

# Control Unit for LED Light Units

## PD3-5024-4-PT(A)

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 4 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.

	<b>WARNING</b>	Indicates that incorrect usage may result in serious injury or death.		<b>Caution</b>	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	MANDATORY ACTIONS
These symbols indicate prohibited actions.				This symbol indicates required actions.

<b>WARNING</b>	
Do not disassemble or modify the Control Unit. Doing so may result in fire or electric shock.	DISASSEMBLY PROHIBITED
Do not touch the plugs or switches with wet hands. Doing so may result in electric shock.	DO NOT TOUCH WITH WET HANDS
Make sure that the Control Unit is free of moisture or any liquid. Doing so may result in fire or electric shock.	DO NOT SUBJECT TO MOISTURE
Before connecting or disconnecting cables, make sure that the power source is turned OFF. Not doing so may result in fire or electric shock.	MANDATORY ACTIONS
Do not touch the power cords during lightning. This may result in electric shock.	PROHIBITED
If abnormal condition occurs such as fuming, heat, smell, noise, or so on, stop using the Control Unit immediately, and turn off the power source. A fire or electric shock may result if the Control Unit is kept used.	MANDATORY ACTIONS

<b>Caution</b>	
Do not connect any Light Units other than CCS LED Light Units. Doing so may cause overcurrent and the device may overheat or ignite.	PROHIBITED
Do not bundle Control Unit cables with high-voltage lines or power lines. Allow leeway when installing the cables.	MANDATORY ACTIONS
Do not use user-made branch cables. Doing so may cause Control Unit failure.	PROHIBITED
Use Light Units that are suitable for the Control Unit ratings. Exceeding the ratings may cause Control Unit failure.	MANDATORY ACTIONS
Do not place the Control Unit in direct sunlight or in a high-humidity environment. Doing so may result in fire due to internal temperature rise.	PROHIBITED
Use a standard Extension Cable that is manufactured by CCS. However, if the cable is too long, the light intensity will decrease due to voltage drop caused by the DC resistance of the cable.	MANDATORY ACTIONS
Always place the Control Unit on a stable and flat location. Not doing so may result in the Control Unit falling or toppling, which may cause malfunction, accidents, or bodily injury.	PROHIBITED
Always hold onto the plug or connector when disconnecting the cables. Pulling on the cable may damage the cable and result in fire or electric shock.	MANDATORY ACTIONS
Do not drop the Control Unit or subject it to impact. Doing so may cause Control Unit failure.	PROHIBITED
Before moving the Control Unit, disconnect all connection cables. Damaging the cables may result in fire or electric shock.	MANDATORY ACTIONS
Do not bend cables or jam them between objects when wiring. Doing so may cause Control Unit failure.	PROHIBITED
When mounting the Control Units in system racks or cases, do not insert the screws more than 5 mm. Doing so may cause short-circuits in internal components.	MANDATORY ACTIONS
Do not intentionally short-circuit the positive and negative output terminals.	PROHIBITED
Use a dry cloth to remove dust or other foreign matter from the electrodes. Failure to do so may result in fire.	MANDATORY ACTIONS
Be sure to use the Control Unit within the range of input voltage. Applying the voltage beyond the range may cause Control Unit failure.	PROHIBITED
Do not wipe the Control Unit with volatiles such as paint thinner or benzene. Discoloration or deterioration of the Control Unit surfaces may occur.	PROHIBITED

## 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 L4. Only the channel on which Light Units are connected can be selected. The channels with same channel No. of 24V LIGHT and HL V 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 (HLV 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 of the intensity.

### Trigger Logic Switch

Selects the logic of the trigger signal.

### Fan Air Inlet (Left side)

This is the air inlet for the cooling fan.

### Terminal Block

Connects the power source to the Control Unit.

### External Trigger Input Connector

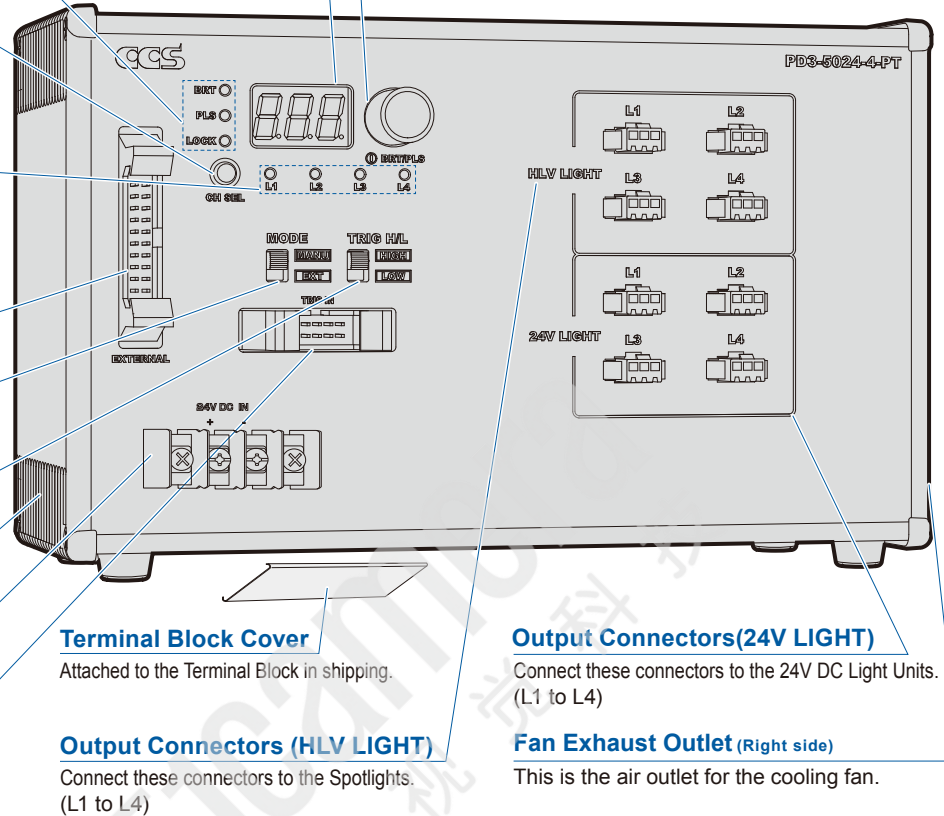
Inputs the ON/OFF signal for ON/OFF Mode.  
 Inputs the trigger signal for Strobe Mode.

### Digital Display

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.



## 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.

### 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.

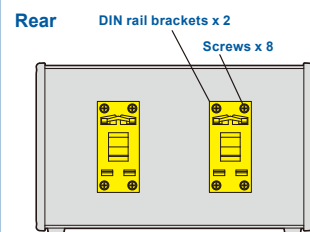
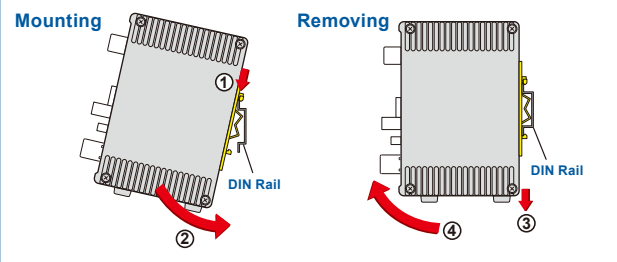
### Mounting the Unit to DIN Rail

#### ▶ 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.



### 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.

### 1 Removing the Rubber Feet from the Bottom of the Unit

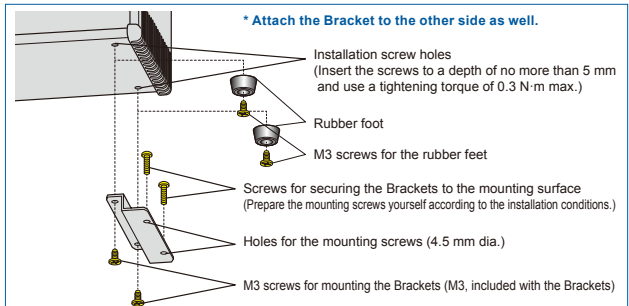
Remove the screws that hold the rubber feet in place using a Phillips screwdriver.

### 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.

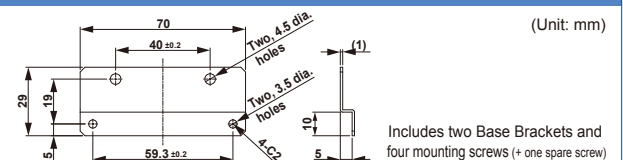
### 3 Securing the Unit with Mounting Screws

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.

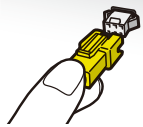
### 1 Connect the LED light

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 HLV LIGHT output connectors.

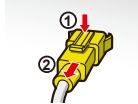
#### Connecting

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



#### Removing

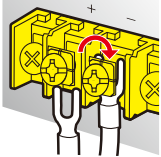
Press the lock and pull out the connector.



### 2 Connect the power cord

Connect the power cord to the Terminal Block and the main power source, then attach the Terminal Block Cover onto the Terminal Block.

The Control Unit will turn ON when power is supplied from the main power source. When the Unit is ON, the digital display will light.



#### Digital Display

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.



#### Caution

- Be sure to connect cables properly with insulated M3 crimp terminals (width: 6.2mm max.). Improper connections may cause fires or product failure.
- Pay attention to the polarity(+/-) when connecting the power cord.

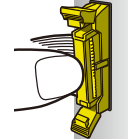
### 3 Connect the external control cable (Optional item, sold separately)

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.

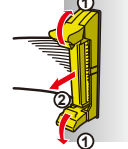
#### Connecting

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.

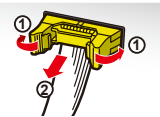
#### Connecting

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

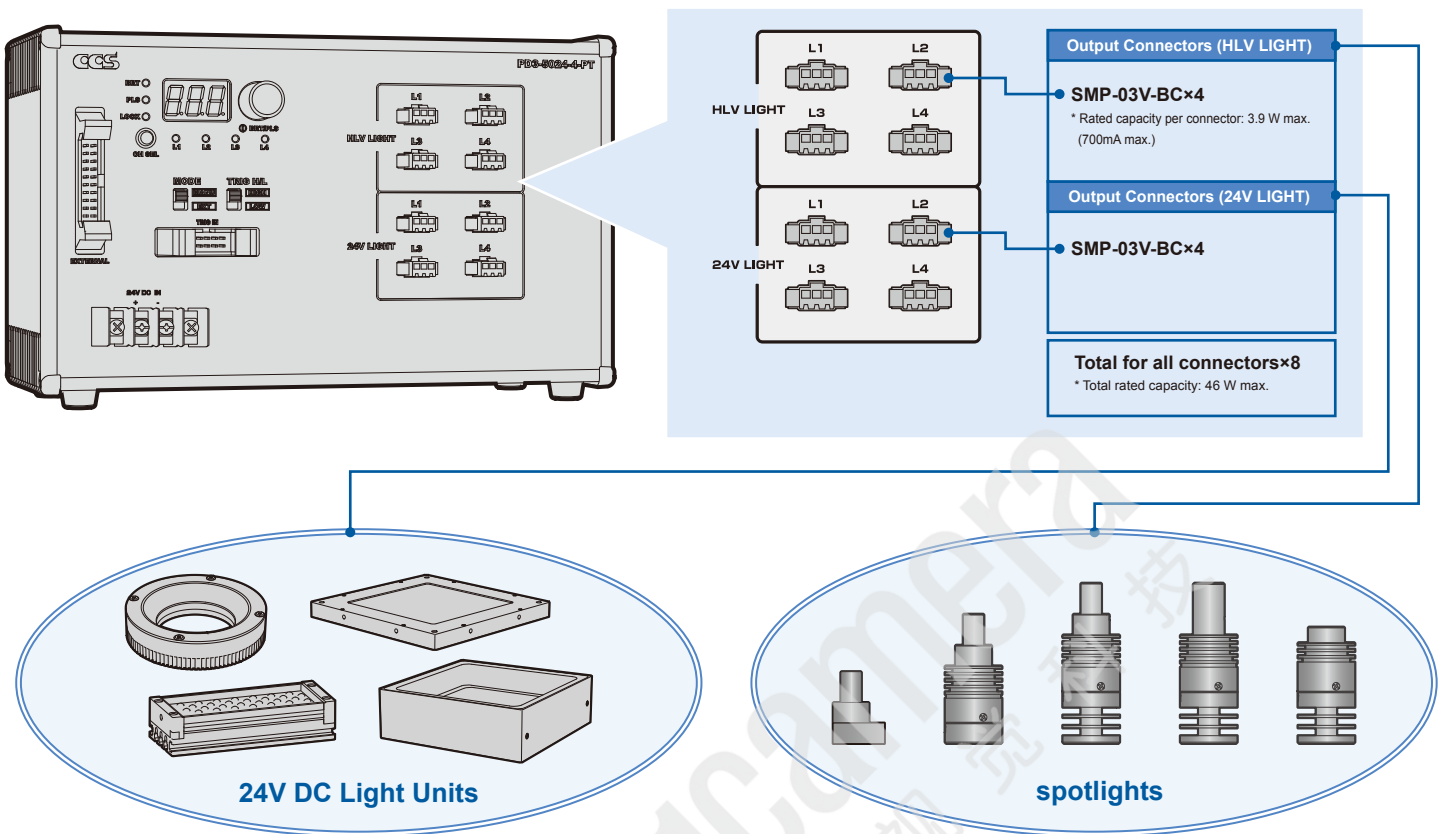
Select the intensity control mode and lighting mode from the following Application Guide and proceed to the indicated reference items.

### Application Guide

		Intensity Control Mode	Intensity control on the front panel	External control of the intensity using a PLC or image process device
Lighting Mode	Continuous Mode	The Light Units are always ON. 	To use manual control in Continuous Mode, refer to items <b>1</b> , <b>2</b> , and <b>3</b> under <b>7 Manual Control</b> .	To use external control in Continuous Mode, refer to items <b>1</b> , <b>2</b> , and <b>3</b> under <b>8 Control with External Signals</b> . 
	ON/OFF Mode	The Light Units are turned ON or OFF according to the external trigger signal input. 	To use manual control in ON/OFF Mode, refer to items <b>1</b> , <b>2</b> , and <b>3</b> under <b>7 Manual Control</b> and <b>9 Inputting the External Trigger</b> . 	To use external control in ON/OFF Mode, refer to items <b>1</b> , <b>2</b> , and <b>3</b> under <b>8 Control with External Signals</b> and <b>9 Inputting the External Trigger</b> . 
	Strobe Mode	The Light Units are turned ON for a set time after the external trigger signal is input. 	To use manual control in Strobe Mode, refer to items <b>1</b> , <b>2</b> , <b>3</b> and <b>4</b> under <b>7 Manual Control</b> and <b>9 Inputting the External Trigger</b> . (Only 24V DC Light Units can be set.) 	To use external control in Strobe Mode, refer to items <b>1</b> , <b>2</b> , <b>3</b> , and <b>4</b> under <b>8 Control with External Signals</b> and <b>9 Inputting the External Trigger</b> . (Only 24V DC Light Units can be set.) 

## 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: HLV3-14, HLV3-2-1/2, and HLV3-22-2-1220 series 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
Rated capacity	46W max.	Per connector: 3.9 W max. (700mA 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.

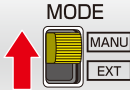
\* If you have changed the lighting mode from the default value, set it to "Continuous Mode or ON/OFF Mode" in item **4**.

## 1 Setting the Manual/External Mode Selector to Manual

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

**Check**

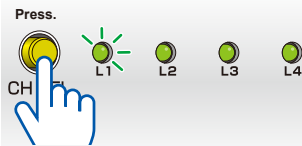
Make sure that the LOCK setting indicator is not light and that the trigger logic switch is set to HIGH. Otherwise you may not be able to perform the rest of this procedure.



## 2 Selecting the Channel

Press the channel selection switch to select the channel to set (L1 to L4). Only channels with Light Units connected to them can be selected. (If a new Light Unit is connected, the lowest channel is automatically selected.)

Four channels from L1 to L4 are allocated to the 24V LIGHT and HL V LIGHT output connectors. When L1 is selected, settings for the L1 Light Unit for the 24V LIGHT connectors and the HL V LIGHT connectors can be changed. The 4 channels can be controlled separately.



## Precautions for Channel Selection

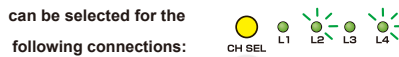
Only channels with Light Units connected to them can be selected. If a Light Unit is removed without turning OFF the power supply, the channel for the Light Unit that is no longer connected may be selected. This does not indicate a malfunction. Check the following table for details. There is risk of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

Operation	24V LIGHT	HLV 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 HL V ID error occurs. (The channel cannot be selected.)

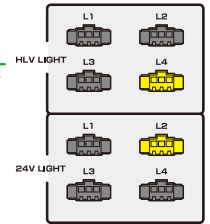
## Connector Connection Example

Channels **L2 and L4**

can be selected for the following connections:

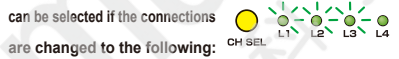


HLV LIGHT : L4  
and  
24V LIGHT : L2



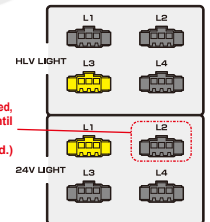
Channels **L1, L2 and L3**

can be selected if the connections are changed to the following:



HLV LIGHT : L3  
and  
24V LIGHT : L1

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: **000**, Minimum: **000**, Maximum: **255**)



Digital display	Light intensity (%)	
	24V LIGHT	HLV LIGHT
000 <b>000</b>	0.4 (Dimly lit)	0.0 (Not lit)
001 <b>001</b>	0.8	0.4
002 <b>002</b>	1.2	0.8
⋮	⋮	⋮
254 <b>254</b>	99.6	99.6
255 <b>255</b>	100.0	100.0

\* The light intensities are theoretical values.

\* When the small value larger than or equal to 001 is set to the Light Unit connected to the HL V LIGHT connector, depending on the model of the Light Unit and the cable length, the Light Unit may not turn ON.

## 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.)

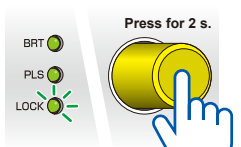
To flash the strobe, turn the setting switch and select a setting from **F01** to **F10** (strobe time of 40 μs to 40 ms). The Light Units are turned ON for the period of time set on the setting switch after the external trigger signal is input. The Strobe Mode can be set for 24V DC Light Units only.

Digital Display	Status
F00 <b>F00</b>	Continuous Mode or ON/OFF Mode
F01 <b>F01</b>	
F02 <b>F02</b>	
F03 <b>F03</b>	Strobe Mode (The Strobe Mode can be set for 24V DC Light Units only.)
F04 <b>F04</b>	
F05 <b>F05</b>	
F06 <b>F06</b>	
F07 <b>F07</b>	
F08 <b>F08</b>	
F09 <b>F09</b>	
F10 <b>F10</b>	

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.



## 8 Control with External Signals

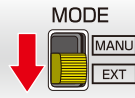
For the sequence of signal inputs, also refer to "Sequence Diagram for Writing Data" on the next page.

- 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.

\* If you have changed the lighting mode from the default value, set it to "Continuous Mode or ON/OFF Mode" in item **4**.

### 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 display.



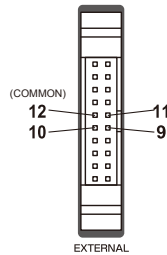
\* Although it is possible to set the external control setting even the manual/external mode selector is set to manual mode, the setting will not be activated until the manual/external mode selector is set to external mode.

### 2 Selecting the Channel

Select the channel (L1 to L4) to set. Use pins 9 to 11 (CHSEL0 to CHSEL2) of the external control connector. Refer to the following table for the settings.

See "Sequence Diagram for Writing Data" on the next page, and hold the setting status of the channels while writing the data in item **3** (or in items **3** and **4**).

No.	11	10	9
Bit	CHSEL2	CHSEL1	CHSEL0
L1	0	0	0
L2	0	0	1
L3	0	1	0
L4	0	1	1



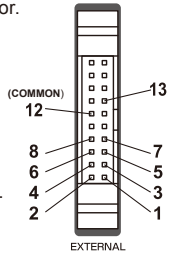
0: Photocoupler ON, 1: Photocoupler OFF (Pins 100 to 111 are not valid.)

Four channels from L1 to L4 are allocated to the 24V LIGHT and HLVLIGHT output connectors. When L1 is selected, settings for the L1 Light Unit for the 24V LIGHT connectors and the HLVLIGHT connectors can be changed. The 4 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  $\mu$ 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 display	B7	B6	B5	B4	B3	B2	B1	B0	24V LIGHT	HLV LIGHT
<b>000</b>	0	0	0	0	0	0	0	0	0.4 (Dimly lit)	0.0 (Not lit)
<b>001</b>	0	0	0	0	0	0	0	1	0.8	0.4
<b>002</b>	0	0	0	0	0	0	1	0	1.2	0.8
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
<b>254</b>	1	1	1	1	1	1	1	0	99.6	99.6
<b>255</b>	1	1	1	1	1	1	1	1	100.0	100.0

\* The light intensities are theoretical values.

0: Photocoupler ON, 1: Photocoupler OFF

\* When the small value larger than or equal to 001 is set to the Light Unit connected to the HLVLIGHT connector, depending on the model of the Light Unit and the cable length, the Light Unit may not turn ON.

### 4 Selecting the Lighting Mode

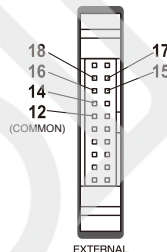
Select the lighting mode form Continuous Mode, ON/OFF Mode, or Strobe Mode.

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  $\mu$ 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  $\mu$ 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 display	M3	M2	M1	M0	
<b>F00</b>	0	0	0	0	Continuous Mode or ON/OFF Mode
<b>F01</b>	0	0	0	1	Strobe Mode (40 $\mu$ s)
<b>F02</b>	0	0	1	0	Strobe Mode (80 $\mu$ s)
<b>F03</b>	0	0	1	1	Strobe Mode (120 $\mu$ s)
<b>F04</b>	0	1	0	0	Strobe Mode (200 $\mu$ s)
<b>F05</b>	0	1	0	1	Strobe Mode (600 $\mu$ s)
<b>F06</b>	0	1	1	0	Strobe Mode (1ms)
<b>F07</b>	0	1	1	1	Strobe Mode (4ms)
<b>F08</b>	1	0	0	0	Strobe Mode (10ms)
<b>F09</b>	1	0	0	1	Strobe Mode (20ms)
<b>F10</b>	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.

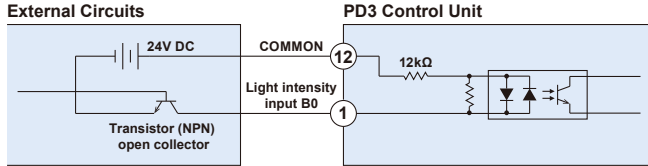
▶ Input Signal and Photocoupler

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.

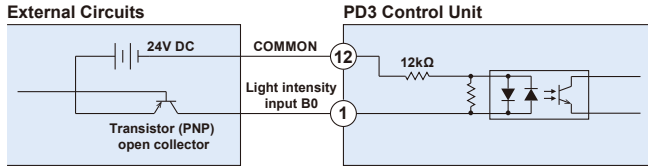
	Signal input	Photocoupler	Data
Sinking	HIGH	OFF	1
	LOW	ON	0
Sourcing	HIGH	ON	0
	LOW	OFF	1

▶ External Signal Connection Example

Sinking



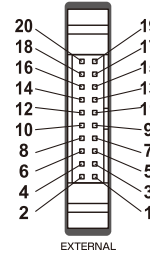
Sourcing



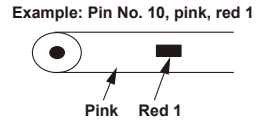
Connection Specifications (for Each Terminal)				
Rated input voltage	Maximum input voltage	Photocoupler ON voltage/ON current	Photocoupler OFF voltage/OFF current	Response time
24V DC	26.4V DC	14.4V DC min./ 1 mA min.	5V DC max./ 0.4 mA max.	Refer to the Sequence Diagram for Writing Data, below.

▶ Connector Layout

External Control Connector Plug

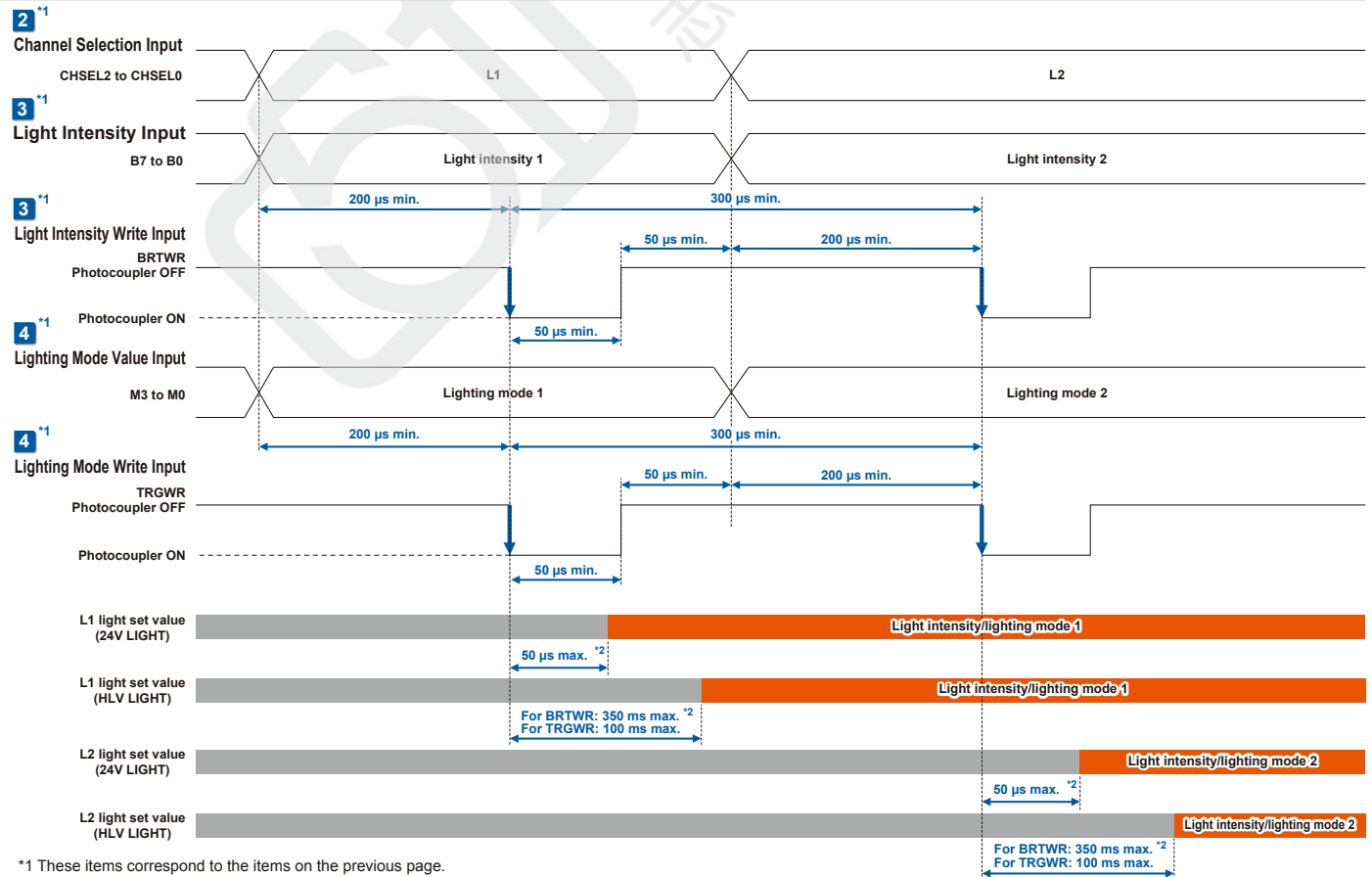


Enlarged Cable Diagram



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



\*1 These items correspond to the items on the previous page.

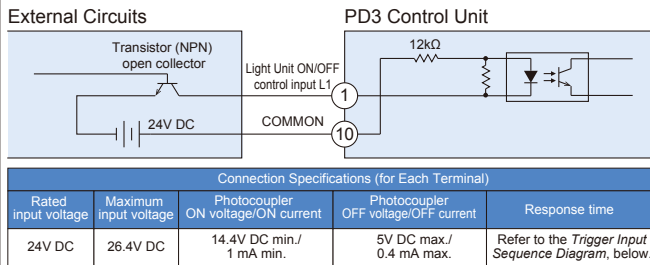
\*2 The response times of the 24V LIGHT and the HL (High Level) LIGHT connectors are very different. If the data is rewritten during the response time for the light set value, the start of the rewrite that was input again is reset as the starting point.

## ▶ Input Signal and Photocoupler

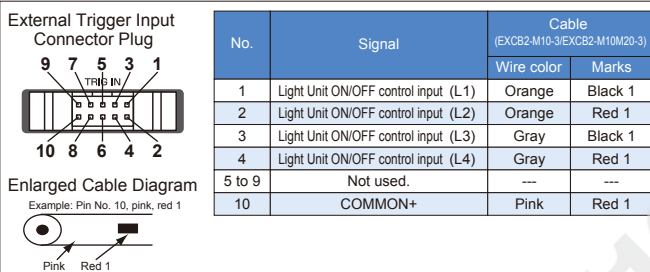
The input signal from the external trigger input connector can be used to control the photocoupler inside the Unit to turn the LED Light Units ON and OFF or to control strobe timing. The operation depends on the setting of the trigger logic switch.

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

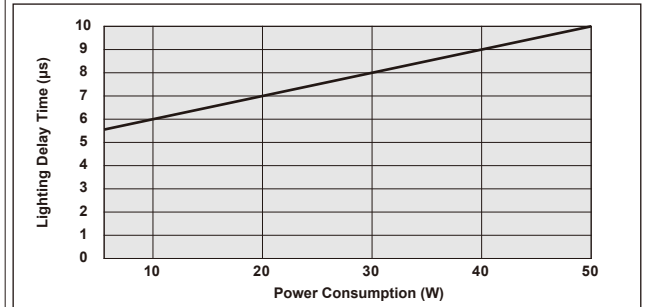


## ▶ Lighting Delay Time

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 HLVLIGHT connectors depends on the intensity of the Spotlights. Refer to the following graphs and tables.

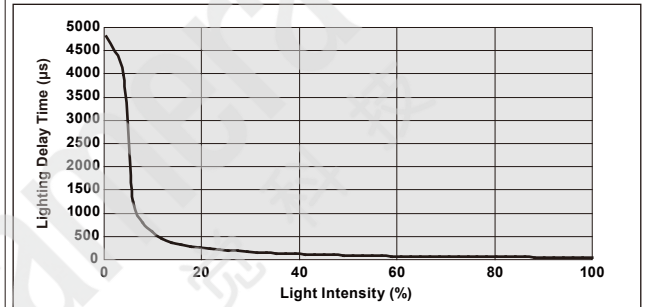
\* The data in the graphs show reference values when a Light Unit or Spotlight with a 5-m cable is used. (The values are for reference only.)

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



Power Consumption	10W	20W	30W	40W	46W
Lighting Delay Time (typ.)	6µs	7µs	8µs	9µs	9.6µs

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



Light Intensity	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Lighting Delay Time (typ.)	610µs	260µs	180µs	130µs	110µs	82µs	73µs	65µs	60µs	55µs

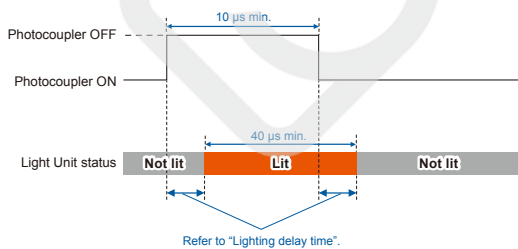
## ▶ Trigger Input Sequence Diagram

- A pulse width of ON signal shall be 10µs or more. The Light Units will be turned on for at least 40µs, even when the input ON signal is less than 40µs.
- 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.

### ON/OFF Mode

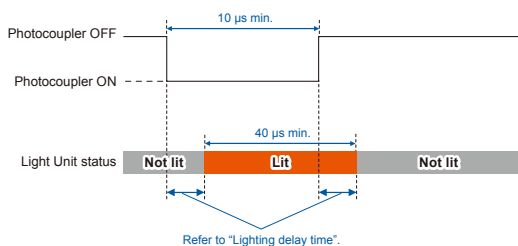
#### ● Trigger Logic Switch Set to HIGH

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



#### ● Trigger Logic Switch Set to LOW

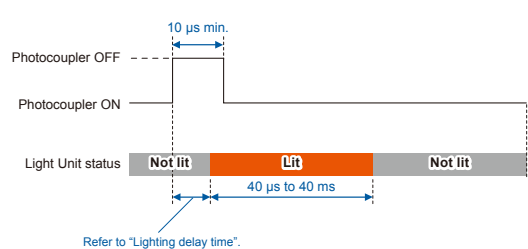
The Light Units turn ON when the photocoupler is ON, and OFF when the photocoupler is OFF.



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

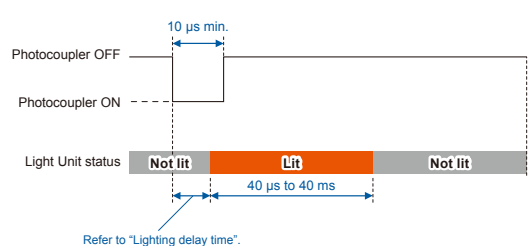
#### ● Trigger Logic Switch Set to HIGH

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).





## 10 Errors

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

Digital display	Error	Status	Clearing the error	Recovery method
	<b>Overcurrent Error</b> 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.
	<b>Fan Stop Error</b> 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  Period	<b>HLV ID Error</b> 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. <b>EId</b> If no Light Unit has ever been connected to the same channel in the 24V LIGHT connectors, EId will be displayed. <b>125</b> 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.

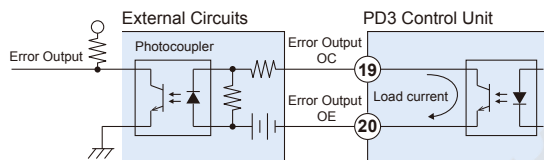
### Error Output

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: 10 mA max.
Leakage current: 50 μA max.

### Error Output Circuit Example

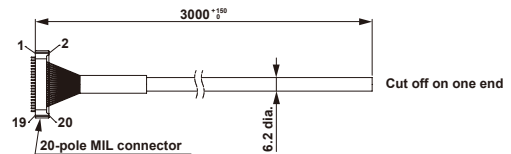


## 11 Optional Accessories (Sold Separately)

(Unit: mm)

### External Control Cable

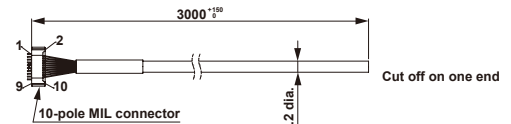
Model: EXCB2-M20-3



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

### External Trigger Input Cable

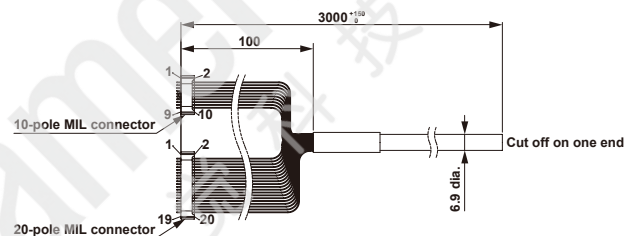
VModel: EXCB2-M10-3



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 power cord connected properly to the terminal block and the main power source?	3		Is the signal setting correct? Check the setting method and sequence diagram.	6, 7	
	Does the digital display show an error? Check the error display.	9		Did you perform a write operation? Perform a write operation after you set the light intensity data.	6, 7	
	Is an appropriate Light Unit connected to the output connector? Check the Light Unit.	4		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
	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		Are the external trigger input cable and external devices wired correctly? Check the connector configuration and correct the wiring.	8	
	Is the lighting mode set correctly? Set the lighting mode to F00 for Continuous Mode or ON/OFF Mode.	5, 6		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	
	Does the logic of the trigger signal match the trigger signal setting switch?	8		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		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.	-	
	Have the wrong channels been selected? Check the channels whose lights are to be controlled.	5, 6		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.	-
	Is the setting switch locked? Press and hold the setting switch for more than two seconds to release the lock.	5				

## 13 Main Specifications

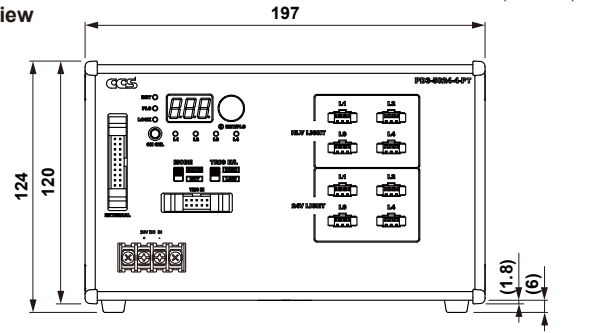
Product name	Control Unit for LED Light Units
Model name	PD3-5024-4-PT(A)
Rated capacity	46 W max. for 8 connectors total
Input voltage (rated)	24V DC
Input voltage (range)	21.6 to 26.4V DC
Power consumption (typ.)	52 W
Rated output voltage	24V DC
Operating temperature and humidity	Temperature: 0 to 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 <sup>2</sup> , 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	EMC standard: Conforms to EN 61326-1 Class A
Input connector	24 VDC input: 2-pin Terminal Block × 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	850 g max.
Accessories	Base Brackets x1 set, Instruction Guide x1

### Specifications for Different Output Connectors

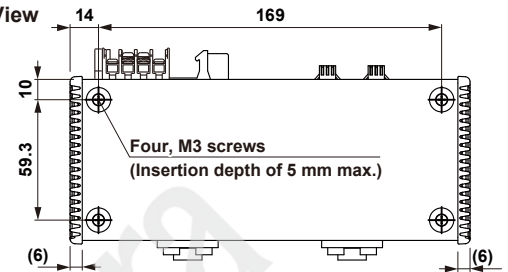
Input type	24V LIGHT	HLV LIGHT
Applicable illuminators	24V DC Light Units	Spotlights: HLV3-14, HLV3-2-1/2, and HLV3-22-2-1220 series HLV2 series, HLV series* *Not including HLV-27 series/HLV-14-R/ HLV-14-GR/HLV-14-BL/HLV-14-SW
Rated capacity	46W max.	Per connector: 3.9 W (700mA) max.
Lighting method	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.) × 4	SMP-03V-BC (J.S.T. Mfg. Co., Ltd.) × 4

## 14 Dimensions

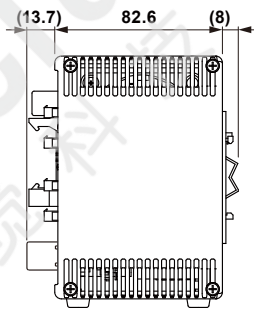
Front View



Bottom View



Side View



### 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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