Colorlight

K10

Receiving Card

Specification V3.0.1

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Revision History

Version	Release Date	Description
V2.1.0	March 14, 2023	Initial release.
V3.0.0	July 27, 2026	Updated the product appearance.
V3.0.1	October 17, 2026	Modify attachment function description Support 4D Color Calibration

01 Introduction

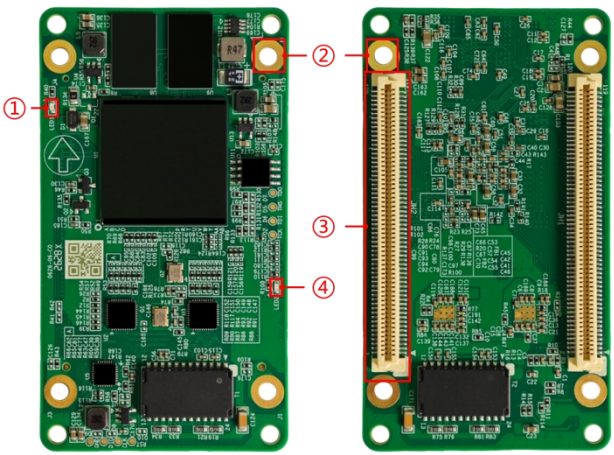
1.1 Overview

The K10 is a fully-featured, high-end compact receiving card developed by Colorlight. Each card has a maximum load capacity of 768×432 pixels and supports up to 32 groups of parallel data or 64 groups of serial data (expandable to 128 groups of serial data). Thanks to its compact dimensions of 80.0 mm × 45.0 mm × 7.8 mm, the K10 is well-suited for cabinets with limited internal space, as well as fine-pitch displays. It adopts high-density connectors for dust and shock resistance, ensuring outstanding stability and reliability.

Covering all functionalities of industry-standard receiving cards, the K10 is ideal for high-end rental and fine-pitch LED displays. Furthermore, it provides a suite of practical and powerful features tailored for high-end applications, adding a competitive edge and boosting the overall value of customers' products.

1.2 Appearance

Top/Bottom



No.	Item	Description	
1	Power indicator	Red steady on: Normal power supply	
2	Mounting hole	For securing the receiving card and improving vibration resistance	
3	High-density connector	120Pin × 2, connecting to the cabinet HUB board. For more details, refer to Chapter 03 Pin Definitions.	
4	Signal indicator	Blinking green (once/sec)	Receiving card: Normal operation Cable: Normal connection
		Blinking green (4 times/sec)	Loop redundancy takes effect
		Blinking green (10 times/sec)	Receiving card: Normal operation Cabinet: Highlighted

NOTE:

The illustration is for reference only. Actual products may vary. For detailed specifications about the high-density connectors used in K10, please refer to the connector specification.

02 Specifications

2.1 Features

Display Effect

- 8-bit/10-bit/12-bit video input
- HDR10/HLG
- Independent Gamma adjustment
- Infi-bit grayscale compensation
- Grayscale refinement
- Frame range: 23.98 – 240Hz
- Low latency
- Better grayscale at low brightness
- Color gamut adjustment
- Dynamic peak brightness

Calibration

- Pixel-level brightness and chroma calibration with high precision
- Fast sending and readback of calibration coefficients
- Full-grayscale calibration
- Thermal dynamic calibration
- 4D Color Calibration

Easy Maintenance

- Full-screen highlighting and numbering
- Image rotation
- Fast firmware upgrade; no power cycle required after upgrade
- Firmware backup and readback
- Supports multiple module types, up to four modules with different routing layouts
- Advanced seam correction
- Supports preset images
- Up to 16 groups of SPI smart modules for storing calibration coefficients and module parameters

- Module hot swap: calibration coefficients load automatically upon module replacement
- Cabinet monitoring: temperature, humidity, power supply, voltage and other parameters

Stable & Reliable

- Cable status monitoring
- Loop redundancy
- Dual-card redundancy
- 24/7 uninterrupted work

NOTE:

For detailed functions, refer to Chapter 06 Appendix. Please contact Colorlight technical staff for any inquiries.

2.2 Performance

Control System

Control area per card	Up to 768×432 pixels (May vary in different applications)
Ethernet port switching	Flexible use for either input or output
Grayscale level	65,536 levels without compensation; up to 4,194,304 levels

Module Compatibility

Driver ICs	PWM
Scan methods	Any scan type from static to 1/128 scan
Module specification	Maximum 1,024 pixels 1 scan (including cascading)
Cabling direction	Left-to-right, right-to-left, top-to-bottom, bottom-to-top cascading
Data group	32 groups of parallel RGB data or 64 groups of serial RGB data (expandable to 128 serial data groups). Data groups are interchangeable.
Data splitting	2~16 splits horizontally or vertically
Empty point/row/column	Supports emptying any point, row, or column

Cabinet-Level Monitoring

Cable monitoring	Total data packets and error packet count, diagnosing network quality to prevent potential risks
Temperature monitoring	1 channel; ambient temperature of the receiving card (-25℃ to 75 ℃)
Humidity monitoring	1 channel; ambient humidity of the receiving card （20% to 95%RH）
Power monitoring	2 channels; operating status of power supplies
Voltage monitoring	2 channels; operating voltage of power supplies 1 channel; internal voltage of the receiving card, no peripheral required
Cabinet monitoring module	Works with M3 to monitor cabinet doors, fans, smoke, etc.

Pixel-Level Calibration

Brightness calibration	Supported, with precision up to 14 bit
Chroma calibration	Supported, with precision up to 14 bit

Others

Optional	Cabinet LCD display, temperature-control relay, irregular module construction, pixel check, etc.

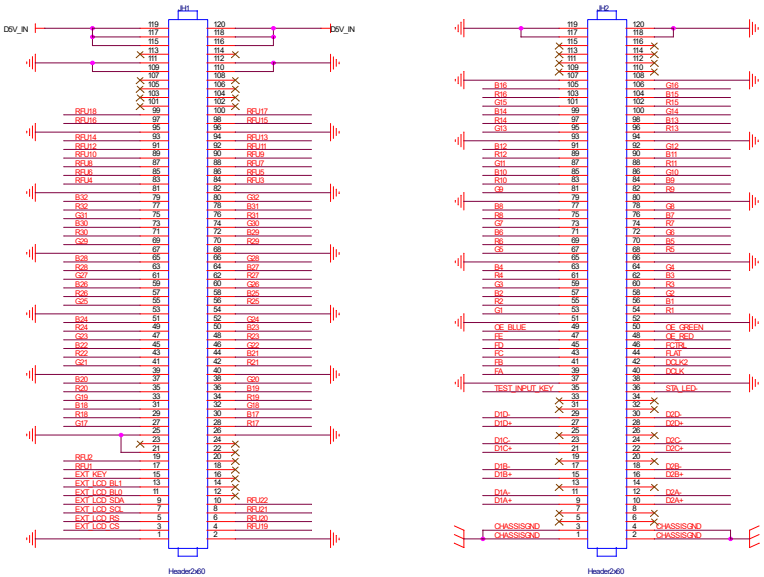
2.3 Hardware

Physical Specifications	
Product dimensions	80.0mm(3.15")×45.0mm(1.77")×7.8mm(0.31") (W×H×D)
Packaging dimensions	550.0mm(21.65")×398.0mm(15.67")×180mm(7.09") (W×H×D)
Packing specifications	Standard blister tray; 4 cards per blister box; 400 cards per carton
Hardware connector	High-density connectors
Transmission rate	1Gb/s
Communication distance	⩽100 m, CAT5e unshielded twisted pair cable
Compatible devices	Gigabit switches, Gigabit fiber optic transceivers
Weight	

Net weight	23g (0.05lbs)
Electrical Specifications	
Input power	DC 3.8V−5.5V, 0.8A
Rated power	4.0W
Operating Environment	
Temperature	-25℃−75℃ (-13°F−167°F)
Humidity	0%RH−80%RH, non-condensing
Storage Environment	
Temperature	-40℃−125℃(-40°F−257°F)
Humidity	0%RH−90%RH, non-condensing

03 Pin Definitions

32 Groups of Parallel Data



JH1					
Description	**Definition**	**Pin No.**		**Definition**	**Description**
Ground	GND	1	2	GND	Ground
LCD display	EXT_LCD_CS	3	4	RFU19	Reserved
	EXT_LCD_RS	5	6	RFU20	
	EXT_LCD_SCL	7	8	RFU21	
	EXT_LCD_SDA	9	10	RFU22	
	EXT_LCD_BL0	11	12	NC	Not connected
	EXT_LCD_BL1	13	14	NC	
	EXT_KEY	15	16	NC	
Reserved for future use (MCU pin)	RFU1	17	18	NC	
	RFU2	19	20	NC	

Ground	GND	21	22	NC	
Not connected	NC	23	24	NC	
Ground	GND	25	26	GND	Ground
RGB output	G17	27	28	R17	RGB output
	R18	29	30	B17	
	B18	31	32	G18	
	G19	33	34	R19	
	R20	35	36	B19	
	B20	37	38	G20	
Ground	GND	39	40	GND	Ground
RGB output	G21	41	42	R21	RGB output
	R22	43	44	B21	
	B22	45	46	G22	
	G23	47	48	R23	
	R24	49	50	B23	
	B24	51	52	G24	
Ground	GND	53	54	GND	Ground
RGB output	G25	55	56	R25	RGB output
	R26	57	58	B25	
	B26	59	60	G26	
	G27	61	62	R27	
	R28	63	64	B27	
	B28	65	66	G28	
Ground	GND	67	68	GND	Ground
RGB output	G29	69	70	R29	RGB output
	R30	71	72	B29	
	B30	73	74	G30	
	G31	75	76	R31	
	R32	77	78	B31	
	B32	79	80	G32	

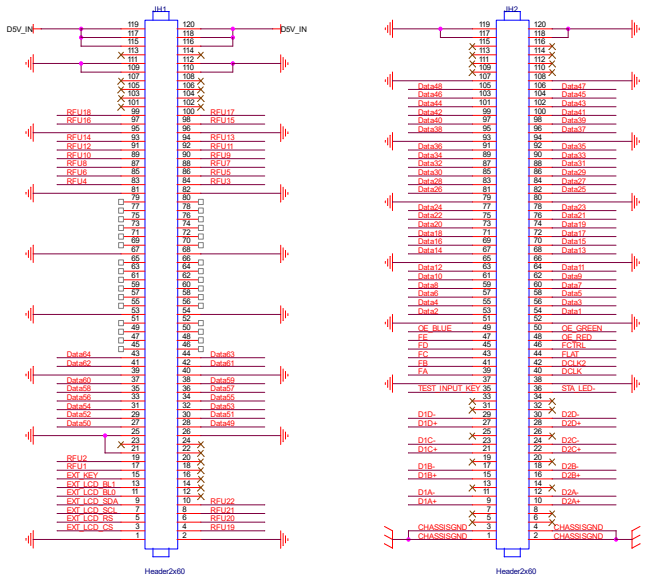
Ground	GND	81	82	GND	Ground
Reserved for future use	RFU4	83	84	RFU3	Reserved for future use
	RFU6	85	86	RFU5	
	RFU8	87	88	RFU7	
	RFU10	89	90	RFU9	
Reserved for future use (MCU pin)	RFU12	91	92	RFU11	
Reserved for future use	RFU14	93	94	RFU13	
Ground	GND	95	96	GND	Ground
Reserved for future use	RFU16	97	98	RFU15	Reserved for future use
	RFU18	99	100	RFU17	
Not connected	NC	101	102	NC	Not connected
	NC	103	104	NC	
	NC	105	106	NC	
	NC	107	108	NC	
Ground	GND	109	110	GND	Ground
	GND	111	112	GND	
Not connected	NC	113	114	NC	Not connected
System power supply	D5V	115	116	D5V	System power supply
	D5V	117	118	D5V	
	D5V	119	120	D5V	

JH2					
Description	**Definition**	**Pin No.**		**Definition**	**Description**
Chassis ground	CHASSISGND	1	2	CHASSISGND	Chassis ground
	CHASSISGND	3	4	CHASSISGND	
Not connected	NC	5	6	NC	Not connected
	NC	7	8	NC	
Ethernet port 1 signal	D1A+	9	10	D2A+	Ethernet port 2 signal
	D1A-	11	12	D2A-	

	NC	13	14	NC	
	D1B+	15	16	D2B+	
	D1B-	17	18	D2B-	
	NC	19	20	NC	
	D1C+	21	22	D2C+	
	D1C-	23	24	D2C-	
	NC	25	26	NC	
	D1D+	27	28	D2D+	
	D1D-	29	30	D2D-	
Not connected	NC	31	32	NC	Not connected
	NC	33	34	NC	
Test button	TEST_INPUT_KEY	35	36	STA_LED-	Operation status indicator
Ground	GND	37	38	GND	Ground
Line decoding signal	FA	39	40	DCLK	Serial shift clock 1
	FB	41	42	DCLK2	Serial shift clock 2
	FC	43	44	FLAT	Latch
	FD	45	46	FCTRL	Line blanking
	FE	47	48	OE_RED	Display enable
Display enable	OE_BLUE	49	50	OE_GREEN	
Ground	GND	51	52	GND	Ground
RGB output	G1	53	54	R1	RGB output
	R2	55	56	B1	
	B2	57	58	G2	
	G3	59	60	R3	
	R4	61	62	B3	
	B4	63	64	G4	
Ground	GND	65	66	GND	Ground
RGB output	G5	67	68	R5	RGB output
	R6	69	70	B5	

	B6	71	72	G6	
	G7	73	74	R7	
	R8	75	76	B7	
	B8	77	78	G8	
Ground	GND	79	80	GND	Ground
RGB output	G9	81	82	R9	RGB output
	R10	83	84	B9	
	B10	85	86	G10	
	G11	87	88	R11	
	R12	89	90	B11	
	B12	91	92	G12	
Ground	GND	93	94	GND	Ground
RGB output	G13	95	96	R13	RGB output
	R14	97	98	B13	
	B14	99	100	G14	
	G15	101	102	R15	
	R16	103	104	B16	
	B16	105	106	G16	
Ground	GND	107	108	GND	Ground
Not connected	NC	109	110	NC	Not connected
	NC	111	112	NC	
	NC	113	114	NC	
	NC	115	116	NC	
Ground	GND	117	118	GND	Ground
	GND	119	120	GND	

64 Groups of Serial Data



JH1					
Description	**Definition**	**Pin No.**		**Definition**	**Description**
Ground	GND	1	2	GND	Ground
LCD display	EXT_LCD_CS	3	4	RFU19	Reserved for future use
	EXT_LCD_RS	5	6	RFU20	
	EXT_LCD_SCL	7	8	RFU21	
	EXT_LCD_SDA	9	10	RFU22	
	EXT_LCD_BL0	11	12	NC	Not connected
	EXT_LCD_BL1	13	14	NC	
	EXT_KEY	15	16	NC	
Reserved for future use	RFU1	17	18	NC	
	RFU2	19	20	NC	
Ground	GND	21	22	NC	

Not connected	NC	23	24	NC	
Ground	GND	25	26	GND	Ground
RGB output	Data50	27	28	Data49	RGB output
	Data52	29	30	Data51	
	Data54	31	32	Data53	
	Data56	33	34	Data55	
	Data58	35	36	Data57	
	Data60	37	38	Data59	
Ground	GND	39	40	GND	Ground
RGB output	Data62	41	42	Data61	RGB output
	Data64	43	44	Data63	
Not connected	NC	45	46	NC	Not connected
	NC	47	48	NC	
	NC	49	50	NC	
	NC	51	52	NC	
Ground	GND	53	54	GND	Ground
Not connected	NC	55	56	NC	Not connected
	NC	57	58	NC	
	NC	59	60	NC	
	NC	61	62	NC	
	NC	63	64	NC	
	NC	65	66	NC	
Ground	GND	67	68	GND	Ground
Not connected	NC	69	70	NC	Not connected
	NC	71	72	NC	
	NC	73	74	NC	
	NC	75	76	NC	
	NC	77	78	NC	
	NC	79	80	NC	
Ground	GND	81	82	GND	Ground

Reserved for future use	RFU4	83	84	RFU3	Reserved for future use
	RFU6	85	86	RFU5	
	RFU8	87	88	RFU7	
	RFU10	89	90	RFU9	
	RFU12	91	92	RFU11	
	RFU14	93	94	RFU13	
Ground	GND	95	96	GND	Ground
Reserved for future use	RFU16	97	98	RFU15	Reserved for future use
	RFU18	99	100	RFU17	
Not connected	NC	101	102	NC	Not connected
	NC	103	104	NC	
	NC	105	106	NC	
	NC	107	108	NC	
Ground	GND	109	110	GND	Ground
	GND	111	112	GND	
Not connected	NC	113	114	NC	Not connected
System power supply	D5V	115	116	D5V	System power supply
	D5V	117	118	D5V	
	D5V	119	120	D5V	

JH2					
Description	**Definition**	**Pin No.**		**Definition**	**Description**
Chassis ground	CHASSISGND	1	2	CHASSISGND	Chassis ground
	CHASSISGND	3	4	CHASSISGND	
Not connected	NC	5	6	NC	Not connected
	NC	7	8	NC	
Ethernet port 1 signal	D1A+	9	10	D2A+	Ethernet port 2 signal
	D1A-	11	12	D2A-	
	NC	13	14	NC	
	D1B+	15	16	D2B+	

	D1B-	17	18	D2B-	
	NC	19	20	NC	
	D1C+	21	22	D2C+	
	D1C-	23	24	D2C-	
	NC	25	26	NC	
	D1D+	27	28	D2D+	
	D1D-	29	30	D2D-	
Not connected	NC	31	32	NC	Not connected
	NC	33	34	NC	
Test button	TEST_INPUT_KEY	35	36	STA_LED-	Operation status indicator
Ground	GND	37	38	GND	Ground
Line decoding signal	FA	39	40	DCLK	Serial shift clock 1
	FB	41	42	DCLK2	Serial shift clock 2
	FC	43	44	FLAT	Latch
	FD	45	46	FCTRL	Line blanking
	FE	47	48	OE_RED	Display enable
Display enable	OE_BLUE	49	50	OE_GREEN	
Ground	GND	51	52	GND	Ground
RGB output	Data2	53	54	Data1	RGB output
	Data4	55	56	Data3	
	Data6	57	58	Data5	
	Data8	59	60	Data7	
	Data10	61	62	Data9	
	Data12	63	64	Data11	
Ground	GND	65	66	GND	Ground
RGB output	Data14	67	68	Data13	RGB output
	Data16	69	70	Data15	
	Data18	71	72	Data17	
	Data20	73	74	Data19	

	Data22	75	76	Data21	
	Data24	77	78	Data23	
Ground	GND	79	80	GND	Ground
RGB output	Data26	81	82	Data25	RGB output
	Data28	83	84	Data27	
	Data30	85	86	Data29	
	Data32	87	88	Data31	
	Data34	89	90	Data33	
	Data36	91	92	Data35	
Ground	GND	93	94	GND	Ground
RGB output	Data38	95	96	Data37	RGB output
	Data40	97	98	Data39	
	Data42	99	100	Data41	
	Data44	101	102	Data43	
	Data46	103	104	Data45	
	Data48	105	106	Data47	
Ground	GND	107	108	GND	Ground
Not connected	NC	109	110	NC	Not connected
	NC	111	112	NC	
	NC	113	114	NC	
	NC	115	116	NC	
Ground	GND	117	118	GND	Ground
	GND	119	120	GND	

NOTES：

1. The operation status indicator is active-low. OE_RED, OE_GREEN and OE_BLUE are display enable pins.
2. Use OE_RED when OE_RGB are not separately controlled. It functions as GCLK when a PWM chip is used.
3. Under the 128-group serial data expansion mode, DATA65 ~ DATA128 multiplex DATA1 ~ DATA64 interface data.

Reference Design for Extended Functions

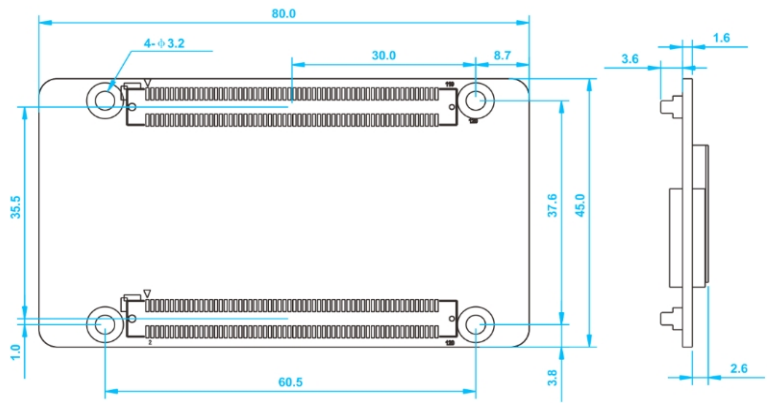
Extended Function Interface Description			
Reserved	**ARM Smart Module**	**LED Panel Flash**	**Description**
RFU1	Reserved	Reserved	Reserved for future use (MCU pin)
RFU2	Reserved	Reserved	Reserved for future use (MCU pin)
RFU3	HUB_CODE0	HUB_CODE0	Smart module multiplex selection signal 1
RFU4	Reserved	HUB_SPI_CLK	LED panel Flash clock signal
RFU5	HUB_CODE1	HUB_CODE1	Smart module multiplex selection signal 2
RFU6	Reserved	HUB_SPI_CS	LED panel Flash chip select signal
RFU7	HUB_CODE2	HUB_CODE2	Smart module multiplex selection signal 3
RFU8	/	HUB_SPI_MOSI	LED panel Flash data input signal
	HUB_UART_TX	/	ARM smart module TX signal
RFU9	HUB_CODE3	HUB_CODE3	Smart module multiplex selection signal 4
RFU10	/	HUB_SPI_MISO	LED panel Flash data output signal
	HUB_UART_RX	/	ARM smart module RX signal
RFU11	HUB_H164_CSD	HUB_H164_CSD	74HC164 data signal
RFU12	Reserved	Reserved	Reserved for future use
RFU13	HUB_H164_CLK	HUB_H164_CLK	74HC164 clock signal
RFU14	POWER_STA1	POWER_STA1	Dual-power monitoring signal 1
RFU15	MS_DATA	MS_DATA	Dual-card redundancy connection signal
RFU16	POWER_STA2	POWER_STA2	Dual-power monitoring signal 2
RFU17	MS_ID	MS_ID	Dual-card redundancy ID signal
RFU18	HUB_CODE4	HUB_CODE4	Smart module multiplex selection signal 5
RFU19	HUM	HUM	Humidity monitoring signal
RFU20	Voltage_ STA1	Voltage_ STA1	Voltage multiplex monitoring signal 1
RFU21	Voltage_ STA2	Voltage_ STA2	Voltage multiplex monitoring signal 2
RFU22	TEMP	TEMP	Temperature monitoring signal

NOTE：

RFU8 and RFU10 are multiplexed extended interfaces. The ARM smart module interface and LED panel Flash interface are mutually exclusive.

04 Reference Dimensions

Unit: mm，Tolerance: ±0.15mm



NOTE:

The K10 high-density board-to-board connector has a mating height of 5.0 mm. 5.0 mm standoffs are recommended. Contact Colorlight technical support for evaluation prior to mold making or mounting cutout.

05 Statement

5.1 Certifications

RoHS, EMC Class B. EMC requires a compatible cabinet design. Please contact Colorlight technical support if needed.

NOTE:

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

5.2 Statement

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06 Appendix

6.1 Function Description

Display Effect

8/10/12bit	Up to 12bit video input and output. The grayscale displayed is 16 times that of the 8bit video source, allowing for a smoother grayscale transition.
HDR10/HLG	Enables HDR10/HLG display when used with an HDR-capable processor, presenting images with high dynamic range, high contrast, and wide color gamut.
Independent Gamma adjustment	Separately tunes grayscale linearity for R, G, B to eliminate low-grayscale color shift, white balance drift and uneven grayscale from mismatched RGB responses.
Infi-bit	The dynamic grayscale compensation enhances the display grayscale and enriches image details at low gray level, ensuring a smooth grayscale transition and better display effect.
Grayscale refinement	When used with a luminance meter and LEDVISION, it measures the actual display performance and precisely calibrates the screen grayscale, effectively resolving hardware-related issues such as grayscale banding and low-grayscale color shift.
High frame rate	Adaptive frame rate technology significantly enhances image smoothness and reduces motion blurring. Supports standard and non-integer frame rates: 30/50/59.94/60/100Hz. Outputs high frame rate images at 120/144/240Hz.
Low latency	Reduces the data transmission time of the video source to 1 frame, effectively ensuring synchronization of the displayed image.
Better grayscale at low brightness	The optimized gamma table algorithm effectively addresses grayscale loss caused by low brightness, improving grayscale performance under low brightness conditions.
Color gamut adjustment	Enables fast gamut tuning and conversion for individual cabinets or full screens via control software, with custom adjustment and one-click reset. High-accuracy color reproduction is available with a colorimeter for various applications.
Dynamic peak brightness	Real-time image analysis preserves shadow details while adjusting highlights dynamically for higher contrast. It optimizes visual effect and reduces power consumption.

Calibration

High-precision calibration	14-bit pixel-level brightness & chroma calibration removes color deviation and ensures uniform brightness and color across the entire screen.
Fast sending and readback of calibration coefficients	Speeds up coefficient sending to and readback from receiving cards, reducing calibration time and boosting maintenance efficiency.
Full grayscale calibration	Stores multiple sets of calibration coefficients for different brightness levels and switches them dynamically in real time for consistent uniformity across all grayscale levels

Thermal dynamic calibration	Tracks screen temperature and adjusts calibration coefficients dynamically to reduce artifacts like cyan cast and cross patterns, delivering stable color performance during long-term operation.

Easy Maintenance

Cabinet highlighting	Supports highlighting the target cabinet using the control software. The highlighted cabinet borders flash, and the blinking frequency of the cabinet's indicator changes, enabling efficient maintenance from the front and back sides of the LED screen.
Quick numbering	Works with the control software to quickly number the receiving cards connected to the selected network ports based on their actual routing sequence, facilitating the setting of screen mapping.
Image rotation	Supports rotating the image on a single cabinet by 90°/180°/270°.
Upgrade without power cycling	Supports firmware upgrades without power cycling, making firmware upgrades and maintenance more convenient.
Multiple types of modules	Supports 4 types of modules with different routing types, making it easy for users to construct multiple types of modules. NOTE: 1 scan (including data group cascade) supports up to 1,024 pixels. The scan lines in the same data group must be consistent. When using 1~2 types of routing tables, a single data group supports up to 1,024 pixels per scan. When using 3~4 types of routing tables, a single data group supports up to 512 pixels per scan.
Advanced seam correction	Works with the control software to enable quick and efficient seam correction, eliminating the perceptible bright and dark lines caused by module assembly. Supports one-click reset of seam coefficients for rental scenarios.
Preset images	Supports customizing the image displayed on startup and in situations where network cable is disconnected or the video signal is lost.
Smart module	Stores calibration coefficients and module data in on-module Flash, enabling production traceability and facilitated after-sales maintenance.

Hardware Monitoring

Cable detection	Detects data transmission status among receiving card and bit error rate, quickly identifying cabinets with hardware connection errors to facilitate maintenance.
Temperature monitoring	Supports cabinet temperature monitoring (compatible cabinet design required). Parameters can be sent to the host PC in real-time and viewed through the control software. Users can customize alerts for temperature anomalies.
Humidity monitoring	Supports cabinet humidity monitoring (compatible cabinet design required). Parameters can be sent to the host PC in real-time and viewed through the control software. Users can customize alerts for humidity anomalies.

Power monitoring	Supports simultaneous monitoring of 2 power channels (compatible cabinet design required). Parameters can be sent to the host PC in real-time and viewed through the software. Users can customize alerts for power anomalies.
Voltage monitoring	Supports simultaneous monitoring of 2 voltage channels (compatible cabinet design required). Parameters can be sent to the host PC in real-time and viewed through the software. Users can customize alerts for voltage anomalies.
Pixel check*	Supports dead pixel check (compatible cabinet design required). Parameters can be sent to the host PC in real-time and viewed through the software. Users can customize alerts for excessive dead pixels.
Smoke monitoring*	Supports cabinet smoke monitoring (works with M3; requires compatible cabinet design). Parameters can be sent to the host PC in real-time and viewed through the control software. Users can customize the smoke density threshold for triggering alerts.
Fan control*	Supports fan control. (Works with M3; requires compatible cabinet design.) Users can enable/disable the fan using the control software. Auto-start and speed control are available with temperature monitoring enabled.
LCD display*	Controls the LCD screen on the cabinet. It displays status information including temperature, voltage and runtime, and supports self-test via the test button under no-signal condition.

Redundancy

Loop redundancy	Redundant Ethernet ports for sender connection to boost cascading reliability; seamless switchover upon single link failure for stable display.
Dual-card redundancy	Two receiving cards connected to one HUB board for a cabinet; backup card takes over instantly if primary card fails.
Firmware redundancy	Supports firmware backup and safe upgrade; prevents firmware loss from cable disconnection or power dropout during upgrade.

NOTE:
Functions marked with * are optional by default.

Colorlight

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