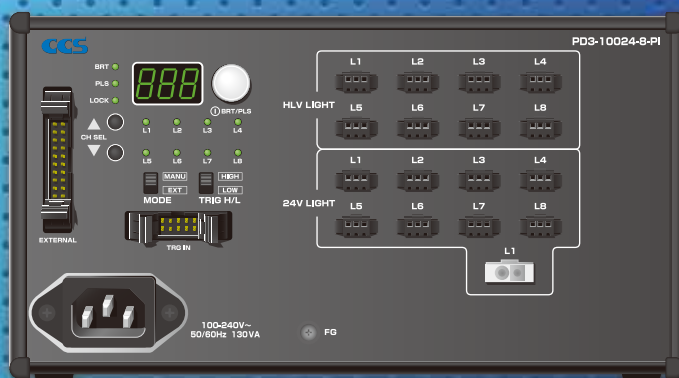


Control Unit for LED Light Units PD3-10024-8-PI

With Parallel Communications

Instruction Guide

Thank you for purchasing a CCS product.
To ensure proper use of the product,
please read this Instruction Guide before
use and keep it for your future reference.



This Control Unit is specifically designed to control the light intensity of CCS LED Light Units. It is mainly used to control LED Light Units that are used for machine vision and industrial inspections.

Features

- Connect 24V DC Light Units and Spotlights. Use up to 8 channels.
- The light intensity can be manually controlled with a switch on the front panel, or externally controlled using a PLC or machine vision equipment.
- Use PWM control to control the 24V DC Light Unit output at a frequency of 125 kHz.
- Data can be written in high-speed with parallel external control.
- Use external trigger inputs to turn Light Units ON and OFF, or to flash the strobe (for 24V DC Light Units only).

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1 Important Information for Equipment Safety — Read before Use —

This product has been designed with full consideration of safety. Incorrect usage of the product may result in fire, electric shock, or other serious damages. Observe the following precautions.

The following symbols are used in this instruction guide to indicate and classify the relative importance of warnings and cautions.

	WARNING	Indicates that incorrect usage may result in serious injury or death.		Caution	Indicates that incorrect usage may result in injury or property damage.
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The following symbols in the instruction guide indicate and classify the precautions.

PROHIBITED	DISASSEMBLY PROHIBITED	DO NOT TOUCH WITH WET HANDS	DO NOT SUBJECT TO MOISTURE	INSTRUCTED	UNPLUG
These symbols mean the prohibited action.				These symbols indicate actions that must be performed.	

WARNING	
Do not disassemble or modify the product. Doing so may result in fire or electric shock.	
Do not touch the plugs or switches with wet hands. Doing so may result in electric shock.	
Make sure that the product is free of moisture or any liquid. Doing so may result in fire or electric shock.	
Before connecting or disconnecting cables, make sure that the power source is turned OFF. Not doing so may result in fire or electric shock.	
Do not touch the power cords during lightning. This may result in electric shock.	
If an abnormal condition occurs, such as fuming, heat, smell, or noise, stop using the product immediately, turn OFF the power source and unplug the power cord. Not doing so may result in fire or electric shock.	

Caution	
Do not connect any Light Units other than CCS LED Light Units. Doing so may cause overcurrent and the device may overheat or ignite.	
Always use one of the following power cords. 100 to 120 V range: SVT or SJT, AWG18, length: 3 m max., dielectric strength: 125 V min. 200 to 240 V range: H05VV-F, AWG18, length: 3 m max., dielectric strength: 250 V min.	
Do not use user-made light cables. Doing so may cause product failure.	
Plug the power cord directly into a wall socket. Using a power strip or connecting many loads from one electrical outlet may cause fire or electric shock.	
Do not place the product in direct sunlight or in a high-humidity environment. Doing so may result in fire due to internal temperature rise.	
Do not bundle product cables with high-voltage lines or power lines. Allow leeway when installing the cables.	
Always place the product on a stable and flat location. Doing so may result in the product falling or toppling, which may cause malfunction, accidents, or bodily injury.	
Always ground the power cord. Not doing so may cause product failure due to static electricity destroying electrical components including those in the Light Unit.	
Do not drop the product or subject it to impact. Doing so may cause product failure.	
Use Light Units that are suitable for the product ratings. Exceeding the ratings may cause product failure.	
Do not bend cables or jam them between objects when wiring. Doing so may cause product failure.	
Make sure that the length of the extension cable for light output is no longer than 5 m. If the extension cable is longer than 5 m, the voltage will drop due to the DC resistance of the cable, and the light intensity will decrease.	
Do not intentionally short-circuit the positive and negative output terminals.	
Do not disconnect the power cord or disassemble the product during operation. Pulling on the cable may damage the cable and result in fire or electric shock.	
Do not wipe the product with volatiles such as paint thinner or benzene. Discoloration or deterioration of the product surfaces may occur.	
Before moving the product, disconnect all connection cables. Damaging the cables may result in fire or electric shock.	
Use a dry cloth to remove dust or other foreign matter from the electrodes. Failure to do so may result in fire.	
When mounting products in system racks or cases, do not insert the screws more than 5 mm. Doing so may cause short-circuits in internal components.	

2 Names and Functions of Parts

Setting Indicators

BRT lit: The light intensity can be set.
PLS lit: The lighting mode can be set.
LOCK lit: The settings are locked.

Channel Selection Switch

Select the channel from L1 to L8. Only the channel on which Light Units are connected can be selected. The channels with same channel No. of 24V LIGHT and HLTV LIGHT are operated simultaneously.

Channel Indicators

The indicator for the selected channel will light. When the L1 indicator is lit, the settings for the L1 Light Unit in the 24V Light Units (24V LIGHT) and the L1 Light Unit in the Spotlights (HLTV LIGHT) can be changed.

External Control Connector

For external control with parallel communications.

Manual/External Mode Selector

Selects manual (MANU) or external (EXT) control mode.

Trigger Logic Switch

Selects the logic of the trigger signal.

Fan Air Inlet (Left side)

This is the air inlet for the cooling fan.

AC Inlet

Connects the power source to the Control Unit.

External Trigger Input Connector

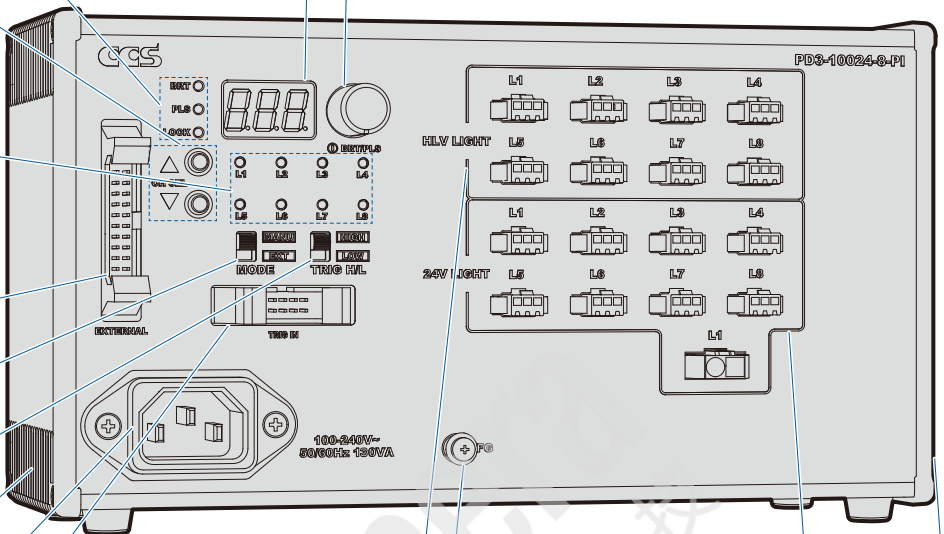
Inputs the ON/OFF signal for ON/OFF Mode.
Inputs the trigger signal for Strobe Mode.

Digital Window

Displays the setting of the light intensity or the setting of the lighting mode.

Setting Switch

Press: Switches between the light intensity setting and lighting mode setting.
Press for at least 2 seconds: Locks the settings.
Rotate: Sets the light intensity or lighting mode.



Output Connectors (HLTV LIGHT)

Connect these connectors to the Spotlights.
L1 to L8 (SMP-03V-BC)

FG terminal

Ground the FG terminal.

Output Connectors (24V LIGHT)

Connect these connectors to the 24V DC Light Units.
L1 to L8 (SMP-03V-BC), L1 (ELR-02V)

Fan Exhaust Outlet (Right side)

This is the air outlet for the cooling fan.

3 Installation

WARNING

Do not place any objects within 20mm from the fan air inlets or fan exhaust outlets. Insufficient ventilation may cause heat to accumulate inside the product and result in a fire.

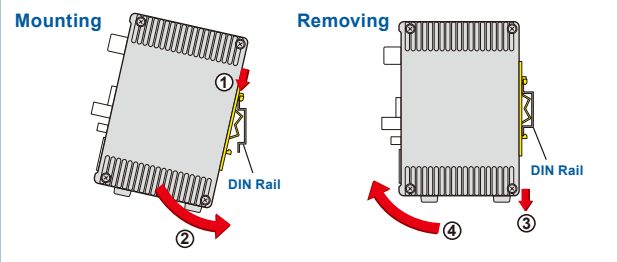
Mounting the Unit to DIN Rail

▶ Mounting to DIN Rail

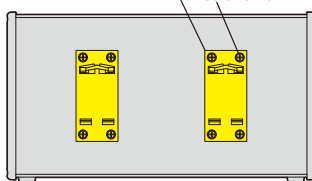
Hook the tab on the upper part of the Unit on the DIN rail and press the Unit in the direction indicated by arrow 2 while pressing it in the direction indicated by arrow 1.

▶ Removing from DIN Rail

Press the Unit down in the direction indicated by arrow 3 and pull it out in the direction indicated by arrow 4.



Rear
DIN rail brackets x 2
Screws x 8



Caution

Do not remove the DIN rail brackets. If they must be removed and attached again, make sure that you use the original screws (or M3 x 4 mm screws). If other screws are used, they may short-circuit internal components and electric shock may occur.

Securing the Unit with Base Brackets (Accessories)

Caution

Always use Base Brackets (model: BK-PD3) when securing the Unit at its base. If it is secured without the Brackets, the Unit may be damaged.

1 Removing the Rubber Feet from the Bottom of the Unit

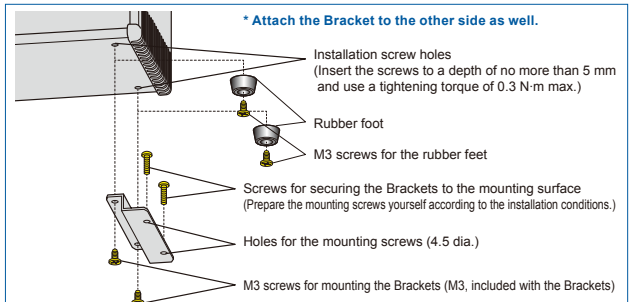
Remove the screws that hold the rubber feet in place using a Phillips screwdriver.

2 Securing the Brackets to the Base of the Unit

Secure the Brackets to the base of the Unit with the four screws that come with the Brackets.

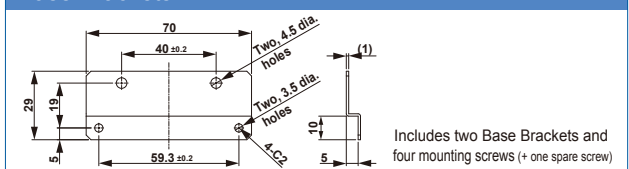
3 Securing the Unit with Mounting Screws

Secure the Unit in place with mounting screws. The mounting screws must be provided by the user.



Base Brackets

Model: BK-PD3



4 Connections



WARNING

Before connecting the Control Unit, make sure that the main power source is turned OFF. Making connections with the power turned ON may result in a fire or electric shock.

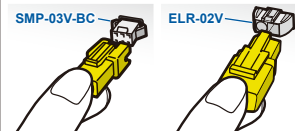
1 Connect the LED Light

Connect the connecting cable to the LED Light Unit to the output connector on the Control Unit.

Connect 24V DC Light Units to the 24V LIGHT output connectors, and Spotlights to the HLVLIGHT output connectors. One of the 24V LIGHT output connectors is an ELR-02V connector for a High-output Light Unit.

Connecting

Insert the connector to the Light Unit all the way in.



Removing

Press the lock and pull out the connector.

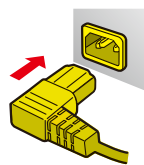


2 Connect the AC Cord

Connect the AC power cord to the AC inlet and a wall socket.

The AC cord that is included with the Unit is for 100 to 120V AC. We recommend using the following for 200 to 240V AC. Cable: GTCE-3 x 1.0 mm² (manufactured by Kawasaki Electric Wire Company), Connector: KS-31AY (manufactured by Kawasaki Electric Wire Company)

Connect the power cord to the Control Unit and a wall socket. The Control Unit will turn ON when power is supplied from the main power source. When the Unit is ON, the digital window will light.



Digital Window

The light intensity of the lowest channel is displayed.



(Display when No Light Unit is connected)



*Data that has been set is retained even after the power is turned OFF with manual or external control.

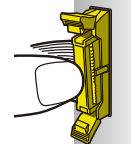
3 Connect the External Control Cable (Optional item, sold separately)

To perform external control, connect the external control cable to the external control connector.

An Optional External Control Cable (EXCB2-M20-3) and an Optional External Control/External Trigger Input Cable (EXCB2-M10M20-3) is available. (The external control and external trigger input can be connected with one cable.) In case using a self-made cable, cable length should be within 3 m at maximum.

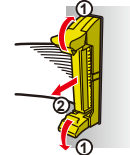
Connecting

Press the connector in until it locks in place.



Removing

Release the lock and remove the connector.



4 Connect the External Trigger Input Cable (Optional item, sold separately)

To use ON/OFF Mode or Strobe Mode, connect the external trigger input cable to the external trigger input connector.

An optional External Trigger Input Cable (EXCB2-M10-3) (sold separately) is available. In case using a self-made cable, cable length should be within 3 m at maximum.

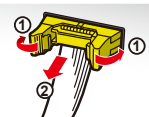
Connecting

Press the connector in until it locks in place.



Removing

Release the lock and remove the connector.



5 What You Can Achieve with This Control Unit

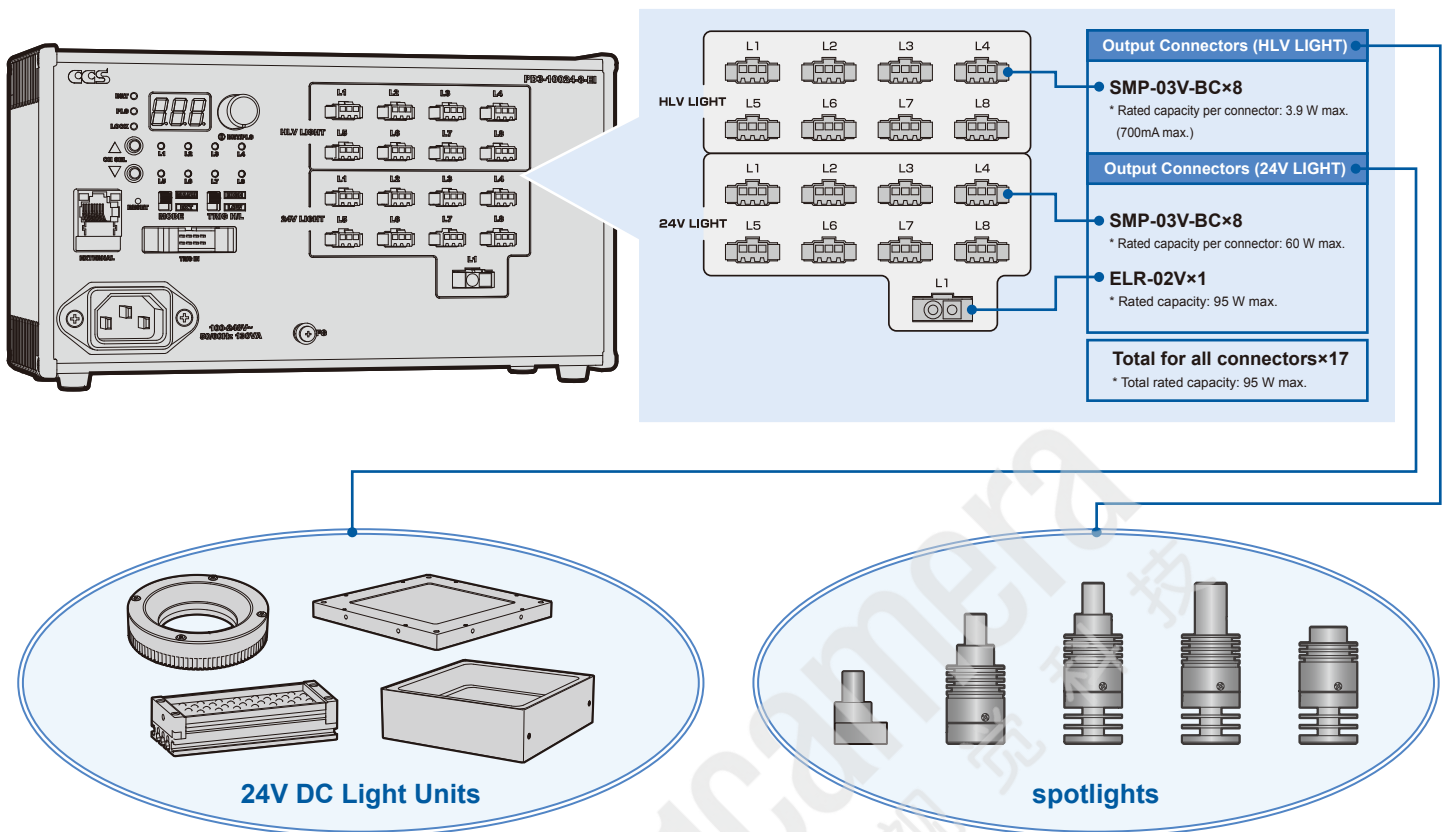
Select the control mode and lighting mode from the following Application Guide and proceed to the indicated reference items.

Application Guide

		Control Mode			
		Lighting Mode		MODE ↑ MANU EXT	Front panel operation
				MODE ↓ MANU EXT	External control using a PLC or image process device
Continuous Mode	The Light Units are always ON.	Power ON Power OFF Not lit. Lit.	To use manual control in Continuous Mode, refer to items 1 , 2 , and 3 under 7 Manual Control	To use external control in Continuous Mode, refer to items 1 , 2 , and 3 under 8 Control with External Signals	External Control Cable (EXCB2-M20-3)
	The Light Units are turned ON or OFF according to the external trigger signal input.	Photocoupler OFF Photocoupler ON * When the Trigger Logic Switch is set to HIGH Not lit. Lit. Not lit.	To use manual control in ON/OFF Mode, refer to items 1 , 2 , and 3 under 7 Manual Control and 9 Inputting the External Trigger	To use external control in ON/OFF Mode, refer to items 1 , 2 , and 3 under 8 Control with External Signals and 9 Inputting the External Trigger	External Control / External Trigger Input Cable (EXCB2-M10M20-3)
	The Light Units are turned ON for a set time after the external trigger signal is input.	Photocoupler OFF Photocoupler ON * When the Trigger Logic Switch is set to HIGH Not lit. Lit. Not lit.	To use manual control in Strobe Mode, refer to items 1 , 2 , 3 and 4 under 7 Manual Control and 9 Inputting the External Trigger	To use external control in Strobe Mode, refer to items 1 , 2 , 3 , and 4 under 8 Control with External Signals and 9 Inputting the External Trigger	External Control / External Trigger Input Cable (EXCB2-M10M20-3)

6 Light Unit Functions

This Control Unit can be connected to Light Units and Spotlights with 24V DC inputs. Connect 24V DC Light Units to the 24V LIGHT connectors and Spotlights to HLV LIGHT connectors. The functions vary with the Light Units that are connected. Check the following table before using the Light Units.



Item		24V LIGHT	HLV LIGHT	Reference page
Applicable illuminators		Light Units with 24V DC input voltage	spotlights: HLV2 series, HLV series* *not including HLV-27 series/HLV-14-R/ HLV-14-GR/HLV-14-BL/HLV-14-SW	10
Lighting method		PWM control or lighting time control	Variable current control	10
Lighting mode	Continuous mode	○	○	5, 6
	ON/OFF mode	○	○	5, 6
	Strobe mode	○	---	5, 6
Control mode	Manual control	○	○	5
	External control	○	○	6, 7
Number of connectors	SMP-03V-BC	8	8	2
	ELR-02V	1	---	2
Rated capacity	SMP-03V-BC	Per connector: 60 W max.	Per connector: 3.9 W max. (700mA max.)	10
	ELR-02V	95W max.	---	10
Lighting delay time		Depends on the power consumption of the Light Units.	Depends on the light intensity of the Light Unit.	8
Channel selection		Depends on which Light Units are connected/disconnected.	Only connected Light Units can be selected.	5
Light Unit connection detection		Detected when connected for the first time.	Detected at any time.	5
Power startup time		0.5 s	3 s	10

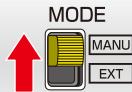
- Make sure that the main power source is turned ON.
- Set items **1**, **2**, and **3** when using Continuous Mode or ON/OFF Mode.
- Set items **1**, **2**, **3**, and **4** when using Strobe Mode.

1 Setting the Manual/External Mode Selector to Manual

Set the Manual/External Mode Selector to MANU to set Manual Mode.

Check

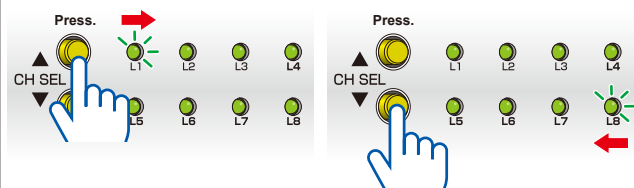
Make sure that the LOCK setting indicator is not light and that the trigger logic switch is set to HIGH. Otherwise you may not be able to perform the rest of this procedure.



2 Selecting the Channel

Press the channel selection switch to select the channel to set (L1 to L8). Press the channel selection switch ▲, to select the Light Units in order from L1 to L8. Press the channel selection switch ▼, to select the Light Units in order from L8 to L1. Only channels with Light Units connected to them can be selected.

(If a new Light Unit is connected, the lowest channel is automatically selected.)



Eight channels from L1 to L8 are allocated to the 24V LIGHT and HLTV LIGHT output connectors. (The ELR-02V connector for 24V LIGHT is L1.) When L1 is selected, settings for the L1 Light Unit for the 24V LIGHT connectors (both SMP-03V-BC/ELR-02V) and the HLTV LIGHT connectors can be changed. The 8 channels can be controlled separately.

Precautions for Channel Selection

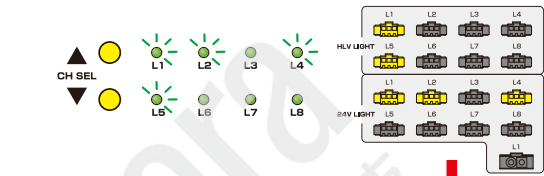
Only channels with Light Units connected to them can be selected. If a Light Unit is removed without turning OFF the power supply, the channel for the Light Unit that is no longer connected may be selected. This does not indicate a malfunction. Check the following table for details. There is risk of fire or electric shock. Make sure that the power supply is turned OFF when you connect Light Units or Spotlights.

Operation	24V LIGHT	HLTV LIGHT
The Light Unit was disconnected without turning OFF the power supply.	The channel with the disconnected Light Unit can be selected.	The channel with the disconnected Light Unit cannot be selected.
A Light Unit that is not supported was connected.	If there is an electrical connection, the Light Unit will light. (The channel can be selected.)	The Light Unit does not turn ON or an HLTV ID error occurs. (The channel cannot be selected.)

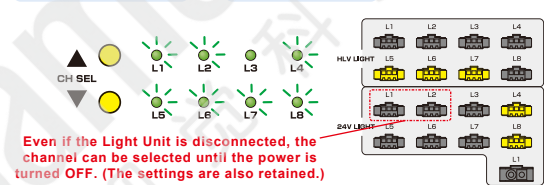
Connector Connection Example

Channels **L1, L2, L4 and L5** can be selected for the following connections:

HLTV LIGHT: L1 and L5 and **24V LIGHT: L1, L2 and L4**.



Channels **L1, L2, L4, L5, L6, L7 and L8** can be selected if the connections are changed to the following: **HLTV LIGHT: L5, L6, and L7** and **24V LIGHT: L4 and L8** without turning OFF the power supply.



Even if the Light Unit is disconnected, the channel can be selected until the power is turned OFF. (The settings are also retained.)

3 Setting the light Intensity

Press the setting switch to light the BRT setting indicator. Turn the setting switch to set a value between 0 and 255. (Default setting: **255**, Minimum: **000**, Maximum: **255**)



Digital Window	Light intensity (%)	
	24V LIGHT	HLTV LIGHT
000	0.4 (Dimly lit)	0.0 (Not lit)
001	0.8	0.4
002	1.2	0.8
...
254	99.6	99.6
255	100.0	100.0

* The light intensities are theoretical values.

4 Selecting the Lighting Mode

Press the setting switch to light the PLS setting indicator.

Turn the setting switch to select the lighting mode from Continuous Mode, ON/OFF Mode, or Strobe Mode. (Default value: **F00**)



4 Selecting the Lighting Mode (Continued)

Continuous Mode

Turn the setting switch and set **F00** to turn ON the Light Units continuously.

ON/OFF Mode (If the external trigger is not used, the Light Units are ON continuously.)

Turn the setting switch and set **F00** to turn the Light Units ON and OFF. The Light Units are turned ON or OFF according to the external trigger signal input.

Strobe Mode (If an external trigger is not used, the Light Units are OFF.)

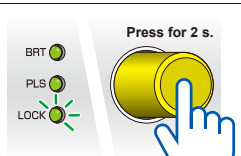
To flash the strobe, turn the setting switch and select a setting from **F01** to **F10** (strobe time of 40 μ s to 40 ms). The Light Units are turned ON for the period of time set on the setting switch after the external trigger signal is input. The Strobe Mode can be set for 24V DC Light Units only.

Digital Window	Status	
F00	Continuous Mode / ON/OFF Mode	
F01	Strobe Mode (The Strobe Mode can be set for 24V DC Light Units only.)	40 μ s
F02		80 μ s
F03		120 μ s
F04		200 μ s
F05		600 μ s
F06		1ms
F07		4ms
F08		10ms
F09		20ms
F10		40ms

For details on the external trigger input, refer to 9. Inputting the External Trigger.

Locking Settings

When the setting switch is pressed for 2 seconds or longer, the lighting mode and light intensity settings are locked, and the LOCK setting indicator lights. (The set values can be viewed.) Pressing the switch again for 2 seconds or longer releases the lock.



- Make sure that the main power source is turned ON.
- Set items **1**, **2**, and **3** when using Continuous Mode or ON/OFF Mode.
- Set items **1**, **2**, **3**, and **4** when using Strobe Mode.

1 Setting the Manual/External Mode Selector to External

Set the Manual/External Mode Selector to EXT to set External Mode. The value set with external control is displayed on the digital window.

* Although it is possible to set the external control setting even the manual/external mode selector is set to manual mode, the setting will not be activated until the manual/external mode selector is set to external mode.



2 Selecting the Channel

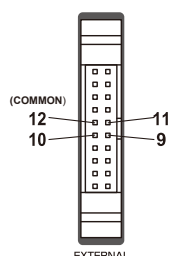
Select the channel (L1 to L8) to set.

Use pins 9 to 11 (CHSEL0 to CHSEL2) of the external control connector.

Refer to the following table for the settings.

Input the write signal and hold the setting status until writing is completed.

No.	11	10	9
Bit	CHSEL2	CHSEL1	CHSEL0
L1	0	0	0
L2	0	0	1
L3	0	1	0
L4	0	1	1
L5	1	0	0
L6	1	0	1
L7	1	1	0
L8	1	1	1



0: Photocoupler ON, 1: Photocoupler OFF

Eight channels from L1 to L8 are allocated to the 24V LIGHT and HLVLIGHT output connectors. (The ELR-02V connector for 24V LIGHT is L1.) When L1 is selected, settings for the L1 Light Unit for the 24V LIGHT connectors (both SMP-03V-BC/ELR-02V) and the HLVLIGHT connectors can be changed. The 8 channels can be controlled separately.

3 Setting the Light Intensity

There are 256 levels to the light intensity.

Use pins 1 to 8 (B0 to B7) of the external control connector.

Refer to the following table for the settings.

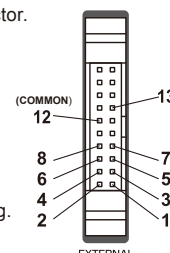
Continue writing data.

Input a signal to pin 13 (BRTWR) that turns ON

the photocoupler for at least 50 μ s.

After that, turn the photocoupler OFF to complete writing.

(Default setting: **000**, Minimum: **000**, Maximum: **255**)



No.	8	7	6	5	4	3	2	1	Light intensity (%)	
Digital window	B7	B6	B5	B4	B3	B2	B1	B0	24V LIGHT	HLV LIGHT
000	0	0	0	0	0	0	0	0	0.4 (Dimly lit)	0.0 (Not lit)
001	0	0	0	0	0	0	0	1	0.8	0.4
002	0	0	0	0	0	0	1	0	1.2	0.8
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
254	1	1	1	1	1	1	1	0	99.6	99.6
255	1	1	1	1	1	1	1	1	100.0	100.0

0: Photocoupler ON, 1: Photocoupler OFF

* The light intensities are theoretical values.

4 Selecting the Lighting Mode

Select the lighting mode form Continuous Mode, ON/OFF Mode, or Strobe Mode.

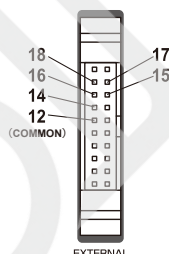
Use pins 15 to 18 (M0 to M3) of the external control connector.

Refer to the following table for the settings. (Default setting: **F00**)

Continue writing data.

Input a signal to pin 14 (TRGWR) that turns ON the photocoupler for at least 50 μ s.

After that, turn the photocoupler OFF to complete writing.



Continuous Mode

Refer to the following table and set the lighting mode to Continuous Mode.

ON/OFF Mode (If the external trigger is not used, the Light Units are ON continuously.)

Refer to the following table and set the lighting mode to ON/OFF Mode. The Light Units are turned ON or OFF according to the external trigger signal input.

Strobe Mode (If an external trigger is not used, the Light Units are OFF.)

The strobe time can be set to between 40 μ s and 40 ms in Strobe Mode. Refer to the following table for the settings.

The Light Units are turned ON for the set time after the external trigger signal is input. The Strobe Mode can be set for 24V DC Light Units only.

No.	18	17	16	15	Lighting mode
Digital window	M3	M2	M1	M0	
F00	0	0	0	0	Continuous Mode or ON/OFF Mode
F01	0	0	0	1	Strobe Mode (40 μ s)
F02	0	0	1	0	Strobe Mode (80 μ s)
F03	0	0	1	1	Strobe Mode (120 μ s)
F04	0	1	0	0	Strobe Mode (200 μ s)
F05	0	1	0	1	Strobe Mode (600 μ s)
F06	0	1	1	0	Strobe Mode (1ms)
F07	0	1	1	1	Strobe Mode (4ms)
F08	1	0	0	0	Strobe Mode (10ms)
F09	1	0	0	1	Strobe Mode (20ms)
F10	1	0	1	0	Strobe Mode (40ms)

0: Photocoupler ON, 1: Photocoupler OFF (Pins 1011 to 1111 are not valid.)

For details on the external trigger input, refer to 9. Inputting the External Trigger.

Input Signal and Photocoupler

The input signal from the external control connector turns the photocoupler inside the Control Unit ON and OFF to set and write data. The input signal is compatible with both the sinking and sourcing devices.

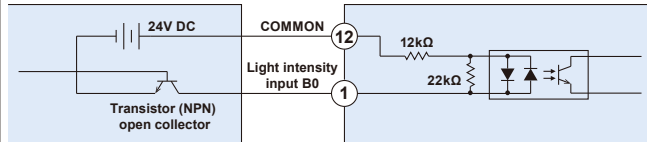
For a sinking device, the photocoupler is OFF when the input signal is high, and for a source type, the photocoupler is ON when the input signal is high.

	Signal input	Photocoupler	Data
Sinking	HIGH	OFF	1
	LOW	ON	0
Sourcing	HIGH	ON	0
	LOW	OFF	1

External Signal Connection Example

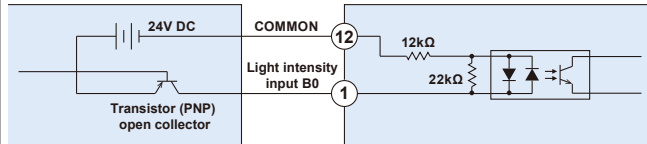
Sinking

External Circuits



Sourcing

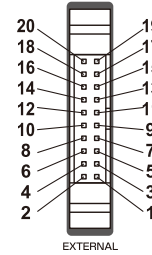
External Circuits



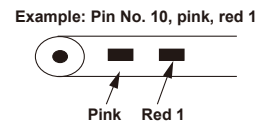
Signal Specifications					
Rated input voltage	Maximum input voltage	ON voltage/ ON current	OFF voltage/ OFF current	Response time	Input impedance
24V DC	26.4V DC	14.4V DC min./ 3 mA max.	5V DC max./ 1 mA max.	50μs max. (24V LIGHT) 100ms max. (HLV LIGHT)	12 kΩ (per terminal)

Connector Layout

External Control Connector Plug

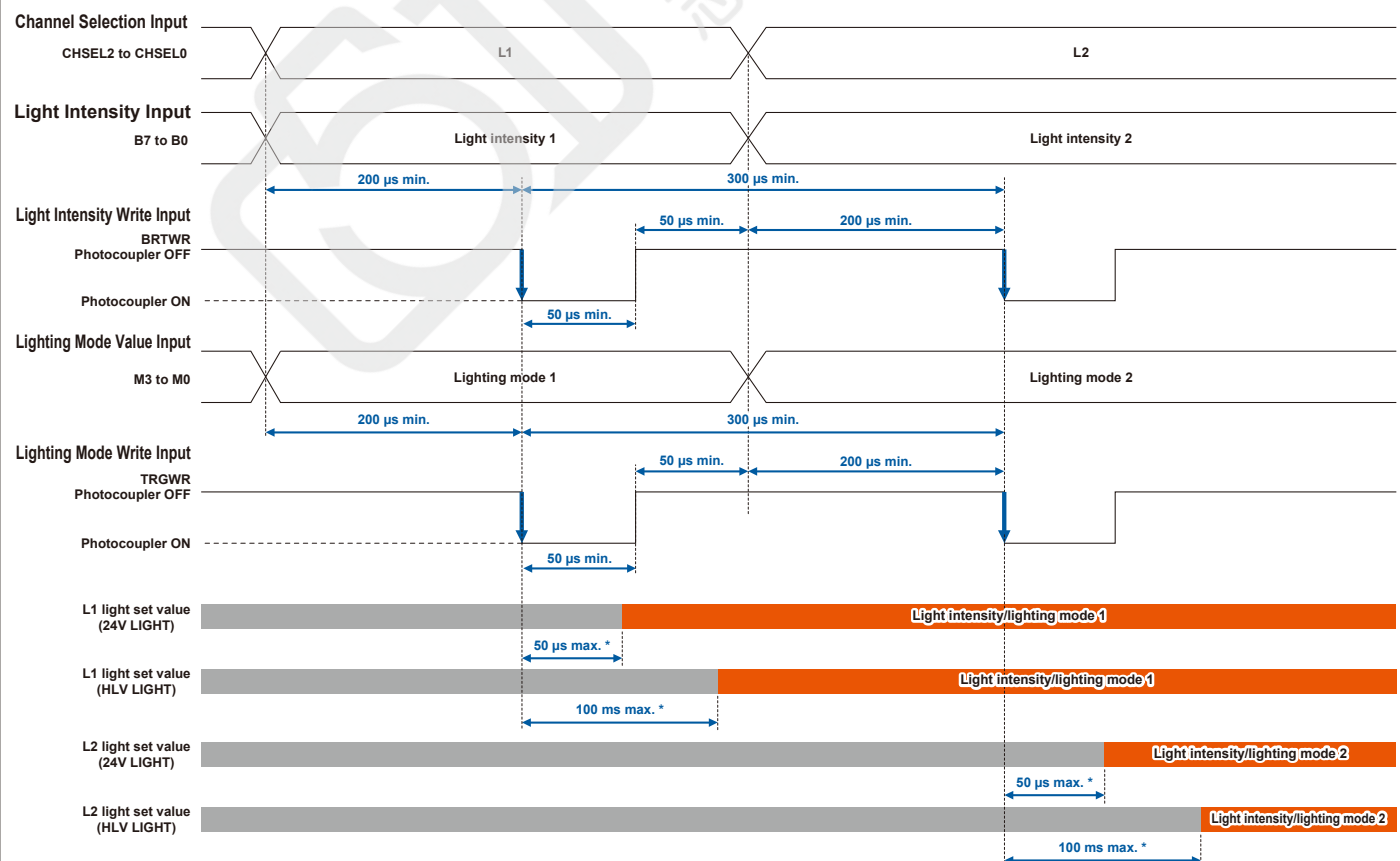


Enlarged Cable Diagram



No.	Bit	Signal	Cable			
			EXCB2-M20-3		EXCB2-M10M20-3	
			Wire color	Marks	Wire color	Marks
1	B0	Light Intensity Input (8 bits)	Orange	Black 1	Orange	Black 2
2	B1		Orange	Red 1	Orange	Red 2
3	B2		Gray	Black 1	Gray	Black 2
4	B3		Gray	Red 1	Gray	Red 2
5	B4		White	Black 1	White	Black 2
6	B5		White	Red 1	White	Red 2
7	B6		Yellow	Black 1	Yellow	Black 2
8	B7		Yellow	Red 1	Yellow	Red 2
9	CHSEL0	Channel Selection (3 bits)	Pink	Black 1	Pink	Black 2
10	CHSEL1		Pink	Red 1	Pink	Red 2
11	CHSEL2		Orange	Black 2	Orange	Black 3
12	COMMON		Orange	Red 2	Orange	Red 3
13	BRTWR	Light Intensity Write	Gray	Black 2	Gray	Black 3
14	TRGWR	Lighting Mode Write	Gray	Red 2	Gray	Red 3
15	M0	Lighting Mode Value Input (4 bits)	White	Black 2	White	Black 3
16	M1		White	Red 2	White	Red 3
17	M2		Yellow	Black 2	Yellow	Black 3
18	M3		Yellow	Red 2	Yellow	Red 3
19	OC	Error Output	Pink	Black 2	Pink	Black 3
20	OE		Pink	Red 2	Pink	Red 3

Sequence Diagram for Writing Data



* The response times of the 24V LIGHT and the HLVD LIGHT connectors are very different.

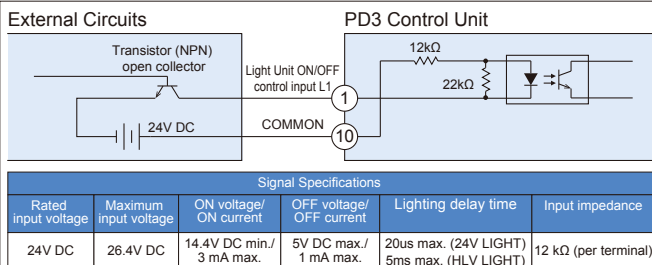
* If the data is rewritten during the response time for the light set value, the start of the rewrite that was input again is reset as the starting point.

Input Signal and Photocoupler

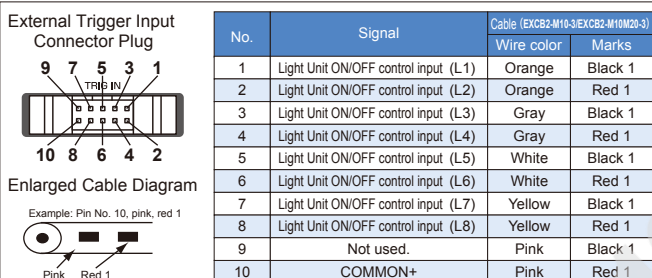
The input signal from the external trigger input connector can be used to control the photocoupler inside the Unit to turn the LED Light Units ON and OFF or to control strobe timing. The operation depends on the setting of the trigger logic switch.

Trigger Logic Switch	Input signal	Photocoupler	ON/OFF Mode	Strobe Mode
HIGH	HIGH	OFF	Light Units ON	Light Units ON for the set time.
	LOW	ON	Light Units OFF	No change
LOW	HIGH	OFF	Light Units OFF	No change
	LOW	ON	Light Units ON	Light Units ON for the set time.

External Trigger Signal Connection Example



Connector Layout

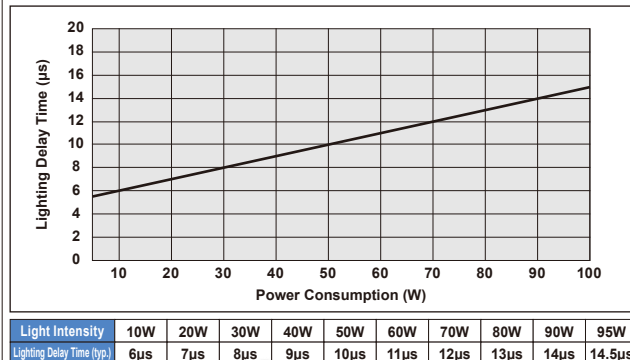


Lighting Delay Time

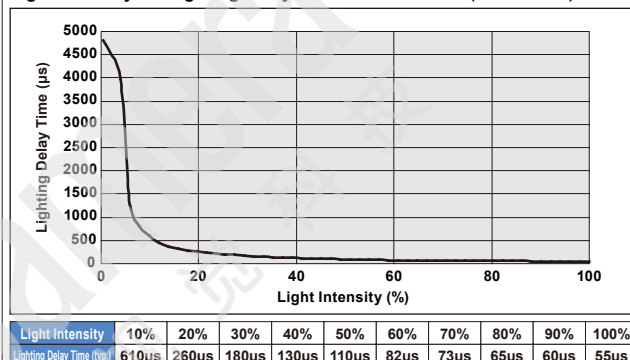
The lighting delay time for lights connected to 24V LIGHT connectors depends on the power consumption of the Light Unit. The lighting delay time for Spotlights connected to 24 HLK LIGHT depends on the intensity of the Spotlights. Refer to the following graphs and tables.

* The data in the graphs show reference values when a Light Unit or Spotlight with a 5-m cable is used. (The values are for reference only.)

Power Consumption vs. Lighting Delay Time Characteristic (24V LIGHT)



Light Intensity vs. Lighting Delay Time Characteristic (HLV LIGHT)

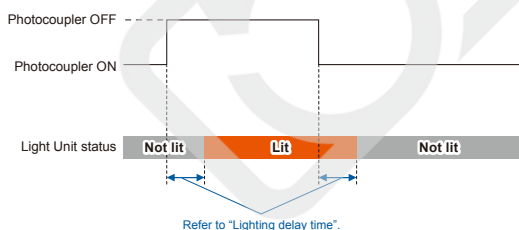


Trigger Input Sequence Diagram

ON/OFF Mode

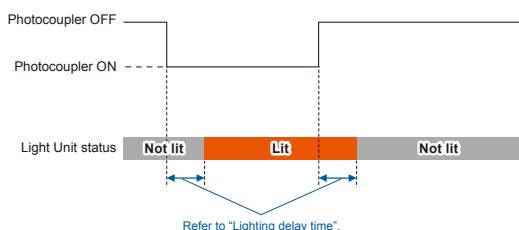
● Trigger Logic Switch Set to HIGH

The Light Units turn ON when the photocoupler is OFF, and OFF when the photocoupler is ON.



● Trigger Logic Switch Set to LOW

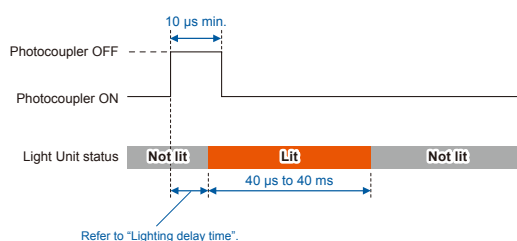
The Light Units turn ON when the photocoupler is ON, and OFF when the photocoupler is OFF.



Strobe Mode (Only 24V DC Light Units can be set.)

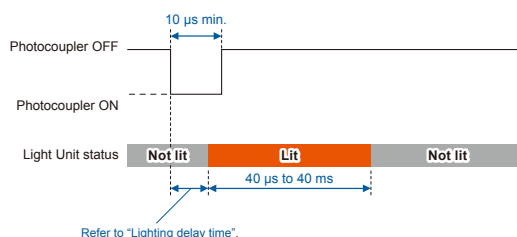
● Trigger Logic Switch Set to HIGH

From the point where the photocoupler goes OFF, the Light Units are turned ON for the set time (40 μs to 40 ms).



● Trigger Logic Switch Set to LOW

From the point where the photocoupler goes ON, the Light Units are turned ON for the set time (40 μs to 40 ms).



* If another trigger is input before the Light Unit turns OFF in Strobe Mode, the starting point of the reentered trigger is taken as the start time and the strobe light continues for the set time from that point.

10 Errors

If an internal error occurs in the Control Unit, it is displayed on the digital window. Refer to the following table and clear the error before using the Control Unit again.

Digital Window	Error	Status	Clearing the error	Recovery method
	Overcurrent Error The current consumption of the Light Unit exceeded 107% of the rating.	Output is stopped.	Check the rating of the LED Light Unit. Connect an LED Light Unit that is within the rating.	Press and hold the setting switch or cycle the power.
	Fan Stop Error The fan has stopped.	Output is stopped.	Doing so may cause product failure. Consult a CCS representative.	Press and hold the setting switch or cycle the power.
 OR 	HLV ID Error A Spotlight outside the ID range was connected to an HLV LIGHT connector. If the channel that is connected to a Spotlight that is outside the ID range is selected, an error will be displayed. Eld If no Light Unit has ever been connected to the same channel in the 24V LIGHT connectors, Eld will be displayed. 125 If a Light Unit is connected to the same channel in the 24V LIGHT connectors, "□□□" is displayed. ("□□□" is the set value.) Light Units that are connected to 24V LIGHT connectors can be set normally.	Normal	Check the Spotlight. Connect a Spotlight that is supported by the Control Unit.	Operation recovers automatically.

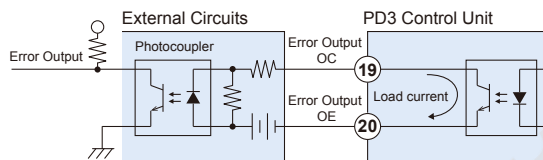
Error Output

The error status is output from pins 19 and 20 of the external control connector. (This applies only to overcurrent errors and fan stop errors.)

Normal operation	Error
Pins 19 and 20 are open.	Pins 19 and 20 are closed.

Signal Specifications
Rated input voltage: 24V DC
Maximum input voltage: 26.4V DC
Load current: 20 mA max.
Leakage current: 50 μA max.

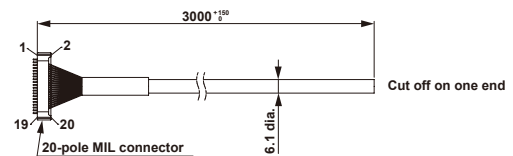
Error Output Circuit Example



11 Optional Accessories (Sold Separately)

External Control Cable

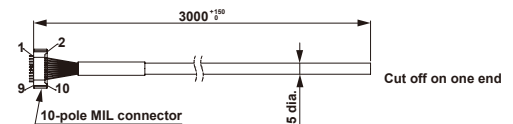
Model: EXCB2-M20-3



Connector: XG4M-2030-T (manufactured by OMRON)

External Trigger Input Cable

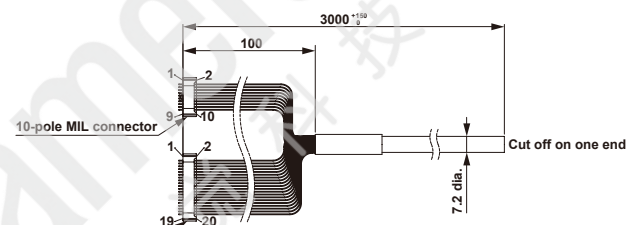
Model: EXCB2-M10-3



Connector: XG4M-1030-T (manufactured by OMRON)

External Control/External Trigger Input Cable (Common)

Model: EXCB2-M10M20-3



External control connector: XG4M-2030-T (manufactured by OMRON)
Trigger input connector: XG4M-1030-T (manufactured by OMRON)

12 Troubleshooting

If you have any problems during product usage, please look up the cause in this chart. If the situation does not improve, or an unexpected situation occurs, please contact CCS Inc.

Symptom	Items to check for fixing the problem	Reference page	Symptom	Items to check for fixing the problem	Reference page	
Lights not illuminating.	Are all power sources turned ON?	3	External light intensity control is not possible.	Is the external control cable inserted firmly into the external control connector and an external device?	3	
	Is the LED light cable inserted firmly into the output connector?	3		Are the external control cable and external device wired correctly? Check the connector configuration and correct the wiring. Both sinking and sourcing input signals are supported, but the signal inputs are different. Check the external signal connection examples.	7	
	Is the AC cord inserted firmly into the AC inlet and a wall socket?	3				
	Does the digital window show an error? Check the error display.	9				
	Is an appropriate Light Unit connected to the output connector? Check the Light Unit.	4		Is the signal setting correct? Check the setting method and sequence diagram.	6, 7	
	Is the output connector the correct one for the connected Light Unit? Connect 24V DC Light Units to the 24V LIGHT connectors and Spotlights to HLV LIGHT connectors.	4		Did you perform a write operation? Perform a write operation after you set the light intensity data.	6, 7	
	Is the lighting mode set correctly? Set the lighting mode to F00 for Continuous Mode or ON/OFF Mode.	5, 6		Unable to turn the Light Unit ON and OFF or use strobe control.	Is the external trigger input cable inserted firmly into the external trigger input connector and an external device?	3
	Does the logic of the trigger signal match the trigger signal setting switch?	8			Are the external trigger input cable and external devices wired correctly? Check the connector configuration and correct the wiring.	8
Is the external trigger input OFF (in ON/OFF Mode or Strobe Mode)? Check the setting method and sequence diagram.	8	Is the lighting mode set correctly? Set the value to F00 for ON/OFF Mode. Set the value to F01 to F10 for Strobe Mode.			5, 6	
		Is the signal setting correct? Check the setting method and sequence diagram.			8	
Light intensity control is not possible.	Is the manual/external switch set correctly? Set it to MANU to operate manually and to EXT for external control.	5, 6	Malfunctioning.	If you are using Strobe Mode with external control, did you perform a write operation? Perform a write operation after you set the lighting mode.	6, 7	
	Is an appropriate Light Unit connected to the output connector? Check the Light Unit.	4		Please use designated power sources with stable voltage. Sharing power sources with inverters, motors, etc., may cause malfunction.	—	
	Is the output connector the correct one for the connected Light Unit? Connect 24V DC Light Units to the 24V LIGHT connectors and Spotlights to HLV LIGHT connectors.	4				
	Have the wrong channels been selected? Check the channels whose lights are to be controlled.	5, 6		Do not bundle product cables with high-voltage lines or power lines. Doing so may cause the product to malfunction. Keep the product cables as far away from such lines as possible.	—	
	Is the setting switch locked? Press and hold the setting switch for more than two seconds to release the lock.	5	Fuming, extreme temperature, smell, noise, or other abnormality.	There is a possibility of product failure. Please stop usage immediately and turn OFF the power switch. Please do not attempt to use or repair the product, since it is dangerous, but contact CCS Inc.	—	

13 Main Specifications

Product name	Digital Control Unit for LED Light Units (with parallel communications)
Model	PD3-10024-8-PI
Rated capacity	95 W max. for 17 connectors total
Input power supply	100 to 240V AC (+10%, -15%), 130 VA, 50/60 Hz
Inrush current (typ.)	15 A (at 100V AC), 30 A (at 200V AC) from a cold start
Ground leakage current	3.5 mA max. (264V AC, 60 Hz, with no load)
Rated output voltage	24V DC
Insulation withstand voltage (input-output, input-FG)	1,500V AC for one minute, Cutoff current: 10 mA, 500V DC, 20 MΩ min.
Operating temperature and humidity	Temperature: 0 to 40°C, Humidity: 20% to 85% (with no condensation)
Storage temperature and humidity	Temperature: -20 to 60°C, Humidity: 20% to 85% (with no condensation)
Vibration resistance	Acceleration: 19.6 m/s ² , Frequency: 10 to 55 Hz, Cycles: 3 minutes, Sweep cycle: For 1 hour each in X, Y, and Z directions
Cooling method	Forced air cooling
CE Marking	Safety standard: Conforms to EN 61010-1, EMC standard: Conforms to EN 61326, Class A.
PSE	Specified Electrical Appliance and Material (DC power supply units) Conformity with METI Ordinance Article 1
Environmental regulations	RoHS compliant
Input connector	AC input: 3-pin inlet EN 60320-1 certified C14 type × 1
External control connector	Trigger input: MIL connector (MIL-C-83503 compliant), 10-pole For setting the light intensity/lighting mode: MIL connector (MIL-C-83503 compliant), 20-pole
Material and surface processing	Material: Aluminum and resin, Surface processing: Blue alumite
Weight	1500 g max.
Accessories	2-m long 3-pin power cord with ground terminal x1, Base Brackets x1 set, Instruction Guide x1

Specifications for Different Output Connectors

Input type	24V LIGHT	HLV LIGHT
Applicable illuminators	24V DC Light Units	Spotlights: HLV2 series, HLV series* *not including HLV-27 series/HLV-14-R/HLV-14-GR/HLV-14-BL/HLV-14-SW
Rated capacity	60W max. (SMP-03V-BC/1 connector) 95W max. (ELR-02V)	3.9W (700mA) max. (SMP-03V-BC/1 connector)
Lighting method	PWM control (125kHz) or lighting time control	Variable current control
Light Unit connection detection	Detected when connected for the first time.	Detected at any time.
Power startup time	0.5 s	3 s
Output connectors	SMP-03V-BC (J.S.T. Mfg. Co., Ltd.) x 8 ELR-02V (J.S.T. Mfg. Co., Ltd.) x 1	SMP-03V-BC (J.S.T. Mfg. Co., Ltd.) x 8

Environmental Regulation

EU RoHS Directive

The RoHS Directive is short for the "restriction of use of certain hazardous substances in electrical and electronic equipment." As a directive, it restricts the use of specific hazardous substances for new electrical and electronic equipment marketed in the EU on or after July 1, 2006, and restricts the use of six substances, which are (1) lead, (2) mercury, (3) cadmium, (4) hexavalent chromium, (5) polybrominated biphenyl (PBB), and (6) polybrominated diphenyl ether (PBDE).

*Standards for "RoHS Directive-Compliant Products"

Lead	Mercury	Cadmium	Hexavalent chromium	PBB	PBDE
1000 ppm max.	1000 ppm max.	100 ppm max.	1000 ppm max.	1000 ppm max.	1000 ppm max.

(Items that are exempted in the RoHS Directive are excluded from these standards.)

China RoHS Directive

China RoHS Directive is formally known as "Management Methods for Controlling Pollution by Electronic Information Products", which was implemented on March 1, 2007 in China. Same as EU RoHS Directive, this regulation restricts the usage of six substances such as lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyl (PBB), and polybrominated diphenyl ether (PBDE). This regulation requires electronic information products which are manufactured or imported, and sold in China, to clearly disclose contents of the 6 restricted substances listed below.

Name and Amount of Toxic and Hazardous Substances or Elements

Usage deadline for environmental protection	Product name	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexavalent chromium (Cr (VI))	PBB	PBDE
10	Control Unit for LED Lights	×	○	×	○	○	○

○ : Indicates that this toxic or hazardous substances contained in all the homogeneous materials for this part, according to SJ/T11363-2006 is within the limit requirement.

× : Indicates that this toxic or hazardous substance contained in all the homogeneous materials for this part, according to SJ/T11363-2006, is over the limit requirement.

*Lead and cadmium are excluded in EU RoHS.

Usage Deadline for Environmental Protection

The number used in this logo is based on "Management Methods for Controlling Pollution by Electronic Information Products" and related regulations from People's Republic of China. It shows the product usage duration in years for environmental protection. After finishing a product usage, the product needs to be re-used or discarded appropriately following local law and regulations, with safety and usage caution.

产品中有害物质或元素的名称及含量

环保使用期限	产品	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr (VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
10	LED 照明专用电源	×	○	×	○	○	○

○ : 表示该有毒有害物质在该部件所有均质材料中的含量均在 SJ/T11363-2006 标准规定的限量要求以下。

× : 表示该有毒有害物质至少在该部件的某一均质材料中的含量超出 SJ/T11363-2006 标准规定的限量要求。

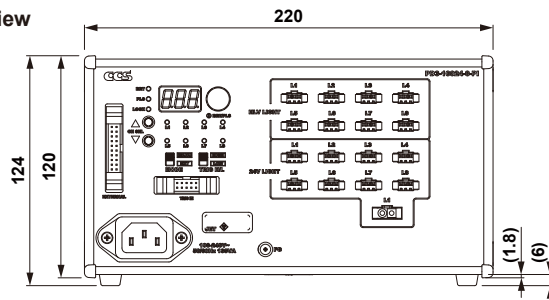
(注) 铅和镉中的“×”，因欧洲 RoHS 没限定，故用“○”表示。

环保使用期限

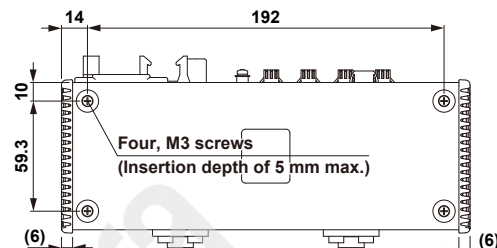
此标志的数字是根据中华人民共和国电子信息产品污染控制管理办法以及有关标准等，表示该产品的环保使用期限的年限。遵守产品的安全和使用上的注意，在产品使用后采取适当的方法根据各地法律，规定，回收再利用或进行废弃处理。

14 Dimensions

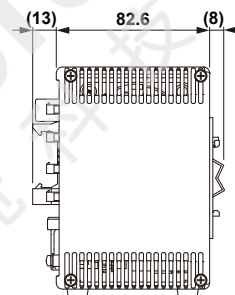
Front View



Side View



Bottom View



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WARRANTY PERIOD: TWO YEARS, STARTING FROM CCS Inc. SHIPPING DATE.

CCS Inc. WILL REPAIR OR REPLACE THE PRODUCT FREE OF CHARGE IF IT SHOULD FAIL TO FUNCTION WITHIN THE SPECIFIED WARRANTY PERIOD. IF EITHER OF THESE CONDITIONS OCCURS, PLEASE TAKE THE PRODUCT TO YOUR CCS SALES REPRESENTATIVE.

WARRANTY TERMS

- CCS Inc. WILL REPAIR OR REPLACE THE PRODUCT FREE OF CHARGE IF IT SHOULD FAIL TO FUNCTION UNDER USE ON OUR SPECIFIED CONDITION IN ACCORDANCE WITH THE INSTRUCTION GUIDE AND OTHER WRITTEN CAUTIONS DURING THE INDICATED WARRANTY PERIOD OF TWO YEARS.
- CCS Inc. WILL CHARGE A REPAIR FEE UNDER THE FOLLOWING CONDITIONS:
 - IF THE PRODUCT HAS BEEN SUBJECTED TO MISUSE, UNAUTHORIZED REPAIRS, OR MODIFICATION FROM ITS ORIGINAL DESIGN.
 - IF THE PRODUCT HAS BEEN DAMAGED FROM IMPACTS DUE TO INAPPROPRIATE HANDLING.
 - IF DAMAGE TO THE PRODUCT RESULTS FROM EXTERNAL CAUSES INCLUDING ACCIDENTS, FIRE, POLLUTION, RIOTS, COMMUNICATION FAILURES, EARTHQUAKES, THUNDERSTORMS, WIND AND FLOOD DAMAGE, OR ANY OTHER ACT OF PROVIDENCE, OR FROM ANY EXTRAORDINARY CONDITIONS SUCH AS ELECTRICAL SURGES, WATER LEAKAGE, CONDENSATION, OR THE USE OF CHEMICALS.
 - IF THE DAMAGE RESULTS FROM CONNECTION TO ANY LED LIGHT UNIT OR TO ANY EQUIPMENT WHICH CCS Inc. DOES NOT MANUFACTURE OR DOES NOT SPECIFY FOR USE.
- CCS ASSUMES NO LIABILITY FOR ANY PURCHASER'S SECONDARY DAMAGE (DAMAGE OF EQUIPMENT, LOSS OF OPPORTUNITIES, LOSS OF PROFITS, ETC.) OR ANY OTHER DAMAGE RESULTING FROM A FAILURE OF OUR PRODUCT.

THIS WARRANTY INFORMATION PROVIDES THE SCOPE OF CCS'S PRODUCT WARRANTY WITHIN THE SPECIFIED PERIOD, AND DOES NOT INDICATE OR IMPLY ANY FURTHER GUARANTEE BEYOND THE WARRANTY TERMS.

CONTACT CCS FOR INQUIRIES OR INFORMATION ON REPAIRS TO THE PRODUCT AFTER THE EXPIRATION OF THE WARRANTY.

Do not use the product in the following situations.

- Under conditions or in an environment not described in this instruction guide.
- In nuclear energy control systems, railroad systems, aviation systems, vehicles, combustion equipment, medical equipment, amusement machines, or safety equipment.
- In applications involving serious risk to life or property, particularly applications demanding a high level of safety.

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Ask any product queries to the following address or to your nearest CCS representative.

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Use our website to find your nearest CCS representative.

➡ <http://www.ccs-grp.com/mvwd/>