PD2 Dual Channel Series Instruction Guide
Control Unit for LED Light Units
PD2-3012-2(A)/PD2-3024-2(A)

1. Safety Precautions ***Read this instruction guide before using the product.**

Thank you for purchasing a CCS product. To properly use the product, please read this instruction guide before use and keep it for your future reference. Be sure to pay special attention to the information marked with "⚠Warning" and "⚠ Caution". The information is provided to prevent injury from electric shock and other accidents.

⚠ Warning	Indicates incorrect usage may result in serious injury or death.
⚠ Caution	Indicates incorrect usage may result in injury or equipment damage.

⚠ Warning

(1) Always use one of the following power cords.
100 to 120V range: SVT or SJT type, AWG18, length: 3m max. , dielectric strength: 125V min. (Note: This power cord is required for compliance with UL)
200 to 240V range: H05VV-F type, AWG18, length: 3m max. , dielectric strength: 250V min. (Note: This power cable is required for compliance with EU)

(2) Plug in or unplug the power cord after turning OFF the power supply.
Otherwise it may result in fire or electric shock. Plug the power cord directly into the wall socket.
Please use the product within electricity voltage/current specifications.
Otherwise it may cause fire and/or electric shock.
Please unplug the power cord when connecting or disconnecting the product and peripherals.
Do not damage or place heavy objects on power cord. There are risks of damaging the cord, which may result fire or electric shock.

(3) If the product is damaged, turn it OFF, unplug the power cord from the wall socket, and contact CCS. Continued usage of the product may result in fire or electric shock.

(4) Follow the operating procedures stipulated for the product in this instruction guide.
Failure to do so may result in diminished protection capabilities.

(5) The product operates at a power supply voltage of 100 to 240V AC. The supplied power cord, however, is for use with 100V. If the product is to be used at 200V or above, use a 200V power cord.

(6) For mounting products in system racks or cases, do not insert M3 type screws more than 6mm. Doing so may cause short-circuit to internal components.

(7) Do not disconnect power cord or disassemble product while operating.
Doing so may result in electric shock.

(8) Do not touch the terminals, plugs, or switches with wet hands.
Doing so may result in electric shock.

(9) Ground the power supply. Use a 3-prong AC power cord with ground terminal for the power supply.

(10)	If smoke appears, the product becomes abnormally hot, unusual smells or sounds are generated, or any other abnormality occurs, stop using the product immediately and turn OFF the power.	

Caution	
(1)	The products become very hot during use. For this reason, do not use them in a closed space. If it is necessary to use them in a closed space, provide sufficient cooling in the form of fans or other cooling devices.
(2)	Install products in following locations: - On a flat and stable locations with minimal vibration - Well-ventilated places with minimal dust. - Places free from any water, oil, liquid, chemical, or steam. - Places free from corrosive or combustible gas. - Places away from water faucets, boilers, humidifiers, air conditioners, heaters, or stoves. - Places that are not subject to sudden temperature changes. - Places where products can be grounded. 
(3)	Observe the following items for the Power Supply: - Always provide dedicated electric power source with stable voltage. Sharing the electric power source with power devices, such as inverters, motors, and so on, may cause product to malfunction. - Disconnect the power plug when the product is not to be used for an extended period of time.  - Do not place the power cord near a heat-generating device, and do not allow the power cord to be scratched. - Do not touch the power cords or connect peripheral devices during lightning. This may result in electric shock.

2. Overview

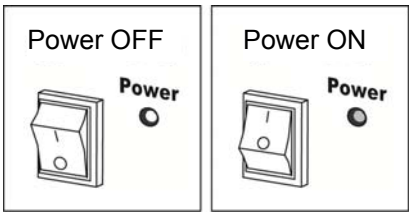
This power supply is for exclusive usage with LED lighting made by CCS.

1. The product can control two LED lights in internal mode using the intensity control knobs on the front panel of the product or in external mode from a PLC, microcomputer, or other device.
2. The external ON/OFF control is available in product.
3. The PD2-3012-2(A) can supply up to 12V at 2.3A (28W) and the PD2-3024-2(A) can supply up to 24V at 1.16A (28W) for CCS LED lighting.
   Do not exceed the maximum wattage for the total number of circuits.

3. Operating Procedure

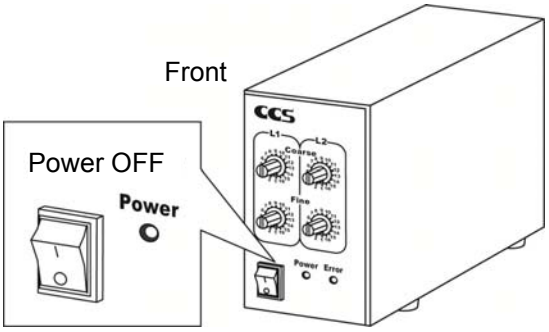
Turning the power ON/OFF

○ side of the power switch is OFF.
The power is ON when | side is pressed.
(The power lamp will be illuminated)



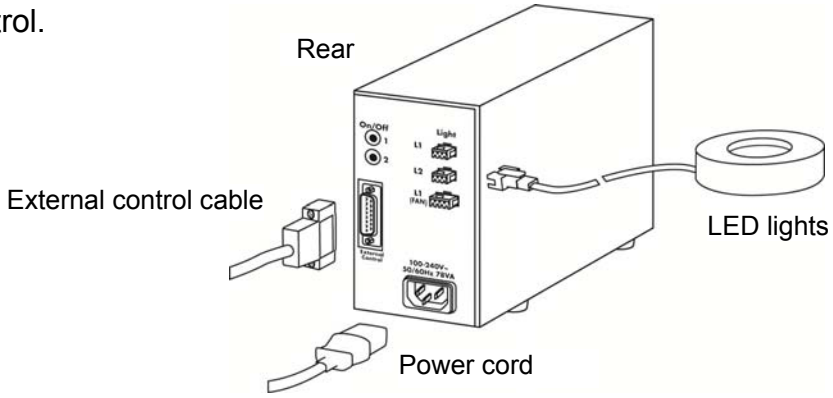
Turning ON lighting

1. Check the power supply switch to make sure it is turned OFF.

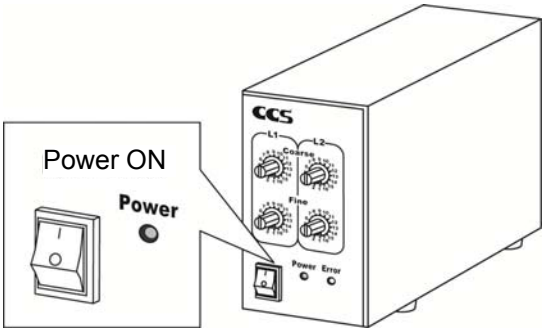


2. Connect the LED lighting to the power supply.
3. Plug the power cord of the power supply into a wall socket.

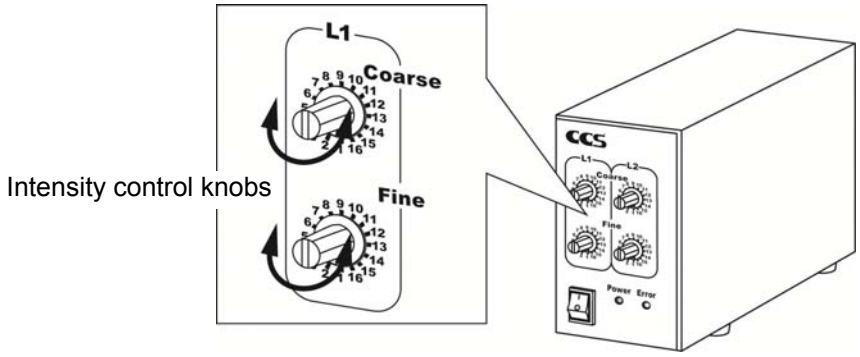
4. Connect an external control cable if it is the case to use external control.



5. Turn the power ON.
(The power lamp will be illuminated)

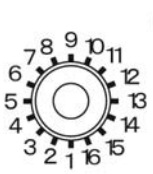


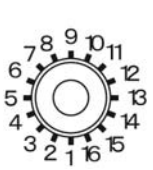
6. Use the intensity control knobs to set lighting intensity.



Adjusting lighting intensity

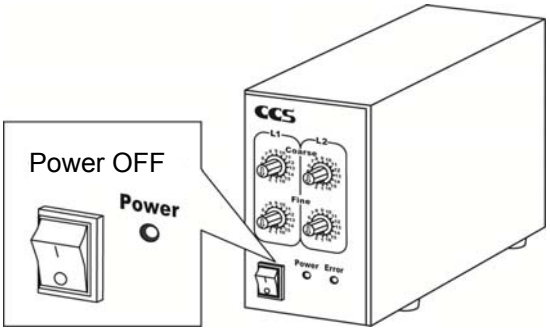
1. Turn the intensity control knobs on the front panel of the product to set the lighting intensity. Each font panel knob controls light intensity in 16 steps. With 16 fine steps for every coarse step (16 steps), the result is up to 256 steps of extremely fine light intensity control.





Turning OFF lighting

1. Turn the power OFF.
   (The power lamp will be turned OFF)

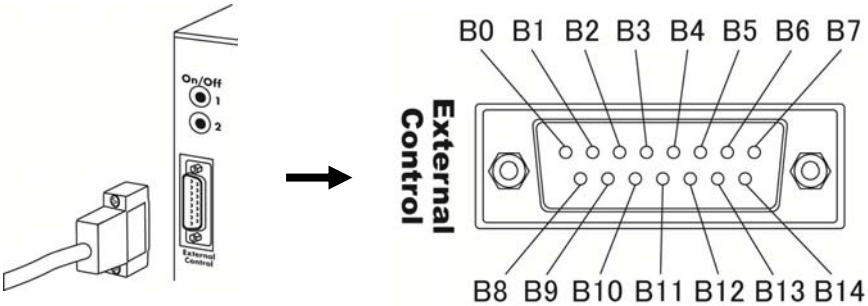


External control

External control

1. A Dsub terminal is provided on the rear panel of the product for external control. The product can be controlled externally using parallel bit control.

Close-up view external control connector



2. Pin bit arrangement for external control terminals

Bit	B0	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	B12	B13
Structure	Light intensity bit (0 to FF)							EXT	WR	ON1	CH	ON2	OCP	

A driver IC or an open collector outputs a signal to each terminal and the external control signals are input to the product at CMOS level.

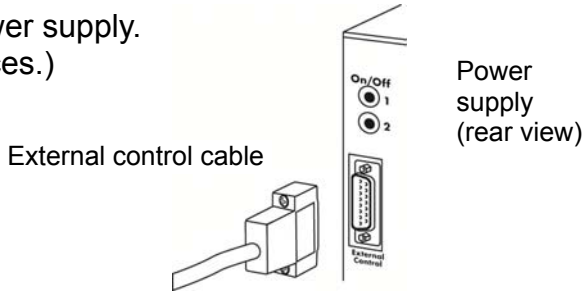
3. Optional external control cable is manufactured by CCS.

4. The product support the following types of external control.

- External and manual light intensity control selection
- Channel selection
- Light intensity settings
- Lighting ON/OFF control
- Overcurrent protection signal monitoring

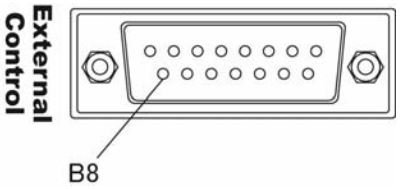
External control

1. Connect the external control cable to the power supply.
(Also connect the lighting and any other devices.)

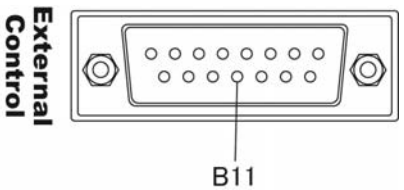


2. Input the desired control signal from the external control cable.

1) External and manual light intensity control selection
Set bit B8 of the Dsub external control connector to Low to set the product to external control mode. Adjusting the light intensity from the front panel is disabled in this mode. Set bit B8 to High to enable light intensity from the front panel and disable externally controlled light intensity.
B8 is active low (i.e., it is valid at 0 V)



2) Channel settings
Set the channel of the lighting that the product will control. Use bit B11 on the Dsub external control connector to specify the channel.

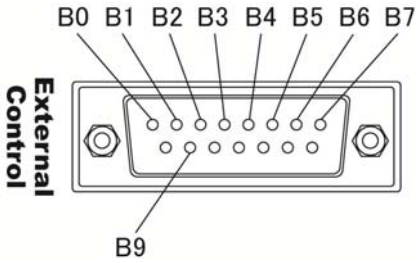


Channel/bit No.	1CH	2CH
B11	L	H

Note: External control connector terminals are 0 V when low (L) and 5 V when high (H).

3) Light intensity settings

Set the 8 bits from B0 to B7 as well as B9 to control light intensity. Specify up to 256 light intensity steps using bits B0 to B7 and send the write signal to write bit B9 to write the light intensity data to the product. Keep the write signal Low(L) for at least 300 µs to write the data, and switch the signal back to High(H) after the minimum write time has elapsed to stop writing data.

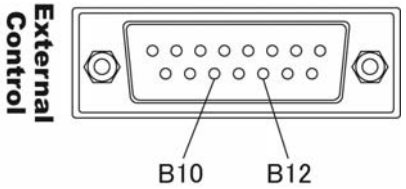


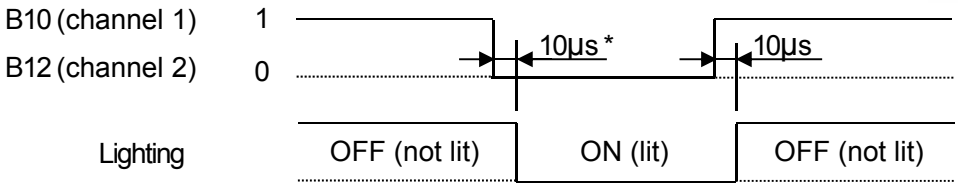
Note: Light intensity settings are enabled only as long as the power supply remains ON and will be lost when the power supply is turned OFF.

steps	B7 [MSB]	B6	B5	B4	B3	B2	B1	B0 [LSB]	Light intensity(%)	Coarse	Fine
1	H	H	H	H	H	H	H	H	0.4	1	1
2	H	H	H	H	H	H	H	L	0.8	1	2
3	H	H	H	H	H	H	L	H	1.2	1	3
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
19	H	H	H	L	H	H	L	H	7.6	2	3
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
254	L	L	L	L	L	L	H	L	99.2	16	14
255	L	L	L	L	L	L	L	H	99.6	16	15
256	L	L	L	L	L	L	L	L	100.0	16	16

4) Lighting ON/OFF control

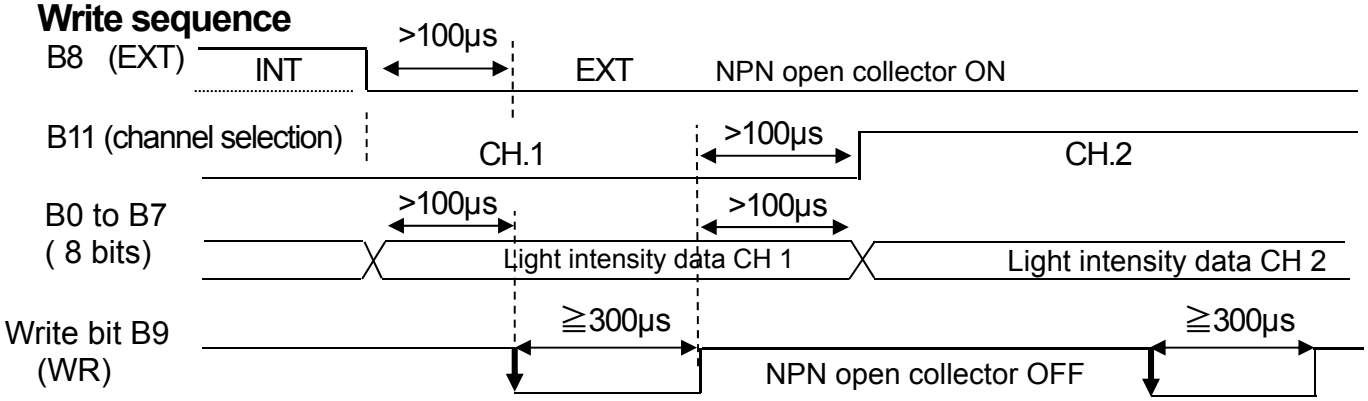
After you have selected the light intensity level, Use bit B10 (channel 1) and bit B12 (channel 2) for ON/OFF control.





*The delay is 10 µs when the light intensity is 100%. If the light intensity is less than 100%, there may be a delay of up to 30 µs.

Write sequence

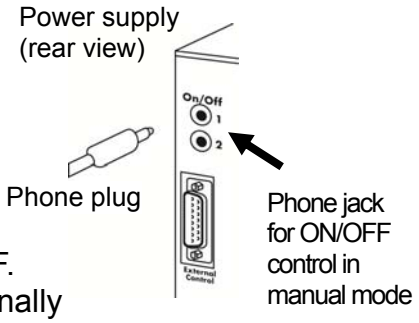


1. External control mode (B8: EXT) outputs in negative logic (Low: L).
2. The channel selection bit B11 output (Low: CH 1, High: CH 2)
3. Light intensity data (B0 to B7) output in negative logic (Low: L)
4. The write bit is output (data is written when the write signal is fall edge).
   Keep the write signal HIGH after the data is written.
5. Data entry cycles must be 500µs or longer.

ON/OFF control in Manual mode

1. In manual mode, the external ON/OFF control is available for the product.

2. Insert the phone plug into the phone jack to send the ON/OFF control signal for manual mode.

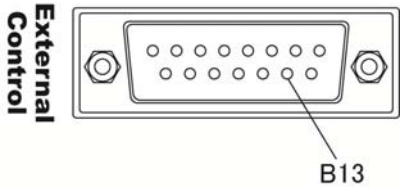


Note: Control is limited strictly to turning lighting ON and OFF.
Note: This option is not available when light intensity is externally controlled.

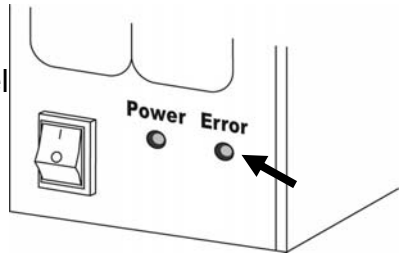
Phone jack (Ø3.5) signal line

Overcurrent protection

Overcurrent protection output
The overcurrent protection output is a monitoring signal that becomes active when overcurrent is detected. It is an output from bit B13. Output circuit is an open collector, with negative logic (active Low).



The product output stops if lighting current consumption (total of all channels) exceeds 107% of the rated current consumption. Also, the error indicator lamp on the front panel of the power supply will light and output cannot be resumed until the power supply is restarted.



4. Connectors

1. Output connectors: SM connectors (JST)

Pin number	12V output	24V output	12V with fan	24V with fan
1	OUT + (12V)	OUT + (24V)	NC	OUT + (24V)
2	OUT -	NC	OUT + (12V)	NC
3		OUT -	OUT -	OUT -
4			Fan GND	Fan GND
Connector	SMP-02V-BC	SMP-03V-BC	SMP-04V-BC	SMP-04V-BC

Channel 1 is output in parallel to the connector with power supply for 4-pin fans.

2. External control connectors: 15-pin D-sub plug with M2.6-mm screws

Each signal is pulled up to the 5V in the internal circuits with resistance.
Use a shielded cable of 3m or less for the control line.

Pin number	Signal
1	Light intensity B0 (LSB)
2	Light intensity B1
3	Light intensity B2
4	Light intensity B3
5	Light intensity B4
6	Light intensity B5
7	Light intensity B6
8	Light intensity B7 (MSB)
9	External control (INT/EXT) B8
10	Light intensity data write (WR) B9
11	Channel 1 ON/OFF control (ON1) B10
12	Light intensity data write channel selection B11 (CH)
13	Channel 2 ON/OFF control B12 (ON2)
14	Overcurrent protection signal output B13 (OCP)
15	Signal GND

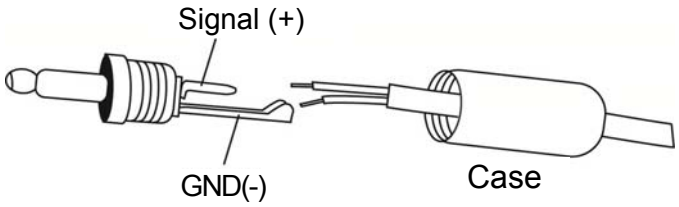
Optional cable: external control cable(cable length: 3m, with one side of the cable cut)
Note: Please read instruction guide using optional cable.

3. Phone jack (Ø 3.5) for manual ON/OFF control

Lighting can be turned ON and OFF manually when the phone plug is inserted into the phone jack. The LED lights will turn ON when the signal is connected to ground and will turn OFF when the signal is disconnected from ground.

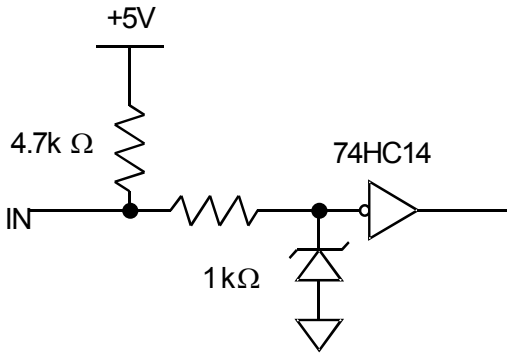
Phone plugs

	Terminal	Signal
1	Inside	ON/OFF signal
2	Outside	GND



Contact your nearest CCS representative if you need to extend the control signal cable or operate in an extremely noisy environment. Cables should not be extended more than 3 m. Potentially harmful noise may be eliminated by installing a 0.01 to 0.1μF capacitor between the signal and ground to ensure proper operation of this product. Phone plugs are not included with the power supply kit, but optional 3m cables with plugs are available.
Note: Please read instruction guide using optional cable.

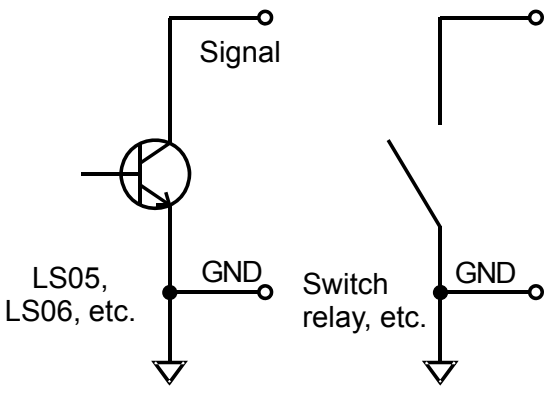
5. PD2 input circuit (negative logic)



Light intensity data: B0 to B7
Control signals: EXT, WR, ON1, ON2, and CH, MANUAL DIMMING ON
Output using a driver IC or NPN open collector
The 24V output of the PLC cannot be input as it is. (Maximum allowable input voltage: 5.5V)

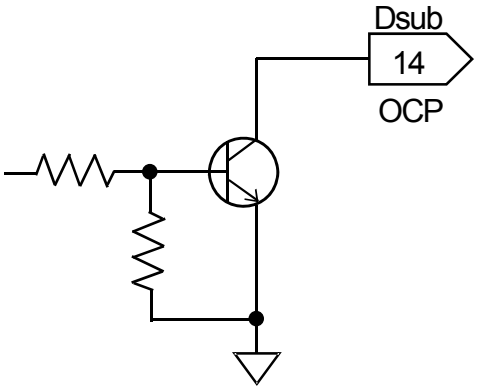
PD2 side:
1V max. at low level (0.8V max. is recommended)
High level: 3.5V min. (4V min. is recommended)

6. Recommended control signal drive circuits: open collector, switches, etc.



When using the PD2 in a noisy environment, we recommend that you isolate the signal and ground lines from the control unit with photo-couplers or photo-MOS relays. Any element that supplies around 10mA can be used to drive the circuit.

7. PD2 overcurrent protection signal output circuit (open collector)

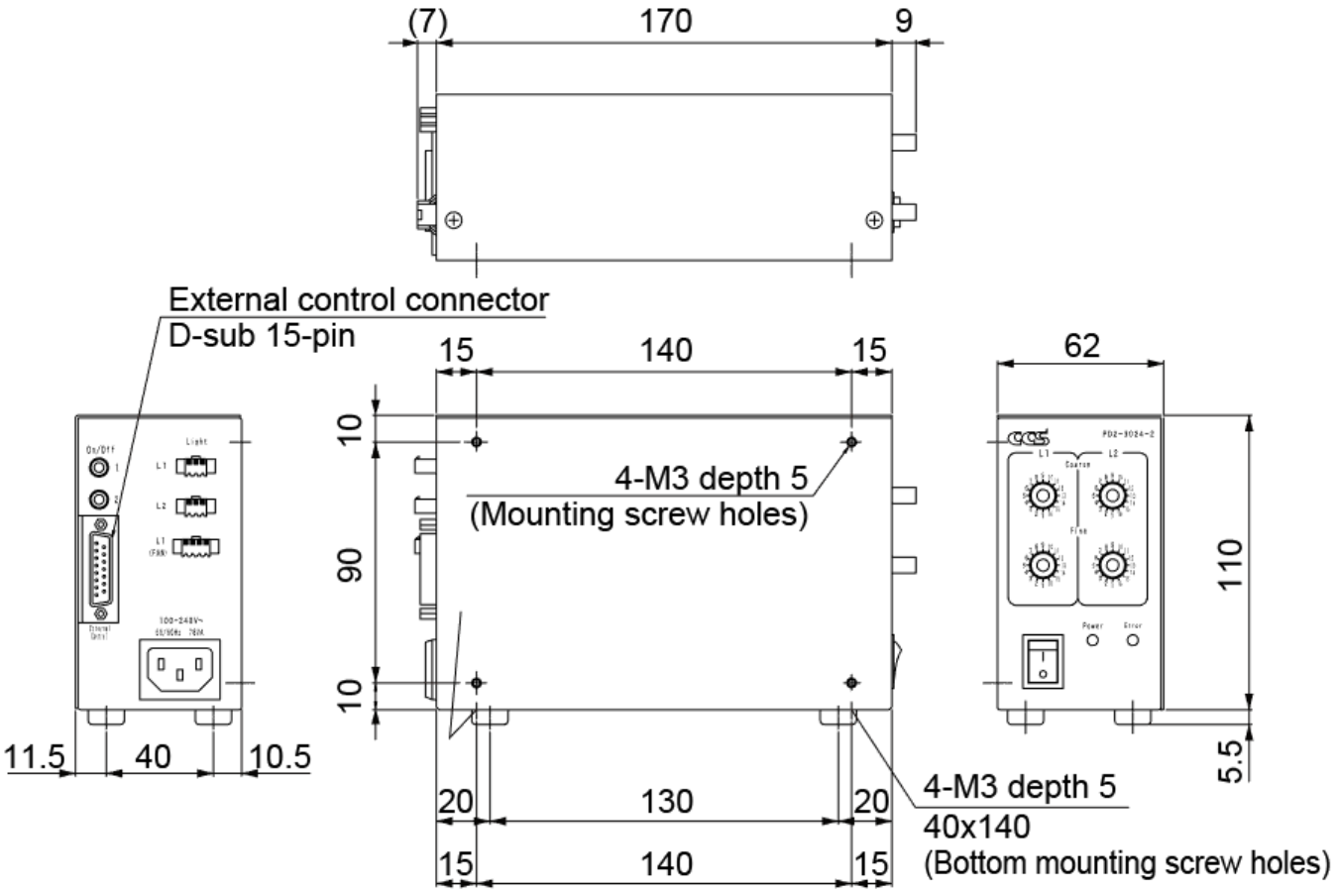


Output transistor
V_{CEO}: 50V
Ic: 100mA
Max. current capacity: 100mA

We recommend usage at a load of 24 V, 20 mA or lower.

8. Dimensional Diagrams (mm)

PD2-3012-2(A) / PD2-3024-2(A)



Supplied 3-prong AC power cord (2m)

9. Specifications

Product name		Control Unit for LED Light Units	
Model		PD2-3012-2(A)	PD2-3024-2(A)
Lighting method		Constant lighting	
Drive method		Constant-voltage system	
Light control method		PWM control	
No. of channels		2 channels	
Applicable illumination (rating)		12V 28W	24V 28W
PWM frequency		62.5KHz	
Light control	Manual	Use of the intensity control knobs on the front panel (Coarse, Fine)(Each 16 steps)	
	External	Input in negative logic (B0 to B7), Manual/External control (NT/EXT), The write bit (WR), Lighting ON/OFF (ON1, ON2), Channel selection (CH)	
Error detection display		The Error indicator (red) on the front panel is lit when overcurrent is detected.	
Error detection output		External control connector 14 pin (OCP): Open collector ON when overcurrent is detected.	
Over current protection *1)		Operates at 107% min. Automatically reset, or manually reset by turning power OFF then ON again.	
Input voltage (rating)		100 to 240V AC	
Input voltage (range)		85 to 264C	
Power consumption (typ.)		78VA	
Frequency		50/60Hz	
Inrush current (typ.)		15A (at 100V AC) Note: From a cold start	
Ground leakage current		3.5mA max. (264C, 60Hz, ith no load)	
Output voltage (rating)		12V DC	24V DC
Output current (rating)		2.3A (total for 2 channels)	1.1A (total for 2 channels)
External control (input)	Insulation	Non-insulated with power supply for illuminator.	
	Circuit	Internally pulling up to +5V power supply by resistance (4.7kΩ) HS-CMOS input	
Dielectric strength (input-output, input-FG)		1500V AC for one minute 10mA cutoff current 500V DC, 20MΩ min.	
Operating temperature and humidity		Temperature: 0 to 40°C, Humidity: 20 to 85%RH (No condensation)	
Storage temperature and humidity		Temperature: -20 to 60°C, Humidity: 20 to 85%RH (No condensation)	
Vibration resistance		Acceleration: 19.6 m/s^2, frequency: 10 to 55 Hz, cycles: 3 minutes, for 1 hour each in X, Y, and Z directions	
Cooling method		Natural air cooling	
Altitude		2000m max.	
Protective ground		Class I	
Pollution level		Pollution level II	
Over voltage category		Category II	
CE marking		Safety standard conform to EN 61010-1 EMC standard conform to EN 61326-1 Class A	
Input connector	AC iput	3-pin, EN 60320-1-certified, C14-type connector x 1 L type terminal, N type terminal, PE type terminal	

<table>
<tr><td rowspan="4">Output connector</td><td rowspan="2">Lighting output</td><td>PD2-3012-2(A)</td><td>SMP-02V-BC (socket) (JST)x2　1 pin: Out+ (12V), 2 pin: Out-</td></tr>
<tr><td>PD2-3024-2(A)</td><td>SMP-03V-BC (socket) (JST)x2
1 pin: Out+ (24V), 2 pin: NC, 3 pin: Out-</td></tr>
<tr><td rowspan="2">Lighting output with Fan</td><td>PD2-3012-2(A)</td><td>SMP-04V-BC (socket) (JST)x1
1 pin: NC, 2 pin: Out+ (12V), 3 pin: Out-, 4 pin: Fan GND</td></tr>
<tr><td>PD2-3024-2(A)</td><td>SMP-04V-BC (socket) (JST)x1
1 pin: Out+ (24V), 2 pin: NC, 3 pin: Out-, 4 pin: Fan GND</td></tr>
<tr><td rowspan="3">External control connector</td><td>Manual ON/OFF control</td><td colspan="2">J-86　Phone jack (Ø3.5) mfd. by Teishin electric mfg. ×2
Center: signal line, Sleeve: GND</td></tr>
<tr><td rowspan="2">External control</td><td colspan="2">15-pin D-sub plug with M2.6mm screws x1</td></tr>
<tr><td colspan="2"><table>
<tr><td>Number</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td></tr>
<tr><td>Structure</td><td>B0</td><td>B1</td><td>B2</td><td>B3</td><td>B4</td><td>B5</td><td>B6</td><td>B7</td></tr>
<tr><td>Number</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td><td></td></tr>
<tr><td>Structure</td><td>INT/EXT</td><td>WR</td><td>ON1</td><td>CH</td><td>ON2</td><td>OCP</td><td>GND</td><td></td></tr>
</table></td></tr>
<tr><td colspan="2">Dimensions</td><td colspan="2">62x170x110mm (WxDxH)
not including protrusions such as connectors, knobs, legs, etc.</td></tr>
<tr><td colspan="2">Material, coating, surface processing</td><td colspan="2">Steel plate t1.0, paint color N3 (leather-tone finish), T75-70L(5PB7/6)</td></tr>
<tr><td colspan="2">Weight</td><td colspan="2">1100g max.</td></tr>
<tr><td colspan="2">Accessories</td><td colspan="2">2-m long 3-prong AC power cord x1,
Instruction guide x1, Optional Cable List x1</td></tr>
</table>

*1: Do not short-circuit positive and negative output terminals.

10. Care and Handling

⚠ Warning

- Turn OFF the Power Supply and unplug it from the wall socket before handling.

⚠ Caution

- Do not scratch the unit by handling it with a hard object.
- Do not let water or cleanser enter the unit.
- Do not use cleansers or chemical agents other than those listed below.

For cleaning, dampen a soft cloth with diluted neutral cleanser, wring out the cloth, and gently wipe off the unit. Use another soft cloth to wipe the unit dry.

MEMO

MEMO

- Contents of this Instruction Guide may be changed without prior notice.
- Illustrations used in this Instruction Guide may differ from actual products.
- CCS maintains the copyright on this Instruction Guide. Unauthorized transfer or reproduction is strictly prohibited.

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

CCS Inc.

Headquarters Shimodachiuri-agaru, Karasuma-dori, Kamigyo-ku,Kyoto 602-8011 Japan

Phone : +81-75-415-8284 Fax : +81-75-415-8278 E-mail : intlsales@ccs-inc.co.jp

Use our website to find your nearest CCS representative. http://www.ccs-grp.com/mvad/

Descriptions in this instruction guide are based on information available as of May 2018.

KZ01893-T001-005