MX40 Pro

LED Display Controller

Specifications

Change History

Document Version	Release Date	Description
V1.2.2	2023-07-04	• Added descriptions for low latency. • Updated the supported driver ICs for frame rate adaptive.
V1.2.1	2023-03-24	Added support for HDR function for DP and SDI connectors.
V1.2.0	2023-01-03	• Added the function of changing the temperature scale. • Added a layer scaling mode: fill screen. • Support the SNMP and Art-Net protocols.
V1.1.1	2022-11-18	• Added a table of load capacity per Ethernet port. • Added the limitations of some functions.
V1.1.0	2022-11-07	• Updated the description of the USB port on the front panel. • Optimized the description of Ethernet port load capacity.

Introduction

The MX40 Pro is a flagship all-in-one LED display controller with 20 Ethernet ports in the brand-new control system COEX series of Xi'an NovaStar Tech Co., Ltd. (hereinafter referred to as NovaStar). This controller integrates video processing and video control into one box and offers rich video input connectors (HDMI 2.0, DP 1.2 and 12G-SDI), 20x Ethernet output ports and 4x 10G optical ports. It can also work with the brand-new software VMP (Vision Management Platform) to provide a better operation and control experience.

Certifications

CCC, CE, FCC, IC, UKCA, UL, CB

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

- 3 types of inputs
  - 3x HDMI 2.0 (with loop through)
  - 1x DP 1.2
  - 1x 12G-SDI (with loop through)
- 3 types of outputs
  - 20x Gigabit Ethernet ports, load capacity up to 9 million pixels
  - 4x 10G optical ports
  - 1x SPDIF digital audio port
- 12-bit, 10-bit and 8-bit video inputs
- 3 types of controls
  - 1x Genlock signal input (with loop through)
  - 2x Ethernet control ports
  - 1x Auxiliary port

Advanced Features

- 4 independent layers
  Support up to 4x 4K layers and layer priority adjustment in Z order.
- Image scaling
  Support 4 image scaling modes: custom, pixel to pixel, snap to canvas, and fill screen.
- Color Replacement
  Support free replacement of any color on the image without affecting the performance of other colors. Replacement of highly saturated colors is recommended for better effect.
- 14Ch Color Correction
  Support precise adjustment to hue, saturation and brightness of black, white and the 12 derived standard colors of the red, green and blue primary colors.
- Curves
  Support adjustment to the image RGBW mapping curves.
- 3D LUT
  The 17×17×17 3D LUT .cube files are supported to adjust the video source colors.
- Dynamic Booster
  Real-time analysis and dynamic adjustment are made to each frame to significantly improve the display contrast and image details for better visual experience, and effectively control and lower the display power consumption, extending the service life of the LED screen.
- Full Grayscale Calibration
  Work with NovaStar's high-precision calibration system and 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 specified receiving cards, 3D emitter and 3D glasses to bring a fascinating and immersive 3D viewing experience.
- HDR
  - Support HDR10 and comply with the SMPTE ST 2084 and SMPTE ST 2086 standards.
  - Support HLG.
- Latency
  - Support low latency and the controller load capacity is not reduced. The latency at the controller is 0 frame (less than 1 ms) in Send-Only Controller working mode and 1 frame in All-In-One Controller working mode.
  - Support additional latency. Zero to two frames of latency can be added at the controller.
- No rectangle restriction
  No rectangle restriction for irregular screens. When calculating resolutions, blank pixels do not count towards the total capacity. The used load capacity of Ethernet ports is the sum of the pixels of all cabinets.
- Frame Rate Adaptive
  The controller can be adaptive to various video input frame rates, including decimal frame rates. Custom frame rates are also supported and the step size of fine tuning frame rate is as small as 0.01 Hz.
- Two working modes
  Support the All-In-One Controller and Send-Only Controller working modes.
  - In the Send-Only Controller mode, the latency can be reduced by one frame.
  - In the All-In-One Controller mode, the layer and scaling functions are available.
- Display system monitoring
  Support monitoring of the device status and screen status. Any fault and alarm information can be reported actively.

Device Controls

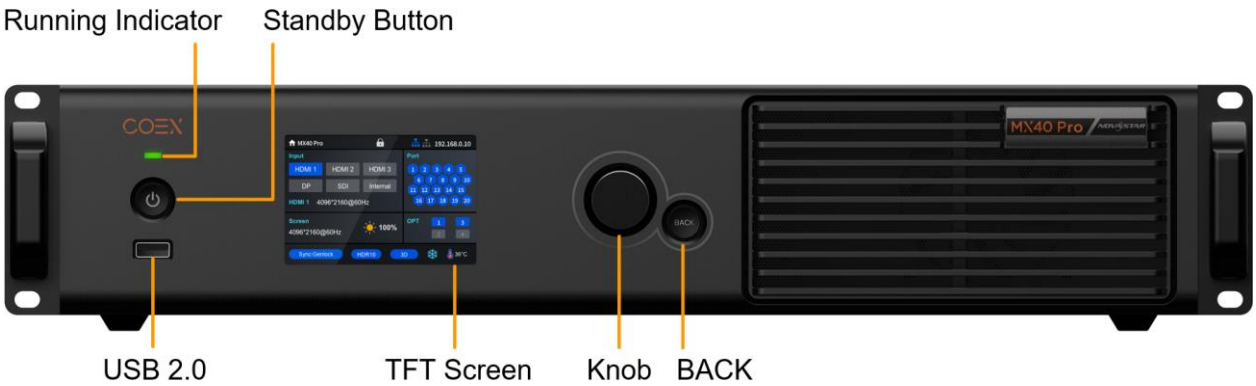
- VMP software control
  The device can be connected to the VMP software to provide easy and convenient operations and smart device management.
- Support the SNMP and Art-Net protocols.
- Cascading control via Ethernet
  The Gigabit Ethernet control ports support TCP/IP protocol and star topology. No 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.

Table 1-1 Function Limitations

Function	Limitation
Frame Rate Adaptive	This function can be achieved when the MX40 Pro works with the A10s Pro receiving card. Currently supported driver ICs include ICND2055, ICND2065, ICND2069, MBI5253A, MBI5253B, MBI5754B, MBI5264, MBI5264B, MBI5264C, and CFD555A. In addition, the .ncp file generated by the Cabinet Tool from NovaStar must be used.
Dynamic Booster	This function can be achieved when the MX40 Pro works with the A10s Pro receiving card. Before operation, brightness and color gamut correction using the CA410-VP427, CA410-P427 or EYE2-400 color analyzer must be completed.
Full Grayscale Calibration	This function can be achieved when the MX40 Pro works with A10s Pro receiving card. A C3200 camera is required to perform full-grayscale calibration.
3D	To use the 3D function, specified 3D glasses are needed. For details, please contact NovaStar technical support.
Low Latency	The Low Latency and Genlock functions are mutually exclusive. To enable low latency, please make sure all Ethernet ports load the cabinets vertically and share the same Y coordinate.
HDR	The HDR function supports automatic parsing and manual setting. The properties of 12G-SDI sources, DP1.2 sources and non-standard HDR sources can be manually set to HDR properties. Using the HDR function reduces the MX40 Pro load capacity by less than half if the MX40 Pro works with the A10s Pro receiving card. For details, see the Ethernet Port Load Capacity section.

Appearance

Front Panel



Name	Description
Running Indicator	• Solid red: Standby • Solid blue: The device is being started. • 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 or longer to restart the device.
USB 2.0	• Connect to a USB drive only to export the device diagnostic result. • Only the NTFS and FAT32 file systems are supported. Others are not supported.

Name	Description
TFT Screen	A 3.5-inch screen to display the device status, menus, submenus and messages for parameter settings
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.
BACK	Go back to the previous menu or cancel the current operation.

Rear Panel

Inputs			
Type	Qty	Description	
HDMI 2.0-1 IN	1	Resolutions	Max resolution: 4096×2160@60Hz/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 2.2 compliant, backwards compatible
		Interlaced signal inputs	Not supported
HDMI 2.0-2 IN	1	Resolutions	Max resolution: 4096×2160@60Hz/8192×1080@60Hz (Forced) Min resolution: 800×600@60Hz
		Max width/height (Forced)	Max width: 8192 pixels (8192×1080@60Hz) Max height: 7680 pixels (1080×7680@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 2.2 compliant, backwards compatible
		Interlaced signal inputs	Not supported
HDMI 2.0-3 IN	1	Resolutions	Max resolution: 4096×2160@60Hz/8192×1080@60Hz (Forced) Min resolution: 800×600@60Hz
		Max width/height (Forced)	Max width: 8192 pixels (8192×1080@60Hz) Max height: 7680 pixels (1080×7680@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 2.2 compliant, backwards compatible
		Interlaced signal inputs	Not supported
DP 1.2	1	Resolutions	Max resolution: 4096×2160@60Hz/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 1.3 compliant
		Interlaced signal inputs	Not supported
12G-SDI IN	1	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).

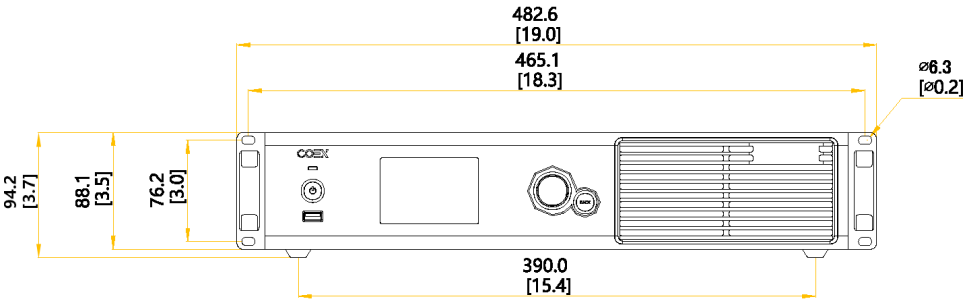
		Resolutions	Max resolution: 4096×2160@60Hz
		Frame rates	Support frame rates up to 60 Hz.
		HDR	Support HDR10 and comply with the SMPTE ST 2084 and SMPTE ST 2086 standards. Support HLG.
		Others	Belden 12G SDI standard cables are recommended. Cables up to 50 meters are supported.
Outputs			
Type	Qty	Description	
1–20	20	Gigabit Ethernet output ports. Support hot backup between Ethernet ports. • Max device load capacity: 9 million pixels • The maximum load capacity per Ethernet port is as follows. For details, see the Ethernet Port Load Capacity section. – 8bit@60Hz: 659,722 pixels – 10bit@60Hz: 494,791 pixels (available only with the A10s Pro receiving card) – 10bit/12bit@60Hz: 329,861 pixels	
OPT 1–4	4	10G optical output ports • OPT 1 transmits the data of Ethernet ports 1 to 10. OPT 3 is the copy channel of OPT 1. • OPT 2 transmits the data of Ethernet ports 11 to 20. OPT 4 is the copy channel of OPT 2.	
HDMI 2.0-1 LOOP	1	HDMI loop through. Up to 8 devices can be cabled in one loop.	
HDMI 2.0-2 LOOP	1		
HDMI 2.0-3 LOOP	1		
12G-SDI LOOP	1	SDI loop through. Up to 8 devices can be cabled in one loop.	
SPDIF OUT	1	A digital audio output (Reserved)	
Controls			
Type	Qty	Description	
ETHERNET	2	Gigabit Ethernet control ports. Support TCP/IP protocol and star topology. 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 MX40 Pro devices 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 MX40 Pro devices can be cascaded.	
AUX	1	An auxiliary port that connects to the central control device (RS232) (Reserved)	

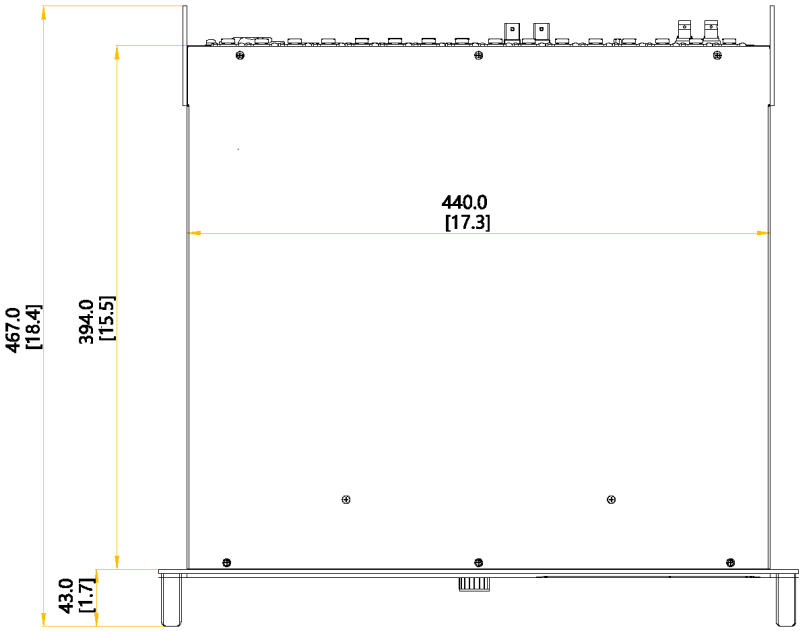
Power		
100-240V~, 50/60Hz, 1.5A	1	An AC power input connector and switch

Note

The maximum input resolution and maximum width and height of HDMI and DP connectors must be obtained by setting the graphics card.

Dimensions





Tolerance: ±0.3 [±0.012] Unit: mm [inch]

Product Specifications

Electrical Specifications	Power input	100-240V~, 50/60Hz, 1.5A
	Max power consumption	95 W
Operating Environment	Temperature	–20ºC to +50ºC
	Humidity	0% RH to 80% RH, non-condensing
Storage Environment	Temperature	–30ºC to +80ºC

	Humidity	0% RH to 95% RH, non-condensing
Physical Specifications	Dimensions	482.6 mm × 94.2 mm × 467.0 mm
	Net weight	7.5 kg
	Gross weight	10.5 kg Note: It is the total weight of the product, accessories, and packing materials packed according to the packing specifications.
Packing Information	Packing box	660.0 mm × 570.0 mm × 210.0 mm, kraft paper box
	Accessory box	408.0 mm × 290.0 mm × 50.0 mm, white cardboard box
	Accessories	• 1x Power cord • 1x Ethernet cable • 1x HDMI cable • 1x DP cable • 1x Certificate of Approval
IP Rating	IP20 Please prevent the product from water intrusion and do not wet or wash the product.	

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 2.0-1	8bit	RGB 4:4:4	4096×2160@60Hz 8192×1080@60Hz
		YCbCr 4:4:4	
		YCbCr 4:2:2	
	10bit	RGB 4:4:4	4096×2160@30Hz 4096×1080@60Hz
		YCbCr 4:4:4	
		YCbCr 4:2:2	4096×2160@60Hz
	12bit	RGB 4:4:4	4096×2160@30Hz 4096×1080@60Hz
		YCbCr 4:4:4	
		YCbCr 4:2:2	4096×2160@60Hz
HDMI 2.0-2	8bit	RGB 4:4:4	4096×2160@60Hz 8192×1080@60Hz
		YCbCr 4:4:4	
		YCbCr 4:2:2	
	10bit	RGB 4:4:4	4096×2160@30Hz 4096×1080@60Hz
		YCbCr 4:4:4	

Input	Bit Depth	Sampling Format	Max Input Resolution
		YCbCr 4:2:2	4096×2160@60Hz
HDMI 2.0-3	8bit	RGB 4:4:4	4096×2160@60Hz 8192×1080@60Hz
		YCbCr 4:4:4	
		YCbCr 4:2:2	
	10bit	RGB 4:4:4	4096×2160@30Hz 4096×1080@60Hz
		YCbCr 4:4:4	
		YCbCr 4:2:2	4096×2160@60Hz
DP 1.2	8bit	RGB 4:4:4	4096×2160@60Hz 8192×1080@60Hz
		YCbCr 4:4:4	
		YCbCr 4:2:2	
	10bit	RGB 4:4:4	4096×2160@30Hz 4096×1080@60Hz
		YCbCr 4:4:4	
		YCbCr 4:2:2	4096×2160@60Hz
	12bit	RGB 4:4:4	4096×2160@30Hz 4096×1080@60Hz
		YCbCr 4:4:4	
		YCbCr 4:2:2	4096×2160@60Hz
12G-SDI	10bit	YCbCr 4:2:2	4096×2160@60Hz

Note

The maximum resolution of HDMI and DP inputs in the table must be obtained by setting the graphics card.

Ethernet Port Load Capacity

When Working with 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	1,649,305.556	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	1,649,305.556	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

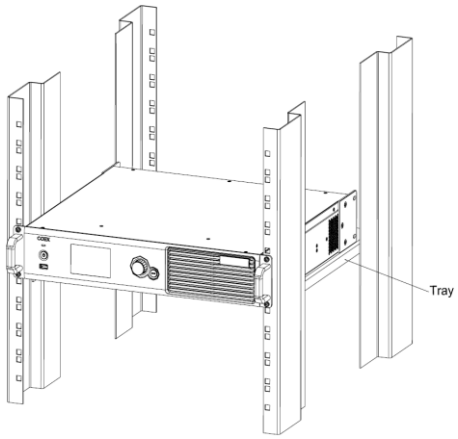
Notes and Cautions

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

When the product needs to be installed on the rack, 4 screws at least M5*12 should be used to fix it. The rack for installation shall bear at least 32kg weight.



- 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).

FCC Caution

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Note: 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 is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Others

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

This is Class A product. In a domestic environment, this product may cause radio interference in which case the user may be required to take adequate measures.

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