













Operation Manual for the PD Single-channel Series Digital Control Power Supply Units for LED Lighting

【1】 Articles for safety ※ Be sure to read before using ※

Thank you for purchasing Digital Control Power Supply Units for LED Lighting. Be sure to read this operation manual carefully and use as described. This manual should be kept with the product and referred to whenever needed. Obey the following articles with “ Warning”  “ Caution ” and  “ Precaution ” in this manual to prevent accidents such as bodily injuries and electric shocks.

<Safety precautions>

	Warning	
	Do not open the cover of the product Electric shock may occur as the voltage of some internal parts is high.	
	Connect the power plug directly to the outlet. Fire and electric shock may occur when connected to an extended table tap or a multiple outlet extension plug. Install and remove the product after disconnecting the power plugs of the main body and peripheral devices from outlets.	
	Do not touch the power plug with wet hands. Otherwise, electric shock may occur.	
	Ground properly. Otherwise, electric shock may occur in case of touching the equipment and the power unit at the same time.	
	In the following cases, turn off the power, pull the power plug from the outlet and stop using immediately. <ul style="list-style-type: none">Smoke rising from the unit.The outside of the unit is too hot.There are strange smells or strange sounds.	
	Do not look at the light of high lumen directly. LED Lighting doesn't have a quality of gathering light like a semiconductor laser, however, do not look at the light of high lumen directly or do not view the electric flashing light directly for a long time. Eye damage may occur.	

【2】 Features

2-1 The unit can control LED lighting (made by CCS).

The unit enables external sequencer, microcomputer, etc. to control dimming in 8-bit.
(0.4 to 100%).

2-2 The unit can control fast external Light-up.

2-3 PD1012 can control power up to 12V, 0.79A (9.5W), PD1024 up to 24V, 0.38A (9W), PD3012 up to 12V, 2.3A (28W), PD3024 up to 24V, 1.16A (28W), and PD5024 up to 24V, 1.92A (46W).

2-4 Since these controllers utilize the pulse-duty method to achieve dimming, they exhibit excellent linearity in luminance control.

【3】 Specifications

3-1 Dimming control

1. Dimming method: approx. 60 kHz pulse-duty control

2. Switchover control:

(i) External on/off of lighting

External mode – Controlled by bit 10 (B10) of the external interface.

Manual mode – Controlled by the dedicated signal input (Microphone jack connector).

(ii) External Mode/Manual Mode switchover

External Mode/Manual Mode can be switched over from one to the other through bit 8 (B8) of an external interface.

3. Dimming value control:

(i) External dimming quantity of light:

The unit can control dimming in 8-bit from outside.

Code (Hexadecimal)	Dimming Quantity of light [%]
0 (0)	0.4
1 (1)	0.8
2 (2)	1.2
⋮	⋮
254 (FE)	99.6
255 (FF)	100.0

Theoretical value: Dimming Quantity of light [%] = (Code + 1) × 100 / 256

(ii) Manual dimming quantity of light

The coarse and fine rotary switch can control dimming in 16 steps respectively.

Coarse	Fine	Dimming Quantity of light [%]
1	1	0.4
1	2	0.8
⋮	⋮	⋮
⋮	⋮	⋮
⋮	⋮	⋮
16	15	99.6
16	16	100.0

Theoretical value: Dimming Quantity of light [%] = {(Coarse - 1) × 16 + Fine} × 100 / 256

- The Dimming quantity of light is influenced by the driver's response time under 8 and upper 248 of Code.
- It is also affected by extension of the lighting cable. (It is different from the theoretical value.)

3-2 External interface

(1) Bit configuration

Bit	B0	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
Construction	Dimming Bit (0 - FF)								EXT	WR	ON

(2) Signal logic

Data and control bits are of negative logic (active LOW). The signals should be output by using a driver IC, an open collector, etc.

(3) External Mode/Manual Mode switchover

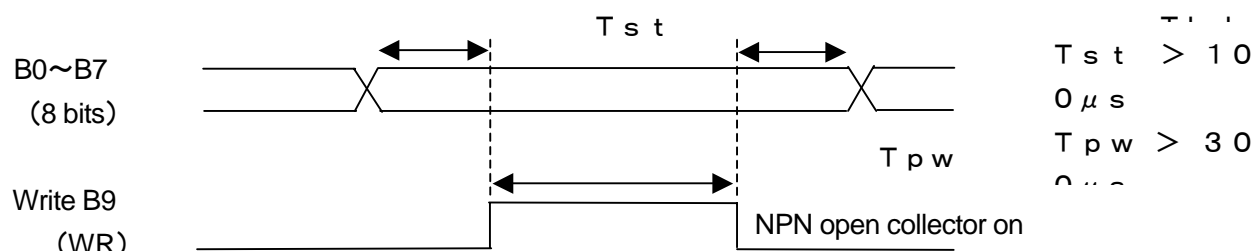
To use in external control mode, make B8 of negative logic (active LOW). (In this mode, manual rotary switch cannot be used.) In manual mode, make B8 HIGH.

External Switching – B8 (EXT)



(4) Data entry sequence:

- Attention* Data can be entered when the unit is in external control mode, not in manual mode. The entered data is volatile. Re-entry is required after turning off the power.



- The dimming data (B0~B7) are output in negative logic (LOW level: 1).
- The write bit is output. (Data are taken in at the fall edge.)
- The desirable interval in the repetition of data saving is 500 μs or more.

(5) External Light-up Control

External Light-up is controlled in External Control Mode. External Light-up B10 (ON)



3-3 Manual Light-up Control

Manual Light-up is controlled in Manual Control Mode.

A signal line of a mini-phone jack (3.5 ϕ)



【4】 Directions for use

(1) Connection

Turn off the power supply switch.

Connect the receptacle of the cord for the LED illuminator to the output plug on the back panel of the power supply. In using Type 10W, ground the FG terminal with 0.5~1.25 sq wires (AWG20~AWG16).

[Caution 1] Connect the plug of the AC cord to the outlet. When controlling in external mode, connect a control connector and a phono plug.

(2) Power supply operation

Turn on the power supply switch.

(3) Intensity control

In manual control mode, the LED lighting intensity may be controlled with the Coarse and Fine rotary switches of the power supply. The LED lighting may be off when the value of Coarse dial is 1 and the value of Fine dial is small.

[5] Connectors

5-1 Output connector: SM connector (JST)

Connector No.	12V output	24 V output	12V with fan ^{*)}	24V with fan ^{*)}
1	OUT+(+12V)	OUT+(+24V)	Empty	OUT+(+24V)
2	OUT-	Empty	OUT+(+12V)	Empty
3		OUT-	OUT-	OUT-
4			Fan GND	Fan GND

^{*)} with fan: Output connector for lighting with fan L1 (FAN)

5-2 External interface connector: DB15 (Male) (M2.6mm) (OMRON)

Use a shielded cable shorter than 3m for the control line.

Pin No.	Color of the Optional Cable ^{*)}	Signal
1	Black	Dimming light B0 [LSB]
2	Black/White	Dimming light B1
3	Red	Dimming light B2
4	Red/White	Dimming light B3
5	Green	Dimming light B4
6	Green/White	Dimming light B5
7	Yellow	Dimming light B6
8	Yellow/White	Dimming light B7 [MSB]
9	Brown	External control (INT/EXT)
10	Brown/White	Dimming Light Writing (WR)
11	Blue	Light-up control (OFF/ON)
12	Blue/White	-
13	Grey	-
14	Grey/White	-
15	Orange	GND

^{*)} Optional cable for external control: EXCB-B3 (The length is 3m, one side of the cable is open.)

5-3 Mini-phone jack (3.5 φ) of Manual light-up control connector

When the supplied plugs are inserted into these phone jack connectors, the Manual Light-up Control is active. The control signal is pulled up to 5V at 4.7k Ω.

When the signal is connected to GND, the light comes on, and when disconnected, the light goes out.

◇ phono plugs

	Terminal	Signal
1	Inside	Control signal
2	Outside	GND



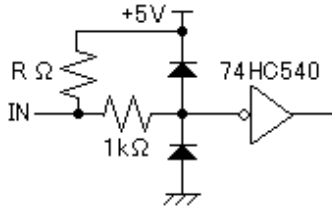
In case of using with extended cable, or in an environment with heavy noise, please consult us.

The extended cable should be less than 3 m.

^{*)} Phono plug is not included in this power supply kit.

^{*)} Optional cable for ON/OFF control: NFCB-3 (The length is 3m, one side of the cable is open.)

[6] PD side input circuit (Negative logic)

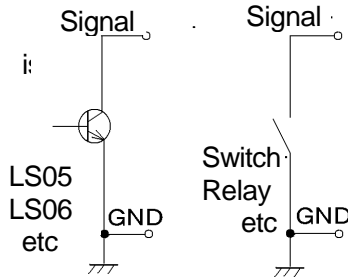


Dimming data : B0 - B7

Control signal : EXT, WRT, ON

Use with Driver IC or NPN open collector.

[7] Recommended control signal drive circuit: Open collector, photo-coupler, relay etc.



When using in surrounding with noise, it


that Signal Line and GND Line should isolate the control unit with photo-couplers or relays.

Any element that supplies current around 10mA can be used.

[8] Rates

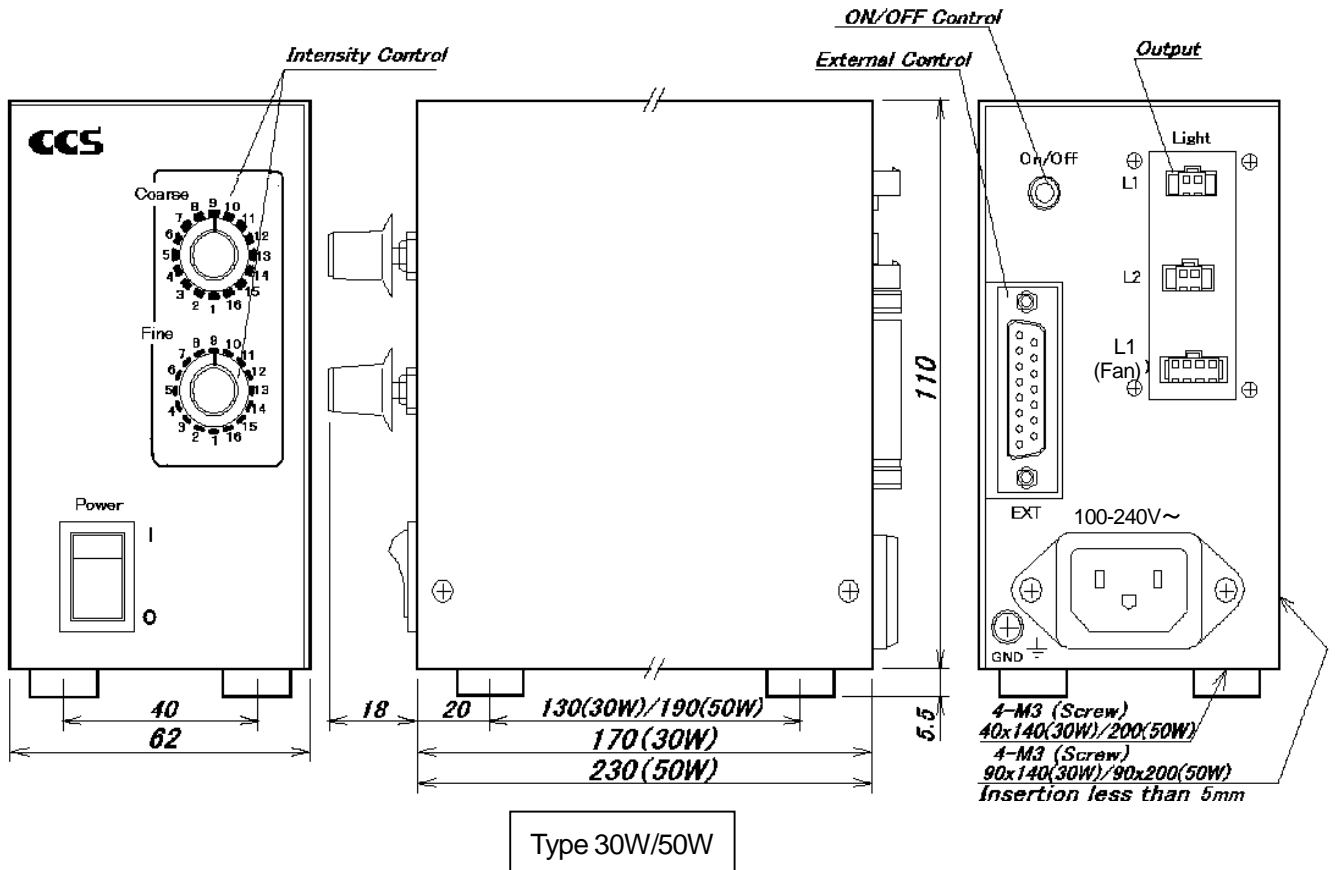
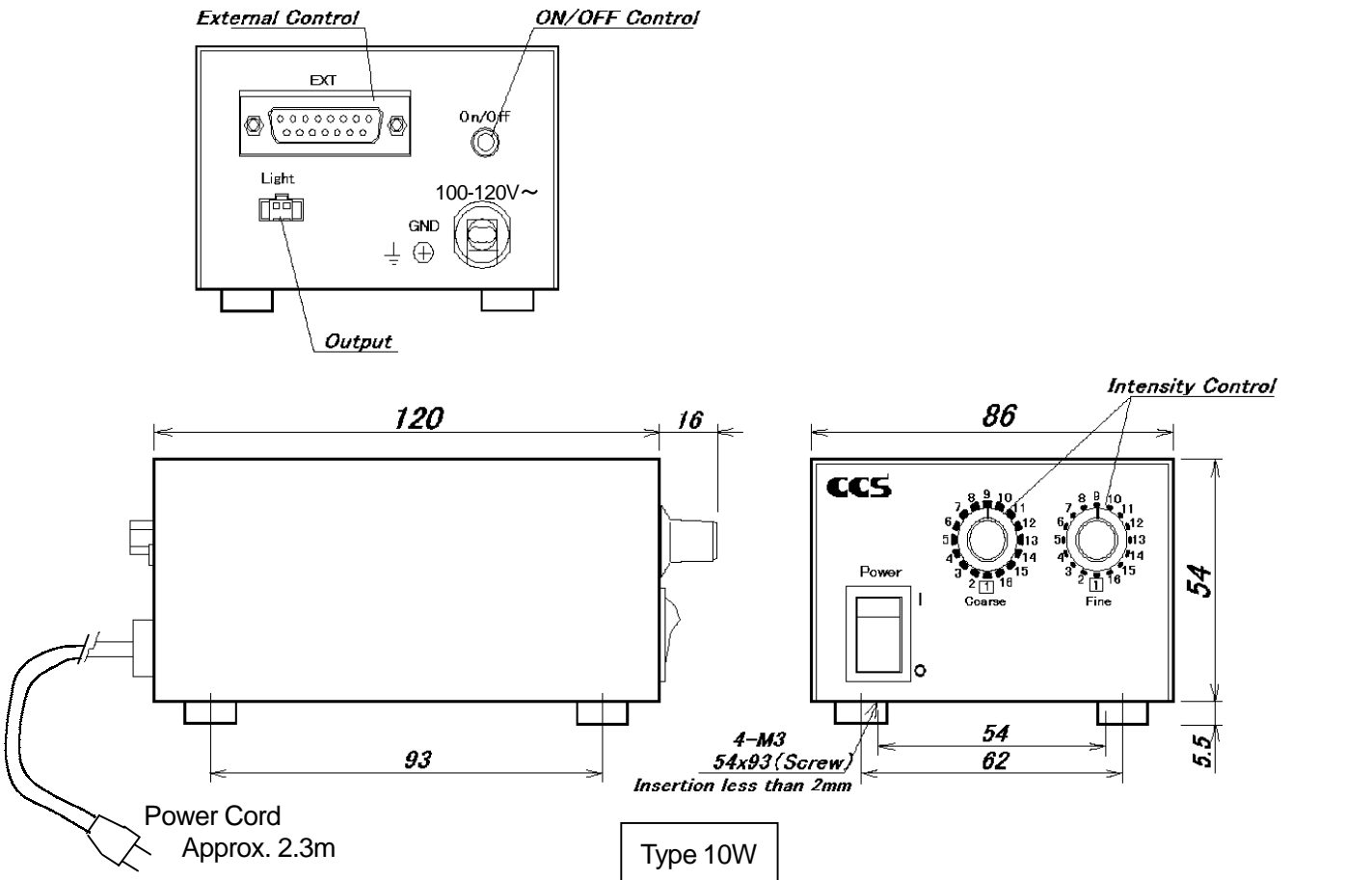
Type	Input	Output
PD-1012	AC100-120V 27V A	DC12V9.5W
PD-3012	AC100-240V 78V A	DC12V28W
PD-1024	AC100-120V 27V A	DC24V9W
PD-3024	AC100-240V 78V A	DC24V28W
PD-5024	AC100-240V 122V A	DC24V46W

- [Attention]
- 1 The operating voltage is -15% to +10% of the input voltage.
 - 2 An overcurrent protection circuit is activated for overload.
(The internal circuit restricts electric power and lowers the quantity of light.)

 Caution	
1.	Ground the FG terminal with AWG20~AWG16 when there is a fear that an operator may touch the power supply unit and a metallic part whose electric potential is different from the power supply unit simultaneously. If the frame doesn't ground and has electric potential, it is better to connect the FG terminal with the FG terminal of the frame. (In using Type 30W/50W, ground the frame with a 3-pole AC cord.)
2.	Use AWG22-28 for the external control cable. A shielded cable shorter than 3m is desirable for the control line to avoid picking up noise.
3.	In case of using the light without cooling fans, turn off the light to control the rise of temperature when not in use.
4.	Do not extend a cable for the light input to more than 5m. Otherwise, the voltage is lowered because of voltage drop occurred by a DC resistance of the cable. The quantity of light decreases since the voltage supplied to the light doesn't reach the rate voltage In spite of 100% light-up.
5.	Do not short the power output although the unit contains an overcurrent protection circuit to protect the driver transistor.
6.	Use the dedicated cord when using the units at AC200V. The supplied power cord is for AC100V although Type 30W/50W runs through the power voltage of AC100 - 240V.
7.	When taking off the rubber legs and case legs and settling the unit in a system rack or a case, the length of the M3 screws which enter the unit should be less than 2mm (10W) or 5mm (30W).

8. To conform to EMC Directive, attach a ferrite core ESD-SR-25 [TOKIN] or equivalent to the power cord for removing the high frequency noise.

[9] Appearance and Size





Precaution

1. Switch off the power when connecting and disconnecting cables.
Otherwise, fire and electric shock may occur.
2. Disconnect the power cable and the external cable when you move the unit.
Damaged cables may cause fire and electric shock.
3. Do not use the unit in a closed system, as the light becomes hot.
Cool down with fans, etc. in case of using in a closed space.
4. In the following cases, turn off the power, pull the power plug from the outlet and stop using instantly.
 - Smoke rising from the unit.
 - The outside of the unit is too hot.
 - There are strange smells or strange sounds.Please contact the local sales office of CCS as it is dangerous for you to repair it.
5. In case of dropping and damaging the unit, please contact the local sales office of CCS after turning off the power and pulling the power plug from the outlet.
Fire and electric shock may occur if you continue to use the unit.
6. Install the unit in the following site.
 - Temperature: 0 – 40 °C. Humidity: 20 – 70 % RH. (No condensation.)
 - At a flat site without vibration.
 - At a site with good ventilation, not exposed to dust.
 - Not at the site where the temperature immediately changes.
 - Not near a faucet, a water heater, a humidifier, an air conditioner or a heater.
(Not at the site where temperature and humidity is too high, nor too low.)
 - Not near things containing water.
7. Obey the following articles for the power source.
 - Take the power as a dedicated power source from the space with steady voltage.
Do not operate the unit from the same power source as an air conditioner, a copy machine, etc. as this causes incorrect operation.
 - Pull off the power plug from the outlet when not using for an extended time.
 - Do not put the power cable near heating machines nor damage it.
 - Do not touch the product and the power plug during the electrical storm.
8. Bundling the camera cable and the power cable together may affect the screen badly.
9. Set the dimming light at MAX in case of using with such a high-speed shutter as 1/4000s.
When using with dimming light at MAX, it is recommended that the unit should be used in intermittent light-up of external control mode.
10. When using color image processing with white LED,
 - In continuous light-up, the quantity of light and color vary in response to the temperature.
 - Regulate the white balance of the camera again about 1 hour after switching on the power.
 - In intermittent light-up, it is possible to use the unit as soon as the power is on.
11. Use the LED light with controlled heat-generation.
 - The lifetime of the LED light is shorter when used at high temperature. In case of continuous use keeping the dimming quantity of light around 50% shows stable performance for a longer time.
 - Turning on the light only when taking in the image, the Intermittent light-up, makes it possible to use the unit under the stable condition with less heat generation.
12. In using the unit under the following conditions, consider the rates, the functions, and safety like a failsafe. Also, contact the sales local office of CCS.
 - In case of using it under conditions and environments not written in this manual.
 - In case of using it for atomic energy, a railway, an airplane, a car, a burning machine, a medical instrument, an entertainment facility or a safety device.
 - In the case when serious influences on life and property are predicted and special safety is required.

■ Exemption

We are not obliged to have any responsibility nor compensation for troubles and damages which occur both directly and indirectly from using the power unit and the LED light.

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