frame rate.
6.	**A few important things to note about operating the NVS-31 Mark II.**	Because the NVS-31 Mark II UI is not updated in real time so the UI status display may not reflect the current device status. As a result, whether the device is operated on the panel, on the UI or both, please refresh the status page from time to time to make sure the information shown is the latest. You should also constantly monitor your video recording and streaming at the same time.
7.	**I've experienced issues with other camera functions after the PUSH AUTO key is pushed.**	After the PUSH AUTO key is pushed, wait for 5 to 6 seconds while the camera adjusts the white balance setting automatically then proceed to the next action.
8.	**Unable to update the NVS-31 Mark II firmware on MAC OS.**	It is recommended to run NVS-31 Mark II web UI on Windows and the recommended browsers are Microsoft Edge, Google Chrome and Firefox.

Appendix 5 Ethernet Cable Selection for HDBaseT Networks

Tips for Setting up an HDBaseT Compliant Network

According to the HDBaseT Alliance Standards, the maximum number of cables allowed in a bundle is six. The table below summarizes the maximum number of cables allowed in a bundle based on the cable type as well as the run distance.

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

When using CAT5e/6 cables, the following installation practices will mitigate external interferences.

1. Do not bundle the first 20 meters of cables in a horizontal cable run.
2. Avoid tight tie wraps, clamping or stapling; tie cables loosely with appropriate cable wraps.
3. Use horizontal cable management, for example, run cables connected to odd ports of the Ethernet switch through the cable manager above and cables connected to even ports of the Ethernet switch through the cable manager below.
4. Lay loose vertically run cables.
5. Reduce the fill ratio capacity of the conduit to 40%.
6. It is recommended to wrap the cable around a cable reel as shown on the left of the diagram below. Compared to loosely laid cables, cables wrapped up in a reel generate substantially lower electromagnetic fields. Compared to a fully stretched cable, it has been tested and proven that cables wrapped up in a cable reel with a diameter of 70 cm experience only slight signal degradation due to noise.

Tips for Setting up an HDBaseT Compliant Network in a Noisy Environment

1. For an outdoor HDBaseT Compliant Network, it is recommended to use UV resistant Ethernet cables to ensure connection quality. UV resistant Ethernet cables are usually coated with black PE jacket.
2. Use SFTP* Ethernet cables if your network environment contains multiple interference sources.

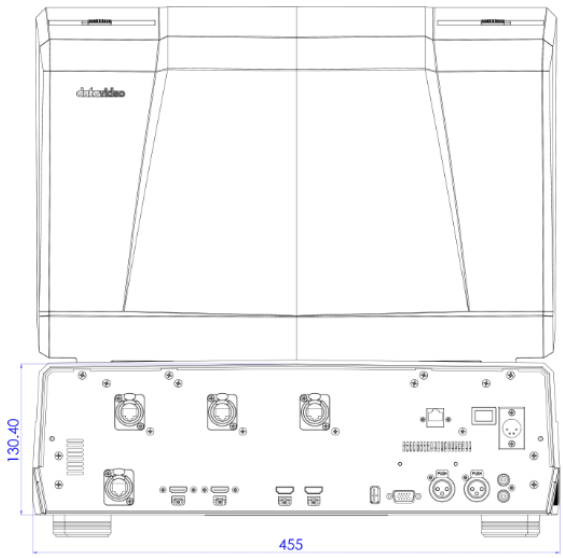
*SFTP stands for Shielded with Foiled Twisted Pairs; the individual twisted pairs are wrapped in a foil tape before being wrapped in an overall flexible yet mechanically strong braid screen. The additional foil on the twisted pairs helps to reduce crosstalk from adjacent pairs and other cables. The braid provides better grounding.

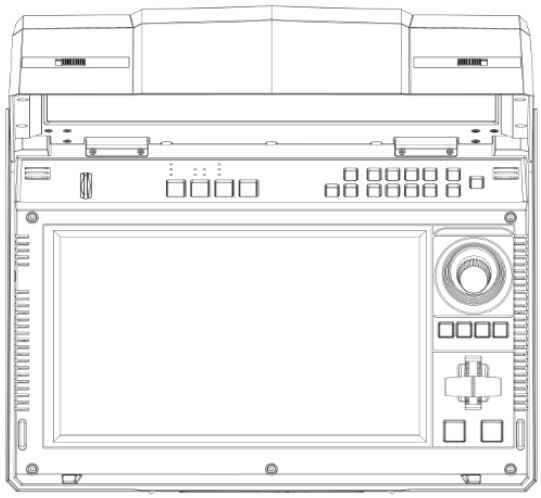
Tips for the Ethernet Cable Selection

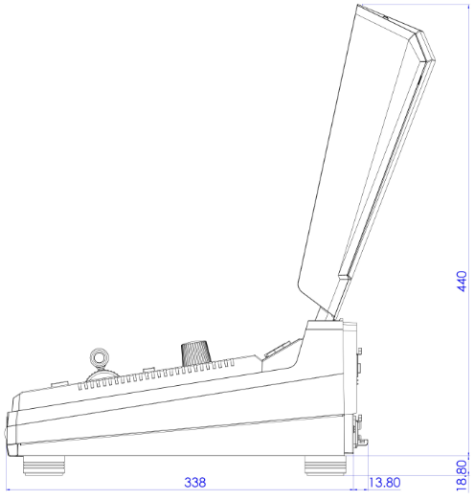
1. Use solid Ethernet cables for better electrical performance.

2. Round Ethernet cables are preferred over the flat ones because they deliver better quality with higher durability, security and clarity in signal communication.
3. Visit the website "http://hdbaset.org/hdbaset-recommended-cables/" for the list of all the HDBaseT Alliance verified Ethernet cable providers.
4. For more information about how to set up an HDBaseT network, visit the website "http://hdbaset.org/installers/" and sign up for free membership.

Appendix 6 Dimensions







All measurements in millimeters (mm)

Appendix 7 Specifications

Model Name	HS-1650T
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 HDBaseT (RJ-45) 1 x Stream Port (RJ-45)
Analogue Audio Input	2 x Balanced XLR 1 x Stereo RCA (L/R) De-embedded Digital Audio
Analogue Audio Output	1x Stereo headphone
Digital Embedded Audio Support	Input: 2 Channels Output: 2 Channels
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, 4 Channels
Built-in Monitor Display	17.3” HD TFT LED backlit, 1920x1080 pixels
Built-in Intercom & Tally	N/A
Streaming Video Encode	H.264 / H.265 / AVC, Main/ High Profile Configurable Bit-rate up to 7 Mbps
Streaming Audio Encode	AAC-LC Configurable bit rate ranging from 32Kbps to 384Kbps Sample rate: 48KHz, 16bit

Model Name	HS-1650T
Product Name	4-Channel HD/SD HDBaseT Portable Video Streaming Studio
Streaming Protocol	RTSP RTMP SRT
Streaming Control	Web browser UI for configuration and control Socket commands
Recording File System	FAT, exFAT
Recording File Format	MP4
Recording Setting Control	Web UI for system configuration and control
Special Features	Built-in camera controller
Dimensions (LxWxH)	455 x 355 x 134 mm
Weight	17.2 Lbs (7.8 Kg), Reinforce Plastic Case
Power	DC 56V, 4.46A
Operating Temperature	0 – 40 °C

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.

Please visit our website for latest manual update.
www.datavideo.com/product/HS-1650T

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