M3

USER MANUAL

RGBlink®

CONTENTS

Thank you for choosing our product!

This User Manual is designed to show you how to use this video processor quickly and make use of all the features. Please read all directions and instructions carefully before using this product.

Declarations

FCC/Warranty

Federal Communications Commission (FCC) Statement

This equipment has been tested and found to comply with the limits for a class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area may cause harmful interference, in which case the user will be responsible for correcting any interference.

Guarantee and Compensation

RGBlink provides a guarantee relating to perfect manufacturing as part of the legally stipulated terms of guarantee. On receipt, the purchaser must immediately inspect all delivered goods for damage incurred during transport, as well as for material and manufacturing faults. RGBlink must be informed immediately in writing of any complains.

The period of guarantee begins on the date of transfer of risks, in the case of special systems and software on the date of commissioning, at latest 30 days after the transfer of risks. In the event of justified notice of compliant, RGBlink can repair the fault or provide a replacement at its own discretion within an appropriate period. If this measure proves to be impossible or unsuccessful, the purchaser can demand a reduction in the purchase price or cancellation of the contract. All other claims, in particular those relating to compensation for direct or indirect damage, and also damage attributed to the operation of software as well as to other service provided by RGBlink, being a component of the system or independent service, will be deemed invalid provided the damage is not proven to be attributed to the absence of properties guaranteed in writing or due to the intent or gross negligence or part of RGBlink.

If the purchaser or a third party carries out modifications or repairs on goods delivered by RGBlink, or if the goods are handled incorrectly, in particular if the systems are commissioned operated incorrectly or if, after the transfer of risks, the goods are subject to influences not agreed upon in the contract, all guarantee claims of the purchaser will be rendered invalid. Not included in the guarantee coverage are system failures which are attributed to programs or special electronic circuitry provided by the purchaser, e.g. interfaces. Normal wear as well as normal maintenance are not subject to the guarantee provided by RGBlink either.

The environmental conditions as well as the servicing and maintenance regulations specified in this manual must be followed by the customer.

Operators Safety Summary

The general safety information in this summary is for operating personnel.

Do Not Remove Covers or Panels

There are no user-serviceable parts within the unit. Removal of the top cover will expose dangerous voltages. To avoid personal injury, do not remove the top cover. Do not operate the unit without the cover installed.

Power Source

This product is intended to operate from a power source that will not apply more than 230 volts rms between the supply conductors or between both supply conductor and ground. A protective ground connection by way of grounding conductor in the power cord is essential for safe operation.

Grounding the Product

This product is grounded through the grounding conductor of the power cord. To avoid electrical shock, plug the power cord into a properly wired receptacle before connecting to the product input or output terminals. A protective-ground connection by way of the grounding conductor in the power cord is essential for safe operation.

Use the Proper Power Cord

Use only the power cord and connector specified for your product. Use only a power cord that is in good condition. Refer cord and connector changes to qualified service personnel.

Use the Proper Fuse

To avoid fire hazard, use only the fuse having identical type, voltage rating, and current rating characteristics. Refer fuse replacement to qualified service personnel.

Do Not Operate in Explosive Atmospheres

To avoid explosion, do not operate this product in an explosive atmosphere.

Installation Safety Summary

Safety Precautions

For all M3 processor installation procedures, please observe the following important safety and handling rules to avoid damage to yourself and the equipment.
To protect users from electric shock, ensure that the chassis connects to earth via the ground wire provided in the AC power Cord.
The AC Socket-outlet should be installed near the equipment and be easily accessible.

Unpacking and Inspection

Before opening M3 processor shipping box, inspect it for damage. If you find any damage, notify the

shipping carrier immediately for all claims adjustments. As you open the box, compare its contents against the packing slip. If you find any shortages, contact your sales representative.

Once you have removed all the components from their packaging and checked that all the listed components are present, visually inspect the system to ensure there was no damage during shipping. If there is damage, notify the shipping carrier immediately for all claims adjustments.

Site Preparation

The environment in which you install your M3 should be clean, properly lit, free from static, and have adequate power, ventilation, and space for all components.

Chapter 1 Your Product

1.1 In the Box

AC Power Cord	USB Cable	Network Cable	DVI Cable

SDI Cable	HDMI to DVI Cable	DVI-I to RCA Convertor	Screw Driver

Anti-static Bag

Note:

AC Power Cable supplied as standard according to destination market.

Warranty/Registration Card is contained in the USB.

1.2 Product Overview

M3 brings together sophisticated presentation switching with advanced mixing capabilities into a single device. The vision mixer console includes broadcast style features for quick access during any performance, along with dual eight-inch LCD displays to monitor video sources, full preview, as well as live/program display monitoring. At the rear of the M3, the familiar X3 modular routing platform become apparent, with a host of new options and features tailored to presentation applications.

Entirely module, right down to fans, filters, and PSU, M3 is fitted as standard with modules for preview and monitoring, communications and Genlock sync. From there, there is an impressive choice of both inputs and output options.

The on board displays can be configured to show outputs as physically arranged, or in any way. Large tactical illuminated buttons along with T-Bar mixing control. Powerful, yet compact, M3 is a fully integrated scaling, processing and mixing for processing and mixing for professional environments from entertainment to integration.

1.2.1 Back Panel

Input Option Slots

1	M3 provides 3 optional input slots. A range of inputs are available for user fitting, including DVI, VGA, HDMI, USB, CVBS and SDI. **DVI-I – DVI** Each DVI module supports 4 DVI-I inputs. Standard DVI signals can input. The DVI port supports up to HDMI 1.3 if the port format is set to HDMI. **HDMI-A – HDMI** Each HDMI module supports 4 HDMI-A inputs. Standard signal from computer can input. **DB15 – VGA** Each VGA module supports 4 DB15 inputs. Standard VGA signals can input. **BNC – CVBS** Each CVBS module supports 8 BNC inputs. Standard video signal from players, cameras can input. **USB-A– USB** Each USB module supports 4 USB-A inputs. Access the USB device or mobile hard disk with USB storage function. Support general image and video formats. **BNC – 3G-SDI** Each SDI module supports 4 SDI inputs and 4 SDI loop outputs. Standard 3G-SDI signals can input. SDI loop input can be connected to another M3 or device with SDI input.

Background Input

18. 19	**HDMI-A – HDMI** Standard signal from computer can input.

AUX Output

7. 8. 9. 10	**DVI-I – DVI (Choose from DVI/SDI/HDMI)** Connect to the monitor or LED display which has DVI interface. (This connector does not support hotplug).

PGM Output

20. 21	**HDMI-A – HDMI** Connect to the display device, video processor or matrix.

PST Output

22	**HDMI-A – HDMI** Connect to the display device, video processor or matrix.

PVW Output

3	**HDMI-A – HDMI** Connect to the display device, video processor or matrix.
4	**DB15 – VGA** Connect to the monitor or LED display which has VGA interface. (This connector does not support hotplug).

Control Connectors

2	**RJ45 – Ethernet** Connect to Ethernet work for remote control by Windows control software.
14	**USB-B – USB** For customizing LOGO, OSD, STILL and MASK saving, and can be loaded. Plus Upgrading.
11. 12	**RS-232** Used for cascade and firmware upgrade. 11: LINK IN is serial female port, the serial communication interface of RS-232 control protocol and multiple cascading control. 12: LINK OUT is serial male port, the serial communication interface of multiple devices cascading control, connect devices through DB9 serial cable.
5. 6	**BNC-Genlock** 5: Genlock input, standard Genlock signal can input. 6: Genlock loop output, can connect to the Genlock input of the next M3 or the device with Genlock input.
15. 16. 17	**TALLY Light**

Female Connector	Pin No.	Channel
5 4 3 2 1 10 9 8 7 6 15 14 13 12 11	1	PGM Ch.1
	2	PST Ch.1
	3	NC
	4	GND
	5	PGM Ch.4
	6	PGM Ch.2
	7	PST Ch.2
	8	NC
	9	GND
	10	PST Ch.4
	11	PGM Ch.3
	12	PST Ch.3
	13	NC
	14	GND
	15	NC
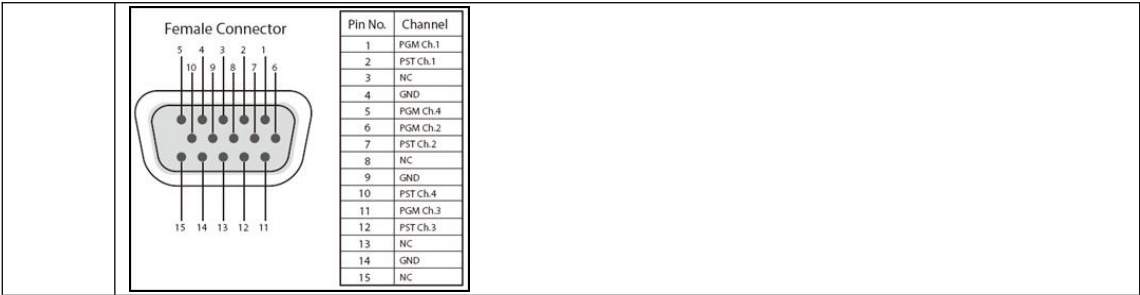
Power Connection

13	**IEC – Power Input** Main power input AC 100-240V Max 205W.

1.2.2 Front Panel
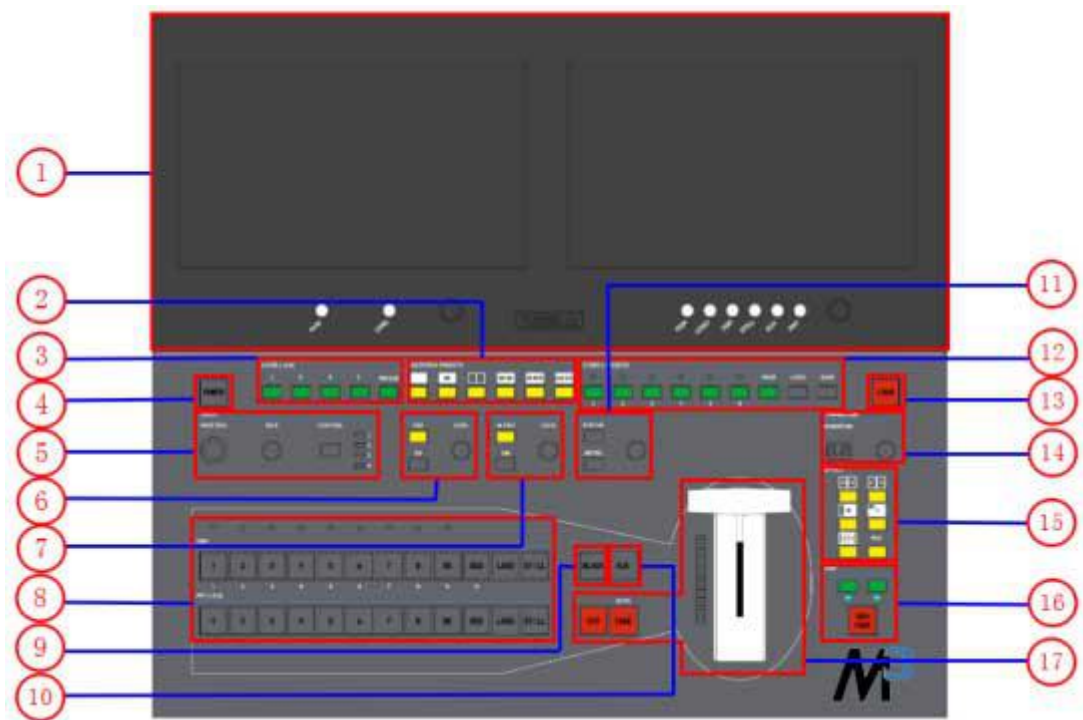
Panel Instruction			
1	LCD display	10	AUX button
2	Multiview presets area	11	Menu area
3	Layer/Aux area	12	Stored presets area
4	Power button	13	Locking button
5	Position, Size and Control area	14	Transition time control area
6	DSK edit area	15	WIPE operation area
7	BLEND edit area	16	OSD edit area
8	Input sources area	17	Switch Modes area
9	Black button		

Power Button

4	**POWER:** Red light indicates standby, while yellow light indicates operating environment.

LCD Display

1	**LCD Display** 8 inch full-color display. PVW Monitor (left): Multiview preview.

	PVW
	Eight images and single image preview switching button.
	CHNL
	Customize source channels (8 out of 12).
	Rotary
	For PVW menu selections, adjustment and confirmation.
	PST/PGM Monitor (right): Preview edit.
	PGM
	For PST and PGM switching.
	LOGO
	Customize the logo.
	OSD
	Customize the OSD.
	STILL
	Customize the STILL.
	AUX
	Quick split for PGM/AUX output card.
	FMT
	Output format settings button.
	Rotary Knob
	For PST menu selections, adjustment and confirmation.

Layer/Aux Button

3	**Button 1/2/3/4**
	For adding or deleting the layer. The light is on when adding a layer, off when deleting a layer and flickers when a layer is selected.
	FREEZE
	Freeze the image or video.

Multiview Presets Area

2	**Multiview Presets**
	Multiview shortcut buttons.
	The button light is on when a PIP mode is selected, mainly for layout settings quickly in multiview.
	☐ : 1P
	▪ : PIP CENT
	◻◻ : SIDE BY SIDE
	▪▪ : 3P

	▭▭▭ : 4P
	▭▭▭▭ : 5P

Position, Size and Control Area

5	**CONTROL** Layer selection button. The light is on when a layer is added, flickers when the layer is can be edited, off when there's no layer. **SIZE** Size adjustment and crop settings. For details, please refer to Scale and Crop. **POSITION Joystick** Position adjustment button. For details, please refer to Set the Position.

DSK Edit Area

6	**DSK** DSK effect editing button. User can select the layer and set the position in DSK menus. **ON** ON/OFF button. The button shines when selecting "ON", and enable the DSK function. Light is off when DSK function is turned off. **LEVEL Rotary Knob** Adjust the alpha of DSK layer. For details, please refer to DSK Settings.

BLEND Edit Area

7	**BLEND** BLEND effect editing button. User can select the layer and set the blending width in BLEND menus. **ON** ON/OFF button. The button shines when selecting "ON", and enables BLEND function. Light is off when the BLEND function is turned off. **LEVEL Rotary Knob** Adjust the blend width. For details, please refer to BLEND Settings.

Input Sources Area

8	**LED Indicator** The button 1/2/3/4/5/6/7/8 is on when the signal or background input is selected for use. **PGM area** For indicating. User cannot change the channel or set the size or position in PGM area. **BK** For indicating. The button is on when enabling background function.

	OSD
	For indicating. The button is on when enabling OSD function.
	LOGO
	For indicating. The button is on when enabling LOGO function.
	STILL
	For indicating, the button is on when enabling STILL function.
	1/2/3/4/5/6/7/8
	When number input is needed, all the buttons representing number shine. It can be used as direct number input of resolution and size.
	PST/Aux area
	For indicating, the button shines when output the signal in PST channel.
	For selecting, Press any button to switch the PST signal.
	For editing, (button light is on -- the channel is used but cannot be edited, button light is flashing -- the channel can be edited, button light is off -- the channel is not selected.
	BK
	Editing function. The button shines when enabling background function.
	OSD
	Editing function. The button shines when enabling OSD function.
	LOGO
	Editing function. The button shines when enabling LOGO function.
	STILL
	Editing function. The button shines when enabling STILL function.

BLACK Button

	BLACK
9	The button shines when enabling black function. Black is only available for PGM channel.

AUX Button

	AUX
10	AUX output settings, it can be customized.

Menu Area

	SYSTEM
	Menu or exit button.
	For details, please refer to Understanding the MENU Structure.
11	**ENTER**
	Confirmation button.
	Menu Rotary Knob
	Menu selection and confirmation button.

Stored Presets Area

	SAVE
12	Support 36 saving modes.

	LOAD
	Load saved views 1 to 36.
	PAGE
	For save or load. 6 pages and 6 banks in total.
	1/2/3/4/5/6 Button
	The button shines when select PAGE or BANK.

Lock Top Panel Area

	LOCK
13	Locking button. The button shines when the buttons in top panel are locked. Press the button again, the button light is off and locking is null.

Transition Time Control Area

	Double Digital Display Tube
	Display the transition time.
14	**Time Rotary Knob**
	Adjust transition time. The adjustment range is between 0.1S~5S.

WIPE Operation Area

15	: **Iris box** ←□→, →□←, ←＋→, →＋←, L←M→R, T←M→B
	: **Iris round** ←O→
	: **WIPE right/left** R→L, L→R
	: **Push to bottom right** T→B, B→T, TL→BR
	: **Blinds vertical** ‖‖‖→
	: **FADE**

OSD Edit Area

16	: The button to enable subtitle to scroll from right to left.
	: The button to enable subtitle to scroll from left to right.
	OSD TAKE

	Subtitles switch button.

Switch Mode Area

17	**<u>CUT</u>** Seamless switching. **<u>TAKE</u>** Seamless switching with effect. **<u>T-BAR</u>** WIPE and fade switching.

1.2.3 Dimension

Following is the dimension of M3:
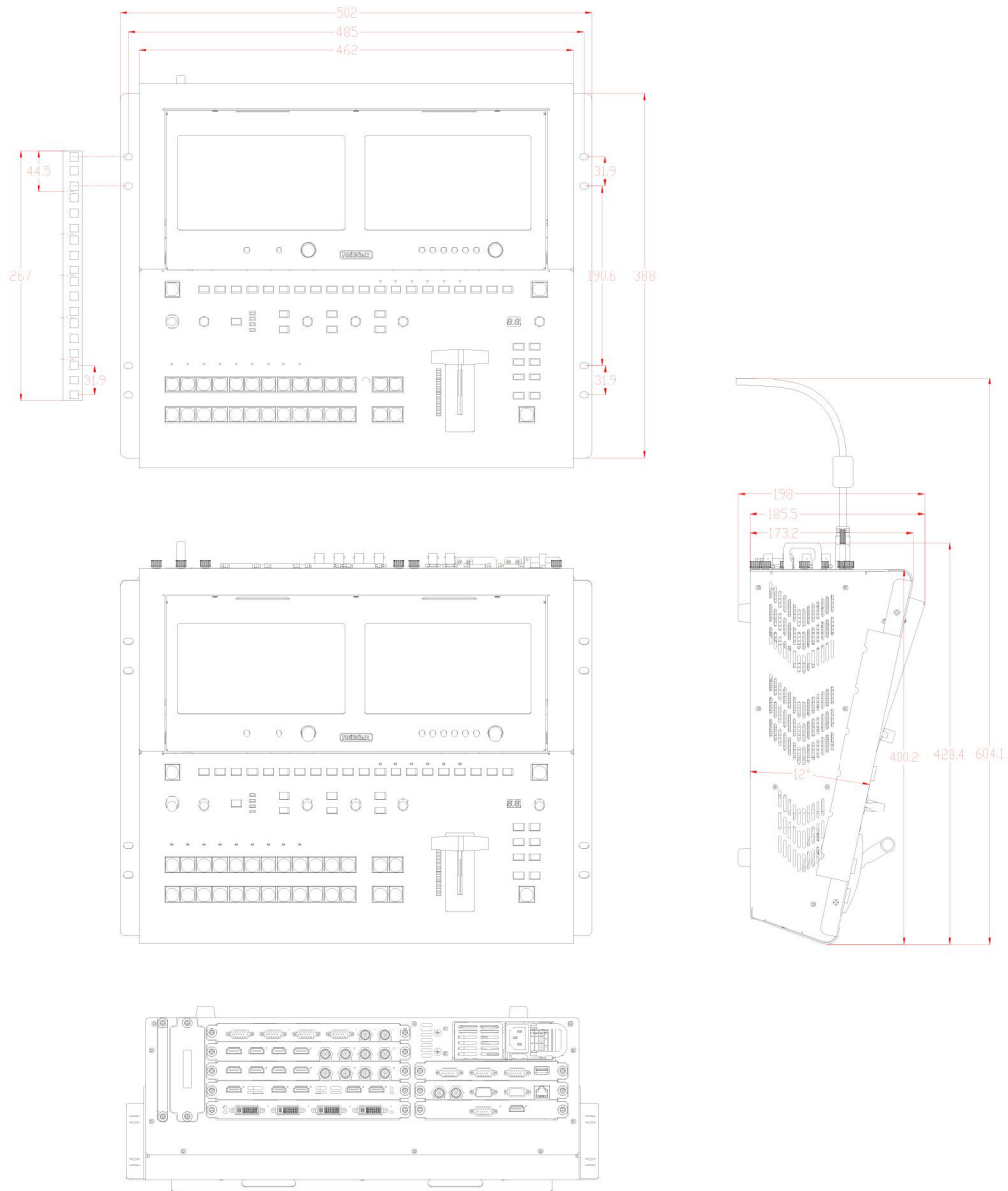
Chapter 2 Installing Your Product

2.1 Plugging in Signals

Connect signals to the product (ensure all devices are powered off first). Tighten connector screws/locks where provided.

2.2 Plugging in Main Power

Connect IEC cable to device and plug into wall socket. Turn on power at wall socket.

2.3 Turning on Your Product

When red light of [POWER] button is on, the device is standby.

Press [POWER] button for 3 seconds, the light will turn yellow and the device is starting up. After 10 seconds, the PVW monitor display the preview signals, as shown in the picture below:
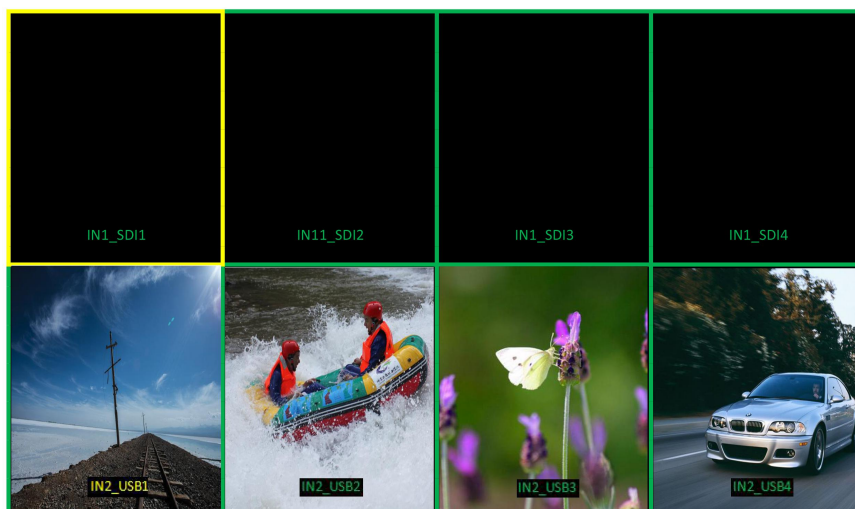
Chapter 3 Using Your Product

3.1 Using the MENU Button

Press [SYSTEM] button to enter the menu display.

Turn the rotary knob to navigate to the menu item required. The option with green background refers to the current item. Press the knob to select and get into the menu item.

As shown in the figure below:
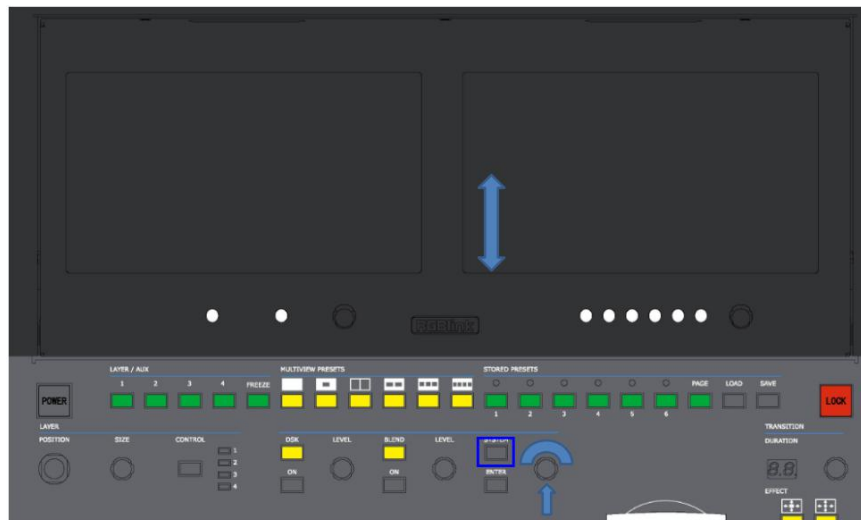
3.2 Understanding the MENU Structure

The MENU structure is shown in the figure below

Input	Output	Background	Mask	DSK
In 1 Port 1 Format	Format	Background	Mask	Layer
In 1 Port 2 Format	Custom Format	Capture and save to Input	Size	Preset
In 1 Port 3 Format	External Sync	Background	Layer	Alpha
In 1 Port 4 Format	4K1K	Picture	ON/OFF	Red Min
In 2 Port 1 Format	ColorSpace/ Sample/ Bit		Mask&PIC Pos X	Red Max
In 2 Port 2 Format			Mask&PIC Pos Y	Green Min
In 2 Port 3 Format			Mask Pos X	Green Max
In 2 Port 4 Format			Mask Pos Y	Blue Min
In 3 Port 1 Format			PIC Pos X	Blue Max
In 3 Port 2 Format			PIC Pos Y	DSK
In 3 Port 3 Format			Load File From U Disk	
In 3 Port 4 Format				
In 4 Port 1 Format				
In 4 Port 2 Format				
In 4 Port 3 Format				
In 4 Port 4 Format				

Blending	Test Pattern	Language	System	Factory Reset
Layer	Output	Chinese	Version	Yes
Blending Width	Test Pattern	English	Ethernet	No
Blending Mode	Solid Color Red		T-BAR Calibration	
3D Frame Brightness	Solid Color Green		Test	
3D Frame H Size	Solid Color Blue		Fan Speed	
3D Frame V Size				
Pure Color Red				
Pure Color Green				
Pure Color Blue				
Pure Color Frame Width				
ON/OFF				

3.3 Using the Menu

Use the menu system for convenient and intuitive operation. The 8 inch HD monitor shows the menu items. The monitor shows the default state when the menu is not in use, or the operation has timed out. Using the SYSTEM button and rotary knob in the top panel, the PGM monitor will show the corresponding menus according to user selections.

3.3.1 Understanding the Main Menu

Press [SYSTEM] button in the default state and turn the rotary knob, the PGM monitor will show the main menus as below:
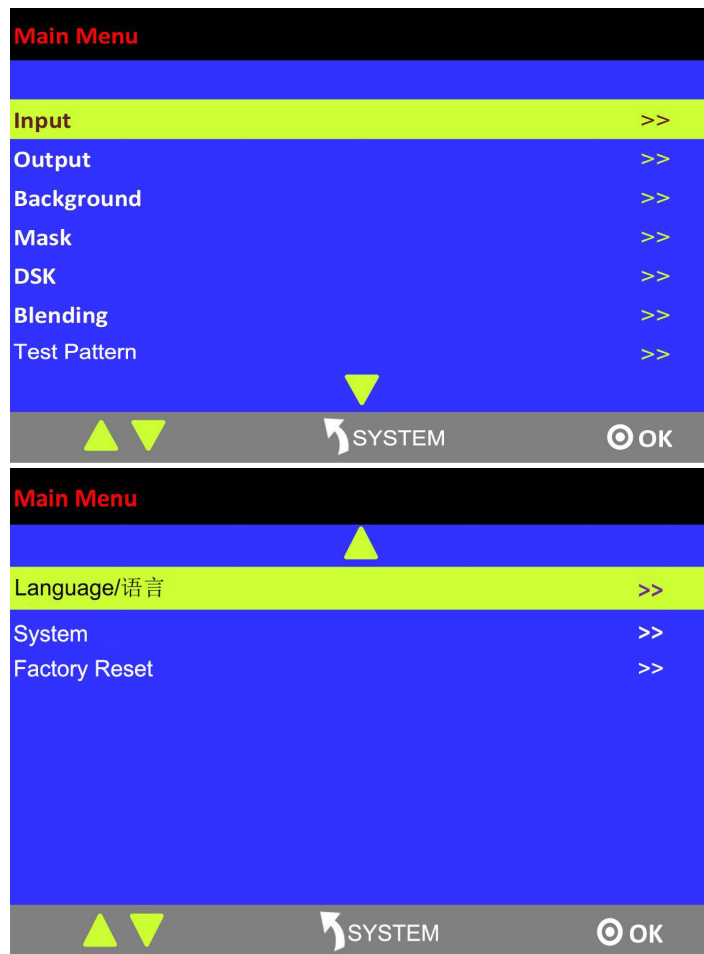
There are 10 items in the main menu, and are displayed in 2 pages. Press [ENTER] button, and select any menu above. Press the rotary knob to confirm, the LCD display will show the submenu. The [SYSTEM] button is also the [Return] button.

3.3.2 Input Menu

Input	
In 1 Port 1	**SDI**
Format	**NO INPUT**
In 1 Port 2	**SDI**
Format	**NO INPUT**
In 1 Port 3	**SDI**
Format	**NO INPUT**
In 1 Port 4	**SDI**

▼

▲ ▼ SYSTEM ◉ OK

Input	
▲	
Format	**NO INPUT**
In 2 Port 1	**USB**
Format	**NO INPUT**
In 2 Port 2	**USB**
Format	**NO INPUT**
In 2 Port 3	**USB**
Format	**NO INPUT**

▼

▲ ▼ SYSTEM ◉ OK

Input	
▲	
In 2 Port 4	**USB**
Format	**NO INPUT**
In 3 Port 1	**DVI**
Format	**NO INPUT**
In 3 Port 2	**DVI**
Format	**NO INPUT**
In 3 Port 3	**DVI**

▼

▲ ▼ SYSTEM ◉ OK
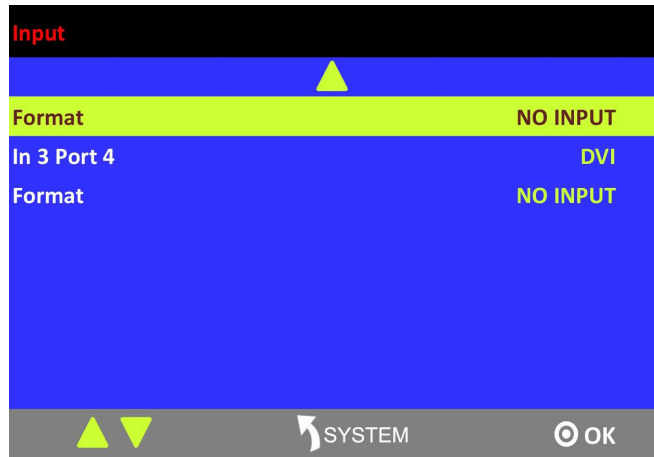
Input and port	Show the input card and port, and the corresponding signal.
Format	Show the format of the corresponding signal.

3.3.3 Output Menu
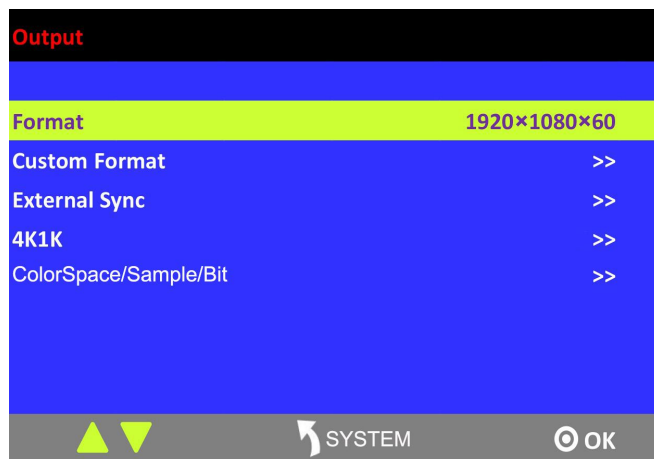
Format	There are 45 kinds of common output resolutions.
Custom Format	The special display project or LED display application would like to require special resolution settings to meet the requirement (refer to Custom Output Resolution).
External Sync	**External Sync** Select "ON" or "OFF" to enable or disable external sync function.
	Input Format Show the input format of external sync.
	Format Set the format of external sync.
4K1K	Enable or disable the 4K1K function.
ColorSpace/Sample/Bit	**Output port** It includes 7 output ports: PGM1, PGM2, PST, AUX1, AUX2, AUX3 and

	AUX4. [Note that AUX appearing in the product (V1.02 with new board) is actually AUX mentioned in this manual. We will update the menu for the next version.] **Type of output ports** HDMI and DVI **Color Space** Set color space on video or image. **Brightness** Range: 0~128

3.3.4 Background Menu
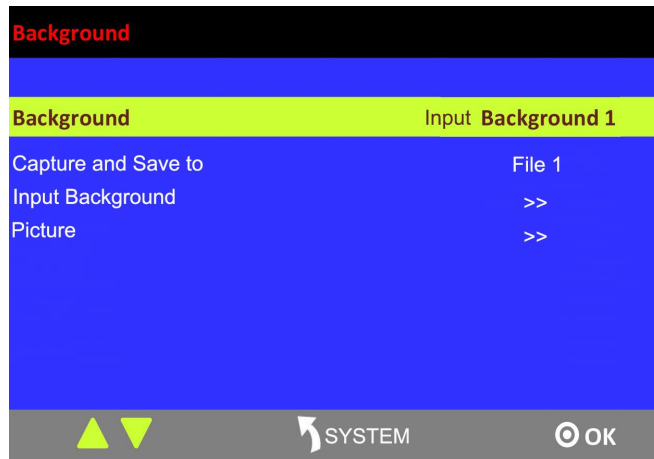
Background	Select background 1, background 2 or image.
Capture and Save to	User can capture the current image and save it. Up to 50 images can be saved. The same saving name will result in replacement of an image saved before. The replacement takes effect after restart.
Input Background	**Resolution** Settings resolution. **Scale H Pos** Range: 0~31 **Scale V Pos** Range: 0~31 **Scale H Size** Set the horizontal size. **Scale V Size** Set the vertical size.
Picture	**Picture** Select a saved image. **Load File from U Disk** User can load a document by U disk. **Delete**

	Delete an image.

3.3.5 MASK Menu
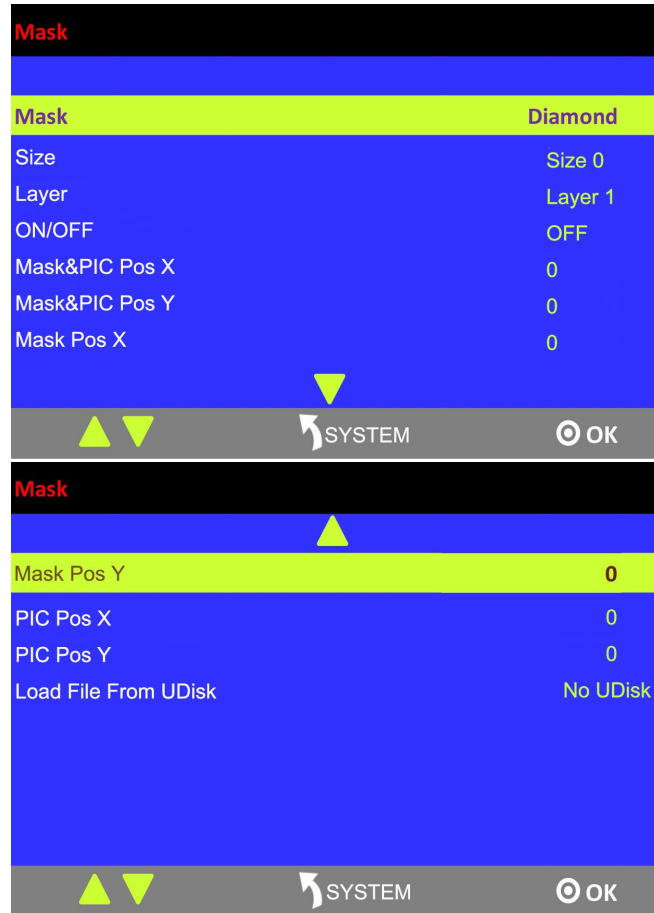
Mask	Support 13 kinds of masks: diamond, round, heart, star, triangle, oval, hexagons, pentagon, 4 point star, 6 point star, lighting, crescent left and crescent right
Size	Set the size of mask.
Layer	Select the layer.
ON/OFF	Select "ON" or "OFF" to enable or disable mask function.
Mask&PIC Pos X	Set the horizontal position of effect and picture.
Mask&PIC Pos Y	Set the vertical position of effect and picture.
Mask Pos X	Set the horizontal position of effect.
Mask Pos Y	Set the vertical position of effect.
PIC Pos X	Set the horizontal position of picture.
PIC Pos Y	Set the vertical position of picture.
Load File From UDisk	User can load customized effect image from UDisk.

3.3.6 DSK Menu

DSK	
Layer	**Layer 1**
Preset	**User**
Alpha	**0**
Red Min	**0**
Red Max	**31**
Green Min	**0**
Green Max	**31**
▼	
▲ ▼ ↰SYSTEM	⊙ OK

DSK	
▲	
Blue Min	**0**
Blue Max	**31**
DSK	**OFF**
▲ ▼ ↰SYSTEM	⊙ OK
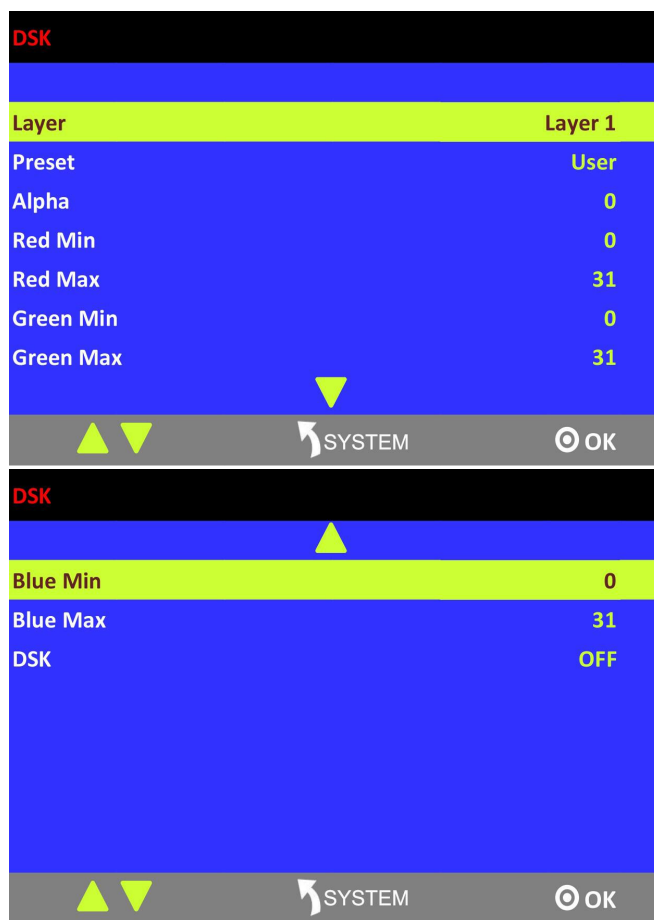
Layer	Select the layer.
Preset	Select user, black background, green background, blue background, red background and white background.
Alpha	The adjustment range is between 0~128.
Red Min	The adjustment range is between 0~255.
Red Max	The adjustment range is between 0~255.
Green Min	The adjustment range is between 0~255.
Green Max	The adjustment range is between 0~255.
Blue Min	The adjustment range is between 0~255.
Blue Max	The adjustment range is between 0~255.
DSK	Select "ON" or "OFF" to enable or disable DSK function.

3.3.7 Blending Menu
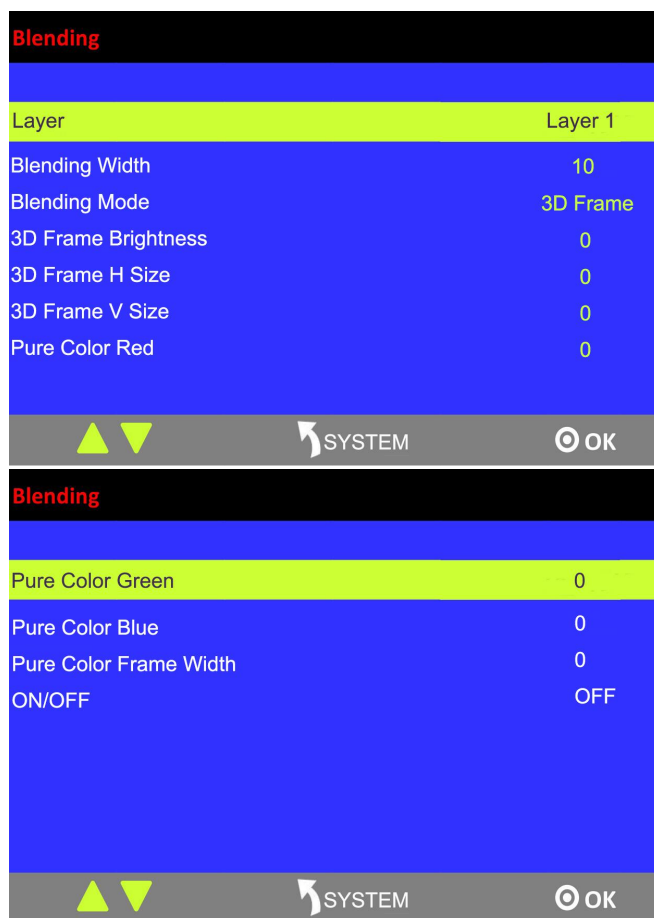
Layer	Select the layer.
Blending Width	Set the blending width, the adjustment range is between 1~90.
Blending Mode	3D Frame, Pure Color Frame, Inline and Outside can be selected.
3D Frame Brightness	Range: 0~255
3D Frame H Size	Range: 0~127
3D Frame V Size	Range: 0~127
Pure Color Red	Range: 0~255
Pure Color Green	Range: 0~255
Pure Color Blue	Range: 0~255
Pure Color Frame Width	Range: 0~23
ON/OFF	Turn on or turn off the function.

3.3.8 Test Pattern

Test Pattern	
Output	Program
Test Pattern	Off
Solid Color Red	0
Solid Color Green	0
Solid Color Blue	0
▲ ▼	SYSTEM ⊙ OK
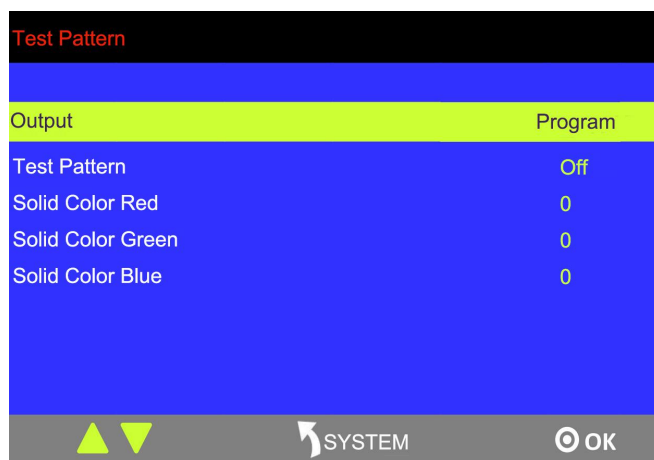
Output	Select program or preview
Test pattern	Select solid color, color bar or off.
Solid Color Red	Range: 0~255
Solid Color Green	Range: 0~255
Solid Color Blue	Range: 0~255

3.3.8 Language Menu

Main Menu	
Language/语言	>>
▲ ▼	SYSTEM ⊙ OK
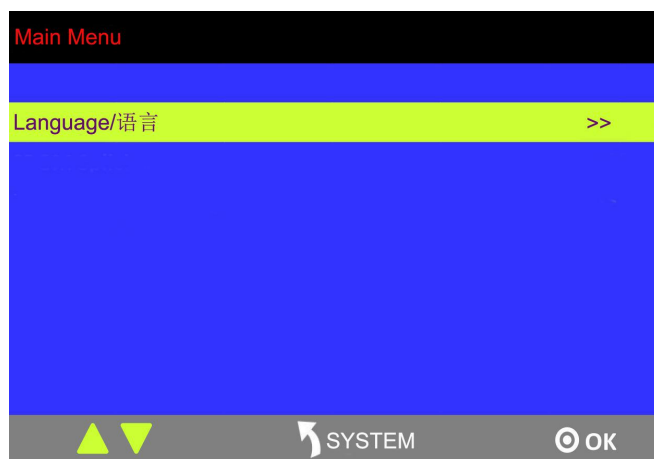
Language	Select Chinese or English.

3.3.9 System Menu
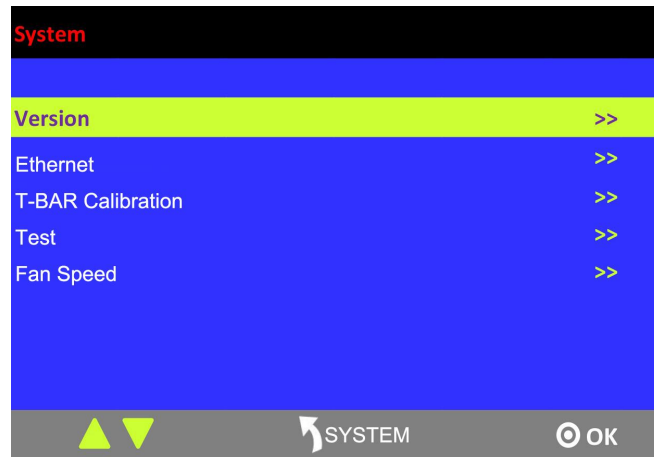
Version	Show the version of LCD, COM, PVW MCU, PVW FPGA, PGM MCU, PGM FPGA, Optional In 1 MCU, Optional In 1 FPGA, Optional In 2 MCU, Optional In 2 FPGA, Optional In 3 MCU, Optional In 3 FPGA, Optional Out MCU and Optional Out FPGA.
Ethernet	Turn on or turn off DHCP. User can edit IP and default gateway and check subnet mask.
T-BAR Calibration	Step 1: Press the T-BAR to the top. Step 2: Choose ON. Step 3: Press the T-BAR to the bottom. Step 4: Choose ON.
Test	Enable or disable the LED test function and adjust the key value.
Fan Speed	**Mode** Auto or custom. **Fan Speed** Range: 50~100

3.3.10 Factory Reset Menu
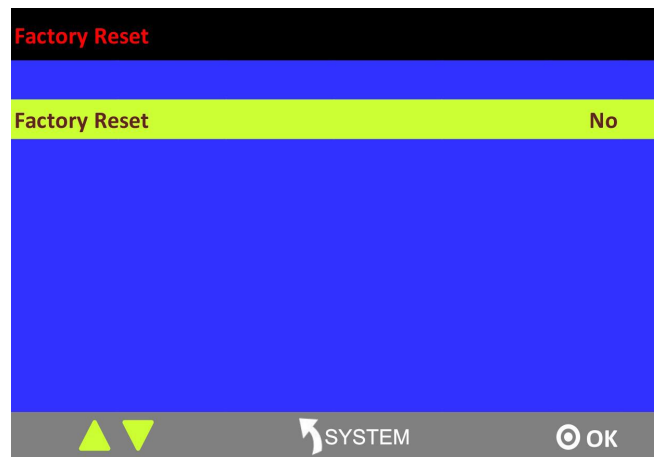
Factory Reset	Select "YES" or "NO". Select "YES" to restore default settings.

3.4 PVW

M3 has an 8 inch HD monitor (HDMI preview or VGA preview), and it supports the functions below:

1. Select any 8 channels from the 12 channels.
2. Quickly switch between single image preview and eight-image preview by pressing [PVW] button.
3. Source name synchronization, and automatically recognition for different input modules.
4. Color indicator of source name. Green for preview; yellow for preset and red for program

3.5 PST

M3 has an 8 inch HD preview display, and one HDMI preview output, it has following functions:

3.5.1 Signal Selection

Press any button in Input Sources Area. For example, press the button [5], the border of signal 5 will turn yellow, and the signal in PGM monitor will be switched to signal 5.

3.5.2 Add or Delete Layer

Press any button of [1] to [4] in Layer/Aux Area to add or delete a layer.
Add layer: The light is on.
Select layer: The light is flashing.
Delete layer: The light is off.

3.5.3 Freeze the Layer

Press [FREEZE] button in Layer/Aux Area, the layer will be frozen. Press the button again, and the layer restores.
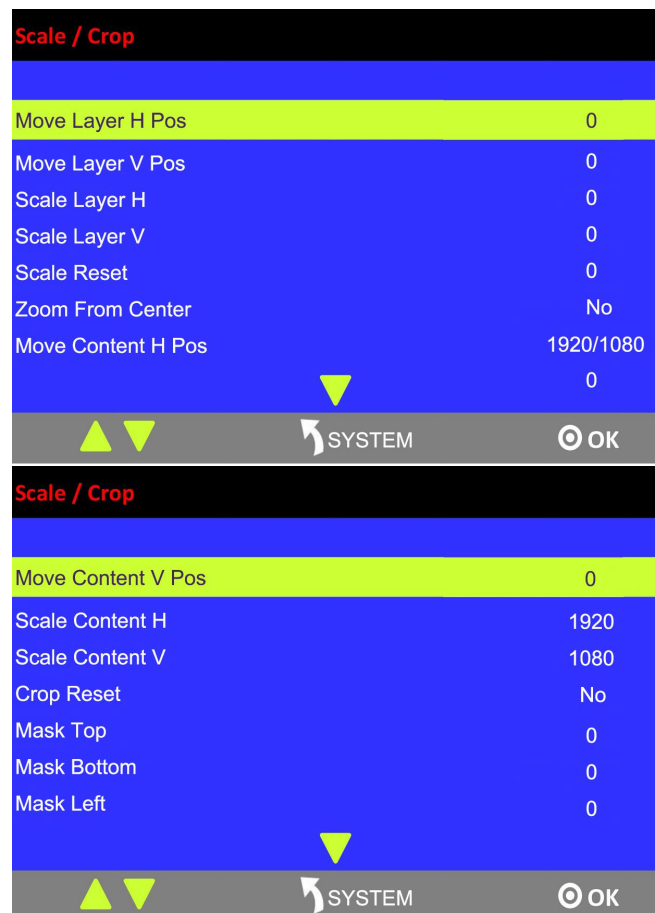
3.5.4 Multiview Presets

1. Press any button in Multiview Presets Area to select multiview layouts, including 1P, PIP CENT, SIDE BY SIDE, 3P, 4P and 5P.
2. Press [CONTROL] button in Position, Size and Control Area to select the layer, different signals can be used as the layer.
3. User can adjust the position, size, crop for the selected layer, and set DSK, BLEND and MASK.

3.5.5 Set the Position

1. Press [CONTROL] button in Position, Size and Control Area to select a layer, the border of the selected layer will turn green.
2. Swing the [POSITION] joystick in Position, Size and Control Area to adjust the position of the layer.
   Swing the joystick to the left or right to change the horizontal position.
   Swing the joystick up or down to change the vertical position.

3.5.6 Scale and Crop

Press [SIZE] button in Position, Size and Control Area, and get into the interface as follows:

Scale / Crop	
Move Layer H Pos	0
Move Layer V Pos	0
Scale Layer H	0
Scale Layer V	0
Scale Reset	0
Zoom From Center	No
Move Content H Pos	1920/1080
▼	0
▲ ▼ ↵ SYSTEM	⊙ OK

Scale / Crop	
Move Content V Pos	0
Scale Content H	1920
Scale Content V	1080
Crop Reset	No
Mask Top	0
Mask Bottom	0
Mask Left	0
▼	
▲ ▼ ↵ SYSTEM	⊙ OK
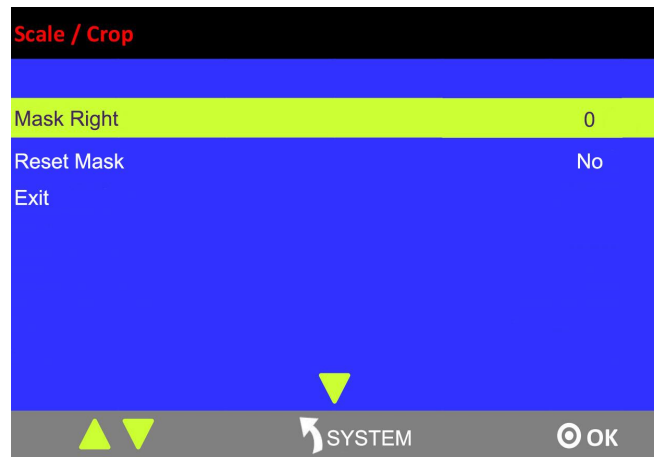
Move Layer H Pos: Adjust the horizontal position of layer.

Move Layer V Pos: Adjust the vertical position of layer.

Scale Layer H: Adjust the width of layer.

Scale Layer V: Adjust the height of layer.

Scale Reset: Reset button.

Zoom From Center: Zoom the width and height in equal proportion.

Move Content H Pos: Crop the horizontal position of layer.

Move Content V Pos: Crop the vertical position of layer.

The layer will be displayed in full screen after being cropped

Scale Content H: Set the width for cropping, and the cropped layer will be displayed in full screen.

Scale Content V: Set the height for cropping, and the cropped layer will be displayed in full screen.

Crop Reset: Reset button.

The layer will not be displayed in full screen after being cropped

Mask Top: Crop the top, and the layer will not be displayed in full screen.

Mask Bottom: Crop the bottom, and the layer will not be displayed in full screen.

Mask Left: Crop the left, and the layer will not be displayed in full screen.

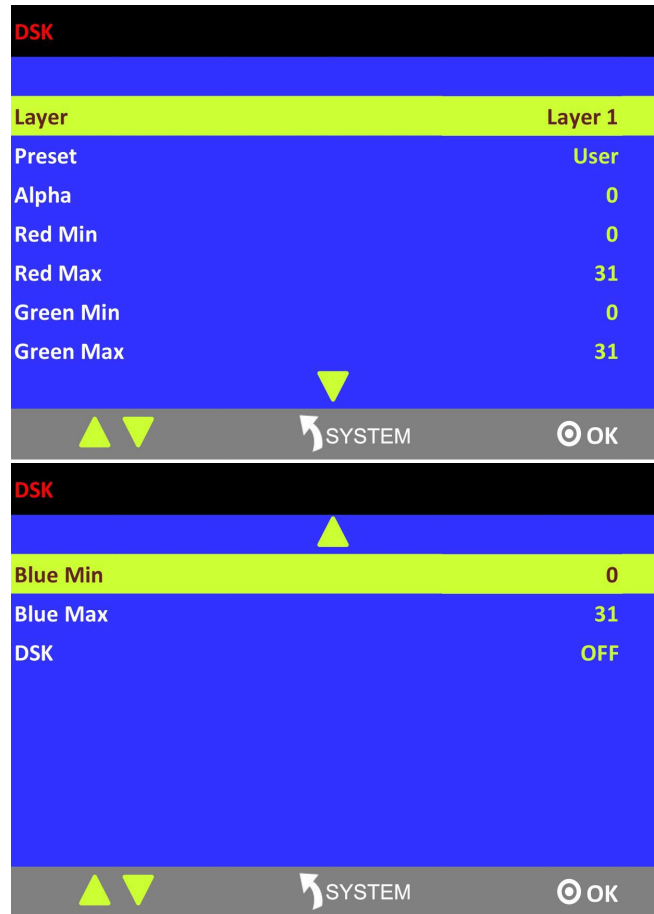**Mask Right:** Crop the right, and the layer will not be displayed in full screen.

Reset Mask: Reset button.

Exit: ESC button to stop settings size/crop.

3.5.7 DSK Settings

1. Firstly, enable the multiview function.
2. Press [SYSTEM] button, and get into the menu items. Turn the rotary knob, and select <DSK>, press the knob to confirm. (Or press [DSK] button to get to the DSK menu items)

Layer: Select the layer for DSK.

Preset: Select user, black background, green background, blue background, red background or white background.

Alpha: The adjustment range is between 0~128.

Red Min: The adjustment range is between 0~255.

Red max: The adjustment range is between 0~255.

Green Min: The adjustment range is between 0~255.

Green Max: The adjustment range is between 0~255.

Blue Min: The adjustment range is between 0~255.

Blue Max: The adjustment range is between 0~255.

DSK: Can select enable or disable the DSK function.

3.5.8 BLEND Settings

M3 has 4 blending modes – 3D Frame, Pure Color Frame, Inline and Outside.

Note:

3 modes can be selected for the same layer simultaneously. However, Inline and Outside cannot be edited on the same layer at the same time. That is, user can select 3D Frame, Pure Color Frame and Inline, or 3D Frame, Pure Color Frame and Outside at a time.

Follow the steps as below:

(1) Select multiview mode first, or BLEND is not available.
(2) Press [BLEND] button and get into the menu as below:

Blending	
Layer	Layer 1
Blending Width	10
Blending Mode	3D Frame
3D Frame Brightness	0
3D Frame H Size	0
3D Frame V Size	0
Pure Color Red	0
▲ ▼ ⤹SYSTEM	⊙ OK

Blending	
Pure Color Green	0
Pure Color Blue	0
Pure Color Frame Width	0
ON/OFF	OFF
▲ ▼ ⤹SYSTEM	⊙ OK

Layer: Select target layer.

Blending Width: The adjustment range is 1~90.

Blending Mode: Inline, Outside, 3D Frame and 3D Pure Frame

3D Frame Brightness: The adjustment range is 0~255.

3D Frame H Size: The adjustment range is 0~127.

3D Frame V Size: The adjustment range is 0~127.

Pure Color Red: The adjustment range is 0~255.

Pure Color Green: The adjustment range is 0~255.

Pure Color Blue: The adjustment range is 0~255.

Pure Color Frame Width: The adjustment range is 0~23.

ON/OFF: Turn on or turn off BLEND.

Follow the operating steps of each mode below:

Inline:

Press [SYSTEM] button and get into the main menu. Rotate the rotary button and select [BLEND]. Also, user can press the shortcut button in the [BLEND] area.

Layer: select target layer
Blending Mode: Inline
Blending Width: 1~90
ON/OFF: select ON to enable the function

See the effect as below:

Outside:

Press [SYSTEM] button and get into the main menu; select [Blending]. Or just press [BLEND] button.

Layer: select target layer
Blending Mode: Outside
Blending Width: 1~90
ON/OFF: select ON to enable the function

See the effect as below:

3D Frame:

Press [SYSTEM] button and get into the main menu; select [Blending]. Or just press [BLEND] button.

Layer: select target layer
Blending Width: 1~90
Blending Mode: 3D Frame
3D Frame Brightness: 0~255
3D Frame H Size: 0~127
3D Frame V Size: 0~127
ON/OFF: select ON to enable the function

See the effect as below:

Pure Color Frame:

Layer: select target layer
Blending Width: 1~90
Pure Color Red: 0~255
Pure Color Green: 0~255
Pure Color Blue: 0~255
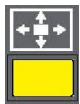Pure Color Frame Width: 0~23
ON/OFF: select ON to enable the function

See the effect as below:

3.5.9 WIPE Settings

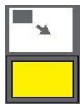1. Press the WIPE buttons in WIPE Operation Area, M3 has 14 kinds of wipe modes:

: Iris box: ←□→, →□←, ←＋→, →＋←, L←M→R, and T←M→B.

: Iris round.

: WIPE: R→L, L→R.

: Push to bottom right: T→B, B→T, LT→RB.

: Blinds vertical

: Fade mode

2. Press [TAKE] button, or use T-bar switcher to switch the image to program with selected wipe.

3.5.10 Mask Settings

1. Press [SYSTEM] button, and get into the menu items.
2. Turn the rotary knob, and select <Mask>, press the knob to confirm:

Mask	
Mask	**Diamond**
Size	Size 0
Layer	Layer 1
ON/OFF	OFF
Mask&PIC Pos X	0
Mask&PIC Pos Y	0
Mask Pos X	0
▲ ▼	↰ SYSTEM ◉ OK

Mask	
Mask Pos Y	**0**
PIC Pos X	0
PIC Pos Y	0
Load File From UDisk	No Disk
▲ ▼	↰ SYSTEM ◉ OK

Enable the mask function:

Turn the rotary knob and select "ON" from <ON/OFF> to enable the mask function.

Select effect:

Turn the knob, and select <MASK>, press the knob to confirm. Turn the rotary knob, and select one of the masks: diamond, round, heart, star, triangle, oval, hexagons, pentagon, 4 point star, 6 point star, lighting, crescent left and crescent right.

Mask settings:

M3 supports user-defined masks loaded from U Disk, and set the selected layer, including effect & PIC Pos X, Y, effect X, Y, PIC Pos X, Y.

3.5.11 Custom OSD on XTOOL

User can custom 200 subtitles at a time on XTOOL.
Follow the steps below:

- Tick OSD ON/OFF.
- Set the parameters as needed.

Note:

- Up to two lines of OSD can be displayed on a page at a time.

- The font settings can be saved in the PC, and can be reused without another editing.

After editing, load the OSD into the device. There are two ways to load.

(1) Load OSD directly with LAN cables.

- Change the COM No. of XTOOL according to the COM No. of the PC ([Management]).
If an exclamation mark appears in the COM, restart the PC.
- Click [Save To Device].
(2) Load OSD with USB
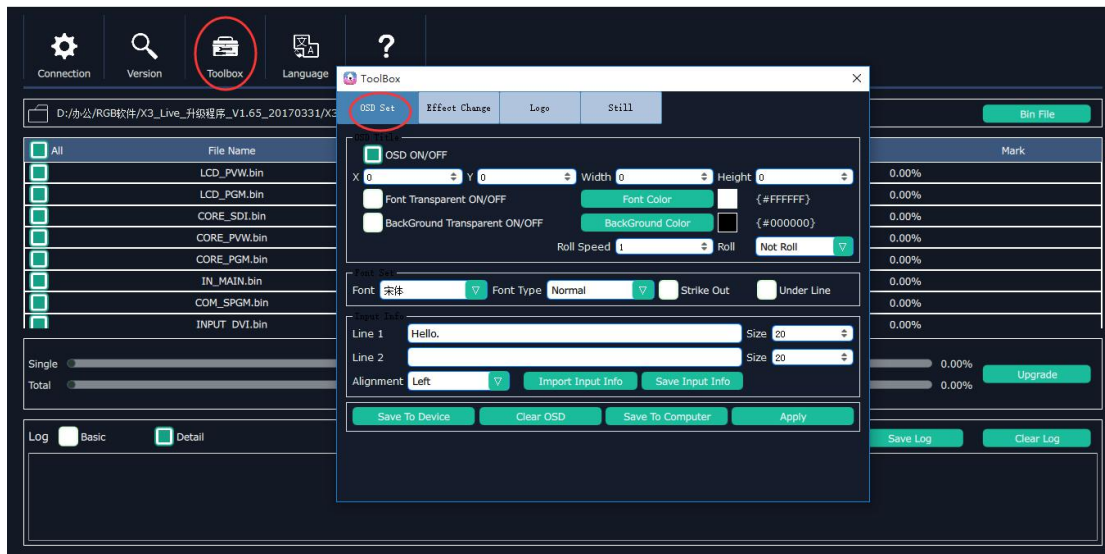- Click [Save to Computer] and save in order (0~199).
- Save the file as M3\OSD.
There are rules to follow for saving the file:
● The file No. should be 0~199 in order. Interruption is not permitted.
● Save the file as M3\OSD.
● The format of USB should be FAT 32.
- Press [OSD] button in the PGM/PST area.
- Select ON and "Load OSD From UDISK".

3.5.12 Custom MASK/EFFECT on XTOOL

First of all, user should create a graphic image with Microsoft Paint. There are some rules to follow in creating an image:
● The background of the image should be white by default.
● It should be 24 bit BMP and the size cannot be larger than the output resolution.
● Paint one image on the canvas at a time, and it's better to be on the top left corner.

Click TOOLBOX and select Effect Change. There are also rules to follow in saving a file:
● The file number should be 14-50 in order. Interruption is not permitted.

- The file should be named as M3\EFFECT.
- USB format: FAT 32

- Insert the USB into the port in the COMM area at the rear panel.
- Press [SYSTEM] button, and select MASK.
- Select "Load File From UDISK".
- Select "ON".
- User can set the size and position of the mask.

Note:
Either MASK, BLEND or DSK can be edited for each scene. They cannot appear at the same time.

3.5.13 Custom LOGO on XTOOL

First of all, user should create a graphic image with Microsoft Paint. There are some rules to follow in creating an image:
- The background of the image should be white by default.
- It should be 24 bit BMP and the dimension should be not more than 256×128.

Select the BMP file and upload. Click TOOLBOX and select LOGO.
There are rules to follow when saving the file:

- The file number should be 0~50 in order. Interruption is not permitted.
- The file should be named as M3\LOGO.
- The format of USB should be FAT 32.

- Press [LOGO] button in the PGM/PST preview below the right LCD screen.
- Select "Load File From UDISK".
- Select "ON".

3.5.14 Custom STILL on XTOOL

First of all, user should create a graphic image with Microsoft Paint. There are some rules to follow in creating an image:
- The background of the image should be white by default.
- It should be 24 bit BMP and the size cannot be larger than 128×128.

Click TOOLBOX and select STILL. There are also rules to follow in saving a file:
- The file number should be 1-50 in order. Interruption is not permitted.
- The file should be named as M3\STILL.
- USB format: FAT 32

- Insert the USB into the port in the COMM area at the rear panel.

- Press [STILL] button in the PGM/PST area.

- Select "Load File From UDISK".

- Select "ON".

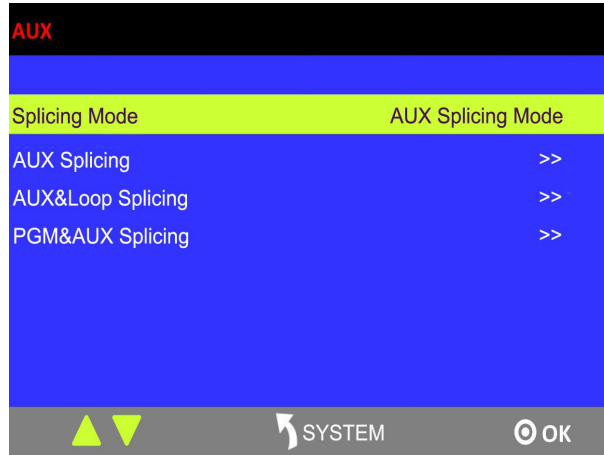- User can set the size and position.

Note:

- Before making LOGO, STILL, OSD and EFFECT, customer can insert the USB disk into the port in the COMM area at the rear panel first, it will create those file with correct name, and then use XTOOL to custom and save to the same USB disk.

- LOGO, STILL and OSD are static layers, and they can coexist in the same layer.

- LOGO, STILL and OSD can be only used for 2K screen.

3.6 PGM Mode

1. Switch the edited PST image to program by pressing the [CUT], [TAKE] button or T-bar, and
    then the PGM image will be switched to PST state, which can be edited.

2. There are 2 HDMI outputs for program, and 4Kx1K output is available.

3. The PGM image can be looped to AUX by internal loop and external loop for quick splice.

3.7 AUX Mode

Press [AUX] button in PST/PGM Monitor Area, and get into the AUX menu items:

AUX	
Splicing Mode	AUX Splicing Mode
AUX Splicing	>>
AUX&Loop Splicing	>>
PGM&AUX Splicing	>>
	▲ ▼ ↰ SYSTEM ◉ OK

M3 has 3 splicing modes, AUX Splicing, AUX&LOOP Splicing and PGM&AUX Splicing.

Note:
Use TAKE/ CUT button for transition under AUX mode. Using T-Bar will lead to deletion of layers.
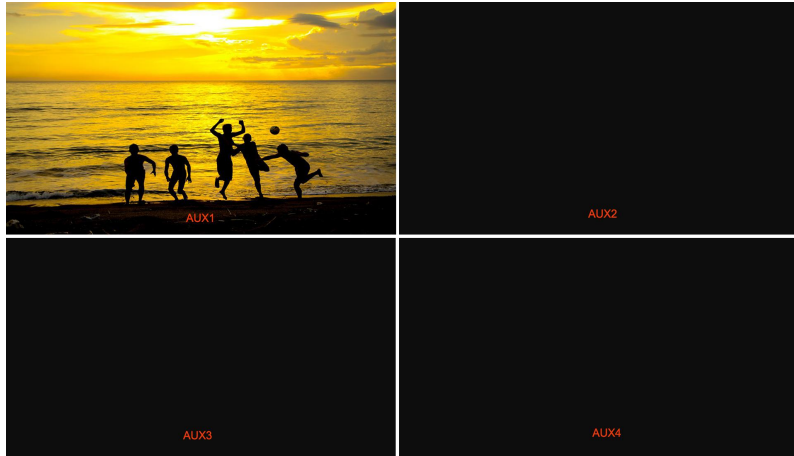
3.7.1 AUX Splicing

1. Turn the rotary knob, and select <AUX Splicing>, press the knob to confirm, and get into the menu items.

AUX	
Splicing Mode	>>
Total W	3840
Total H	2160
First W	1920
First H	1080
Start X	0
Start Y	0
	▲ ▼ ↰ SYSTEM ◉ OK

2. Select the splicing mode, <⊞> and <||||> can be selected.

⊞ Splicing Mode

(1) Select the signal, for example, select signal 5, as shown below:

(2) Then, the H Total is 3840, V Total is 2160.

AUX 1: AUX 1 Pos X is 0, AUX 1 Pos Y is 0, AUX 1 H Size is 1920, AUX 1 V Size is 1080.

AUX 2: AUX 2 Pos X is 1920, AUX 2 Pos Y is 0, AUX 2 H Size is 1920, AUX 2 V Size is 1080.

AUX 3: AUX 3 Pos X is 0, AUX 3 Pos Y is 1080, AUX 3 H Size is 1920, AUX 3 V Size is 1080.

AUX 4: AUX 4 Pos X is 1920, AUX 4 Pos Y is 1080, AUX 4 H Size is 1920, AUX 4 V Size is 1080.

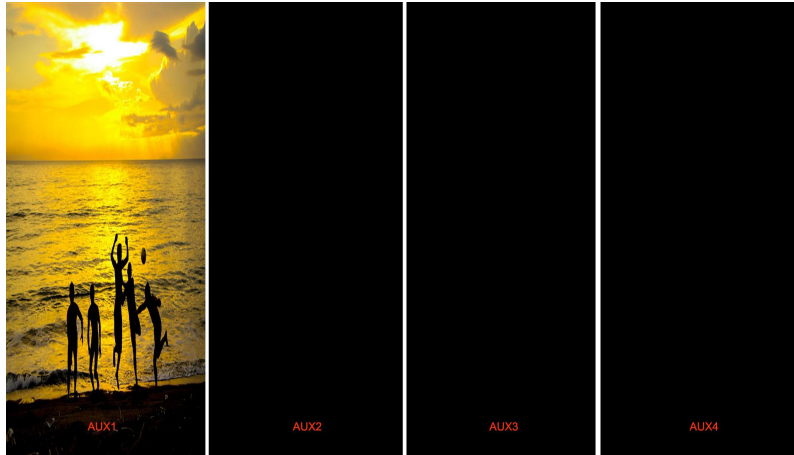User can also customize the size and position of each AUX.

(3) Press [SIZE] button;

According to the parameters from Step 2, set Scale H Size as 3840, [1920 (AUX1/3)+1920 (AUX2/4)=3840], and set Scale V Size as 2160 [1080 (AUX1/3)+1080 (AUX2/4)=2160]. The image or video will output to the 4 split screens, as shown in the figure below:

|||| Splicing Mode

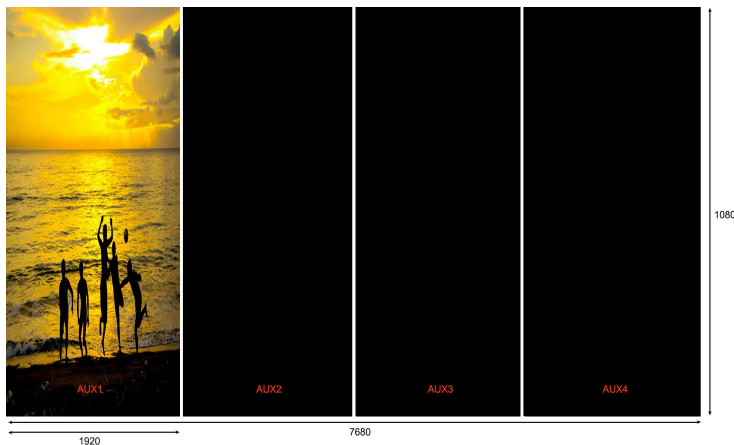(1) Select the signal, for example, select signal 5, as shown below:

(2) Then, the H Total is 7680, V Total is 1080.

AUX 1: AUX 1 Pos X is 0, AUX 1 Pos Y is 0, AUX 1 H Size is 1920, AUX 1 V Size is 1080.

AUX 2: AUX 2 Pos X is 1920, AUX 2 Pos Y is 0, AUX 2 H Size is 1920, AUX 2 V Size is 1080.

AUX 3: AUX 3 Pos X is 3840, AUX 3 Pos Y is 0, AUX 3 H Size is 1920, AUX 3 V Size is 1080.
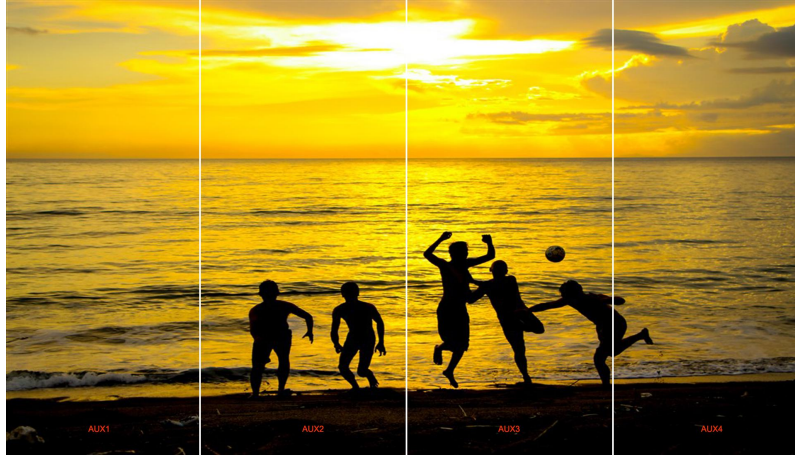
AUX 4: AUX 4 Pos X is 5760, AUX 4 Pos Y is 0, AUX 4 H Size is 1920, AUX 4 V Size is 1080.

User can also customize the size and position of each AUX.

(3) Press [SIZE] button;

According to the parameters from Step 2, set Scale H Size as 7680, [1920 (AUX1)+1920 (AUX2) +1920 (AUX3) +1920 (AUX4)=7680]. The image or video will output to the 4 split screens, as shown in the figure below:

PIP (only available on M3 e)

PIP is available under AUX Splicing mode on M3 e. (Please refer to M3 e AUX split manual).

Note:

When [Control] button is on, the background layer can be edited; when the light is off, the sub-layers can be edited. User can set the size and position of sub-layers with [SIZE] button.

3.7.2 AUX&LOOP Splicing

In this mode, the port can display up to 5 images. Select 2K1K multiview and loop splice the multiview, the views will be displayed on 4K2K or 8K1K screen. The mode has two kinds of loop: internal loop and external loop. External loop means that the loop is done by actual connection between one of the PGM port (HDMI) to the one of the HDMI/DVI input ports.

External loop

(1) Press [AUX] button, and get into the menu:
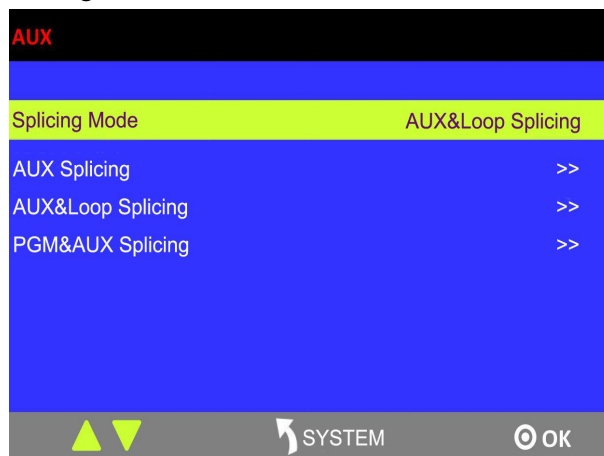
(2) Select 田 or ||||.

田 **Splicing**

Select the loop port after actual connection, for example, Port 12 (DVI).

(3) select loop mode, and select ⊞ or ||||.

(4) Then, the total W is 3840, total H is 2160.

AUX 1: AUX 1 Pos X is 0, AUX 1 Pos Y is 0, AUX 1 H Size is 1920, AUX 1 V Size is 1080.

AUX 2: AUX 2 Pos X is 1920, AUX 2 Pos Y is 0, AUX 2 H Size is 1920, AUX 2 V Size is 1080.

AUX 3: AUX 3 Pos X is 0, AUX 3 Pos Y is 1080, AUX 3 H Size is 1920, AUX 3 V Size is 1080.

AUX 4: AUX 3 Pos X is 1920, AUX 3 Pos Y is 1080, AUX 3 H Size is 1920, AUX 3 V Size is 1080.

User can set the position, height and width of each port.

(5) Press [SIZE] button;

According to the parameters from Step 2, set Scale H Size as 3840, [1920 (AUX1/3)+1920 (AUX2/4)=3840], and set Scale V Size as 2160 [1080 (AUX1/3)+1080 (AUX2/4)=2160]. The image or video will output to the 4 split screens, as shown in the figure below:

Internal loop:

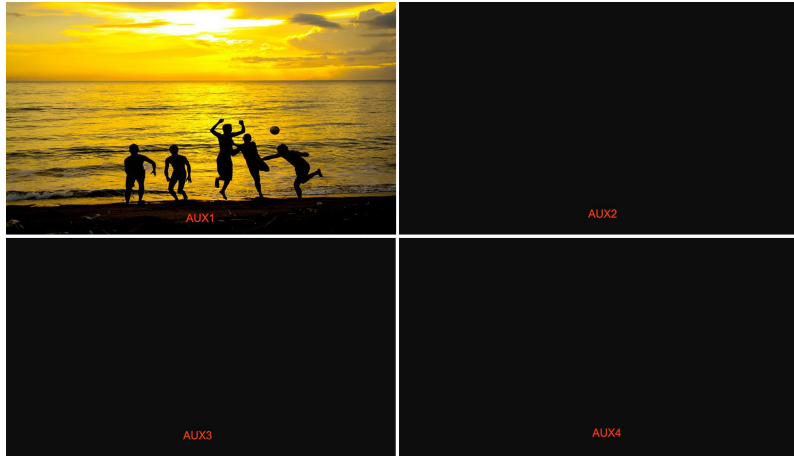(1) Press the rotary button and select <AUX&LOOP Splicing>, press the button to confirm.

(2) Press <PGM LOOP> and select <internal loop>.

(3) Select ⊞ or ||||.

In the internal loop mode, the PST screen on the right only displays PGM views, and switching between PST and PGM views is not available. Connect PST OUT port to another device to preview. Press [BK] button, and the signal can be selected.

⊞ Splicing Mode

(1) Select the signal, for example, select signal 5, as shown below:

(2) Then, the H Total is 3840, V Total is 2160.

AUX 1: AUX 1 Pos X is 0, AUX 1 Pos Y is 0, AUX 1 H Size is 1920, AUX 1 V Size is 1080.

AUX 2: AUX 2 Pos X is 1920, AUX 2 Pos Y is 0, AUX 2 H Size is 1920, AUX 2 V Size is 1080.

AUX 3: AUX 3 Pos X is 0, AUX 3 Pos Y is 1080, AUX 3 H Size is 1920, AUX 3 V Size is 1080.

AUX 4: AUX 4 Pos X is 1920, AUX 4 Pos Y is 1080, AUX 4 H Size is 1920, AUX 4 V Size is 1080.

User can also customize the size and position of each AUX.

(3) Press [SIZE] button;

According to the parameters from Step 2, set Scale H Size as 3840, [1920 (AUX1/3)+1920 (AUX2/4)=3840], and set Scale V Size as 2160 [1080 (AUX1/3)+1080 (AUX2/4)=2160]. The image or video will output to the 4 split screens, as shown in the figure below:

|||| Splicing Mode

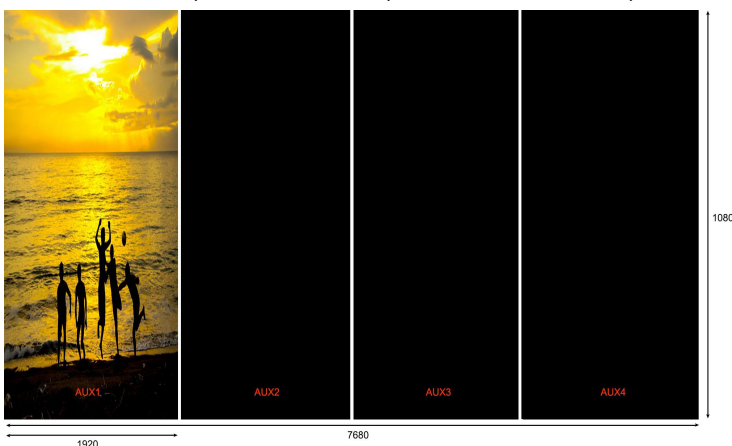(1) Select the signal, for example, select signal 5, as shown below:

(2) Then, the H Total is 7680, V Total is 1080.

AUX 1: AUX 1 Pos X is 0, AUX 1 Pos Y is 0, AUX 1 H Size is 1920, AUX 1 V Size is 1080.

AUX 2: AUX 2 Pos X is 1920, AUX 2 Pos Y is 0, AUX 2 H Size is 1920, AUX 2 V Size is 1080.

AUX 3: AUX 3 Pos X is 3840, AUX 3 Pos Y is 0, AUX 3 H Size is 1920, AUX 3 V Size is 1080.
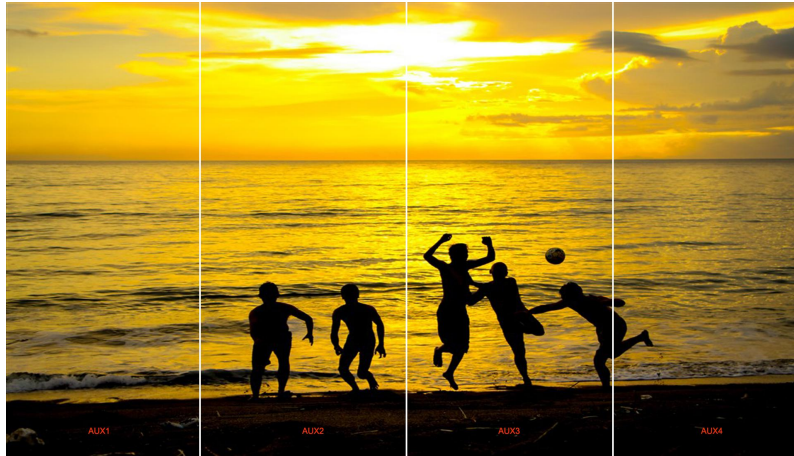
AUX 4: AUX 4 Pos X is 5760, AUX 4 Pos Y is 0, AUX 4 H Size is 1920, AUX 4 V Size is 1080.

User can also customize the size and position of each AUX.

(3) Press [SIZE] button;

According to the parameters from Step 2, set Scale H Size as 7680, [1920 (AUX1)+1920 (AUX2) +1920 (AUX3) +1920 (AUX4)=7680]. The image or video will output to the 4 split screens, as shown in the figure below:

3.7.3 PGM&AUX Splicing

1. Turn the rotary knob, and select <PGM&AUX Splicing>, press the knob to confirm, and get into
   the menu items.
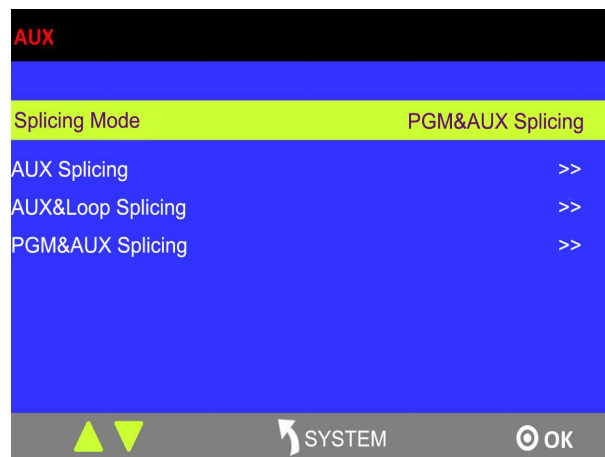
2. Select the splicing mode, <|||||> and <||||||> can be selected.

Note:

田 splicing is not available for the version (V1.02).

||||| Splicing Mode

(1) Select the signal, for example, select signal 5, as shown below:

(2) Then, the H Total is 9600, V Total is 1080.

PGM: PGM Pos X is 0, PGM Pos Y is 0, PGM H Size is 1920, PGM V Size is 1080.

AUX 1: AUX 1 Pos X is 1920, AUX 1 Pos Y is 0, AUX 1 H Size is 1920, AUX 1 V Size is 1080.

AUX 2: AUX 2 Pos X is 3840, AUX 2 Pos Y is 0, AUX 2 H Size is 1920, AUX 2 V Size is 1080.

AUX 3: AUX 3 Pos X is 5760, AUX 3 Pos Y is 0, AUX 3 H Size is 1920, AUX 3 V Size is 1080.

AUX 4: AUX 4 Pos X is 7680, AUX 4 Pos Y is 0, AUX 4 H Size is 1920, AUX 4 V Size is 1080.
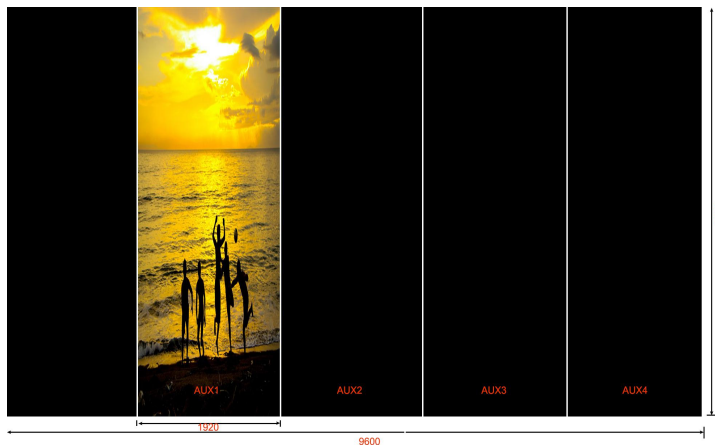
User can also customize the size and position of each AUX.

(3) Press [SIZE] button;

According to the parameters from Step 2, set Scale H Pos as 0 and Scale H Size as 9600, [1920 (PGM)+1920 (AUX1)+1920 (AUX2)+1920 (AUX3)+1920 (AUX4)=9600], as shown in the figure below:

|||||| Splicing Mode

(1) Press [SYSTEM] button, and get into the menu items, select <4K1K> in <Output> option, and select "ON".

(2) Select the splicing mode <||||||>.

(3) Select the signal, for example, select signal 5, as shown below:
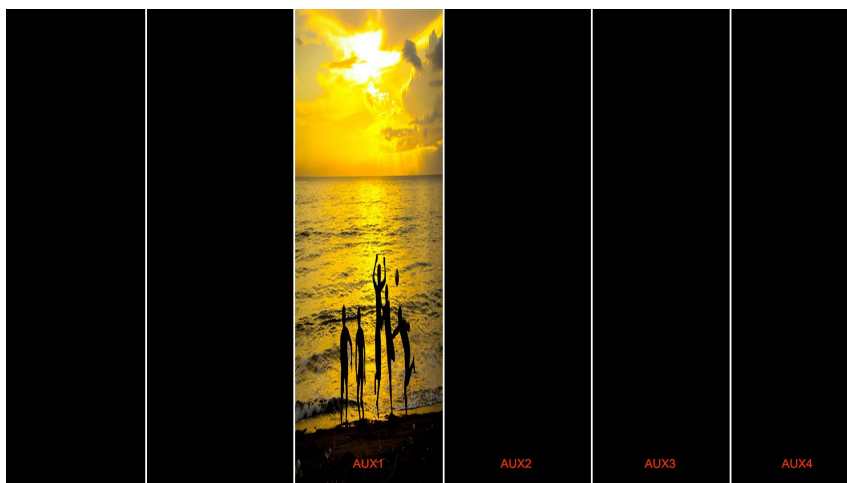
(4) Then, the H Total is 11520, V Total is 1080.

PGM1: PGM1 Pos X is 0, PGM1 Pos Y is 0, PGM1 H Size is 1920, PGM1 V Size is 1080.

PGM2: PGM2 Pos X is 1920, PGM2 Pos Y is 0, PGM2 H Size is 1920, PGM2 V Size is 1080.

AUX 1: AUX 1 Pos X is 3840, AUX 1 Pos Y is 0, AUX 1 H Size is 1920, AUX 1 V Size is 1080.

AUX 2: AUX 2 Pos X is 5760, AUX 2 Pos Y is 0, AUX 2 H Size is 1920, AUX 2 V Size is 1080.

AUX 3: AUX 3 Pos X is 7680, AUX 3 Pos Y is 0, AUX 3 H Size is 1920, AUX 3 V Size is 1080.

AUX 4: AUX 4 Pos X is 9600, AUX 4 Pos Y is 0, AUX 4 H Size is 1920, AUX 4 V Size is 1080.

User can also customize the size and position of each AUX.
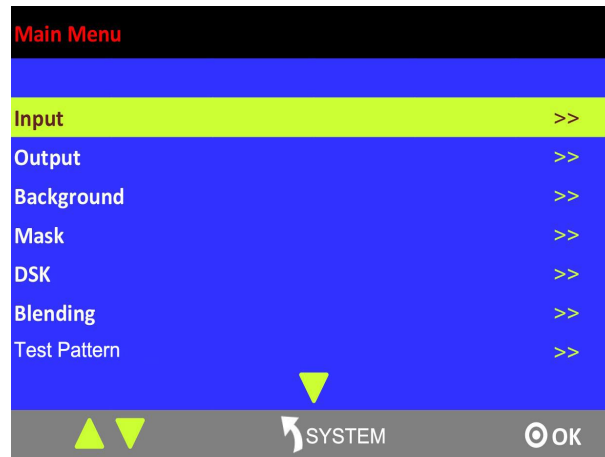
(5) Press [SIZE] button;

According to the parameters from Step 4, set Scale H Pos as 0 and Scale H Size as 11520, [1920 (PGM1)+1920 (PGM2)+1920 (AUX1)+1920 (AUX2)+1920 (AUX3)+1920 (AUX4)=11520], as shown in the figure below:

3.8 4K1K Mode

1. Press [SYSTEM] button, and get into the menu items, turn the rotary knob, and select
   <Output>.

Main Menu	
Input	>>
Output	>>
Background	>>
Mask	>>
DSK	>>
Blending	>>
Test Pattern	>>
▼	
▲ ▼ ↰SYSTEM ⊙ OK	

2. Press the knob to confirm. Turn the rotary knob, and select <4K1K>, set "ON":

Output	
Format	>>
Custom Format	>>
External Sync	>>
4K1K	>>
Color Space/Sample/Bit	>>
▲ ▼ ↰SYSTEM ⊙ OK	

3. Press [CONTROL] button, and select the layer.

4. Press any button in the PST area, and select the signal.

5. Press [SIZE] button, and set Scale H Size as 3840. This is the 4K1K mode.

If output the dual graphics to the background input, the operation is as follows:
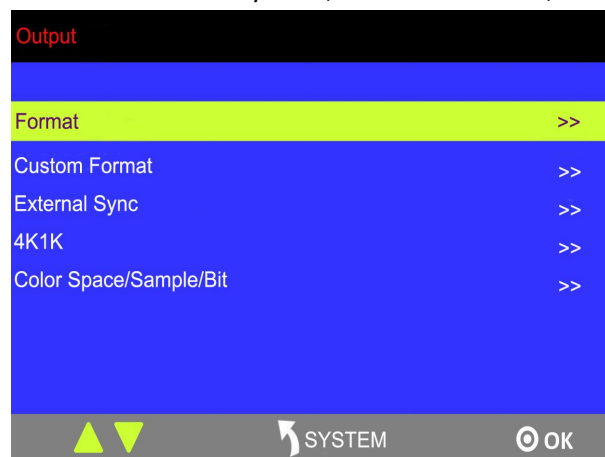
1. Input the dual graphics signal (HDMI background input).

2. Press [SYSTEM] button, and get into the menu items, turn the rotary knob, and select
   <Output>.

3. Press the knob to confirm. Turn the rotary knob, and select <4K1K>, set "ON":

4. Press [BK] button in the PST area, and select the background signal, then it realizes the 4K1K
   mode.

Note:

The background input resolution much be greater than output resolution.

3.9 Switch Image

1. T-BAR switch: Switch the PST image to PGM with wipe and fade by T-bar.

2. CUT switch: Seamlessly switch the PST image quickly to PGM by pressing [CUT] button.

3. TAKE switch: Switch the PST image to PGM with wipe and fade by pressing [TAKE] button.

4. TRANSITION DURATION: Transition duration settings, the adjustment range is between 0.1~9.9S.

3.10 Set the Output Resolution

3.10.1 Select the Output Resolution

1. Press [SYSTEM] button, and get into the menu items, turn the rotary knob and select <Output>:
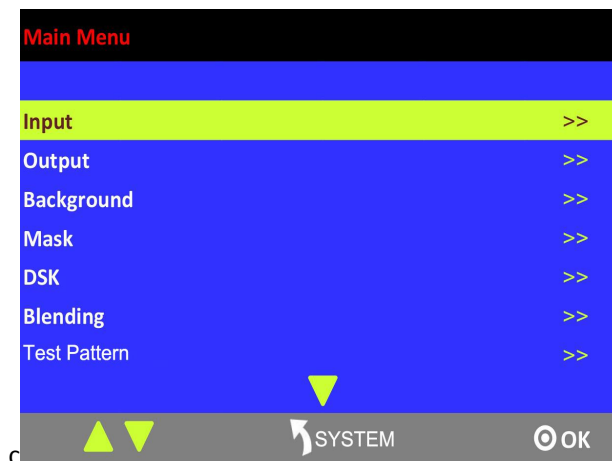
2. Press the rotary knob to confirm, and get into the menus .

3. <Format> is the default option, press the rotary to confirm. Turn the rotary knob, select the output resolution according to actual need.

3.10.2 Custom Output Resolution
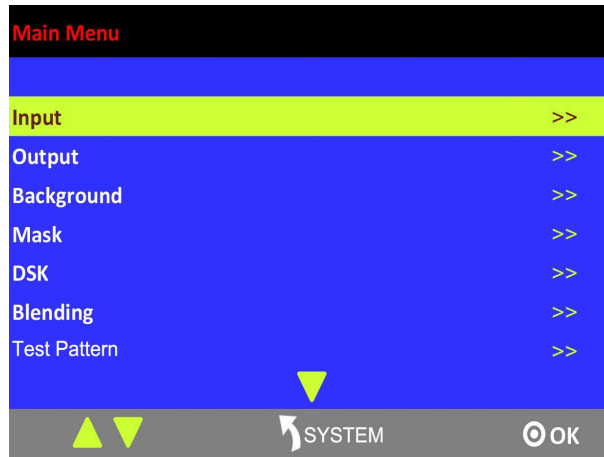
1. Press [SYSTEM] button, and get into the menu items, turn the rotary knob and select <Output>:

2. Press the rotary knob to confirm, and get into the menus.

3. Turn the rotary knob, and select <Custom Format>, press the rotary knob to confirm.

4. Set H Active, V Active and Freq according to the actual need, then select <Set> and set "Yes", press the rotary knob to confirm.

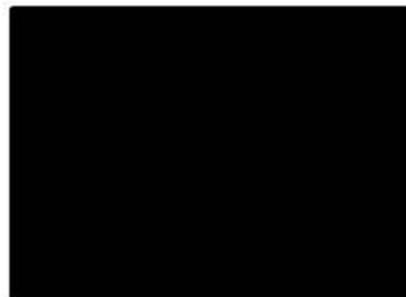# 3.11 Using Black Out

Black out description:

Black out with one-key touch.

M3 provides black effect processing for program output and preview output, with cut black effect.

Operation is as below:

Press [BLACK] button, the button light is on, and the program turns black.

The effect is shown as below:

3.12 Saving Views

M3 provides 36 positions for saving or recording parameters. To save current parameters and settings:

1. Press [SAVE] button in Stored Presets Area, the button [SAVE] and [PAGE] lights are on, and some of buttons 1~6 are lit and some are flashing. The button lit can be saved and flash will be overwrite, press the button lit to save.
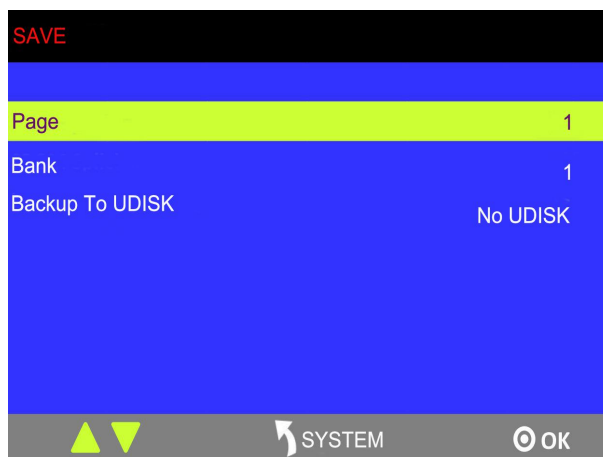
SAVE	
Page	1
Bank	1
Backup To UDISK	No UDISK
▲ ▼	↰ SYSTEM ⦿ OK

2. Select PAGE, for example, the button [2] is on, press the button [2].

3. After setting the PAGE, it will jump to Bank option, or example, the button [2] is on, press the button [2].

4. Press [SAVE] button again, the button light is off, and enable the function.

3.13 Recall Saved Settings

M3 provides 36 positions for saving or recording parameters. To recall saved settings:

1. Press [LOAD] button in Stored Presets Area, the button [LOAD] and [PAGE] lights are lit, and some of buttons 1~6 are lit and some are flashing. The button lit is ready for recall and flash means just recall, press the button lit to recall.

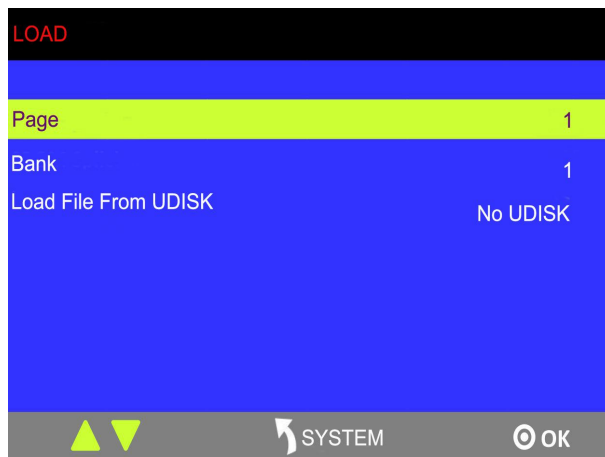| LOAD	
Page	1
Bank	1
Load File From UDISK	No UDISK

▲ ▼ ⤵SYSTEM ⊙ OK

2. Select PAGE, for example, the button [2] is on, press the button [2].

3. After setting the PAGE, it will jump to Bank option, or example, the button [2] is on, press the button [2].

4. Press [LOAD] button again, the button light is off, and enable the function.

Chapter 4 Ordering Codes

4.1 Product

210-0003-36-1   M3

4.2 Options

4.2.1 Input Options

190-0003-01-0   Quad DVI Input Module
                   4× DVI
190-0003-02-0   Quad HDMI Input Module
                   4 × HDMI
190-0003-03-0   Quad VGA Input Module
                   4 × VGA
190-0003-04-0   Quad SDI Input Module
                   4 × SDI
190-0003-06-0   8 Way CVBS Input Module
                   8 × CVBS
190-0003-07-0   Quad USB Input Module
                   4 × USB (each with loop)

4.2.2 Output Options (AUX)

190-0003-21-0   Quad DVI Output Module
                   4 × DVI
190-0003-22-0   Quad HDMI Output Module
                   4 × HDMI
190-0003-24-0   Quad SDI Output Module
                   4 × SDI

Chapter 5 Support

5.1 Questions and Troubleshooting

5.1.1 Customize the MASK, LOGO and STILL

Frequently Asked Question	Can user customize the MASK, LOGO and STILL for M3?
Troubleshooting	Yes, LOGO image format should be 24 bits BMP format bitmap, total pixels image size must not exceed 256 x128. And the picture of the sticker format should be 24 bits BMP format bitmap, total pixels image size must not exceed 128 x128. Make the MASK, LOGO and STILL and copy them to the USB Disk.

5.1.2 Add the Layer

Frequently Asked Question	How many layers can be added for M3?
Troubleshooting	Including 4 layers and 1 background in video input, as well as the LOGO, STILL and OSD, totally 8 layers. The OSD supports 200 pieces of subtitles and paging function.

5.1.3 Input and Output Option Module Type

Frequently Asked Question	What kinds of input and output module does M3 support?
Troubleshooting	Same with VENUS X3. Supported input modules: DVI, VGA, SDI, HDMI, USB and CVBS. Supported AUX output modules: DVI, HDMI, SDI.

5.1.4 Blending and MASK cannot open synchronously

Frequently Asked Question	Blending and MASK cannot open synchronously if enable the DSK function.
Troubleshooting	User can only enable one function among DSK, Blending and MASK.

5.2 Contact Us

Web
www.rgblink.com

Phone
+86-592-577-1197

Email
Sales   sales@rgblink.com
Support   support@rgblink.com

Social Media
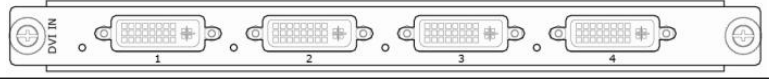
@RGBLINK   /rgblink   +rgblink   /rgblink   rgblink   rgblink
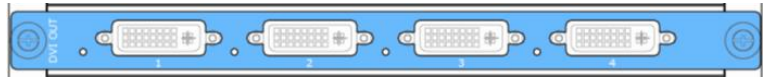
Chapter 6 Appendix

6.1 Specification

CVBS Input Module	
Interface Appearance	
Board Size	216(L)×20(W)（mm）
Number of Inputs	8
Connector	Standard BNC Socket
Supported Standards	PAL I NTSC I SECAM
Signal Level	1Vpp±3db　(0.7V Video+0.3v Sync) 75 ohm
Multiplex	480i I 576i
VGA Input Module	
Interface Appearance	
Board Size	216(L)×20(W)（mm）
Number of Inputs	4
Connector	Standard DB15 Socket
Supported Standard	VGA-UXGA
Signal Level	R、G、B、Hsync、Vsync:0 to1Vpp±3dB　(0.7V Video+0.3v Sync) 75 ohm black level: 300mV Sync-tip: 0V
Supported Resolution	VGA-UXGA (800×600@60 I 1024×768@60 I 1280×1024@60 I 1440×900@60 I 1600×1200@60)
DVI Input Module	
Interface Appearance	
Board Size	216(L)×20(W)（mm）
Number of Inputs	4
Connector	Standard DVI-I socket
Supported Resolution	SMPTE: 625/25/50 PAL, 525/29.97/59.94 NTSC, 1080P50/59.94/60 I 1080i50/59.94/60 I 720p50/59.94/60 VESA: 800×600@60 I 1024×768@60 I 1280×768@60 I 1280×1024@60 I 1600×1200@60 I 1920×1080@60
Signal Level	TMDS pwl, single pixel input,165MHz bandwidth
Format Standard	HDMI 1.3
USB Input Module	
Interface Appearance	
Board Size	216(L)×20(W)（mm）

Number of Inputs	4
Connector	Standard USB port
Supported Standard	Support general Image and video formats
HDMI Input Module	
Interface Appearance	
Board Size	216(L)×20(W)（mm）
Number of Inputs	4
Connector	HDMI standard type A interface
Supported Resolution	SMPTE: 625/25/50 PAL, 525/29.97/59.94 NTSC, 1080P50/59.94/60 | 1080i50/59.94/60 | 720p50/59.94/60 VESA: 800×600@60 | 1024×768@60 | 1280×768@60 | 1280×1024@60 | 1600×1200@60 | 1920×1080@60
Embedded Audio Channels	Choose one from the two inputs
Format Standard	HDMI 1.3
3G-SDI Input Module	
Interface Appearance	
Board Size	216(L)×20(W)（mm）
SDI Input	
Number of Inputs	4
Connector	BNC
Data Rate	2.97Gb/s, 2.97/1.001Gb/s, 1.485Gb/s, 1.485/1.001Gb/s and 270Mb/s
Supported Standard	SMPTE 425M - 3G Level A Format
Supported Resolution	SMPTE 425M (3G Level A) 4:2:2: 1920×1080/60 (1:1), 1920×1080/50 (1:1). SMPTE 274M (HD): 1920×1080I/60 (2:1) or 1920×1080/30 (PsF) I 1920×1080I/50 (2:1) or 1920×1080/25 (PsF) I 1920×1080/30 (1:1), 1920×1080/25 (1:1) I 1920×1080/24 (1:1), 1920×1080/24 (PsF) SMPTE 125M (SD): 1440×487/60 (2:1) SMPTE ITU-R BT.656 (SD): 1440×576/50 (2:1) Or dual link progressive, 625-line generic.
Balance	Belden 1694A cable: 150m at 2.97Gb/s 250m at 1.485Gb/s 480m at 270Mb/s
SDI Loop Out	
Number of Loop Out	4
Connector	BNC
Data Rate	2.97Gb/s, 2.97/1.001Gb/s, 1.485Gb/s, 1.485/1.001Gb/s and 270Mb/s

Supported Standard	SMPTE 425M - 3G Level A Format
Supported Resolution	SMPTE 425M (3G Level A) 4:2:2: 1920×1080/60 (1:1), 1920×1080/50 (1:1). SMPTE 274M (HD): 1920×1080I/60 (2:1) or 1920×1080/30 (PsF) I 1920×1080I/50 (2:1) or 1920×1080/25 (PsF) I 1920×1080/30 (1:1), 1920×1080/25 (1:1) I 1920×1080/24 (1:1), 1920×1080/24 (PsF) SMPTE 125M (SD): 1440×487/60 (2:1) SMPTE ITU-R BT.656 (SD): 1440×576/50 (2:1) Or dual link progressive, 625-line generic.
Balance	Belden 1694A cable: 150m at 2.97Gb/s 250m at 1.485Gb/s 480m at 270Mb/s

DVI Output Module	
Interface Appearance	
Board Size	216(L)×20(W)（mm）
Number of Outputs	4
Connector	Standard DVI-I Socket
Signal Level	TMDS pw, 165MHz bandwidth
Supported Resolution	SMPTE: SMPTE: 625/25/50 PAL, 525/29.97/59.94 NTSC, 1080P50/59.94/60 I 1080i50/59.94/60 I 720p50/59.94/60 VESA: 720×480@50i I 720×480@60i I 1024×768@60 I 1024×768@75 I 1024×768@85 I 1280×720@50 I 1280×720@59.94 I 1280×720@60 I 1280×800@60 I 1280×1024@60 I 1280×1024@75 I 1280×1024@85 I 1360×768@60 I 1366×768@60 I 1400×1050@60 I 1440×900@60 I 1600×1200@60 I 1680×1050@60 I 1920×1080@50i I 1920×1080@59.94i I 1920×1080@60i I 1920×1080@50 I 1920×1080@59.94 I 1920×1080@60 I 1920×1200@60 I 2048×1152@60 I 2560×816@60

SDI Output Module	
Interface Appearance	
Board Size	216(L)×20(W)（mm）
Number of outputs	4
Connector	BNC interface
Signal level	800mV±10%
Supported Standard	SMPTE 425M - 3G Level A Format
Supported Resolution	SMPTE: 480i I 576i, 720p/50/59.94/60 I 1080i/50/59.94/60 I 1080p/50/59.94/60
Equalization	Belden 1694A 100m HD 1.485G, 300m SD 270Mbps

HDMI Output Module	
Interface Appearance	
Board Size	216(L)×20(W)（mm）
Number of outputs	4
Connector	HDMI standard type A interface
Supported Resolution	SMPTE: 625/25 PAL, 525/29.97 NTSC, 625/50p PAL, 525/59.94p NTSC, 720p50/59.94/60 I 1080i50/59.94/60 I 1080P50/59.94/60 VESA: 800×600@60 I 1024×768@60 I 1280×768@60 I 1280×1024@60 I 1600×1200@60 I 1920×1080@60 I 1920×1080@50
Format Standard	HDMI 1.3
HDMI PGM Output	
Number of Outputs	2
Connector	HDMI standard type A interface
Supported Resolution	SMPTE: 625/25 PAL, 525/29.97 NTSC, 625/50p PAL, 525/59.94p NTSC, 720p50/59.94/60 I 1080i50/59.94/60 I 1080P50/59.94/60 VESA: 800×600@60 I 1024×768@60 I 1280×768@60 I 1280×1024@60 I 1600×1200@60 I 1920×1080@60 I 1920×1080@50
Format Standard	HDMI 1.3
HDMI Background Input	
Interface Appearance	2
Connector	HDMI standard type A interface
Supported Resolution	SMPTE: 1080P50/59.94/60 I 720p50/59.94/60 VESA: 800×600@60 I 1024×768@60 I 1280×768@60 I 1280×1024@60 I 1600×1200@60 I 1920×1080@60
Embedded Audio Channels	Choose one from the two inputs
Format Standard	HDMI 1.3
HDMI PST Output	
Number of outputs	1
Connector	HDMI standard type A interface
Supported Resolution	SMPTE: 625/25 PAL, 525/29.97 NTSC, 625/50p PAL, 525/59.94p NTSC, 720p50/59.94/60 I 1080i50/59.94/60 I 1080P50/59.94/60 VESA: 800×600@60 I 1024×768@60 I 1280×768@60 I 1280×1024@60 I 1600×1200@60 I 1920×1080@60 I 1920×1080@50
Format Standard	HDMI 1.3
HDMI PVW Output	

Number of outputs	1
Connector	HDMI standard type A interface
Supported Resolution	SMPTE: 625/25 PAL, 525/29.97 NTSC, 625/50p PAL, 525/59.94p NTSC, 720p50/59.94/60 I 1080i50/59.94/60 I 1080P50/59.94/60 VESA: 800×600@60 I 1024×768@60 I 1280×768@60 I 1280×1024@60 I 1600×1200@60 I 1920×1080@60 I 1920×1080@50
Format Standard	HDMI 1.3
VGA PVW Output	
Number of outputs	1
Connector	Standard DB15 Socket
Supported Resolution	VESA: 800×600@60 I 1024×768@60 I 1024×768@75 I 1280×768@60 I 1280×1024@60 I 1440×900@60 I 1400×1200@60 I 1600×1200@60 I 1920×1080@60 I 1920×1200@60 I 2048×1152@60
Signal Level	R, G, B, Hsync、 Vsync:0 to1Vpp±3dB (0.7V Video+0.3v Sync) 75 ohm black level: 300mV Sync-tip: 0V
Genlock Interface	
Genlock Input	
Number of Inputs	1
Connector	BNC
Genlock Loop	
Number of Inputs	1
Connector	BNC
Supported Resolution	480i I 576i I 1080i59.94 I 1080i50 I 720p50 I 720p59.94 I 1080p50 I 1080p59.94 I 1080p60 I 1080psf23.98 I 1080psf24
Function	
Switch	Support any two inputs fade in fade out
Extras	
Communication	RS232 USB TCP/IP
Power Supply	100-240V IEC-3
Working Environment	0°C~45°C
Stored Environment	10% to 90%
Product Warranty	3 years parts and labor warranty

6.2 Software Upgrade

Use XTOOL to upgrade the software.

6.2.1 Installing XTOOL

Environment Requirements:

Processor: 1 GHz or above 32 bit or 64 bit processor

Memory: 2 GB or more

Graphics: Support DirectX 9 128M or above (open AERO effect)

Hard disk space: Above 16G (primary partitions, NTFS format)

Monitor: Resolution must be 1280 x720 pixel or above (it can not display normally if the resolution is lower than 1280 x720)

Operating system: Windows 7 or above (full version, not Ghost version or compact version)
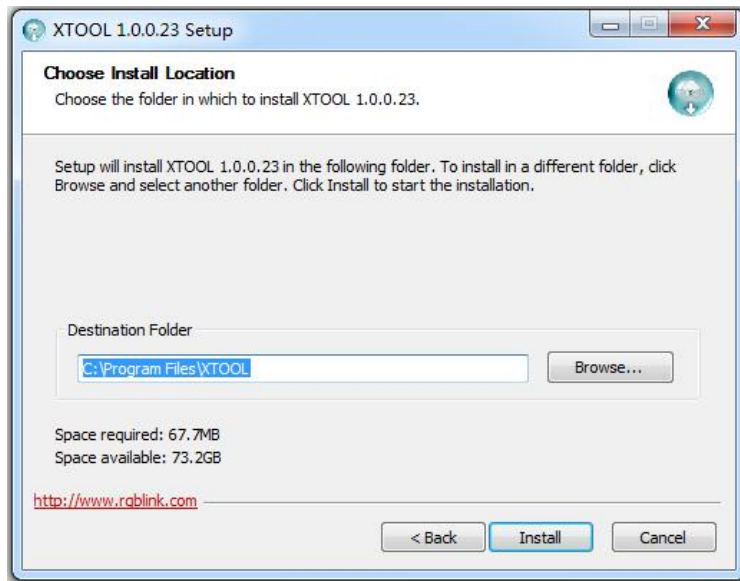

Double click icon, it will pop-up the installer language box, select the language, for example, select "English", and click "OK" to confirm.
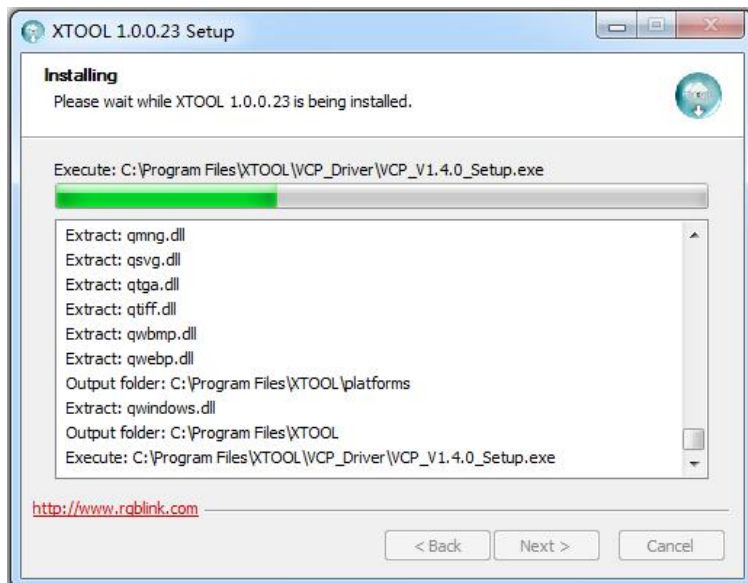

Click "Next" to install:

Select "Browse…" to select the XTOOL software installation path:
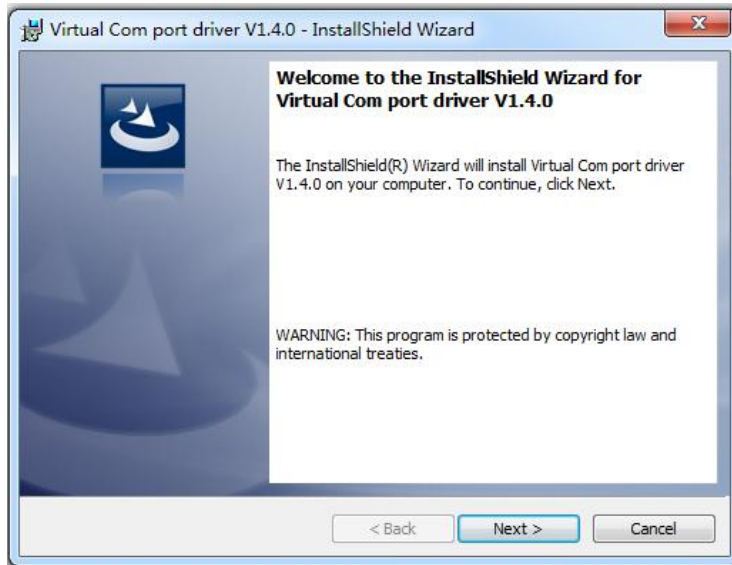

Note:

User should get the rights in "Roles Management" when installing the software to disk C if the system is Windows 7 or above.
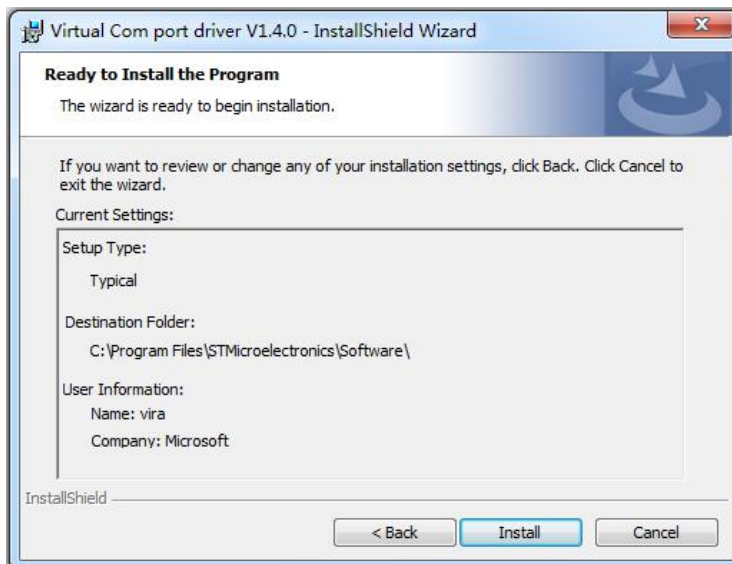
Click "Install":

During installation, it will pop up the window of Install Shield Wizard for Virtual Com port:

(1) If user install the XTOOL software for the first time, click "Next":

Then click "Install", as shown in the figure below:
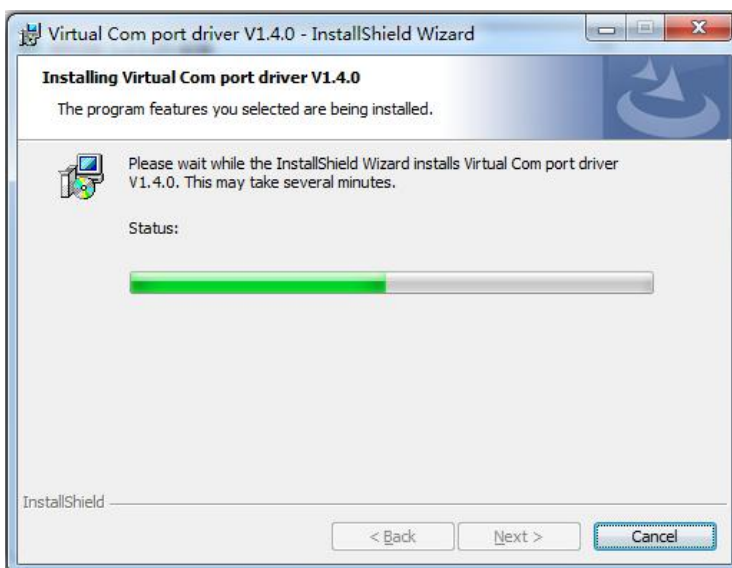
Click "Finish" and complete the installation, as shown in the figure below:
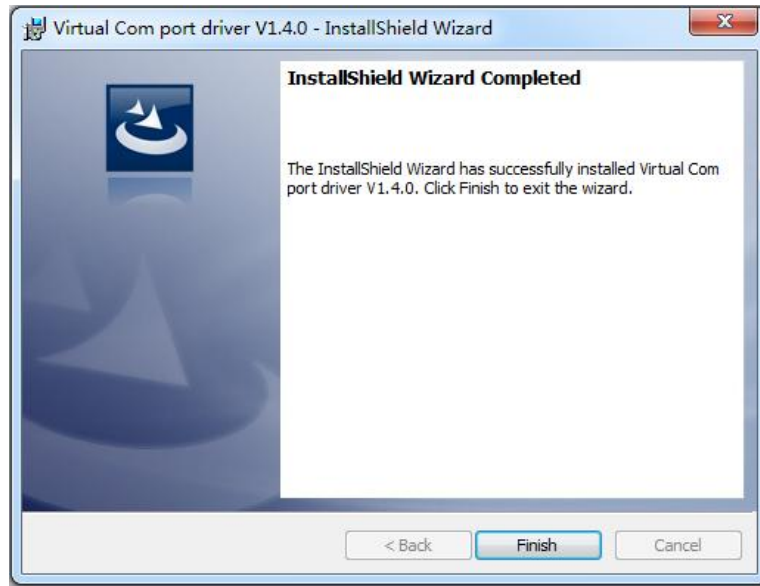
Then it will pop up the window of installation wizard for device driver, click "Next" to complete the installation.

(2) If user have installed the XTOOL software before, click "Cancel", and it will pop up the window as below:
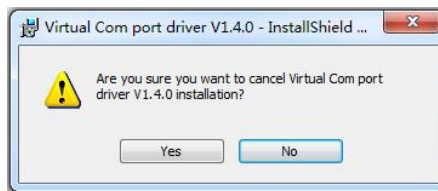
Click "Yes" to cancel installation.
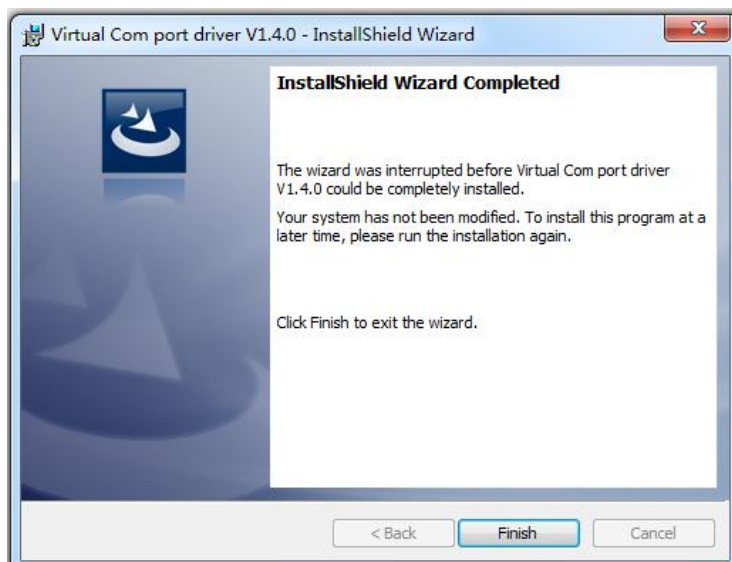
Click "Finish" to exit installation.

Then it will pop up the window of installation wizard for device driver, click "Cancel" to exit the installation.

Click "Finish" and is ready to run the XTOOL software:

6.2.2 Upgrading the device

(1) Click "Connection", and window pops up as follows:

Serial Comm, Net Comm and USB Comm can be selected. Click "OK" to confirm. When connected, the status indicator light turns green, see the picture below:
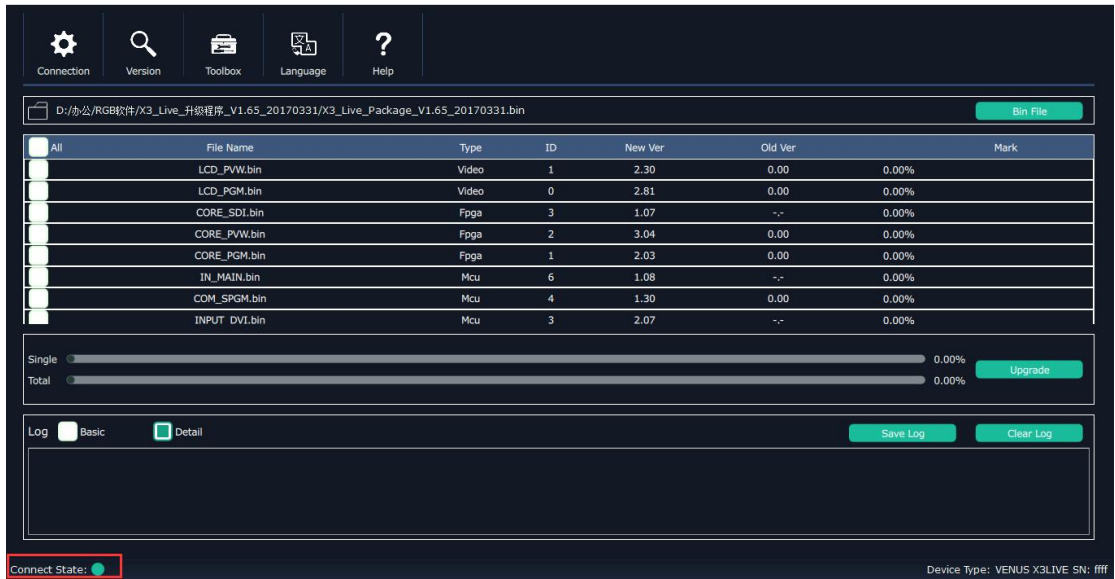
(2) Click bin file on the top right corner.
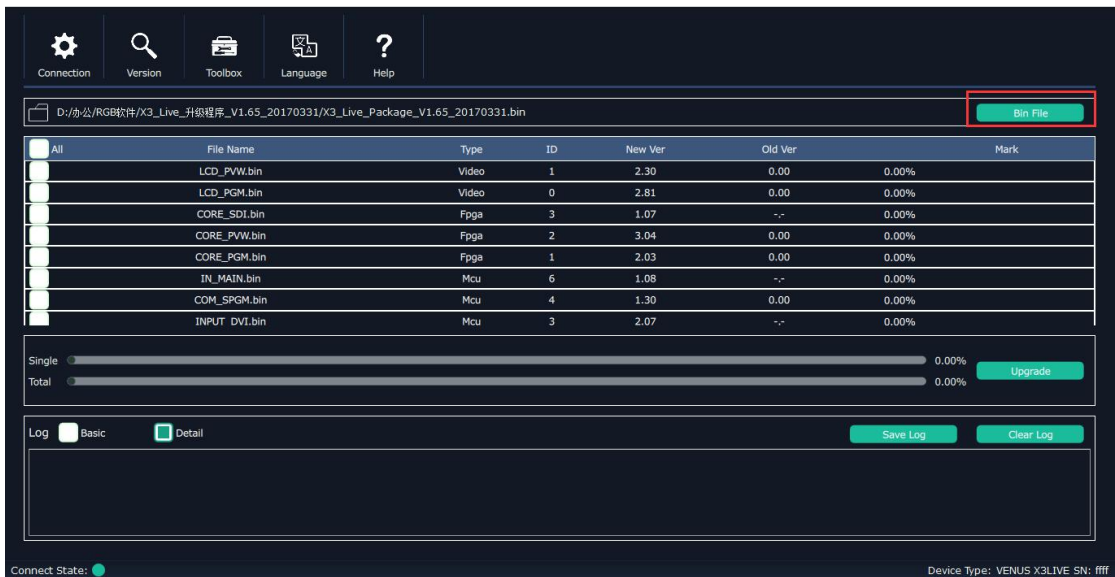
(3) Upload the target upgrade package, and tick "ALL". Items that need upgrade will turn green.

	File Name	Type	ID	New Ver	Old Ver	Mark
All						
	LCD_PVW.bin	Video	1	2.30	0.00	0.00%
	LCD_PGM.bin	Video	0	2.81	0.00	0.00%
	CORE_SDI.bin	Fpga	3	1.07	-.-	0.00%
	CORE_PVW.bin	Fpga	2	3.04	0.00	0.00%
	CORE_PGM.bin	Fpga	1	2.03	0.00	0.00%
	IN_MAIN.bin	Mcu	6	1.08	-.-	0.00%
	COM_SPGM.bin	Mcu	4	1.30	0.00	0.00%
	INPUT DVI.bin	Mcu	3	2.07	-.-	0.00%
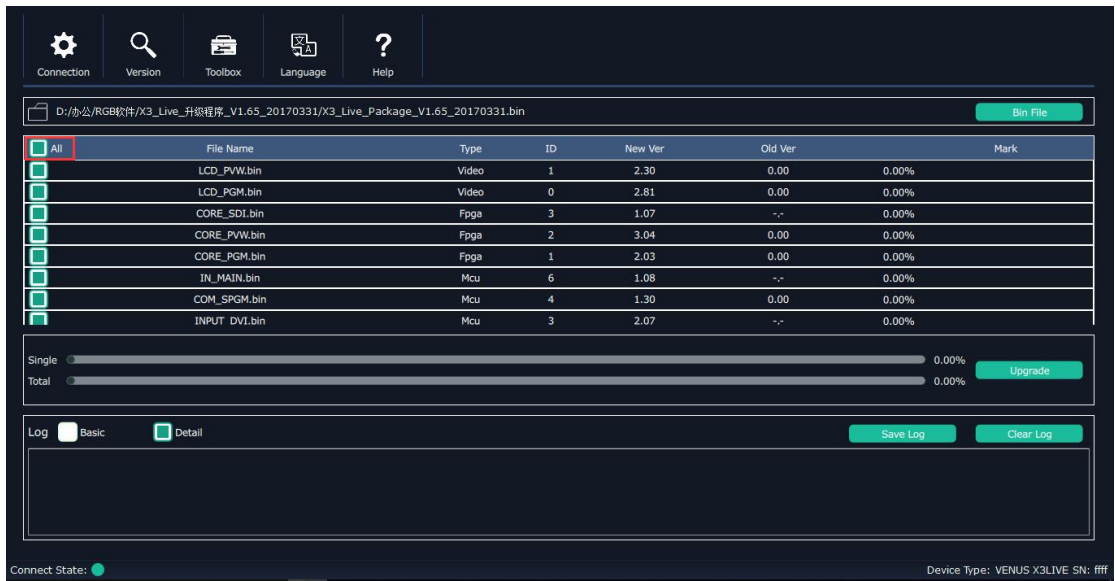
(4) Click "Upgrade".

*User should reboot the device after upgrade.

6.3 Module Installation

M3 and X3 support replaceable input and output optional modules, user can install or replace the optional module according to actual need. Take X3 for example, the specific installation steps are as follows:

Install the Optional Module

1. Unscrew the 2 captive screws in input modules block, and pull out the input module
   block, as shown in figure:

Captive Screw
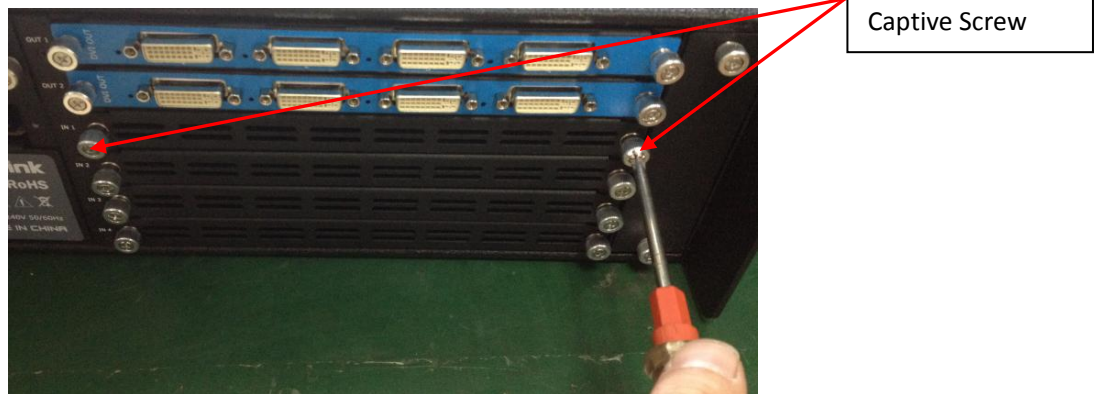
2. Install the input module:

For the whole PCB input module with DVI or HDMI interface, fix the input module on the plate with 2 M3*4 flat screws, also need to install the 2G Micro SD card.

Micro SD card
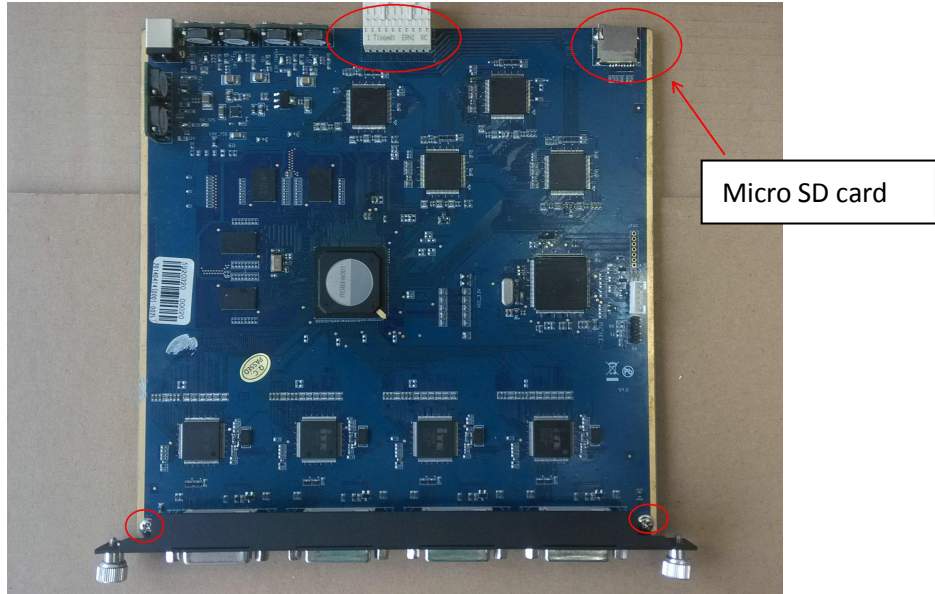
DVI input module:

① For the joined PCB input module with CVBS, HDMI, VGA, USB or SDI interface, fix the input module on the plate with 2 M3*4 flat screws and 2 M3*4 round head screws.
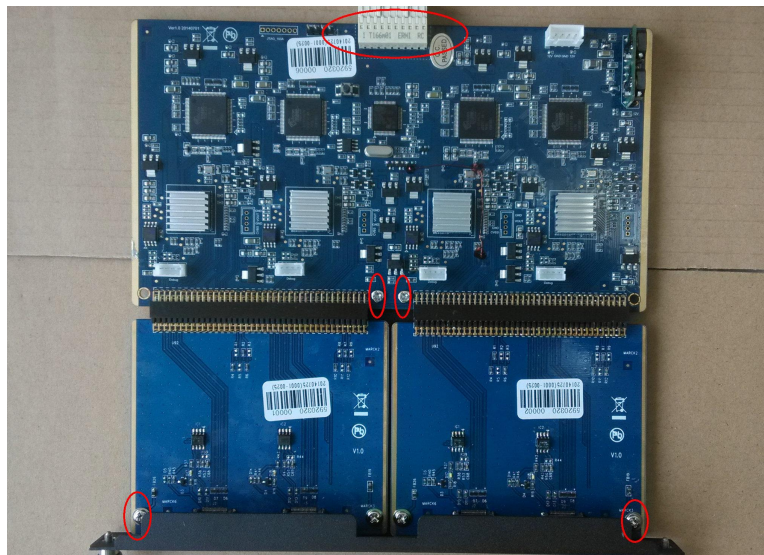
HDMI input module:

VGA input module:

CVBS input module:

USB input module:

3. Fix the input module block with fixed screws, as shown in figure:

4. Press the input modules into the device along the slide rail, and screw the captive screws, as shown in figure:

Note:

The install steps of output module installation and input/output module replacement are the same as above.

6.4 Terms & Definitions

The following terms and definitions are used throughout this guide.

- **"ASCII":** American Standard for Information Interchange. The standard code consisting of 7-bit coded characters (8 bits including parity check) used to exchange information between data processing systems, data communication systems, and associated equipment. The ASCII set contains control characters and graphic characters.

- **"Aspect ratio":** The relationship of the horizontal dimension to the vertical dimension of an image. In viewing screens, standard TV is 4:3, or 1.33:1; HDTV is 16:9, or 1.78:1. Sometimes the ":1" is implicit, making TV = 1.33 and HDTV = 1.78.

- **"AV":** Audio visual, or audio video.

- A **"Background"** is an unscaled source, typically originating from a computer. A background source appears at the system's lowest priority — visually in back of all other sources.

- **"Baudrate":** Named of J.M.E. Baudot, the inventor of the Baudot telegraph code. The number of the electrical oscillations per second, called baud rate. Related to, but not the same as, transfer rate in bits per second (bps).

- **"Blackburst":** The video waveform without the video elements. It includes the vertical sync, horizontal sync, and the chroma burst information. Blackburst is used to synchronize video equipment to align the video output. One signal is normally used to set up an entire video system or facility. Sometimes it is called House sync.

- **"BNC":** Bayonet Neill-Concelman. A cable connector used extensively in television and named for its inventors. A cylindrical bayonet connector that operates with a twist-locking motion. To make the connection, align the two curved grooves in the collar of the male connector with the two projections on the outside of the female collar, press, and twist. This allows the connector to lock into place without tools.

- **"Brightness":** Usually refers to the amount or intensity of video light produced on a screen without regard to color. Sometimes called "black level.

- "**CAT 5**": Category 5. Describes the network cabling standard that consists of four unshielded twisted pairs of copper wire terminated by RJ-45 connectors. CAT 5 cabling supports data rates up to 100 Mbps. CAT 5 is based on the EIA/TIA 568 Commercial Building Telecommunications Wiring Standard.

- **"Color bars":** A standard test pattern of several basic colors (white, yellow, cyan, green, magenta, red, blue, and black) as a reference for system alignment and testing. In NTSC video, the most commonly used color bars are the SMPTE standard color bars. In PAL video, the most commonly used color bars are eight full field bars. In the computer, the most commonly used color bars are two rows of reversed color bars.

- **"Color burst":** In color TV systems, a burst of subcarrier frequency located on the back porch of the composite video signal. This serves as a color synchronizing signal to establish a frequency and phase reference for the chroma signal. Color burst is 3.58 MHz for NTSC and 4.43 MHz for PAL.

- **"Color temperature":** The color quality, expressed in degrees Kelvin(K), of a light source. The higher the color temperature, the bluer the light. The lower the temperature, the redder the light. Benchmark color temperature for the A/V industry include 5000°K, 6500°K, and 9000°K.

- **"Contrast ratio":** The radio of the high light output level divided by the low light output level. In theory, the contrast radio of the television system should be at least 100:1, if not 300:1. In reality, there are several limitations. In the CRT, light from adjacent elements contaminate the area of each element. Room ambient light will contaminate the light emitted from the CRT. Well-controlled viewing conditions should yield a practical contrast ratio of 30:1 to 50:1.

- **"DVI":** Digital Visual Interface. The digital video connectivity standard that was developed by DDWG (Digital Display Work Group). This connection standard offers two different connectors: one with 24 pins that handles digital video signals only, and one with 29 pins that handles both digital and analog video.

- **"EDID":** Extended Display Identification Data – EDID is a data structure used to communicate video display information, including native resolution and vertical interval refresh rate requirements, to a source device. The source device will then output the optimal video format for the display based on the provided EDID data, ensuring proper video image quality. This communication takes place over the DDC – Display Data Channel.

- **"Ethernet":** A Local Area Network (LAN) standard officially known as IEEE 802.3. Ethernet and other LAN technologies are used for interconnecting computers, printers, workstations, terminals, servers, etc. within the same building or campus. Ethernet operates over twisted pair and over coaxial cable at speeds starting at 10Mbps. For LAN interconnectivity, Ethernet is physical link and data link protocol reflecting the two lowest layers of the OSI Reference Model.

- **"Frame":** In interlaced video, a frame is one complete picture. A video frame is made up of two fields, or two sets of interlaced lines. In a film, a frame is one still picture of a series that makes up a motion picture.

- **"Gamma":** The light output of a CRT is not linear with respect to the voltage input. The difference between what you should have and what is actually output is known as gamma.

- **"HDMI" - High – Definition Multimedia Interface:** An interface used primarily in consumer electronics for the transmission of uncompressed high definition video, up to 8 channels of audio, and control signals, over a single cable. HDMI is the de facto standard for HDTV displays, Blu-ray Disc players, and other HDTV electronics. Introduced in 2003, the HDMI specification has gone through several revisions.

- **"HDSDI":** The high-definition version of SDI specified in SMPTE-292M. This signal standard transmits audio and video with 10 bit depth and 4:2:2 color quantization over a single coaxial cable with a data rate of 1.485 Gbit/second. Multiple video resolutions exists including progressive 1280x720 and interlaced 1920x1080 resolution. Up to 32 audio signals are carried in the ancillary data.

- **"JPEG" (Joint photographic Expects Group):** Commonly used method of lossy compression for photographic images using a discreet cosine transfer function. The degree of compression can be adjusted, allowing a selectable tradeoff between storage size and image quality. JPEG typically achieves 10:1 compression with little perceptible loss in image quality. Produces blocking artifacts.

- **"MPEG":** Motion Picture Expect Group. A standard committee under the auspices of the International Standards Organization working on algorithm standards that allow digital compression, storage and transmission of moving image information such as motion video,

CD-quality audio, and control data at CD-ROM bandwidth. The MPEG algorithm provides inter-frame compression of video images and can have an effective compression rate of 100:1 to 200:1.

- **"NTSC":** The color video standard used in North America and some other parts of the world created by the National Television Standards Committee in the 1950s. A color signal must be compatible with black-and-white TV sets. NTSC utilizes an interlaced video signals, 525 lines of resolution with a refresh rate of 60 fields per second (60 Hz). Each frame is comprised of two fields of 262.5 lines each, running at an effective rate of 30 frames per second.

- **"Operator":** Refers to the person who uses the system.

- **"PAL":** Phase Alternate Line. A television standard in which the phase of the color carrier is alternated from line to line. It takes four full pictures (8 fields) for the color-to-horizontal phase relationship to return to the reference point. This alternation helps cancel out phase errors. For this reason, the hue control is not needed on a PAL TV set. PAL, in many transmission forms, is widely used in Western Europe, Australia, Africa, the Middle East, and Micronesia. PAL uses 625-line, 50-filed (25 fps) composite color transmission system.

- **"PIP":** Picture-in-Picture. A small picture within a larger picture created by scaling down one of the images to make it smaller. Each picture requires a separate video source such as a camera, VCR, or computer. Other forms of PIP displays include Picture-by-Picture (PBP) and Picture-with-Picture (PWP), which are commonly used with 16:9 aspect display devices. PBP and PWP image formats require a separate scaler for each video window.

- **"Polarity":** The positive and negative orientation of a signal. Polarity usually refers to the direction or a level with respect to a reference (e.g. positive sync polarity means that sync occurs when the signal is going in the positive direction).

- **"RJ-45":** Registered Jack-45. A connector similar to a telephone connector that holds up to eight wires, used for connecting Ethernet devices.

- "RS-232": An Electronic Industries Association (EIA) serial digital interface standard specifying the characteristics of the communication path between two devices using either DB-9 or DB-25 connectors. This standard is used for relatively short-range communication and does not specify balanced control lines. RS-232 is a serial control standard with a set number of conductors, data rate, word length, and type of connector to be used. The standard specifies component connection standards with regard to the computer interface. It is also called RS-232-C, which is the third version of the RS-232 standard, and is functionally identical to the CCITT V.24 standard.

- **"Saturation":** Chroma, chroma gain. The intensity of the color, or the extent to which a given color in any image is free from white. The less white in a color, the truer the color or the greater its saturation. On a display device, the color control adjusts the saturation. Not to be confused with the brightness, saturation is the amount of pigment in a color, and not the intensity. Low saturation is like adding white to the color. For example, a low-saturated red looks pink.

- **"Scaling":** A conversion of a video or computer graphic signal from a starting resolution to a new resolution. Scaling from one resolution to another is typically done to optimize the signal for input to an image processor, transmission path or to improve its quality when presented on a particular display.

- **"SDI":** Serial Digital Interface. The standard based on a 270 Mbps transfer rate. This is a 10-bit, scrambled, polarity independent interface with common scrambling for both component ITU-R 601 and composite digital video and four channels of (embedded) digital audio.

- **"Seamless Switching":** A feature found on many video switchers. This feature causes the switcher to wait until the vertical interval to switch. This avoid a glitch (temporary scrambling) which normally is seen when switching between sources.

- **"SMPTE":** Society of Motion Picture and Television Engineers. A global organization, based in the United States, that sets standards for baseband visual communications. This includes film as well as video and television standards.

- **"S-Video":** A composite video signal separated into the luma ("Y" is for luma, or black and white information; brightness) and the chroma ("C" is an abbreviation for chroma, or color information).

- **"Sync":** Synchronization. In video, sync is a means of controlling the timing of an event with respect to other events. This is accomplished with timing pulses to insure that each step in a process occurs at the correct time. For example, horizontal sync determines exactly when to begin each horizontal scan line. Vertical sync determines when the image is to be refreshed to start a new field or frame. There are many other types of sync in video system.(Also known as "sync signal" or "sync pulse.")

- **"TCP/IP":** Transmission Control Protocol/Internet Protocol. The communication protocol of the Internet. Computers and devices with direct access to the Internet are provided with a copy of the TCP/IP program to allow them to send and receive information in an understandable form.

- **"USB":** Universal Serial Bus. USB was developed by seven PC and telecom industry leaders (Compaq, DEC, IBM, Intel, Microsoft, NEC, and Northern Telecom). The goal was easy plug-and-play expansion outside the box, requiring no additional circuit cards. Up to 127 external computer devices may be added through a USB hub, which may be conveniently located in a keyboard or monitor. USB devices can be attached or detached without removing computer power. The number of devices being designed for USB continues to grow, from keyboards, mice, and printers to scanners, digital cameras, and ZIP drives.

- **"VESA":** Video Electronics Standards Association. A nonprofit number organization dedicated to facilitating and promoting personal computer graphics through improved standards for the benefit of the end-user. www.vesa.org

- **"VGA":** Video Graphics Array. Introduced by IBM in 1987, VGA is an analog signal with TTL level separate horizontal and vertical sync. The video outputs to a 15-pin HD connector and has a horizontal scan frequency of 31.5 kHz and vertical frequency of 70 Hz (Mode 1, 2) and 60 Hz (Mode 3). The signal is non-interlaced in modes 1, 2, and 3 and interlaced when using the 8514/A card (35.5 kHz, 86 Hz) in mode 4. It has a pixel by line resolution of 640×480 with a color palette of 16 bits and 256,000 colors.

- **"YCrCb":** Used to describe the color space for interlaced component video.

- **"YPbPr":** Used to describe the color space for progressive-scan (non-interlaced) component video.

6.5 Revision History

The table below lists the changes to the Video Processor User Manual.

Format	Time	ECO#	Description	Principal
V1.0	20180201	0000#	Release	Linger