MX2000 Pro

LED Display Controller

Specifications

Change History

Version	Release Date	Description
V1.1.0	2023-09-28	Added information for DP 1.2, HDMI 2.1 and 12G-SDI input cards
V1.0.0	2023-09-08	First release

Introduction

The MX2000 Pro is a large professional 8K LED display controller from Xi'an NovaStar Tech Co., Ltd. (hereinafter referred to as NovaStar), designed as part of the COEX control system series. Its remarkable features include 12-bit color depth, 360 Hz capability, real-time multi-screen scaling, 0-frame latency, and HDR supportability, providing precise brightness control, true-to-life color fidelity, and an excellent image quality. Its card-based modular design is specifically tailored for future LED displays, allowing for flexible input and output card configurations that are stable and easy to maintain. With a compact 2U size, it supports up to 8x 4K or 4x 8K video inputs, with a maximum load capacity of 35.38 million pixels, making it ideal for large-screen configurations.

Additionally, it supports seamless backup and automatic switching between devices and cards. In case of any malfunction, it promptly switches over while issuing automatic alerts, ensuring stable output on-site. It can also work with the brand-new software VMP (Vision Management Platform) to provide a better operation and control experience.

The MX2000 Pro offers many advantages such as highly integrated design, premium image quality, powerful performance, tremendous load capacity, and easy control. It is widely used in rental services for large events, xR/VP studios, large fixed installation applications, TV production, e-sports events, exhibition halls, and other application scenarios.

Certifications

The certification application is in progress. Please contact NovaStar if needed.

If the product does not have the relevant certifications required by the countries or regions where it is to be sold, please contact NovaStar to confirm or address the problem. Otherwise, the customer shall be responsible for the legal risks caused or NovaStar has the right to claim compensation.

Features

Inputs and Outputs

- 2x input card slots, users may choose input cards of the following types:
  - 4K input card: 4× HDMI 2.0
  - 8K input card: 2× DP 1.4
- Authentic 12bit video input

  12bit/10bit/8bit supported
- Supports real-time previewing and monitoring of the video source input and LED screen display status.
- 2x output card slots

  MX_4x10G_Fiber output card: Work with CVT10 fiber converter to achieve 1G transmission (capable of loading 650,000 pixels in a single Ethernet cable).
- Supports frame rates of up to 360 Hz (max frame rate is decided by the screen's hardware configuration).

Screen Management

- Card-based screen

  To cope with multi-screen application scenarios with ease and to achieve flexible configuration, this feature allows user to configure LED screen based on output cards.
- Synchronized output splicing

  With the help of frame synchronization, the output images on the same screen are completely synchronized. This enables the output to deliver smooth playback and perfect image without issues such as picture stutter, frame loss, image tearing, and noticeable cut lines.
- No rectangle restriction

  No rectangle restriction for irregular screens. This means when calculating resolutions, blank pixels do not count towards the total capacity. The used load capacity of Ethernet ports is the sum of the resolutions of all cabinets.
- Preset

  For optimal display in various scenarios, users can adjust display parameters such as layers, brightness, color temperature, and gamma ahead of time and save them as presets. Users can save up to 128 customizable presets which can be easily applied or switched with just one click.

Advanced Features

- Multi-Layer

  A single output card supports up to 4x layers or the entire device supports up to 8x 4K layers.

  Each layer supports 4 scaling modes: custom, pixel to pixel, snap to canvas, and fill screen.

- Layer Roaming

  Supports cross-card output of layers within the screen.

- Color Replacement

  Replace any color in the image with another color without affecting other colors. It is recommended to choose color with higher saturation for replacement to achieve better outcome.

- 14Ch Color Correction

  Supports precise adjustment to the hue, saturation, and brightness of the 12 standard colors derived from the three primary colors (RGB) and black and white.

- Color Curves

  Supports adjustment to the RGBW curves of the screen.

- 3D LUT

  Use the 3D LUT file (.cube) with an accuracy of 17×17×17 to adjust the colors of the video source.

- Full-Grayscale Calibration

  Work with NovaStar's high-precision calibration system and the C3200 scientific grade camera to generate unique calibration coefficients for each grayscale, ensuring uniformity of each grayscale and dramatically improving the image quality.

- 3D

  Work with the receiving card that supports 3D function, the 3D emitter and 3D glasses to bring a fascinating and immersive 3D viewing experience.

- HDR
  - Supports HDR10 and comply with the SMPTE ST 2084 and SMPTE ST 2086 standards.
  - Supports HLG.
- Latency
  - Different layers can have different latency settings. The minimum processing latency of the LED display controller is reduced to 0-frame (less than 1 ms), achieving low latency without reducing the load.
  - Supports additional latency. Users can choose to add zero to two frames of latency.
- Frame Rate Adaptive

  Adjusts the display effects for varying frame rates range from 23.98 Hz to 360 Hz, ensuring that the max brightness and color temperature remain consistent at different frame rates.

- Frame Multiplication
  - Frame interpolation: Outputs images that are captured from multiple shooting angles with different backgrounds at the same time. Solid green backgrounds can also be inserted to allow for easy post-production adjustments.
  - Frequency multiplication: Supports high frame rates of up to 360 Hz. This feature is to accommodate multi-angle camera shooting to improve the screen performance under the camera.

- Shutter Fit

  Automatically adjusts the driver IC parameters according to the camera shutter angle to fix problems of black lines, grayscale addition, and grayscale loss during camera shooting in xR scenarios.

Device Controls

- LCD touch panel

  Equipped with a 5-inch touchscreen, which is responsive, sturdy and durable. Users can easily give commands with a gentle touch, making the operation effortless.

- Cascading control via Ethernet

  The Gigabit Ethernet control ports support TCP/IP and star topology. No switch or router is needed to deploy multiple devices on the same LAN via device cascading as the network switching function is already built in.

- VMP software control

  The device can be connected to the VMP software to provide easy and convenient operations and smart device management.

- Supports the SNMP and Art-Net protocols.
- Automated system monitoring and alarm

  Hardware monitoring capabilities that encompass fan speed, module temperatures, voltage levels, and operational status. It automatically detects and reports any device faults or alarm information, ensuring the stable and secure operation of the LED display system.

- Device backup
  - Hot backup between devices.
  - Hot backup between output cards.

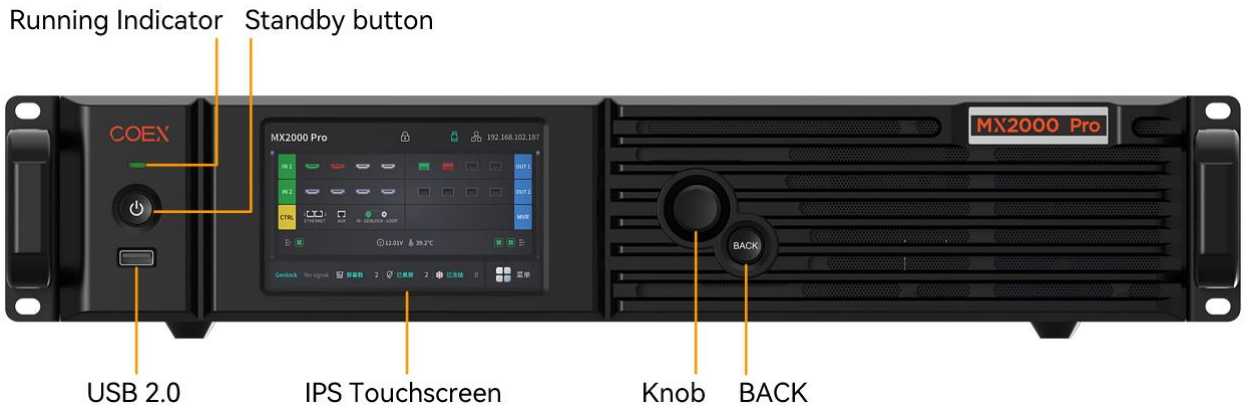
Table 1 Function limitations

Function	Limitations	
	1G Solution (MX_4x10G_Fiber Output Card)	5G Solution (CX_1x40G_Fiber Output Card)
Frame Rate Adaptive	To use this function, it is required to work with the A10s Pro receiving card and currently supported driver ICs include:	To use this function, it is required to work with the CA50E, CA50C, or XA50 receiving cards and currently supported driver ICs

Function	Limitations	
	1G Solution (MX_4x10G_Fiber Output Card)	5G Solution (CX_1x40G_Fiber Output Card)
	ICND2055, ICND2065, ICND2069, MBI5253A, MBI5253B, MBI5754B, MBI5264, MBI5264B, MBI5264C, CFD555A. In addition, the .ncp file generated by the Cabinet Tool from NovaStar must be used.	include: ICND2055, ICND2065, ICND2069, ICND2076, MBI5264, MBI5264B, MBI5264C. In addition, the .ncp file generated by the Cabinet Tool from NovaStar must be used.
Full-Grayscale Calibration	It is required to work with the A10s Pro receiving card and users need to use a C3200 camera to perform the full-grayscale calibration.	It is required to work with the CA50E, CA50C, or XA50 receiving cards and users need to use a C3200 camera to perform the full-grayscale calibration.
3D	To use the 3D function, specified 3D glasses are needed. For details, please contact NovaStar technical support.	
HDR	Supports automatic parsing and manual setting of HDR. For non-standard HDR sources, they can only be set to HDR properties manually.	

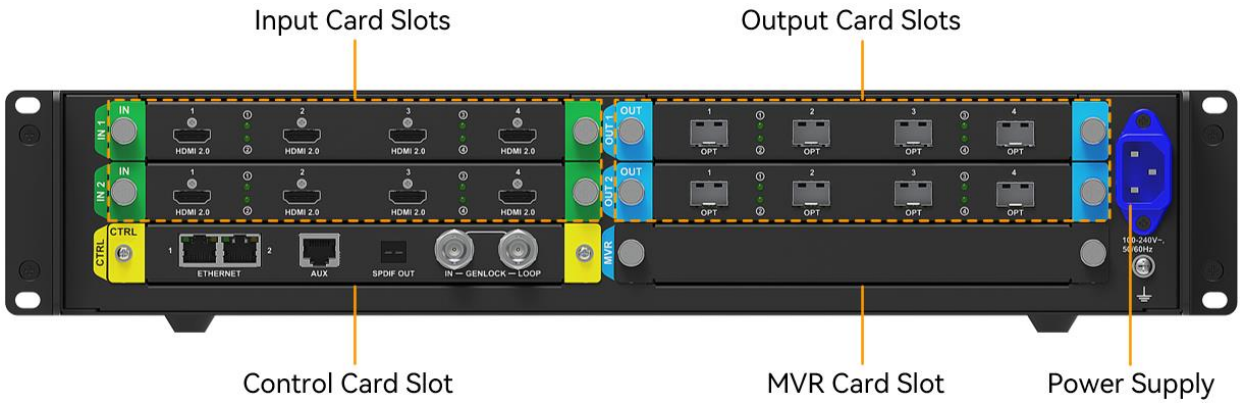
Appearance

Front Panel



Name	Function
Running indicator	• Solid red: The device is in standby mode. • Solid blue: The device is being powered on. • Solid green: The device is running normally. • Flashing red: The device is running abnormally.
Standby button	• Press the button to power on or power off the device. • Hold down the button for 5s to 10s to restart the device.
USB 2.0	• For exporting the device diagnostic result to a USB drive only. • Only the NTFS and FAT32 file systems are supported. Others are currently not supported.
IPS Touchscreen	A 5-inch screen that is for displaying the device status, configuring settings, and sending commands.
Knob	• On the home screen, press the knob to enter the main menu screen. • On the main menu screen, rotate the knob to select a menu item or adjust the parameter value. Press the knob to confirm the operation. • Hold down the knob and BACK button simultaneously for 5s or longer to lock or unlock the buttons and screen.
BACK	Go back to the previous menu or cancel the current operation.

Rear Panel



All product pictures shown in this document are for illustration purpose only. Actual product may vary.

Note

Markings on the rear panel card slot:

- The card slot marked with "IN x" only supports the installation of input cards, where x is the slot number. For example, IN 1 indicates the first input card slot.
- The card slot marked with "OUT x" only supports the installation of output cards, where x is the slot number. For example, OUT 2 indicates the second output card slot.
- The card slot marked with "MVR" only supports the installation of MVR output card. (Reserved)
- The card slot marked with "CTRL" only supports the installation of control card.

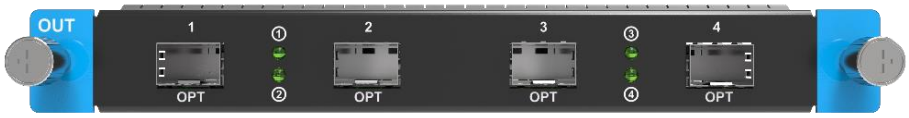
Input Card			
MX_4×HDMI 2.0 input card			
			
Type	Qty	Description	
HDMI 2.0	4	Resolution	Max resolution: 4096×2160@60Hz or 8192×1080@60Hz (Forced) Min resolution: 800×600@60Hz
		Max width/height (Forced)	Max width: 8192 pixels (8192×1080@60Hz) Max height: 8192 pixels (1080×8192@60Hz)
		Frame rates	23.98 / 24 / 25 / 29.97 / 30 / 47.95 / 48 / 50 / 59.94 / 60 / 71.93 / 72 / 75 / 100 / 119.88 / 120 / 143.86 / 144 / 240 Hz
		HDR	Support HDR10 and comply with the SMPTE ST 2084 and SMPTE ST 2086 standards. Support HLG.
		EDID management	Support standard resolutions, up to 3840×2160@60Hz. Support custom input resolutions.
		HDCP	HDCP 2.3 compliant, backwards compatible with HDCP 2.2/HDCP 1.4/HDCP 1.3.
		Interlaced signal inputs	Not supported.

<table>
<tr><td colspan="4">MX_2×HDMI 2.1 input card</td></tr>
<tr><td colspan="4"> 
</td></tr>
<tr><td>Type</td><td>Qty</td><td colspan="2">Description</td></tr>
<tr><td rowspan="6">HDMI 2.1</td><td rowspan="6">2</td><td>Resolution</td><td>Max resolution: 8192×4320@30Hz (Forced)
Min resolution: 800×600@60Hz</td></tr>
<tr><td>Max width/height (Forced)</td><td>Max width: 8192 pixels (8192×4320@30Hz)
Max height: 8192 pixels (4320×8192@30Hz)</td></tr>
<tr><td>Frame rates</td><td>23.98 / 24 / 25 / 29.97 / 30 / 47.95 / 48 / 50 / 59.94 / 60 / 71.93 / 72 / 75 / 100 / 119.88 / 120 / 143.86 / 144 / 240 Hz</td></tr>
<tr><td>HDR</td><td>Support HDR10 and comply with the SMPTE ST 2084 and SMPTE ST 2086 standards.
Support HLG.</td></tr>
<tr><td>EDID management</td><td>Support standard resolutions, up to 3840×2160@60Hz.
Support custom input resolutions.</td></tr>
<tr><td>HDCP</td><td>HDCP 2.3 compliant, backwards compatible with HDCP 2.2/HDCP 1.4/HDCP 1.3.</td></tr>
<tr><td colspan="2">Interlaced signal inputs</td><td>Not supported</td></tr>
<tr><td colspan="4">MX_4xDP 1.2 input card</td></tr>
<tr><td colspan="4"> 
</td></tr>
<tr><td>Type</td><td>Qty</td><td colspan="2">Description</td></tr>
<tr><td>DP 1.2</td><td>4</td><td>Resolution</td><td>Max resolution: 4096×2160@60Hz or 8192×1080@60Hz (Forced)
Min resolution: 800×600@60Hz</td></tr>
</table>

		Max width/height (Forced)	Max width: 8192 pixels (8192×1080@60Hz) Max height: 8192 pixels (1080×8192@60Hz)
		Frame rate	23.98 / 24 / 25 / 29.97 / 30 / 47.95 / 48 / 50 / 59.94 / 60 / 71.93 / 72 / 75 / 100 / 119.88 / 120 / 143.86 / 144 / 240 Hz
		HDR	Support HDR10 and comply with the SMPTE ST 2084 and SMPTE ST 2086 standards. Support HLG.
		EDID management	Support standard resolutions, up to 3840×2160@60Hz. Support custom input resolutions.
		HDCP	Support HDCP 2.3, backwards compatible with HDCP2.2/ HDCP 1.4/ HDCP 1.3.
		Interlaced signal inputs	Not supported.

MX_2×DP 1.4 input card

Type	Qty	Description	
DP 1.4	2	Resolution	Max resolution: 7680×4320@30Hz (Forced) Min resolution: 800×600@60Hz
		Max width/height (Forced)	Max width: 8192 pixels (8192×4320@25Hz) Max height: 8192 pixels (4320×8192@25Hz)
		Frame rates	23.98 / 24 / 25 / 29.97 / 30 / 47.95 / 48 / 50 / 59.94 / 60 / 71.93 / 72 / 75 / 100 / 119.88 / 120 / 143.86 / 144 / 240 Hz
		HDR	Support HDR10 and comply with the SMPTE ST 2084 and SMPTE ST 2086 standards. Support HLG.

		EDID management	Support standard resolutions, up to 3840×2160@60Hz. Support custom input resolutions.
		HDCP	HDCP 2.3 compliant, backwards compatible with HDCP 2.2/HDCP 1.4/HDCP 1.3.
		Interlaced signal inputs	Not supported.
MX_4×12G-SDI input card			
			
Type	Qty	Description	
12G-SDI	4	Standards	Support ST-2082 (12G), ST-2081 (6G), ST-424 (3G) and ST-292 (HD) standard video inputs. Support 3G-Level A/Level B (DS mode).
		Resolution	Max resolution: 4096×2160@60Hz
		Frame rate	Support frame rates up to 60 Hz.
		HDR	Support HDR10 and comply with the SMPTE ST 2084 and SMPTE ST 2086 standards. Support HLG.
		Interlaced signal inputs	Support converting interlaced signals to progressive signals.
		Others	Belden 12G SDI standard cables are recommended. Cables up to 50 meters are supported.
Output Card			
MX_4×10G_Fiber output card			
			

Type	Qty	Description
OPT 1-4	4	10G optical ports • Support single-mode and multi-mode optical fiber modules, with a maximum transmission distance of 10 km. • A single optical port has the same load capacity of 10x 1G Ethernet ports, and a single card supports up to 40x Ethernet port outputs. • The maximum load of a single 1G Ethernet port is as follows, please refer to Ethernet Port Load Capacity for more details: – 8bit@60Hz: 659,722 pixels – 10bit@60Hz: 494,791 pixels (available only with the A10s Pro receiving card) – 10/12bit@60Hz: 329,861 pixels
Control Card		
		
Type	Qty	Description
ETHERNET	2	Gigabit Ethernet control ports. Support TCP/IP and star connection. They have the same functions without priority and order, and can be connected to VMP software. No switch or router is needed to deploy multiple devices on the same LAN via device cascading as the network switching function is already built in. Up to 20 units of MX2000 Pro can be cascaded.
GENLOCK	1	A pair of Genlock signal connectors. Support Bi-Level and Tri-Level. • IN: Accept the sync signal. • LOOP: Loop the sync signal. For standard Genlock signal generators, up to 20 units of MX2000 Pro can be cascaded.
AUX	1	An auxiliary connector that connects to the central control device (RS232) (Reserved)
SPDIF	1	A digital audio output (Reserved)

Power		
Connector	Qty	Description
100-240V~, 50/60Hz	1	AC power input connector

Applications

Solution Build

Based on the installed output cards (MX_4x10G_Fiber output card/CX_1x40G_Fiber output card), users can build 1G/5G solutions with different models of fiber converters and receiving cards. 1G/5G refers to the output bandwidth of a single Ethernet port. For more detailed information, please refer to Ethernet Port Load Capacity.

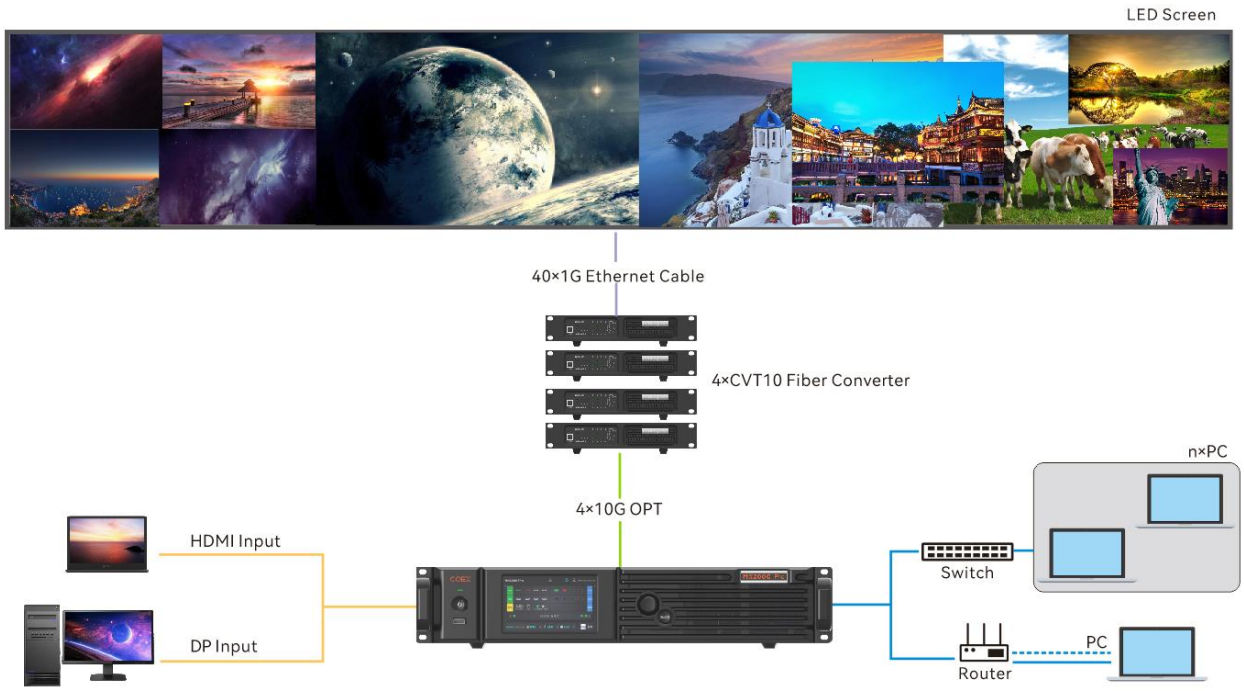
Table 2 COEX system build

Solution	Output Card	Fiber Converter	Receiving Card
1G Solution	MX_4x10G_Fiber output card	CVT10, CVT10 Pro	1G receiving cards such as A10s Pro
5G Solution	CX_1x40G_Fiber output card	CVT8-5G	5G receiving cards such as CA50E

Note

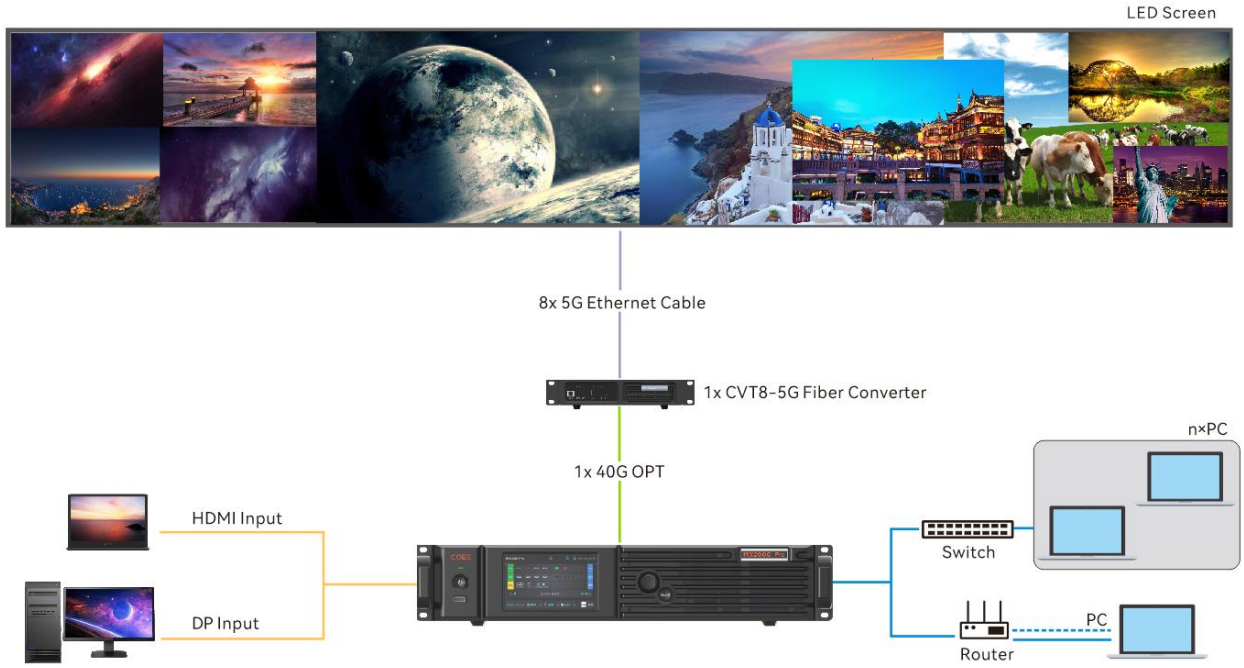
It is not possible to build 1G and 5G solutions with an MX2000 Pro at the same time.

1G Solution (MX_4x10G_Fiber Output Card)



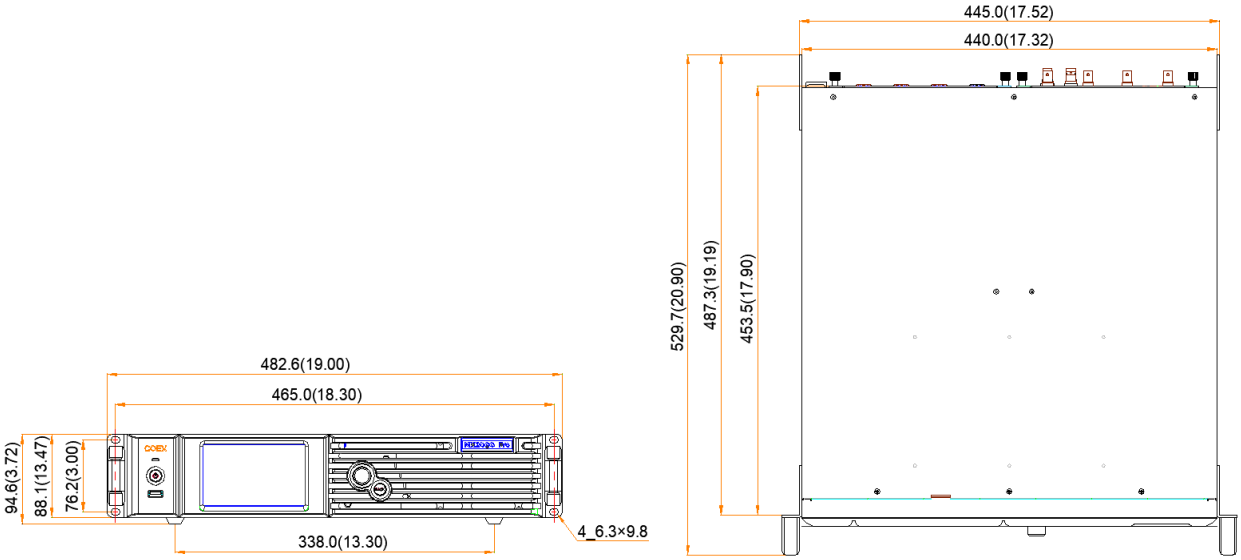
This diagram is an example of two input cards and one MX_4x10G_Fiber output card installed on an MX2000 Pro. The actual application may vary.

5G Solution (CX_1x40G_Fiber Output Card)



This diagram is an example of two input cards and one CX_1x40G_Fiber output card installed on an MX2000 Pro. The actual application may vary.

Dimensions



Tolerance: ±0.5 Unit: mm

Specifications

Electrical Specifications	Power supply	100-240V~, 50/60Hz
	Max power consumption	260 W
Operating Environment	Temperature	0°C to +45°C
	Humidity	0% RH to 80% RH, non-condensing
Storage Environment	Temperature	-10°C to +60°C
	Humidity	0% RH to 95% RH, non-condensing
Physical Specifications	Dimensions	482.6 mm × 94.6 mm × 529.7 mm (foot pad included)
	Weight	• Standard (1x control card, 1x input card, 1x output card) – Net weight: 12.0 kg – Total weight: 12.5 kg • Fully installed (1x control card, 2x input cards, 2x output cards) – Net weight: 13.0 kg – Total weight: 13.5 kg **Note:** Total weight refers to the weight of the product, accessories, and packing materials.
Packing Information	Packing box	660.0 mm × 570.0 mm × 210.0 mm, kraft paper box
	Accessories	1x Power cord, 1x Ethernet cable 1x Quick Start Guide, 1x Customer Letter, 1x Safety Manual, 1x Certificate of Approval
IP Rating	IP20 Please prevent the product from water intrusion and do not wet or wash the product.	

Noise Level (typically at 25°C/77°F)	53 dB (A)

The amount of power consumption may vary depending on various factors such as product settings, usage, and environment.

Video Source Specifications

Input	Bit Depth	Sampling Format	Max Input Resolution
HDMI 2.0	8bit	RGB 4:4:4	4096×2160@60Hz
		YCbCr 4:4:4	
		YCbCr 4:2:2	
	10bit	RGB 4:4:4	4096×2160@48Hz
		YCbCr 4:4:4	
		YCbCr 4:2:2	4096×2160@60Hz
	12bit	RGB 4:4:4	4096×2160@30Hz
		YCbCr 4:4:4	
		YCbCr 4:2:2	4096×2160@60Hz
DP 1.4	8bit	RGB 4:4:4	7680×4320@30Hz
		YCbCr 4:4:4	
		YCbCr 4:2:2	
	10bit	RGB 4:4:4	7680×4320@24Hz
		YCbCr 4:4:4	
		YCbCr 4:2:2	7680×4320@30Hz
	12bit	RGB 4:4:4	5120×2160@60Hz
		YCbCr 4:4:4	
		YCbCr 4:2:2	7680×4320@30Hz

Ethernet Port Load Capacity

1G Solution (MX_4x10G_Fiber Output Card)

When Working with A10s Pro Receiving Card

When working with the A10s Pro receiving card, the formula of calculating the load capacity per Ethernet port and the detailed parameters are as follows:

- 8bit: Load capacity × 24 × Frame rate < 1000 × 1000 × 1000 × 0.95
- 10bit: Load capacity × 32 × Frame rate < 1000 × 1000 × 1000 × 0.95
- 12bit: Load capacity × 48 × Frame rate < 1000 × 1000 × 1000 × 0.95

Max Load Capacity per Ethernet Port (Pixels)			
Frame Rate / Bit Depth	8bit	10bit	12bit
24 Hz	1,649,306	1,236,979	824,653
25 Hz	1,583,333	1,187,500	791,667
30 Hz	1,319,444	989,583	659,722
50 Hz	791,667	593,750	395,833
60 Hz	659,722	494,792	329,861
120 Hz	329,861	247,396	164,931
144 Hz	274,884	206,163	137,442
240 Hz	164,931	123,698	82,465

When Working with Other Armor Series Receiving Cards

The formula of calculating the load capacity per Ethernet port and the detailed parameters are as follows.

- 8bit: Load capacity × 24 × Frame rate < 1000 × 1000 × 1000 × 0.95
- 10bit: Load capacity × 48 × Frame rate < 1000 × 1000 × 1000 × 0.95
- 12bit: Load capacity × 48 × Frame rate < 1000 × 1000 × 1000 × 0.95

Max Load Capacity per Ethernet Port (Pixels)			
Frame Rate / Bit Depth	8bit	10bit	12bit
24 Hz	1,649,306	824,653	824,653
25 Hz	1,583,333	791,667	791,667
30 Hz	1,319,444	659,722	659,722
50 Hz	791,667	395,833	395,833
60 Hz	659,722	329,861	329,861
120 Hz	329,861	164,931	164,931
144 Hz	274,884	137,442	137,442
240 Hz	164,931	82,465	82,465

5G solution (CX_1x40G_Fiber Output Card)

When working with the CA50E, CA50C, or XA50 receiving cards, the formula of calculating the load capacity per Ethernet port and the detailed parameters are as follows:

- 8bit: Load capacity × 24 × Frame rate < 5G × 0.75
- 10bit: Load capacity × 30 × Frame rate < 5G × 0.75
- 12bit: Load capacity × 36 × Frame rate < 5G × 0.75

Max Load Capacity per Ethernet Port (Pixels)			
Frame Rate / Bit Depth	8bit	10bit	12bit
24 Hz	6,480,000	5,182,500	4,320,000
25 Hz	6,220,800	4,975,200	4,147,200
30 Hz	5,184,000	4,146,000	3,456,000
50 Hz	3,110,400	2,487,600	2,073,600
60 Hz	2,592,000	2,073,000	1,728,000
120 Hz	1,296,000	1,036,500	864,000
144 Hz	1,080,864	864,441	720,576
240 Hz	648,000	518,250	432,000

Notes and Cautions

Notes for Battery

- The battery is not intended to be replaced.
- Disposal of a battery into fire or a hot oven, or mechanically crushing or cutting of a battery can result in an explosion.
- Leaving a battery in an extremely high temperature surrounding environment can result in an explosion or the leakage of flammable liquid or gas.
- A battery subjected to extremely low air pressure may result in an explosion or the leakage of flammable liquid or gas.

Notes for Installation

The product can be mounted in a standard 19-inch rack capable of withstanding at least four times the total weight of the mounted equipment. Four M5 screws are required to fix the product.

- Elevated Operating Ambient - If installed in a closed or multi-unit rack assembly, the operating ambient temperature of the rack environment may be greater than room ambient. Therefore, consideration should be given to installing the equipment in an environment compatible with the maximum ambient temperature (Tma) specified by the manufacturer.

- Reduced Air Flow – Installation of the equipment in a rack should be such that the amount of air flow required for safe operation of the equipment is not compromised.
- Mechanical Loading – Mounting of the equipment in the rack should be such that a hazardous condition is not achieved due to uneven mechanical loading.
- Circuit Overloading – Consideration should be given to the connection of the equipment to the supply circuit and the effect that overloading of the circuits might have on overcurrent protection and supply wiring. Appropriate consideration of equipment nameplate ratings should be used when addressing this concern.
- Reliable Earthing – Reliable earthing of rack-mounted equipment should be maintained. Particular attention should be given to supply connections other than direct connections to the branch circuit (e.g. use of power strips).

Others

This product can only be placed horizontally. Do not mount vertically or upside-down.

Trademark

NOVASTAR is a trademark of Xi'an NovaStar Tech Co., Ltd.

Statement

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