

Control Unit for LED Light Units

PD3-5024-4-ET(A)

With Ethernet 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 Ethernet.
- Use PWM control to control the 24V DC Light Unit output at a frequency of 125 kHz.
- TCP/IP and UDP/IP Ethernet communications can be used for 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		MANDATORY ACTIONS
These symbols indicate prohibited actions.				This symbol indicates required actions.					

		WARNING	
Do not disassemble or modify the Control Unit. 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 Control Unit 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 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.	

		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.		Do not bundle Control Unit cables with high-voltage lines or power lines. Allow leeway when installing the cables.	
Do not use user-made branch cables. Doing so may cause Control Unit failure.		Use Light Units that are suitable for the Control Unit ratings. Exceeding the ratings may cause Control Unit failure.	
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.		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.	
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.		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.	
Do not drop the Control Unit or subject it to impact. Doing so may cause Control Unit failure.		Before moving the Control Unit, disconnect all connection cables. Damaging the cables may result in fire or electric shock.	
Do not bend cables or jam them between objects when wiring. Doing so may cause Control Unit failure.		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.	
Do not intentionally short-circuit the positive and negative output terminals.		Use a dry cloth to remove dust or other foreign matter from the electrodes. Failure to do so may result in fire.	
Be sure to use the Control Unit within the range of input voltage. Applying the voltage beyond the range may cause Control Unit failure.		Do not wipe the Control Unit with volatiles such as paint thinner or benzene. Discoloration or deterioration of the Control Unit surfaces may occur.	

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.

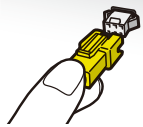
1 Connect the LED Light

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 HL V LIGHT output connectors.

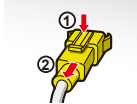
Connecting

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



Removing

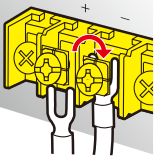
Press the lock and pull out the connector.



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.

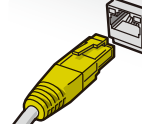
3 Connect the LAN Cable (Provided by the user)

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

The LAN cable must be provided by the customer. (Cable length should be within 30 m at maximum.) This product recognizes either cross-cable or straight-cable automatically by auto-negotiation function. Please reboot the product when changing the cable.

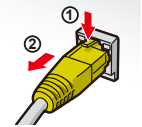
Connecting

Firmly insert the connector of the LAN cable.



Removing

Press the lock and pull out 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.

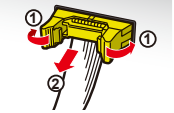
Connecting

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

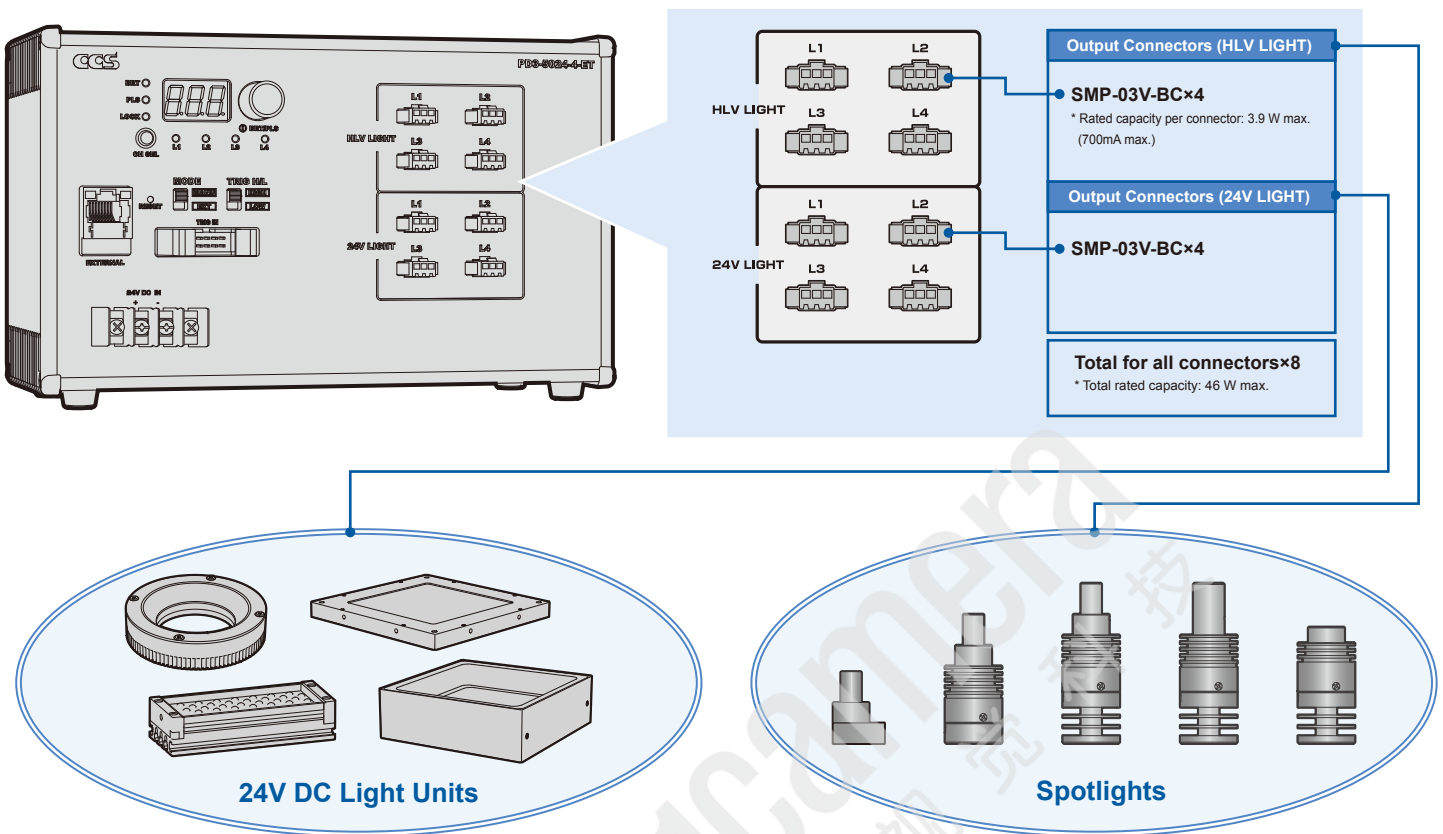
Select the control mode and lighting mode from the following Application Guide and proceed to the indicated reference items.

Application Guide

	Control Mode	MODE ↑ MANU EXT	Front panel operation	MODE ↓ MANU EXT	External control 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 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 .
	ON/OFF Mode The Light Units are turned ON or OFF according to the external trigger signal input. <p>* When the Trigger Logic Switch is set to HIGH</p> <p>* It is possible to turn LED light unit ON and OFF by Ethernet communications, too.</p>		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 . 		External trigger signal or Ethernet communications setting can be selected when using ON/OFF mode by external control. To use external trigger signal in ON/OFF mode, refer to items 1 , 2 , and 3 under 8 Control with External Signals and 9 Inputting the External Trigger . To use Ethernet communications setting in ON/OFF mode, refer to items 1 , 2 , 3 , and 5 under 8 Control with External Signals .
	Strobe Mode The Light Units are turned ON for a set time after the external trigger signal is input. <p>* When the Trigger Logic Switch is set to HIGH</p>		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 . (Only 24V DC Light Units can be set.) 		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 . (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

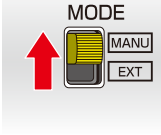
- Make sure that the main power source is turned ON.
- Set items **1**, **2**, and **3** when using Continuous Mode or ON/OFF Mode.*
- Set items **1**, **2**, **3**, and **4** when using Strobe Mode.

* 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.

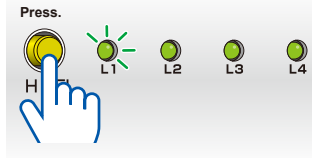
Check Make sure that the LOCK setting indicator is not light and that the trigger logic switch is set to HIGH. Otherwise you may not be able to perform the rest of this procedure.



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

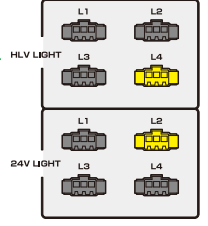
Only channels with Light Units connected to them can be selected. If a Light Unit is removed without turning OFF the power supply, the channel for the Light Unit that is no longer connected may be selected. This does not indicate a malfunction. Check the following table for details. There is risk of 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:



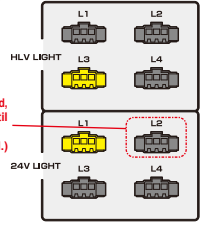
HLV LIGHT : **L4**

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
000 000	0.4 (Dimly lit)	0.0 (Not lit)
001 001	0.8	0.4
002 002	1.2	0.8
⋮	⋮	⋮
254 254	99.6	99.6
255 255	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 (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 F00	Continuous Mode or ON/OFF Mode	
F01 F01		40μs
F02 F02		80μs
F03 F03	120μs	
F04 F04	200μs	
F05 F05	600μs	
F06 F06	Strobe Mode (The Strobe Mode can be set for 24V DC Light Units only.)	
F07 F07		1ms
F08 F08		4ms
F09 F09		10ms
F10 F10		20ms
	40ms	

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

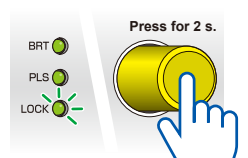
4 Selecting the Lighting Mode

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**)



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

An external device such as a PLC or image processing device transmits the send data to the Control Unit. The Control Unit processes the data and returns the results. The external device gets the receive data as the execution results.

Communications Specifications (*1)

TCP/IP protocol or UDP/IP protocol (Switching operation is not required.), and Ethernet (Baud rate: 10 Mbps or 100 Mbps, automatically detected; Transmission medium: 10BASE-T or 100BASE-TX)

Command Formats

Sample of Alphanumeric Characters: **ABCDEFGHIJKLMNPOQRSTUVWXYZ 0123456789**

Send Data (*2)

Function	Header	Channel specification	Send command		Checksum	Delimiter	Default (*9)	
			Command	Data (*3)				
Light Intensity Setting	@	00 to 03 (Refer to *4) FF: All channels (F command used for the batch setting for each channel and L command only)	F	000 to 255 (Refer to *5)	00 to FF (Refer to *8)	<CR><LF>	000	
Lighting Mode Setting			S	00 to 10 (Refer to *6)			00	
ON/OFF Setting			L	0: Not lit, 1: Lit (Refer to *7)			1	
Setting Status Check			M	---			---	
Error Status Check		C	---	---				
All Channel Initialization		R	---	---				
IP Address		E01	00 (fixed)	E02			000.000.000.000 to 255.255.255.255 (Specify all digits, e.g., specify "192.168.000.005" instead of "192.168.0.5.")	192.168.000.002
Subnet Mask		E03						255.255.255.000
Default Gateway		E05						192.168.000.001
Reply IP Address		E04						192.168.000.016
Reception Port Setting		E06	00000 to 65535 (Specify all digits, e.g., specify "04561" instead of "4561.")	40001				
Reply Port Setting				30001				

Receive Data (*10)

Function	Header	Channel specification	Receive command		Checksum	Delimiter	
			OK	NG			
Light Intensity Setting	@	00 to 03 (Refer to *4) FF: All channels (F command used for the batch setting for each channel and L command only)	O	N	00 to FF (Refer to *8)	<CR><LF>	
Lighting Mode Setting							---
ON/OFF Setting							F999.S99.L9 (Refer to *11)
Setting Status Check							00: Normal, 11: Error
Error Status Check		---					
All Channel Initialization		---					
IP Address		---					
Subnet Mask		---					
Default Gateway		---					
Reply IP Address		---					
Reception Port Setting		---					
Reply Port Setting		---					

<< Annotation >>

*1) The number of TCP connection (possible numbers to connect at same time) which PD3 correspond is "1"

*2) Send a data within 4 seconds from "Header" to "Delimiter", otherwise time-out error occurs and command data will be rejected.

*3) Specify all numbers in decimal format.

*4) Channel Specification 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.

Channel	L1	L2	L3	L4
Set value	00	01	02	03

(Set values that are higher than 03 are not valid.)

*5) Light Intensity Settings

The light intensity is controlled to any of 256 levels. 000 to 255 (000: Minimum, 255: Maximum)

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

* 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.

*6) Lighting Mode Settings

Select the lighting mode form Continuous Mode, ON/OFF Mode, or Strobe Mode. The lighting time can be set in Strobe Mode. (The Strobe Mode can be set for 24V DC Light Units only.) For details on the external trigger input, refer to 9. Inputting the External Trigger.

Status	Continuous Mode or ON/OFF Mode	Strobe Mode									
		40μs	80μs	120μs	200μs	600μs	1ms	4ms	10ms	20ms	40ms
Digital display	F00	F01	F02	F03	F04	F05	F06	F07	F08	F09	F10
Set value	00	01	02	03	04	05	06	07	08	09	10

(Set values that are higher than 10 are not valid.)

Continuous Mode

Set the value to 00 to enter Normal Mode and keep the Light Unit lit continuously.

ON/OFF Mode

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

Set the value to 00 to enter ON/OFF Mode and turn the Light Unit 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.)

Select the lighting time from 01 to 10 (40 μs to 40 ms) to use a strobe light. 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.

*7) ON/OFF setting from Ethernet communications without regards to trigger logic switch, turned OFF at '0' and ON at '1'.
 When operating Ethernet communications and trigger signal input at same time in ON/OFF mode.
 When Trigger logic switch is at HIGH: if ether controls setting to OFF setting, Light unit will be turned OFF
 When Trigger logic switch is at LOW: if ether controls setting to ON setting, Light unit will be turned ON

*8) Checksum

The codes of the ASCII characters from the header to the send command are added, the lowest byte is converted to hexadecimal, and two characters are sent.

(* The lowest byte (two characters) of 17F)
 is taken, so the checksum is 7F.

Example: Setting the Light Intensity of Channel 2 to 125

	Header	Channel			Sent command				Total
	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7		
Character	@	0	1	F	1	2	5		
ASCII (hexadecimal)	40 hex	30 hex	31 hex	46 hex	31 hex	32 hex	35 hex	17F hex	

*9) Except for the ON/OFF setting, any changes to the default values will be held after the power supply is turned OFF. The ON/OFF setting will not be held.

*10) There is no received data when timeout error occurs.

*11) Received Command for Setting Status Check (F999.S99.L9): F999 = F command set value (F000 to F255), S99 = S command set value (S00 to S10), L9 = L command set value (L0: Not lit, L1: Lit) L1 must be returned immediately after the power supply is turned ON.

Batch Setting for Each Channel (Available Only When "FF" Is Set for the Channel Specification)

When you specify the data in the form "aaa/bbb/ccd/ddd" to the F command, you can set the light intensities for each channel with a single send data at a time. If you specify "FFF" for a data, the light intensity of the corresponding channel will not be changed.

Example) @FFF123/045/FFF09942CRLF: Setting the light intensity to 123 for L1, 045 for L2. The light intensity for L3 will not be changed. Setting the light intensity to 099 for L4.

When you specify the data in the form "a/b/c/d" to the L command, you can set ON/OFF signals for each channel with a single send data at a time. If you specify "F" for a data, the ON/OFF status of the corresponding channel will not be changed.

Example) @FFL1/F/0/07CCRLF: Setting the signal to ON for L1. The ON/OFF status for L2 will not be changed. Setting the signals to OFF for L3 and L4.

Setting Procedures

- Make sure that the main power source is turned ON.
- Set items 1, 2, and 3 when using Continuous Mode.*
- Set items 1, 2, 3, and 5 when using 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 Setting Up the Network (Only Initially and When Settings Are Changed)

Set the Unit's IP address and the reply address. To enable the settings that were changed, cycle the power supply.

* If the IP address changes, do not forget to change the send destination of commands.

Item	Setting example	Send data	Receive data when OK	Receive data when NG
IP Address	192.168.3.2	@00E01192.168.003.00230CRLF	@000EFCRLF	@00N014FCRLF (when there is a command error) @00N0351CRLF (when there is a set value out of range error)
Subnet Mask	255.255.255.0	@00E02255.255.255.00035CRLF		
Default Gateway	192.168.3.1	@00E03192.168.003.00131CRLF		
Reception Port Setting	4561	@00E040456149CRLF		
Reply IP Address	192.168.3.10	@00E05192.168.003.01033CRLF		
Reply Port Setting	4562	@00E06045624CCRLF		

3 Setting the Light Intensity

Specify the channel and set the light intensity.

Setting example	Send data	Receive data when OK	Receive data when NG
Setting the L3 light intensity to 75	@02F07584CRLF	@02OF1CRLF	@00N014FCRLF (when there is a command error)

4 Setting the Lighting Mode

Specify the channel and set the lighting mode.

Setting example	Send data	Receive data when OK	Receive data when NG
Setting the L2 lighting mode to 200 μs in Strobe Mode	@01S0458CRLF	@01OF0CRLF	@01N0352CRLF (when there is a set value out of range error)

5 To Set ON/OFF Signal in ON/OFF Mode

Specify the channel and set ON/OFF signal.

Setting example	Send data	Receive data when OK	Receive data when NG
To turn all light units OFF	@FFL048CRLF	@FFO1BCRLF	@FFN027CCRLF (When there is checksum error)

To Check the Setting Status

When checking the setting status, send the following command after specify the channel.

Setting example	Send data	Receive data when OK	Receive data when NG
To check the setting status of L1.	@00MEDCRLF	@00OF075.S04.L060CRLF (If Intensity=75, Strobe mode=200μs, Light unit=OFF)	@00N0250CRLF (When there is checksum error)

Checking the Unit Status

Send the following command to check the Unit status.

Setting	Send data	Receive data when OK	Receive data when NG
Checking the Unit status	@00CE3CRLF	@00O004FCRLF (normal)	@00N0351CRLF (when there is a set value out of range error)

Resetting the Light Intensity and Lighting Mode

To restore the external control setting to default value, send the following command.

Setting	Send data	Receive data when OK	Receive data when NG
All Channel Initialization	@00RF2CRLF	@00OEFCLRF	@00N014FCRLF (when there is a command error)

Initialize the Network Setting

If the IP address setting and others is incorrect, you will not be able to connect to the Control Unit. You will also not be able to reset the IP address and others. If that occurs, use a pointed object to press the external control reset switch on the front panel to reset network settings to their default values.

To enable the reset settings, cycle the power supply



9 Inputting an External Trigger

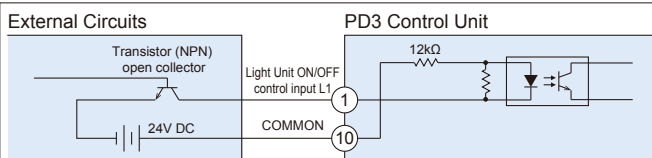
▶ Input Signal and Photocoupler

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.

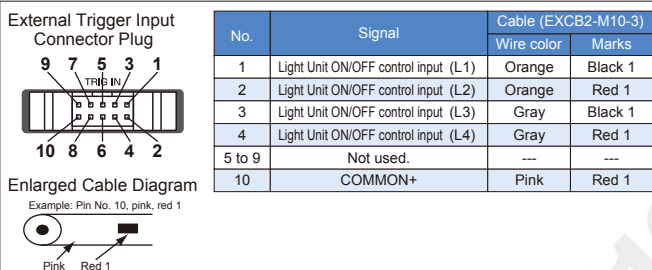
* When operating trigger signal input and Ethernet communications at same time in ON/OFF mode. When Trigger logic switch is at HIGH: if ether controls setting to OFF setting, Light unit will be turned OFF. When Trigger logic switch is at LOW: if ether controls setting to ON setting, Light unit will be turned ON.

▶ External Trigger Signal Connection Example



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 <i>Trigger Input Sequence Diagram</i> , below.

▶ Connector Layout

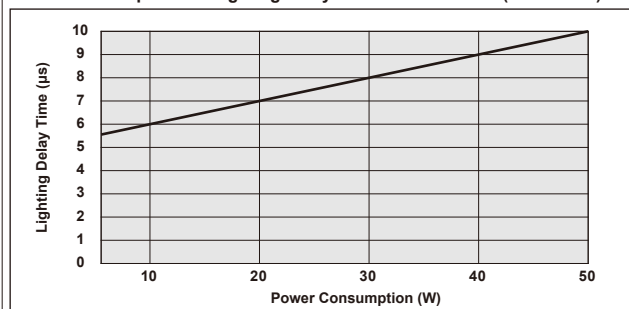


▶ Lighting Delay Time

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.

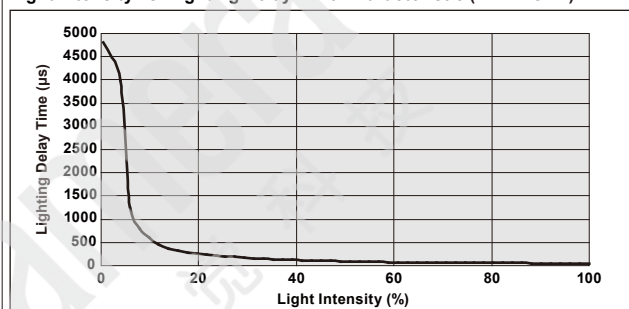
* The data in the graphs show reference values when a Light Unit or Spotlight with a 5-m cable is used. (The values are for reference only.)

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

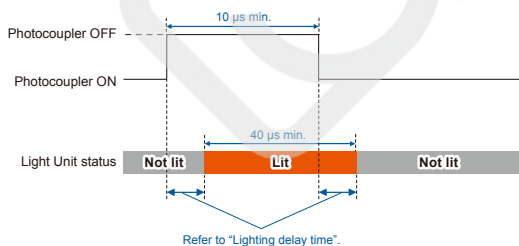
▶ Trigger Input Sequence Diagram

- 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

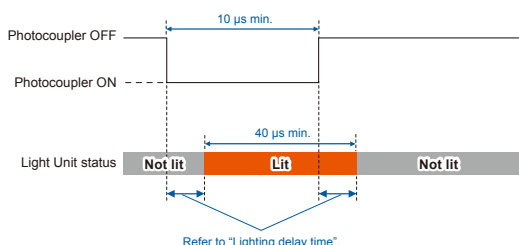
• Trigger Logic Switch Set to HIGH

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



• Trigger Logic Switch Set to LOW

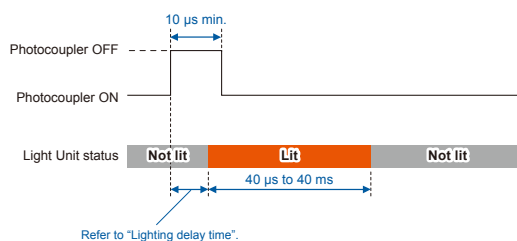
The Light Units turn ON when the photocoupler is ON, and OFF when the photocoupler is OFF.



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

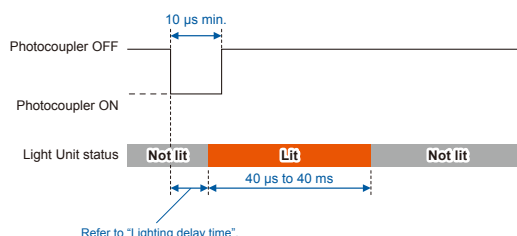
• Trigger Logic Switch Set to HIGH

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
	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. If no Light Unit has ever been connected to the same channel in the 24V LIGHT connectors, EId will be displayed. 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

When detecting the error during external control, command will be received as acknowledgement for checking status (over current confirmation) command "C". (This applies only to overcurrent errors and fan stop errors.)

* Immediately after the error, occurrence of an error will be noticed only one time by using UDP protocol. Notify data is the same as checking status (over current confirmation) command "C".

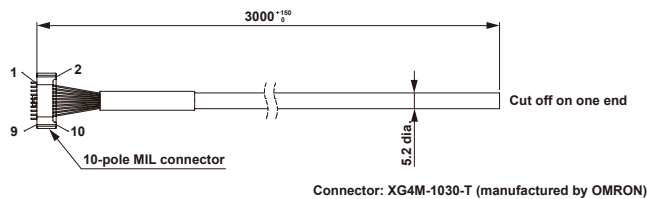
For details, refer to 8. Control with External Signals.

11 Optional Accessories (Sold Separately)

(Unit: mm)

External Trigger Input Cable

Model: EXCB2-M10-3



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 control is not possible.	Is the external control cable (LAN 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		Was the command sent correctly? Set the network settings and data correctly.	6, 7	
	Is the power cord connected properly to the terminal block and the main power source?	3		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 digital display show an error? Check the error display.	9			Are the external trigger input cable and external devices wired correctly? Check the connector configuration and correct the wiring.	8
	Is an appropriate Light Unit connected to the output connector? Check the Light Unit.	4			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 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			Is the signal setting correct? Check the setting method and sequence diagram.	8
	Is the lighting mode set correctly? Set the lighting mode to F00 for Continuous Mode or ON/OFF Mode.	5, 6		Malfunctioning.	Please use designated power sources with stable voltage. Sharing power sources with inverters, motors, etc., may cause malfunction.	-
	Does the logic of the trigger signal match the trigger signal setting switch?	8			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.	-
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	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 an appropriate Light Unit connected to the output connector? Check the Light Unit.	4				
	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				
	Is the setting switch locked? Press and hold the setting switch for more than two seconds to release the lock.	5				

13 Main Specifications

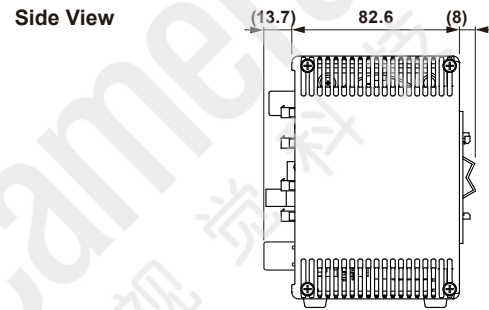
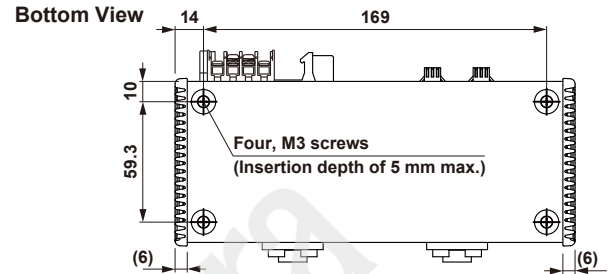
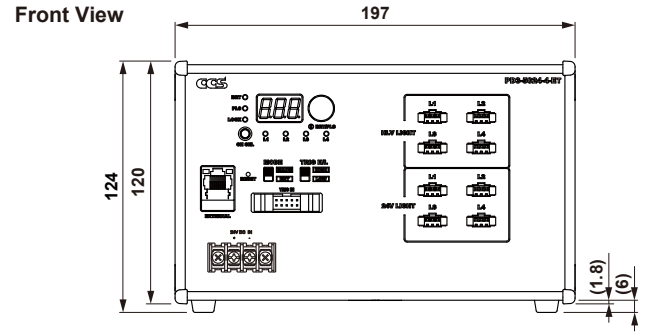
Product name	Control Unit for LED Light Units
Model name	PD3-5024-4-ET(A)
Rated capacity	46 W max. for 8 connectors total
Input voltage (rated)	24V DC
Input voltage (range)	21.6 to 26.4V DC
Power consumption (typ.)	52 W
Rated output voltage	24V DC
Operating temperature and humidity	Temperature: 0 to 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 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	EMC standard: Conforms to EN 61326-1 Class A
Input connector	24 VDC input: 2-pin Terminal Block × 1
External control connector	Trigger input: ML connector (MIL-C-83503 compliant), 10-pole For setting the light intensity and lighting mode: RJ-45
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

(Unit: mm)



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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