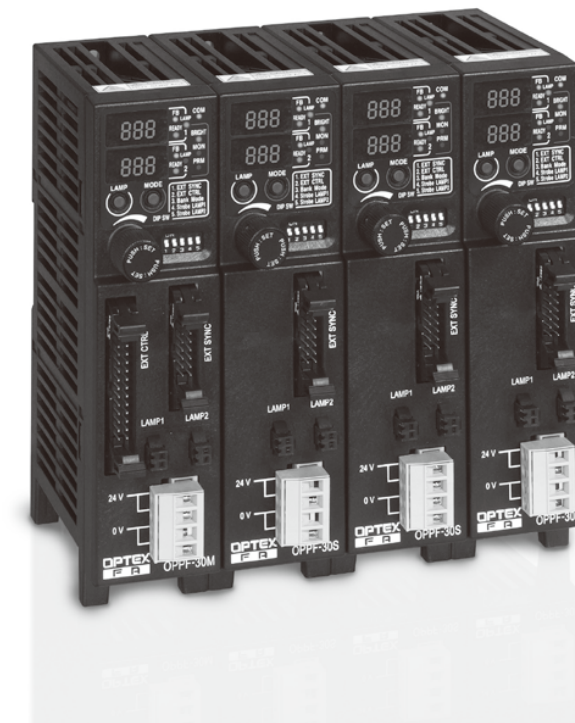


LED controller Advanced  
**OPPF series** Instruction Manual



- Thank you for the purchase of the LED controller Advanced "OPPF series."
- Before using it, please read this manual carefully to ensure proper use.
- After reading this manual, keep it carefully in an easily accessible location for future reference.
- This product should not be used as safety equipment intended for the protection of human body.
- The warranty period of this product is one year after delivery. - Notwithstanding the above, any fault attributable to natural disasters or any other similar disasters or undue alteration or repair will be excluded from the scope of the warranty.

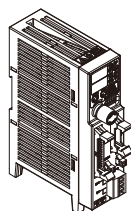
## Introduction

### Features

#### LED controller Advanced “OPPF series”

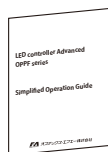
- Compatible with two modes, including PWM lighting and strobe lighting.
- Capable of lighting brightness/temperature monitoring and feedback control by utilizing “FALUX sensing.”
- The external brightness control is compatible with three communication modes of RS232, parallel and analog 0-5 V.
- Equipped with the bank registration functionality of the brightness values, making it possible to switch the bank with fewer input lines.
- The synchronous input may be selected from 5-30 V input type and TTL input type.

The following items are contained in the package. Make sure that everything is in place.



OPPF series unit

1



Simplified Operation Guide

1 copy



Instruction Manual CD-ROM

1

### Product line up

Type	Part number	
	Standard type	TTL type
Master NPN	OPPF-30MN	OPPF-30MN-TTL
Slave NPN	OPPF-30SN	OPPF-30SN-TTL
Master PNP	OPPF-30MP	OPPF-30MP-TTL
Slave PNP	OPPF-30SP	OPPF-30SP-TTL

### Versions

You can see version of each hardware / software through PRM setting mode.

**Display version:** Shows the software version of the user interfacer.

**Controller version:** Shows the software version of the controller (1-2 digit) and logic version (3rd digit).

**Lighting device version:** Shows the software version of the lighting device connected.



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## For Safe Use of the Product

### Significance of Symbols

To prevent any safety hazards to human body and damage to the equipment, this document shows things to be observed as classified in the following manner.

	<b>Warning</b>	Indicates that any improper operation by neglecting the instruction shown with this symbol may result in injuries.
	<b>Caution</b>	Indicates that any improper operation by neglecting the instruction shown with this symbol may result in property damage (such as breakdown of this product).

### Warning

#### General Notes

- Do not operate the unit on any voltage other than 24V DC. Any in compliance may result in a fire, electric shock or breakdown.
- Do not disassemble or modify the unit. Any in compliance may result in a fire or electric shock.
- The lighting outputs cannot be connected in parallel or in series for the operation.
- The lighting outputs may only be connected to LED lighting devices. Do not connect them to any other circuits.

#### Using Environment/Conditions

- To ensure proper and safe use of the product, avoid the following locations for the installation. Any in compliance may result in a fire, electric shock or breakdown.
  - Humid, dusty or poorly ventilated location
  - Location subjected to direct sunlight or high temperatures
  - Location subjected to corrosive gases or flammable gases
  - Location directly subjected vibrations and impacts
  - Location subjected to splash of water, oil and chemicals
  - Location potentially subjected to static electricity
- Keep the cables away from the high voltage lines and power lines wherever possible. Otherwise, malfunction or breakdown may result due to noise.
- When fixing cables, bind them over a spiral tube or any other protective materials. Any direct binding will cause the concentration of the loads to the cables on the bound portion, potentially resulting in breakage or short circuit.
- This product is a precision instrument. Please be careful to avoid any impacts and vibrations.

#### Actions upon any Problems

- In any of the following cases, immediately turn OFF the power. Any use in extraordinary conditions may result in a fire, electric shock or malfunction. For repair, please contact our sales office.
- Ingress of water or foreign matter into the interior of the unit.
- The unit dropped or the casing damaged.
- Smoke or unusual odor coming out of the controller.

### Caution

#### About the Use

- Before operating the equipment, make sure that the present product is working properly in terms of functions and performance.
- Provide sufficient safety measures to prevent damage of various sorts in any case of breakdown with any of our products.
- Please note that functions and performance are not guaranteed for any use of the product beyond the specifications or for any modified product.
- When connecting or disconnecting any of the cables, be sure to power OFF the units connected to the unit. Any in compliance may result in damage to the unit and devices connected to it. While setting items, do not turn OFF the power.
- Otherwise, part or whole of the setting data may be lost.
- Keep the cables away from the high voltage lines and power lines wherever possible. Otherwise, malfunction or breakdown may result due to noise.
- Do not block the ventilation holes of the unit and peripheral devices. Any in compliance may cause the internal temperature to rise, resulting in breakdown.
- Any use of our product in combination with other equipment may not deliver satisfactory functions and performance depending on the using conditions and environments. It should be sufficiently considered before use.
- Do not use the product for the purpose of protecting human body.

#### Treating this Product

- This product is a precision instrument. Please be careful to avoid any impacts and vibrations.
- Avoid any sharp change in temperature with the equipment, including peripheral units. Otherwise, condensation may occur.
- Do not wipe it with wet rag and do not use benzene, thinner or alcohol for cleaning.
- Any failure to comply with it may cause discoloration or distortion.
- Where the unit is severely contaminated, wipe the surface off the dirt with a rag that has been dipped in a thin detergent solution and wrung hard and then wipe it again with dry soft rag.

## Installation Notes

### Installing the Product

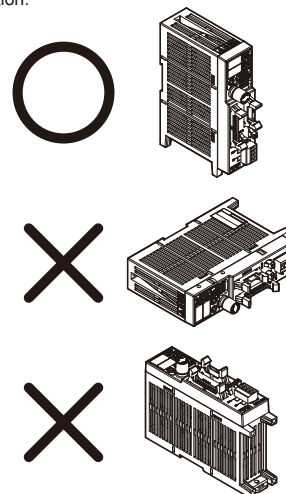
Fit the controller to the DIN rail or use the screw holes on the bottom surface to securely fix it.

### Caution

Avoid any dusty or moist environment for the installation of this product. Since the present product is not protected against any ingress of dust or water, dust or water may enter into the controller, constituting a cause of breakdown.

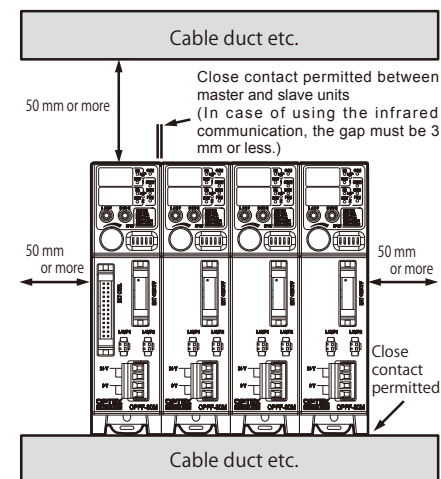
### Notes about the Installation Position of the Controller

Install the controller in a position shown circled in the figure below. Avoid any other positions for the installation.



- Allow a gap of 50 mm or more and left- and right-hand sides of the OPPF series.
- Avoid closing the openings above and below the unit. Take sufficient care to cause convection for release of heat.
- The operating ambient temperature range of the OPPF series is 0-45°C. Take the following into consideration.
  - Avoid installing the unit directly over devices that generate a large amount of heat (heater, transformer, power supply unit etc.).
  - Where the ambient temperature may rise beyond 45°C, install a forced cooling fan or air conditioner.
  - When installing the controller in an enclosure, locate it at the bottom wherever possible.

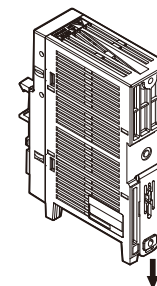
- To ensure safe connection of cables, secure a gap of 70 mm or more on the front of the connector panel surface of this product.



### Securing The Unit

#### When installing on DIN rail

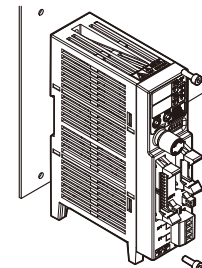
The master and slave units are specified for installation on DIN rail. When attaching or removing the unit, pull the claw at the bottom in the direction of the arrow.



#### When installing by the back surface

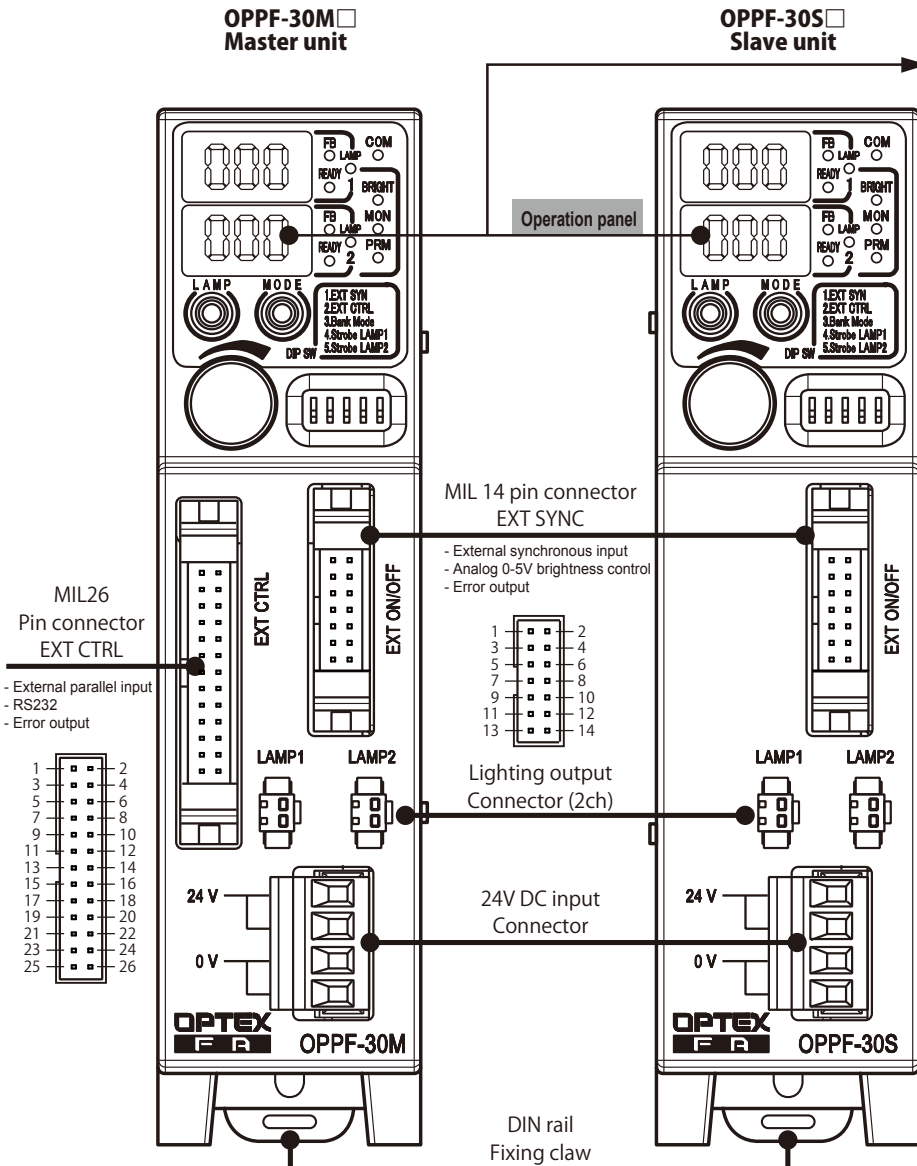
Install this unit at a stable, vibration-free location.

Housing hole dimension:  
2-  $\phi 4.5$   
For further details, see the drawing of the unit.



# Components and Their Functions

## Master Unit and Slave Unit



## Operation panel

### LAMP1 display

Brightness value/monitored value  
Setting name

### LAMP2 display

Brightness value/monitored value  
Setting

### Lamp switching button

### Mode switching button

### Value setting dial

### Enter button

### READY indicator

Red: lighting ready  
Flashing red: LED output over current or LED over heat  
Unit: insufficient input voltage of 24V DC

### Display of FB (feedback) state

Green: FB working  
Flashing orange: FB error or alarm on monitored brightness  
Red: communication with the lamp terminated  
Unit: feedback function not used

### COM state of infrared communication between master and slave

Green: communication normal  
Flashing red: communication error  
Red: communication shut down  
Unit: no communication underway

### LAMP1/2

Lit while selected

### Mode display

BRIGHT: brightness value setting/display mode  
MON: monitoring mode  
PRM: setting mode

### DIP SW dip switches (ON when raised)

DSW1: external synchronization (common to LAMP1 & 2)  
DSW2: external brightness control mode  
DSW3: bank mode  
DSW4: strobe mode LAMP1  
DSW5: strobe mode LAMP2

## Operations for Each Mode



### BRIGHT brightness value setting/display mode

Brightness values are shown on LAMP1 and LAMP2 displays.

- Press** Selects either LAMP1 or LAMP2 for setting the brightness value with the dial.
- Press** Switches to the MON monitoring mode.
- Press long** Switches to the PRM setting reference mode.
- Rotate** Changes the brightness value of the currently selected lamp. A counterclockwise turn by one click decreases the value by 1 and a clockwise turn increases it by 1.
- Press** Moves the position of the brightness value to be changed. When in the bank mode, the relevant bank number is displayed first. If left for 30 seconds, the position for the change returns to the lowest position.
- Press long** Pressing the two buttons at the same time brings about a locked state. Performing the same operation again unlocks the state. In the locked state, the brightness values and settings cannot be changed.



### PRM setting reference mode (The upper menu display flashes.)

- Press** Selects a setting to be displayed from LAMP1 and LAMP2.
- Press long** Returns to the BRIGHT brightness setting/display mode.
- Rotate** Switches the setting item to be displayed.
- Press** Transitions to the PRM setting reference mode.



### MON monitoring mode

Monitored values are displayed on LAMP1 and LAMP2 displays. If no lamp is connected, "--" will be displayed.

- Press** While the button is pressed, the voltage correction factors (%) for LAMP1 and LAMP2 are displayed. Where the feedback function is not used, "100" will be displayed.
- Press** Returns to the BRIGHT brightness setting/display mode.
- Press** Displays the internal temperature (°C) of the lamp. If no lamp is connected, "--" will be displayed.
- Press simultaneously** Displays the internal temperatures (°C) of the power supply unit. The upper and lower values represent the temperatures in the vicinity of the LAMP1 and LAMP2 driving circuits, respectively. Once either of the temperatures reaches 105°C or more, the brightness value is decreased to a 1/4 level to protect the internal circuits.

### PRM setting change mode (The lower setting display flashes.)

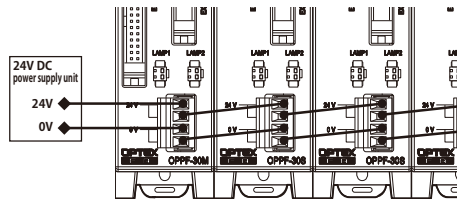
- Press long** Returns to the PRM setting reference mode without writing the changed setting.
- Rotate** Changes the currently displayed setting.
- Press** Moves the position of a setting to be changed. If left for 30 seconds, the position for the change returns to the lowest position.
- Press long** Writes the changed setting and returns to the PRM setting reference mode.

# Connecting Cables

## Connecting Cables

### 24V DC input (power supply)

**Connector** : Omron socket 4-pole type  
XW4B-04C1-H1  
**Applicable wire** : 0.2 - 2.1 mm<sup>2</sup>, 24 - 14AWG  
**Length of stripping part** : 7mm  
**Upper two poles** : 24V DC  
**Lower two poles** : 0V  
**Caution** : Use one pole for one wire. When supplying power across units, use unused terminals.



### Lighting output (LAMP1, LAMP2)

**Connector housing** : JST's SMR-02V-B

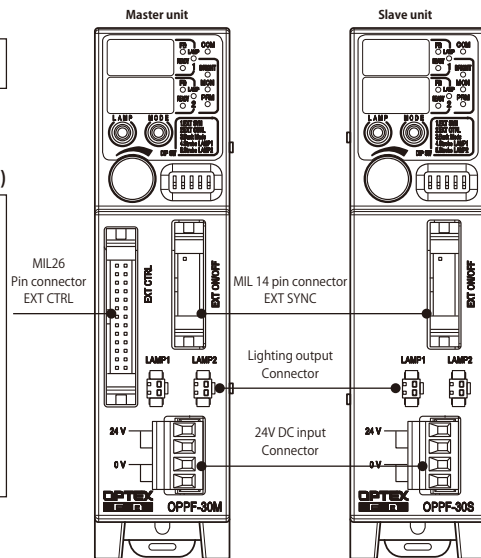
### Master unit: MIL 26 pin connector (EXT CTRL) Master unit/slave unit: MIL 14 pin connector (EXT SYNC)

**[Recommendation]**  
**Manufacturer** : MISUMI  
MIL socket connector wiring harness  
Universal IDC type

Example) Cut-off type on one end  
AWG28 twisted pair single-shielded  
Master unit: MIL 26 pin type (2 m) →  
HIFS-S-E-26-2

**Caution** : Common to master and slave units: MIL 14 pin type (2 m) → HIFS-S-E-14-2

Use shielded cables in any environment subjected to noises.

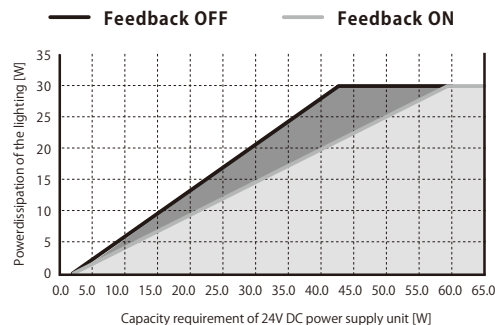


### Capacity Requirement of 24V DC Power Supply

Based on the power dissipation of the LED lamps connected, select a 24V DC power supply unit with a capacity greater than the power requirement.  
\* Maximum power dissipation for a connectable LED lamp: 30 W

#### Attention:

When operating in combination with other devices, the power requirement will be affected by the characteristics of such devices. Therefore, when selecting a power supply unit, allow a sufficient margin for the capacity than shown in the diagram (about double for example).



# Infrared Communication

## Major Functions of Infrared Communication between Master and Slave Units

### - Copy of setting onto the slave unit by the operation on the master unit (setting cPy)

All settings of the master unit's LAMP1 are copied into LAMP2 of the master unit and LAMP1 and LAMP2 of all slave units. A long press on the mode button on the operation panel causes the transition to the "PRM setting mode." Now the copy is enabled by the setting cPy.

### - Setting the brightness values, switching the bank, reading & writing the settings, and reading the state of the slave unit by the master unit through RS232

Response time from the serial command transmission to the master unit to the slave unit's switching of the brightness value (bank): 24 - 60 ms

### - Setting the brightness values and switching the bank of the slave unit by the master unit through external parallel input

The states of DSW2 and DSW3 must be set to be the same for both master and slave units.

If the settings differ, the slave unit cannot accept commands through the external parallel input.

Response time from the parallel input to the master unit to the slave unit's switching of the brightness value (bank): 20 - 60 ms

### - Reflecting the error state of the slave unit on the error output of the master unit

Any occurrence of a feedback error or LED output over current error of the slave unit causes the error output of the master unit to turn ON.

There will be a maximum delay of 250 ms from the occurrence of an error on the slave unit to the error output turning ON on the master unit.

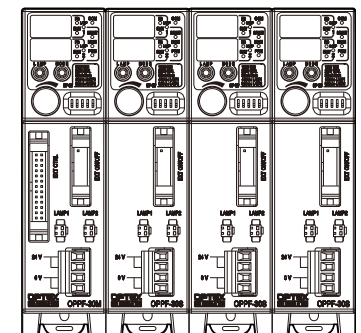
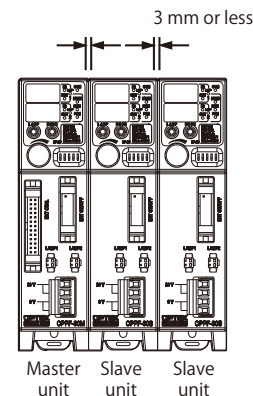
### Particular Notes

To ensure the stability of infrared communication, the units should basically be in close contact with each other and, at worst, the gap between them should not exceed 3 mm. The installation of the units should be made onto DIN rails to avoid any change in the gaps.

### Assignment of Station Numbers

The station numbers to be designated by the external parallel input and serial communication are assigned sequentially starting at the left-hand side unit.

	Master unit	Slave unit	Slave unit	Slave unit
LAMP1	0	2	4	6
LAMP2	1	3	5	7





# PWM Brightness Control and Strobe Mode

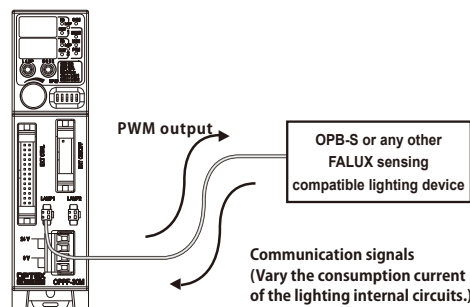
Patent pending

## Differences from Conventional Products

With the OPFF series, connecting a FALUX sensing-compatible lighting device makes it possible to communicate with it to read the LED brightness and internal temperature of the device, in addition to the power supply for the lighting.

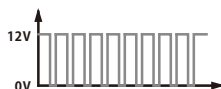
The communication does not require any dedicated cable. Communication signals are superimposed on two wires connected to the lighting device.

Any lighting device without FALUX sensing capability may also be connected as before.



To drive the internal circuits of the lighting device, a voltage of approximately 6 V is applied while the lamp is unlit. (LED will not illuminate with the 6 V voltages.)

### Conventional PWM output



### PWM output of OPFF



### Conventional strobe output

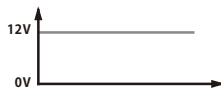


### Strobe output of OPFF

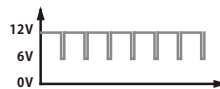


In addition, since communication signals are superimposed, the lamps will not be in a state of direct current lighting even under the 100% duty condition.

### Conventional PWM output (at maximum duty)



### PWM output of OPFF (at maximum duty)



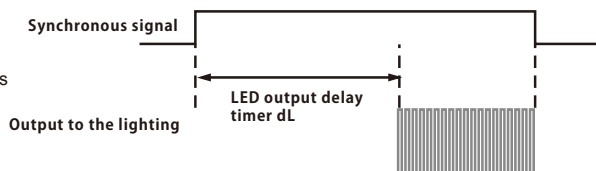
## PWM Mode

Where the DIP SW4 (LAMP1) or DIP SW5 (LAMP2) is set OFF, the system will work in the PWM mode. Use the value setting dial to set the brightness value (0 - 999). The maximum capacity for connectable lighting equipment is a total of 30 W for 2 channels.

### - PWM lighting by external trigger

While the DIP SW1 is set ON, the lighting may be controlled by the external synchronous input. In that case, the delay time from the rise of the trigger input to the actual emission of light will vary as shown below depending on the tFL filter time setting.

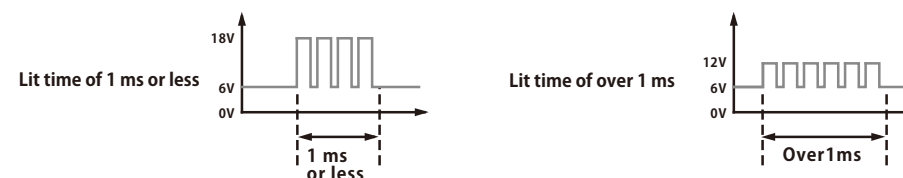
- Filter time 1  $\mu$ s: fluctuation of 200 ns
- Filter time 5  $\mu$ s: fluctuation of 1  $\mu$ s
- Filter time 25  $\mu$ s: fluctuation of 5  $\mu$ s
- Filter time 100  $\mu$ s: fluctuation of 20  $\mu$ s



## Strobe Mode

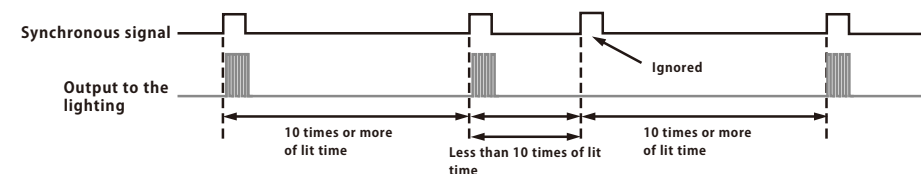
When the DIP SW4 (LAMP1) or DIP SW5 (LAMP2) is set ON, the equipment will work in the strobe mode. Use the value setting dial to set the brightness value (0 - 999). The strobe-lit time is specified by the setting Stb. (10  $\mu$ s - 9.99 ms, at an increment of 10  $\mu$ s)

- In case the lit time is 1 ms (Stb setting of 100) or less, the lighting is driven with a high voltage of 18 V to illuminate the LED's at a three times higher brightness.
- In that case, the maximum capacity of the lighting connectable to each lamp is 15 W.
- In case the lit time exceeds 1 ms (Stb setting of 100), the lighting is driven with a standard voltage of 12 V
- In that case, the maximum capacity for connectable lighting equipment is a total of 30 W for 2 channels, which is the same as in the PWM mode.



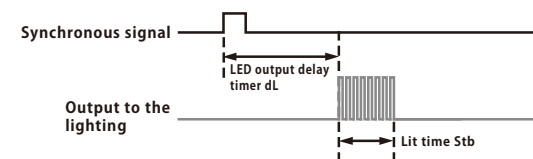
In the 18 V-driven strobe mode, no synchronous input is accepted until the elapse of time equal to 10 times the lit time, for the purpose of protecting the LED's.

There is no such restriction for the case of driving with 12 V.



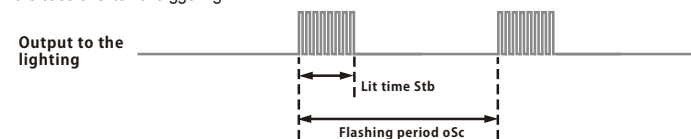
### - Strobe lighting by external trigger

When the DIP SW1 is set ON, the lighting may be controlled by the external synchronous input. In that case, since the lighting control signal and the PWM are mutually synchronized, there will be no variation in the number of output pulses for all lighting-ups.



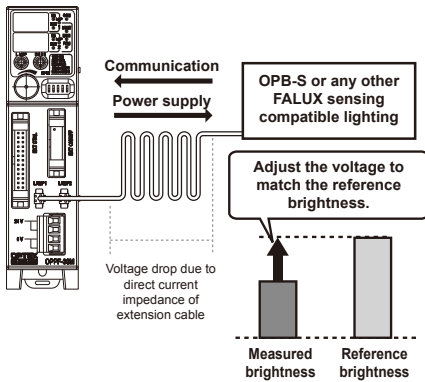
### - Strobe lighting by internal automatic trigger

When the DIP SW1 is set OFF, it will flash at a period of the setting oSc. The restriction on the duty cycle works in the same way as in the case of external triggering.



# Monitoring and Feedback Functions

Patent pending



## Overview

A FALUX sensing-compatible lighting device senses the brightness of LED lighting with its built-in photo-diode. It accurately measures the brightness not only in the case of continuous lighting but also in any situation of less frequent flashing.

If the monitored brightness exceeds 999, the last three digits are displayed. For example, any monitored brightness of 1000 - 1099 is shown as 000 - 099. If the monitored brightness is 1100 or over, only the last three digits are shown flashing.

The feedback function compares the measured brightness with the reference brightness recorded in the lighting device and fine-adjusts the output voltage to control the brightness to match the reference value.

Furthermore, in addition to the brightness, the internal temperature is measured in the lighting device and monitored by the power supply unit.

Through RS232 communication, the monitored values may be read.

## Usage (1) Detecting the Drop in the Brightness without Feedback to Release an Alarm (without feedback)

Set the setting Fb to OFF and bAL to the lower limit value (%) of the monitored brightness for alarm release.

Example) To release an alarm output upon any brightness decrease of 10%:  
bAL = 90 (%)

If the cable for the lighting device is long, the actual brightness will be reduced due to the component of direct current impedance. Through the monitoring menu, check the monitored brightness against the brightness control value. Where the brightness control value and monitored value are 500 and 450, respectively, for example, the brightness is already decreased to 90% (= 450/500). If you wish to

Release an alarm at a brightness further 10% lower than that, set a value of 81% (= 90% x 90%) as the monitored brightness lower limit value for alarm.

For the release of the alarms, FBERR1 or FBERR2 output or ERR output of the master unit is used.

## Usage (2) Feedback Function

Set the setting Fb to ON. Set bAL to the lower limit value (%) of the monitored brightness for alarm release (optional). The output voltage will be adjusted to maintain the reference brightness appropriate for the brightness control value.

Generally, extending the lighting cable will actually decrease the brightness of the lighting due to the decreased voltage by the direct current component and also due to the dull waveform attributable to the inductance component and capacity component. If you actually extend the cable to 10-15 meters and use a lighting device of a relatively large capacity, the brightness may sometimes decrease to a half level or even lower. The feedback function will effectively work to compensate for the voltage drop by the direct current impedance.

Pressing the LAMP button in the monitoring mode makes it possible to view the voltage compensation rate (%).

For example, if the voltage is compensated to 15 V, the displayed value will be 15/12=125%. Shown below are variation ranges.

PWM mode: 92 - 150%

Strobe mode: 89 - 122% (in case of 12 V output: 92 - 150%)

## Notes about the Use of the Monitoring and Feedback Functions

The monitoring and feedback functions may not work in the following cases.

- The monitored brightness cannot reflect any smear of the lens or diffuse plate of the lighting device.
- If the brightness control value is less than 50, the feedback function is automatically turned OFF.
- Where the pulse width for the external synchronous input is very small (about 2  $\mu$ s or less), the lit time will become extremely short and, therefore, the communication with the lighting device will be broken.
- If the cable to the lighting device is long and the capacity of the device is large, the communication with the device may be disabled. In that case, decrease the PWM frequency to 50 or 20.
- If the communication with the lighting device is unstable due to noises, take anti-noise measures, such as protecting the lighting device cable with shield cover (shield gasket etc.)

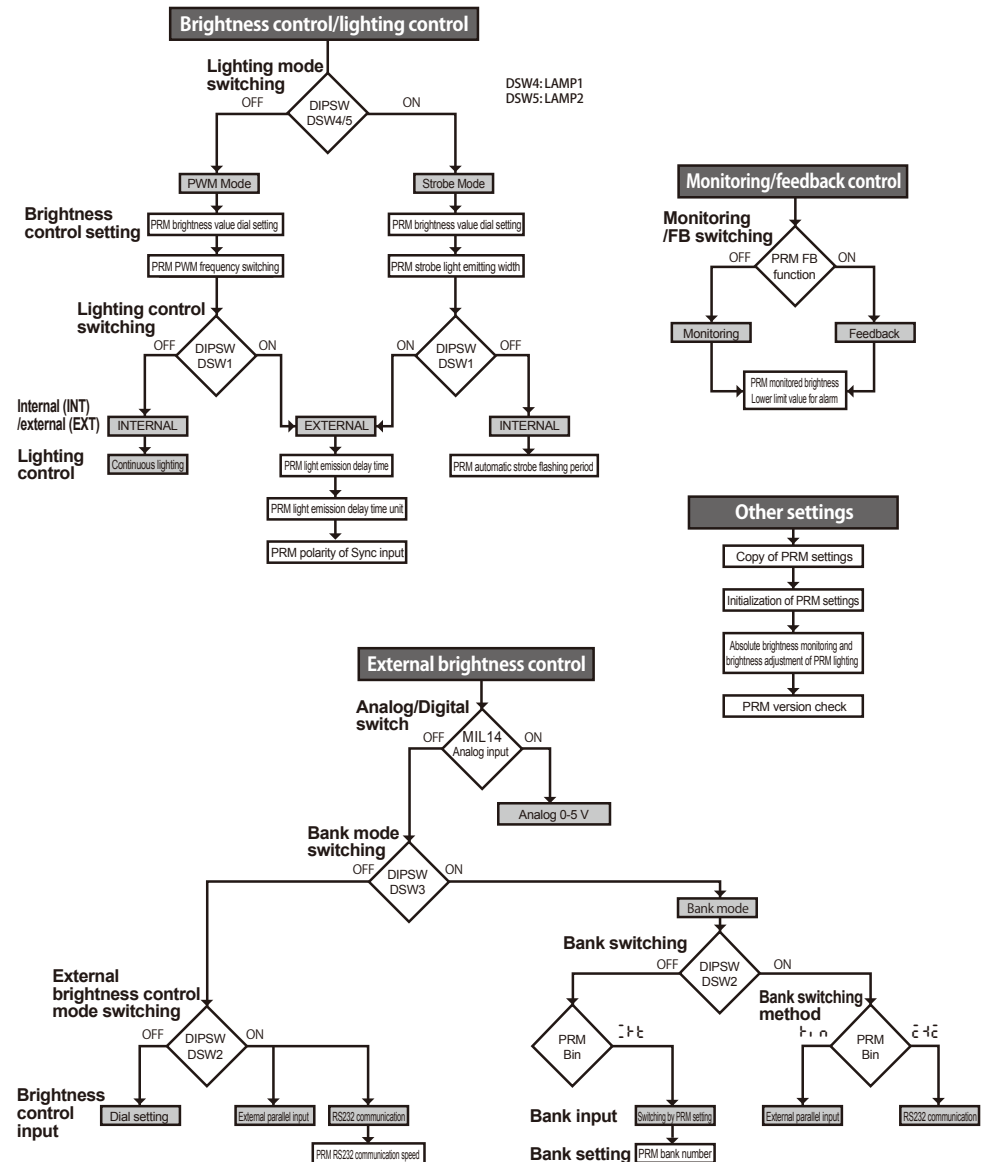
Shown below are operating conditions for the monitoring and feedback.

- Where the external synchronous input is used and the lit time is short, it may take a long time for the feedback actions to converge. The monitoring of the brightness requires at least 8 flashing actions. In case of continuous lighting, it requires 100 ms or more of lit time.
- Where the lighting device has been replaced, the targeted level of brightness is not achieved immediately after a significant change in the brightness control value. Therefore, the restoring to its normal state is accelerated by temporarily performing continuous lighting (DSW1 = OFF).
- The monitored brightness alarm action requires a minimum of 24 flashes or 300 ms or more of lit time. When the powering OFF is done after a minimum of 160 flashes or 2 seconds or more of lit time, a feedback-compensated output voltage is saved in memory. Upon the next powering ON, the device is lit in the same state as before the powering OFF.
- The period of updating the brightness by the communication between the lighting device and power supply unit is 21 ms. The period for the temperature is 105 ms.

# Setting Procedures

## Operation Flowcharts

For setting each setting, see the flowcharts shown below.



# Setting Procedures

## Setting the Brightness Control Values

Besides the dial-based setting, the methods of setting the brightness control value include the use of external signal input. The external signal input is selectable from the three methods of parallel input, RS232 communication and analog input.

- Brightness control by dial → Operations for Each Mode on p6
- Brightness control by external parallel input → Inputs and Outputs on p16
- Brightness control by RS232 communication → RS232 Communication on p18
- Brightness control by analog input → Inputs and Outputs on p16

With the brightness control values set in the banks in advance, the value may be switched with less amount of input. The registration of the values may be done on up to 16 banks.

The bank switching measure is selectable from three methods, including PRM setting, external parallel input and RS232.

- Bank switching through PRM setting: → List of PRM Setting Items on p15
- Bank switching through external parallel input: → Inputs and Outputs on p16
- Bank switching through RS232 communication: → RS232 Communication on p18

	DIP SW		PRM			EXT CTRL ML26-pin					EXT CTRL ML26-pin	
	DSW2	DSW3	Setting bin	Setting bno	Setting b0 - b15	D0-D3 input	D4-D9 input	WR input	L0-L2 input	RS232	ANALOG input	AIN1,2 input
Brightness control value setting by dial	OFF	OFF	---	---	---	---	---	---	---	---	OFF	---
Designation of brightness control value through external parallel input	ON	OFF	---	---	---	Last ... bits of brightness control value 4bit	First ... bits of brightness control value 6bit	When writing	Designate station no.	---	OFF	---
Designation of brightness control value through RS232 communication	ON	OFF	---	---	---	---	---	---	---	EVO command	OFF	---
Designation of brightness control value through analog input	---	---	---	---	---	---	---	---	---	---	ON	0 - 5 V applied
Designation of brightness control value by bank switching through PRM setting	OFF	ON	SEt	Bank designated by 0 - 15	Brightness control values of banks	---	---	---	---	---	OFF	---
Designation of brightness control value by bank switching through external parallel input	ON	ON	Ein	---	Brightness control values of banks	Bank number	---	---	Designate station no.	---	OFF	---
Designation of brightness control value by bank switching through RS232 communication	ON	ON	232	---	Brightness control values of banks	---	---	---	---	Bn, BNO command	OFF	---

\* About the bank switching

- Bank numbers are common to the external parallel input and RS232 communication. The bank numbers are deleted upon powering OFF.

- The bank numbers by the PRM setting are set separately from those for the parallel input and RS232 communication. The bank numbers are retained despite any powering OFF.

## List of PRM Setting Items

A long press on the mode button on the operation panel causes the transition to the "PRM setting mode."

Indication	Name	Range	Initial value	Unit	LAMP1,2	Details
Stb	Strobe lighting width	1 - 999	1	10 μs	Individual	Valid in the strobe mode.
oSc	Automatic strobe flashing period	1 - 250	250	1ms	Common	Sets the flashing period of strobe that work in the strobe mode and continuous lighting (DSW1 = OFF).
dL	LED output delay timer	0 - 999	0	10 μs/1 ms	Individual	The unit may be switched by the setting dLu. Becomes valid with the external lighting control (DSW1 = ON).
dLu	Unit of LED output delay timer	10u,1	10u	-	Individual	The value of 10u sets the unit of the LED output delay timer at 10μs and the value 1 at 1 ms. The delay time ranges that can be set are 0 - 9.99 ms and 0 - 999 ms, respectively. Becomes valid with the external lighting control (DSW1 = ON).
tFL	Filter time factor for Sync input selection	1u,5u,25u,100	1u	μs	Common	Designates the time for filtering to remove noises of the synchronous inputs. The input delay times are 0.8 - 1.0μs, 4 - 5μs, 20 - 25μs, and 80 - 100μs, respectively. Becomes valid with the external lighting control (DSW1 = ON).
tPL	Polarity of Sync input	PoS,NEG	PoS	-	Individual	PoS: While the synchronous input is ON (electric current passing), the lighting device is illuminated. In the strobe mode, the device will be lit with the rise of a pulse. nEG: While the synchronous input is OFF, the lighting device is illuminated. In the strobe mode, the device will be lit with the fall of a pulse. Becomes valid with the external lighting control (DSW1 = ON).
bAL	Monitored brightness lower limit value for alarm	0 - 100	0	%	Individual	If the brightness of the lighting device being monitored has decreased to a level below the designated percent value of the reference brightness, the feedback error output turns ON. Note that, if the cable for the lighting device is long, the brightness will be reduced due to the component of direct current impedance.

Indication	Name	Range	Initial value	Unit	CH1,2	Details
Fb	Feedback Function	oFF,on,cPb	oFF	-	Individual	This function is to adjust the voltage applied to the lighting device so the brightness of the lighting device being monitored matches the brightness control value. Voltage can be varied in a range of 11 - 18 V in the normal mode and 16 - 22 V in the strobe mode. If the targeted brightness cannot be achieved despite any adjustment of the voltage, the feedback error output turns ON. When the brightness control value is less than 50, the feedback function automatically turns OFF. cPb: Turns OFF the supplying of 6 V communication voltages to the lighting device. The value is selected for models on which the supplying of 6 V causes the lighting device to light up.
PFR	PWM frequency switching	20,50,100	100	kHz	Common	Switches the PWM frequency. If the cable to the lighting device is long, the capacity of the device is large, and the brightness control value is also large, the communication between the power supply and the lighting device may be broken. In that case, decrease the PWM frequency.
Bin	Bank switching method	Ein,232,SEt	Ein	-	Individual	Selects the method of bank switching. Valid in the bank mode (DSW3 = ON). Ein: By using the external parallel input (D0-D3) of the master unit, designates a binary value in ON/OFF state to switch the bank. Powering OFF causes the bank number to return to 0 (zero). Valid in the external brightness control and bank mode (DSW2 = ON, DSW3 = ON). 232: Through the use of RS232 of the master unit, switches the bank by a communication command (BNO). Powering OFF causes the bank number to return to 0 (zero). Valid in the external brightness control and bank mode (DSW2 = ON, DSW3 = ON). SEt: Selects a bank number by the setting bno. Valid in the bank mode (DSW3 = ON) without external brightness control (DSW2 = OFF).
bno	Bank number	0 - 15	0	-	Individual	Switches the bank in accordance with this setting. Displayed only when bin = SEt in the bank mode (DSW3 = ON). Valid in the bank mode (DSW3 = ON) without external brightness control (DSW2 = OFF).
b0	Brightness control value of bank 0	0 - 999	0	-	Individual	Capable of designate, for each bank, the brightness control value to be used in bank switching. With the currently selected bank, rotating the volume dial to change the brightness control value changes this setting as well. Valid in the bank mode (DSW3 = ON).
b1	Brightness control value of bank 1					
b2	Brightness control value of bank 2					
b3	Brightness control value of bank 3					
b4	Brightness control value of bank 4					
b5	Brightness control value of bank 5					
b6	Brightness control value of bank 6					
b7	Brightness control value of bank 7					
b8	Brightness control value of bank 8					
b9	Brightness control value of bank 9					
b10	Brightness control value of bank 10					
b11	Brightness control value of bank 11					
b12	Brightness control value of bank 12					
b13	Brightness control value of bank 13					
b14	Brightness control value of bank 14					
b15	Brightness control value of bank 15					
bps	RS232 communication speed	oFF,48,96,192,384,576,115	96	-	Common	Sets the RS232 communication speed. (Displayed is the value for master unit only.) oFF: Terminates the communication function. 48: Communication at 4800 bps. 96: Communication at 9600 bps. 192: Communication at 19200 bps. 384: Communication at 38400 bps. 576: Communication at 57600 bps. 115: Communication at 115200 bps.
cPy	Copy of settings	no,yES	no	-	Common	Copies the settings of the master unit's LAMP1 into LAMP2 of the master unit and LAMP1 and LAMP2 of slave units. (Displayed is the value for master unit only.)
ini	Initialization of the settings	no,yES	no	-	Common	Initializes the settings of LAMP1 and LAMP2 to the factory shipped state.
brt	Absolute brightness monitoring and brightness adjustment of the lighting intensity	0 - 999	-	-	Individual	While ordinary brightness monitoring displays the relative brightness of the lighting device against the level at the factory shipment, this displays the relative brightness in comparison with the reference value that depends on the lighting device model. (Brightness reflecting individual differences) Upon any change of the setting, the monitored brightness is shown in the upper row and the brightness control value in the lower. By adjusting the brightness control value, the brightness can be matched to the targeted level.
dUr	Display version	-	-	-	Common	Displays the software version of the user interface.
PUR	Controller version	-	-	-	Common	Displays the software version (1-2 digits) and logic version (3rd digit).
LUR	Lighting device version	-	-	-	Individual	Displays the software version of the lighting device connected.
End	Termination of the setting menu	-	-	-	Common	Terminates the display of settings and returns to the display of brightness control value.

■ Bank-related settings are displayed only where the DIP SW3 bank mode is ON.

■ The versions are displayed only when the dial has been turned with the LAMP button held pressed.



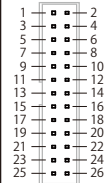
# Input & output

## List of Input and Output Functions

### - Master unit MIL 26 pin connector EXT CTRL

Pin number	Name	Input & output	Signal name	Details
1	D0	input	Brightness control bit 0/bank switching 0	In case of the external brightness control (DSW2 ON) and not in the bank mode (DSW3 ON), each corresponds to the 0th to 3rd bit when switching the brightness control value through the external parallel input. In case of the external brightness control (DSW2 ON) and in the bank mode (DSW3 ON), the bank number may be designated.
2	D1	input	Brightness control bit 1/bank switching 1	
3	D2	input	Brightness control bit 2/bank switching 2	
4	D3	input	Brightness control bit 3/bank switching 3	
5	D4	input	Brightness control bit 4	Input for switching the brightness control value through external parallel input. Each corresponds to 4th to 9th bit. The value is designated on a binary basis. Valid in case of the external brightness control (DSW2 ON) and not in the bank mode (DSW3 OFF).
6	D5	input	Brightness control bit 5	
7	D6	input	Brightness control bit 6	
8	D7	input	Brightness control bit 7	
9	D8	input	Brightness control bit 8	
10	D9	input	Brightness control bit 9	
11	L0	input	LAMP switching 0	Designates the LAMP number as the object of external brightness control or bank switching. With the master unit, LAMP1 is selected by setting OFF the L2, L1 and L0 and LAMP 2 selected by the combination of L2 and L1 = OFF and L0 = ON.
12	L1	input	LAMP switching 1	
13	L2	input	LAMP switching 2	
14	WR	input	Brightness control value writing	By turning ON this input, the brightness control value may be written. In case of using bank numbers, it is not necessary to use this.
15	COMINA	-	Input COM	Common terminal for inputs. The individual input is turned ON by applying 5 - 24 V across that input and this common terminal.
16	COMOUTA	-	Output COM	Common terminal for outputs. Upon turning ON of the output, electric current will flow from the output to this common terminal. (With PNP type, the direction is reversed.)
17	ERR	Output	Error output (FB, overcurrent)	Turns ON upon occurrence of a feedback error, monitored brightness alarm activation, LED over heat or the activation of over current protection of the lighting device. Where slave units are connected, if any of such slave units releases an error, this output will turn ON as well. (The reflection of the error state of slave units involves a delay of up to 250 ms.)
18 - 23	-	-	-	-
24	TXD	Output	Serial TXD	Output transmitted by RS232.
25	RXD	input	Serial RXD	Input received by RS232.
26	SG	-	Serial GND	Common terminal for RS232.

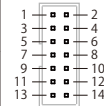
MIL26  
Pin connector



### - Master unit/slave unit MIL 14 pin connector EXT SYNC

Pin number	Name	Input & output	Signal name	Details
1	SYNC1	input	LAMP1 synchronous input	In case of the external lighting control (DSW1 = ON), LAMP1 stays ON while this input is ON. The polarity can be switched by tPL of the PRM setting. In the strobe mode (DSW4 = ON), LAMP1 turns ON with the rise of this input.
2	SYNC2	input	LAMP2 synchronous input	In case of the external lighting control (DSW1 = ON), the LAMP2 will be lit while this input is ON. The polarity can be switched by tPL of the PRM setting. In the strobe mode (DSW5 = ON), LAMP2 turns ON with the rise of this input.
3	COMINB	-	Input COM	Common terminal for inputs. The input is turned ON by applying 5 - 24 V across the synchronous input and this common terminal.
4	COMOUTB	-	Output COM	Common terminal for outputs. Upon turning ON of an output, electric current will flow from the output to this common terminal. (With PNP type, the direction is reversed.)
5	OVC	Output	Over current error	If any of the lighting devices LAMP1 and LAMP2 fall into a state of over current, this output turns ON.
6	FBERR1	Output	LAMP1 feedback error	Stays ON while the feedback error exists or the monitored brightness alarm is activated with LAMP1.
7	LON1	Output	LAMP1 lit	Stays ON while the LAMP1 is lit.
8	FBERR2	Output	LAMP2 feedback error	Stays ON while the feedback error exists or the monitored brightness alarm is activated with LAMP2.
9	LON2	Output	LAMP2 lit	Stays ON while the LAMP2 is lit.
10	ANALOG	input	Analog brightness control switching input	When this input is turned ON, the brightness may be controlled by the voltage of analog inputs AIN1 and AIN2. LAMP1 and LAMP2 cannot be switched individually.
11	AIN1	input	LAMP1 analog input	Analog input for LAMP1. The voltage range of 0 - 5 V corresponds to the brightness control value range of 0 - 999.
12	5V	Output	Service 5 V output	5 V output to be used for analog input
13	AIN2	input	LAMP2 analog input	Analog input for LAMP2. The voltage range of 0 - 5 V corresponds to the brightness control value range of 0 - 999.
14	ACOM	-	Analog common	Common terminal for analog input.

MIL14  
Pin connector

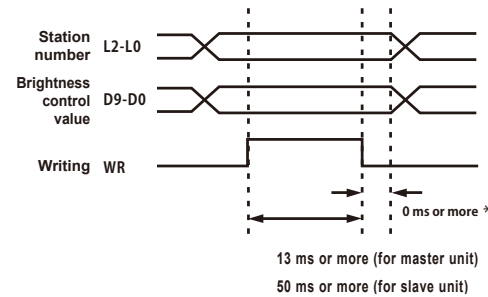


## Timing Chart

Shown below are the timing charts for the brightness control value setting and the bank switching in the external parallel input.

### Brightness value setting

After the WR state kept ON for a predetermined period of time, the brightness control value is written.  
\* Do not change the value before the write signal being turned OFF.  
The brightness control value of the external parallel input is converted into 999 when it is in the range of 1000 - 1023.



Lighting device setting	Station number	L0	L1	L2
Master unit LAMP1	0	OFF	OFF	OFF
Master unit LAMP2	1	ON	OFF	OFF
First slave unit LAMP1	2	OFF	ON	OFF
First slave unit LAMP2	3	ON	ON	OFF
Second slave unit LAMP1	4	OFF	OFF	ON
Second slave unit LAMP2	5	ON	OFF	ON
Third slave unit LAMP1	6	OFF	ON	ON
Third slave unit LAMP2	7	ON	ON	ON

\* D9 - D0 inputs for the designation of the brightness control values are in binary format.

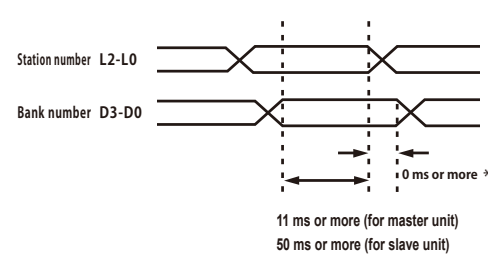
### Response time

The switching will occur in the following time from the brightness control value writing (WR).

- Master unit as stand-alone: 5 - 13 ms
- Slave units connected: 20 - 60 ms

### Bank switching

The value is written when the bank number has been inputted for a predetermined period of time.  
\* Do not change the value before the bank signal being turned OFF.



Bank number designation	D0	D1	D2	D3
Bank 0	OFF	OFF	OFF	OFF
Bank 1	ON	OFF	OFF	OFF
Bank 2	OFF	ON	OFF	OFF
Bank 3	ON	ON	OFF	OFF
Bank 4	OFF	OFF	ON	OFF
Bank 5	ON	OFF	ON	OFF
Bank 6	OFF	ON	ON	OFF
Bank 7	ON	ON	ON	OFF
Bank 8	OFF	OFF	OFF	ON
Bank 9	ON	OFF	OFF	ON
Bank 10	OFF	ON	OFF	ON
Bank 11	ON	ON	OFF	ON
Bank 12	OFF	OFF	ON	ON
Bank 13	ON	OFF	ON	ON
Bank 14	OFF	ON	ON	ON
Bank 15	ON	ON	ON	ON

### About the bank switching

- Bank numbers are common to the external parallel input and RS232 communication.
- The bank numbers are deleted upon powering OFF.
- Bank numbers by the PRM setting are set separately from those of parallel input or RS232 communication.
- The bank numbers are retained despite any powering OFF.

### Response time

The switching will occur in the following time from the bank input.

- Master unit as stand-alone: 5 - 11 ms
- Slave units connected: 20 - 60 ms

## RS232 Communication

RS232 communication is performed using the pins 24 through 26 of the MIL 26 pin connector.

**Baud rate** 9600 bps (initial value). Changeable in the PRM setting change mode. (OFF/ 4800/ 9600/ 19200/ 38400/ 57600/ 115200)

**Data length** 8bit

**Stop bit** 1bit

**Parity** None

**Flow control** None

Station number	Master unit	Slave unit	Slave unit	Slave unit
LAMP1	0	2	4	6
LAMP2	1	3	5	7

### Request command (transmitted by the external device)

0	1	2	3	4	5	6	7	8	9	10	11	12
Header '@'(40H)	Station number '0' - '7'	Command 'A' - 'Z', '0' - '9' 3 bytes			Write or read '0000' - '9999' or 'R'(52H) Variable length in a range of 1 - 4 bytes				Checksum '00' - 'FF'		Delimiter 'CR+LF' (0DH,0AH)	

### Response command (transmitted by the display CPU)

0	1	2	3	4	5	6	7	8	9	10	11	12
Header '@'(40H)	Station number '0' - '7'	Command 'A' - 'Z', '0' - '9' 3 bytes			Write or read 'W'(57H) or '0000' - '9999' Variable length in a range of 1 - 4 bytes				Checksum '00' - 'FF'		Delimiter 'CR+LF' (0DH,0AH)	

\* If the command length is less than 3 characters, it is padded with blank(s) (20H) at the trailing end. (Example: 'FB ')

\* The character 'H' as part of 'xxH' signifies a hexadecimal value. The value '20H' equals to 32 in decimal.

### Checksum

The transmission data are added as binary (header + station number + command + read or write) and the last 8 bits reversed (complement of 1 obtained). Then the two-digit hexadecimal number is converted into ASCII characters for storage as the checksum.

When skipping the calculation of the checksum, '\*\*\*' (2AH, 2AH) may be sent out in place of the checksum.

### When the response command cannot be received

- Communication speeds or any other settings are wrong.
- Wiring connections are incorrect as for the serial transmission and reception.
- Wrong command has been transmitted.
- Checksum mismatches.

Shown above are some of the possible causes.

Check the communication speed settings and then try the transmission of @0STBR\*\* (40H, 30H, 53H, 54H, 42H, 52H, 2AH, 2AH, 0DH, 0AH).

### When the response command has been received

Transmitted if the serial communication has been successfully established, irrespective of the successful or unsuccessful result of reading or writing.

In case of successful completion, a response command is transmitted in response to the request command.

Upon any failure, a response command of the same contents as the request command is transmitted.

However, if the variable length section of the request command contains any value that is invalid for the input, the variable length part is converted to '9999' for transmission.

### Response time

The setting will be switched in the following period of time from the completion of a command receipt.

- Master unit as stand-alone: approx. 8 ms
- Slave units connected: 24 - 60 ms

## List of Commands

When writing data, the data are once written locally for comparison with those read from the EEPROM. If they differ from each other, the data are written onto the EEPROM.

	Contents	Data	
		Read ( 'R' )	Write (data)
EVO	External brightness control *1)	0 - 999	Same as shown left
STB	Strobe lighting width	1 - 999	Same as shown left
OSC	Automatic strobe flashing period	1 - 250	Same as shown left
DL	LED output delay timer	0 - 999	Same as shown left
DLU	Unit of LED output delay timer	0, 1 : 10 $\mu$ s / 1ms	Same as shown left
TFL	Filter time factor for Sync input selection	0 - 3 : 1 $\mu$ s / 5 $\mu$ s / 25 $\mu$ s / 100 $\mu$ s	Same as shown left
TPL	Trigger input polarity	0, 1 : PoS / nEG	Same as shown left
BAL	Monitored brightness lower limit value for alarm	0 - 100	Same as shown left
MON	Reading the monitored value	0 - 2047	None
FB	Feedback Function	0 - 2 : off / on / cPb	Same as shown left
FBR	Reading the feedback compensation rate	0 - 2047 : permillage of output voltage compensation	None
PFR	PWM frequency switching	0 - 2 : 20kHz / 50kHz / 100kHz	Same as shown left
BIN	Bank switching method *2)	0 - 2 : Ein / 232 / SEt	Same as shown left
BNO	Bank number *3)	0 - 15 (bank number currently selected)	0 - 15 (Change the bank number currently selected)
Bn	Setting/reading the brightness control value of bank n *4)	0 - 999	Same as shown left
LAB	Absolute brightness for lighting device data monitoring	0 - 4095	None
TMm	Reading the temperature *5)	-99 - 255 (° C) Response of -00 where no lighting device is connected	None

\*1) Valid when the external brightness control is ON.

The external brightness control value is not saved on the EEPROM. (The external brightness control value returns to 0 (zero) upon powering ON or OFF.)

\*2) 0 : Ein (external parallel)/1 : 232 (RS232 communication)/2 : SEt (PRM setting change mode)

In case of reading, the bank number currently being used is returned. (Whatever may be the bank switching method.)

In case of writing, the following two conditions must be met for overwriting.

- External bank switching (DSW2 = ON/DSW3 = ON)

- "232 (RS232 communication)" for the bank switching method

\*3) In addition, the bank number as changed by the RS232 communication (external parallel) is not saved on the EEPROM. (The bank number returns to 0 (zero) upon powering ON/OFF.)

\*4) The character 'n' is to be replaced with a bank number. Bank 0 translates to "B0" and bank 10 to "B10."

In case the bank number is a single digit number, pad it with 20H (blank) for the last digit.

\*5) The character 'm' is to be replaced with a character 0 through 2. Character 0 represents the temperature of the lighting device, 1 the temperature of LAMP1 control circuit board of the power supply unit, and 2 the temperature of LAMP2 control circuit board of the power supply unit.

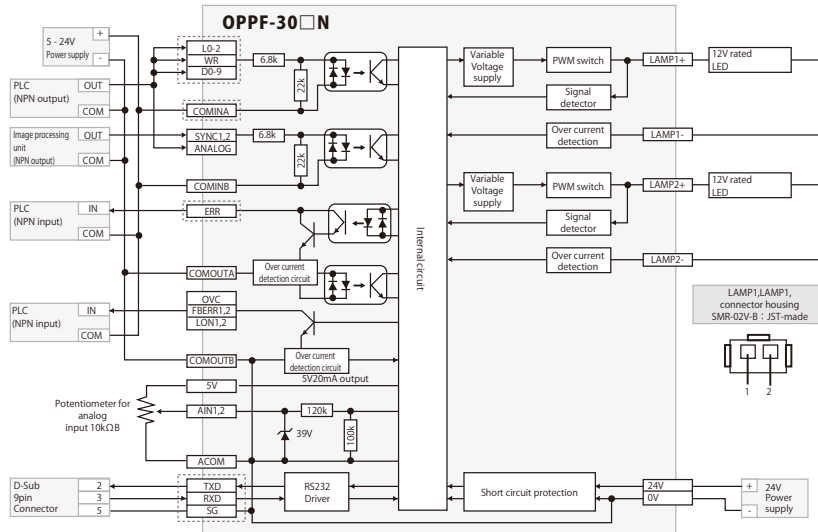
In case of TM1 and TM2 commands, any one station number is designated for each of the units. Therefore, @TM1R\*\* and @1TM1R\*\* return the same results.

# Circuit diagram

## Standard type

### NPN type

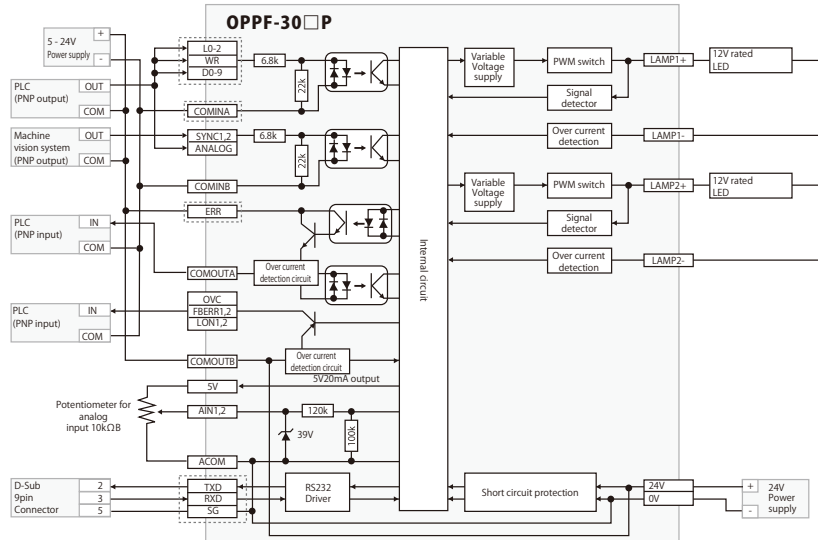
: for master unit only



\* COMOUTB is connected to 0V of power supply internally.

### PNP type

: for master unit only



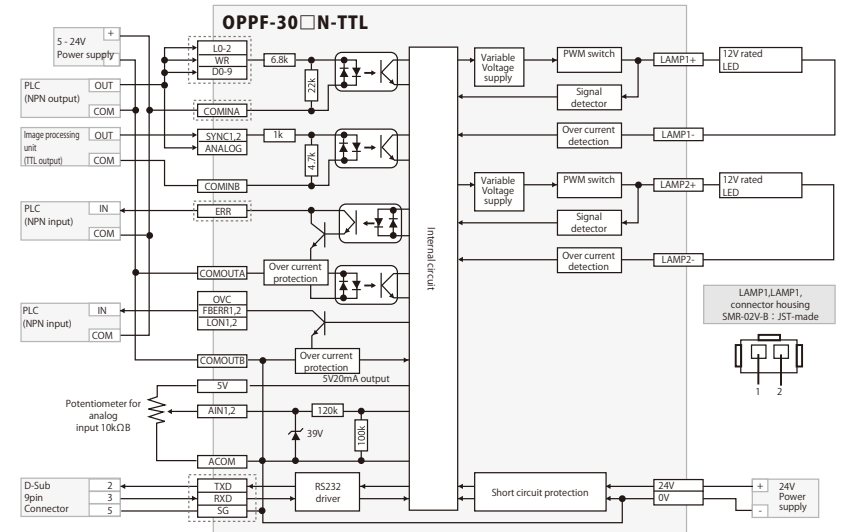
\* COMOUTB is connected to 24V of power supply internally.

\* COMOUTA means ERR (Error) on PNP type

## TTL type

### NPN type

: for master unit only

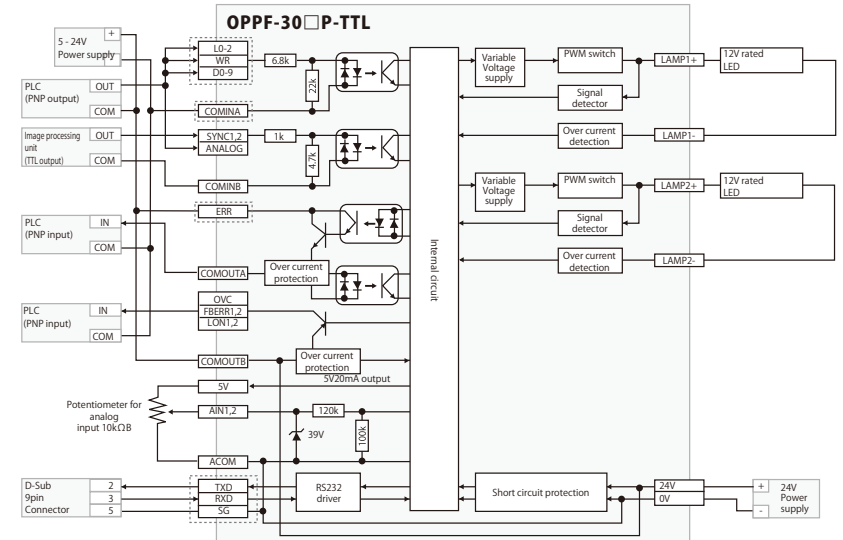


\* TTL input (SYNC1, 2) and analog switching (ANALOG) cannot be used at the same time. When using the analog brightness control, connect COMINB to the positive side of the external power supply (5 - 24V).

\* COMOUTB is connected to 0V of power supply internally.

### PNP type

: for master unit only



\* When using the TTL input (SYNC1, 2) and analog switching (ANALOG) at the same time, connect COMINB to the negative side of the external power supply (5 - 24V).

\* COMOUTB is connected to 24V of power supply internally.

\* COMOUTA means ERR (Error) on PNP type

## Troubleshooting

Symptom	Check items
Does not power ON.	<ul style="list-style-type: none"> <li>Is the power cable properly connected? Is the capacity of the 24V DC power supply sufficient?</li> <li>Is there any deficiency with the 24V DC input voltage?</li> <li>Is the polarity of the 24V DC input correct?</li> <li>Is there any wrong polarity for the transmission of power across units?</li> <li>Isn't there any transition wiring through the power connector that is not connected to a unit?</li> </ul>
Lighting device does not illuminate.	<ul style="list-style-type: none"> <li>Are the connectors of the lighting device properly connected?</li> <li>Isn't the brightness control value set at 0?</li> <li>Isn't the unit set in the external lighting control mode (DSW1: ON)?</li> <li>Isn't the LED output over current error?</li> </ul>
Unable to control the brightness.	<ul style="list-style-type: none"> <li>Isn't it in a locked state? Unlock it. (See page 7 for the unlocking method.)</li> <li>Isn't the unit set in the external brightness control mode (DSW2: ON)?</li> </ul>
Unable to change the settings.	<ul style="list-style-type: none"> <li>Isn't it in a locked state? Unlock it. (See page 7 for the unlocking method.)</li> <li>Is there any wrong designation of station number for the external control?</li> </ul>
Erroneously illuminates or the lighting flickers.	<ul style="list-style-type: none"> <li>Are the connectors of the external control cable properly connected?</li> <li>Any wiring from the same power supply as with the inverter, motor or any other motive power devices may cause malfunctions.</li> <li>Bundling the cables together with high voltage cords and motive power lines may cause malfunctions.</li> </ul>
The lighting is dim.	<ul style="list-style-type: none"> <li>It may indicate the degradation of the lighting device. In the monitoring mode, compare the brightness control value and the monitored value.</li> <li>Isn't the READY indicator on the operation panel flashing in red? If the internal temperature of the power supply unit exceeds 105 °C, the lighting output is limited to a one fourth level. In the monitoring mode, press the LAMP button and the dial at the same time to check it.</li> </ul>
The lighting flickers.	<ul style="list-style-type: none"> <li>Are the lighting connectors securely inserted?</li> <li>Turn OFF the feedback function as a trial.</li> </ul>
Does not respond to the synchronous input.	<ul style="list-style-type: none"> <li>Are the connectors properly connected?</li> <li>Are the signals being properly sent out from the signal output devices?</li> <li>Any wrong designation of station number?</li> <li>Are the connections correctly made in accordance with the NPN or PNP type?</li> <li>For the brightness control setting and bank switching in case of the external parallel input, the states of DSW2 and DSW3 must be set the same for both master and slave units.</li> </ul>
The communication setting is disabled between the master and slave unit or between slave units.	<ul style="list-style-type: none"> <li>Is the gap between units 3 mm or less?</li> <li>Is there anything to block the infrared communication ports between units?</li> </ul>
Error occurs with monitoring and feedback.	<ul style="list-style-type: none"> <li>Where the pulse width for the external synchronous input is very small (about 2 <math>\mu</math>s or less), the lit time will become extremely short and, therefore, the communication with the lighting device will be broken.</li> <li>If the cable to the lighting device is long and the capacity of the device is large, the communication with the device may be disabled. In that case, decrease the PWM frequency to 50 or 20.</li> </ul>
Wrong value is written through the parallel input.	<ul style="list-style-type: none"> <li>Isn't there any wrong wiring connection?</li> <li>Isn't there any error in the station number, brightness control value and the input terminals?</li> <li>Isn't there any incompliance with the instructions of the timing charts?</li> </ul>
Unable to communicate by RS232.	<ul style="list-style-type: none"> <li>Are the baud rates the same between the input/out devices and OPFF?</li> <li>Is the wiring properly connected for the serial transmission and reception?</li> <li>Is the transmitted command correct?</li> <li>Is the checksum value correct?</li> </ul> <p>Examine the communication speed settings and then try the transmission of @0STBR** (40H, 30H, 53H, 54H, 42H, 52H, 2AH, 2AH, 0DH, 0AH).</p>

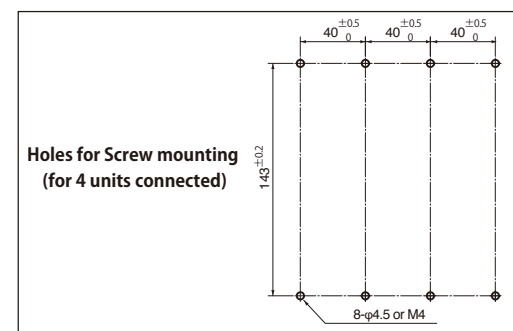
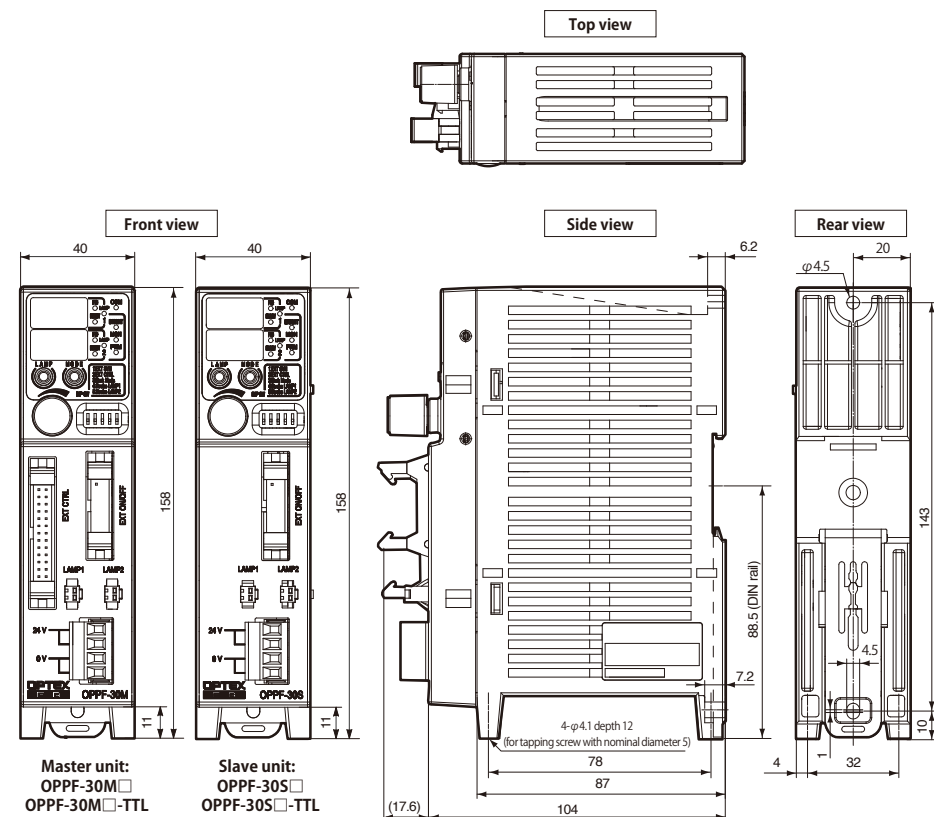
### Error Display on the Operation Panel Indicator

UL t	Displayed if the 24V DC supply voltage has dropped to 18 V or lower.
Lo	
F oc	Communication error of the internal circuit. It is attributable to some failure.
t rr	

- LED for READY state
- Flashing red: LED output over current or LED over heat
- Unlit: 24V DC input voltage insufficient
- LED for FB (feedback) state
- Flashing orange: FB error or alarm on monitored brightness
- Lit red: communication with the lamp terminated

- LED for COM state of infrared communication between master and slave
- Flashing red: communication error (slave only)
- Lit red: communication shut down (slave only)
- Unlit: no communication underway

## Dimensions



## Specifications

Part number	OPPF-30MN	OPPF-30MP	OPPF-30SN	OPPF-30SP
Type	Master unit NPN	Master unit PNP	Slave unit NPN	Slave unit PNP
Power supply	24V DC±10%			
Power dissipation	Feedback OFF: max. 1.8 A, feedback ON: max. 2.5 A,			
Lighting output	2ch			
Output power	PWM mode: up to 30 W (total for 2 channels), strobe mode: up to 15 W (per channel)			
Output voltage	PWM mode: 12V DC (standard), strobe mode: 18V DC (standard)			
Output current	PWM mode: up to 2.5 A (total for 2 channels), strobe mode: up to 4.5 A (per channel)			
PWM control	PWM control Frequency: 20/50/100kHz, 1,000 steps * Common to PWM mode and strobe mode			
Strobe control	Pulse width: 10 μs - 10 ms (increment of 10 μs) * If it exceeds 1 ms, use 12V DC for driving. Restriction on the flashing period: 10% duty cycle (A period of 10 times the pulse width or over is necessary.)			
Monitoring	Lighting brightness monitoring/lighting device internal temperature monitoring - setting the monitored brightness lower limit value for alarm Period of updating by communication between the lighting device and the power supply- brightness: 21 ms, temperature 105 ms			
Feedback	Variable voltage scheme - PWM mode: 11 - 18V DC, strobe mode: 16 - 22V DC, accuracy: ±1.5% or less (typical)			
Input	External synchronous inputs: 2, Analog/Digital switch: 1, Parallel input for brightness control: 10 (4 are used for switching Bank Write signal for parallel input) Write signal for parallel input: 1, Channel switch: 3		External synchronous inputs: 2, Analog/Digital switch: 1	
	Turn-ON voltage: 5 V or over, turn-OFF voltage: 1.2 V or lower, maximum input voltage: 30 V Synchronous input response time (actual) In case of 24 V input (OFF→ ON: 5 μs, ON → OFF: 60 μs) In case of 5 V input (OFF → ON: 44 μs, ON → OFF: 41 μs) Input impedance: 6.8 kΩ, insulated; input response time (actual): 5 - 13 ms 0 - 5 V, input impedance: 220 kΩ, uninsulated			
Analog input	LED output over current error output: 1, feedback warning outputs: 2, lighting device - lit outputs: 2			
Output	Open collector: max. 100 mA /30V DC, residual voltage: 1.0 V or lower			
	LED over current & LED over heat & feedback error output: 1 Open collector: max. 100mA/30V DC, residual voltage: 1.5 V or lower		-	
LED output protection	Over current			
Output protection	Over current			
Other protection	Power supply internal temperature monitoring (At 105°C or over, PMW output is decreased to a 1/4 level.) Lighting device internal temperature monitoring, lighting brightness reduction alarm			
Communication I/F	RS232 1ch baud rates: 4800/9600/19200/38400/57600/115200		-	
Communication between Master and slave	Infrared communication type, RS232 communication from master to slave, external input control (brightness control, bank switching) Transmission from slave unit to master unit (error info, read via RS232), copying setup Communication cycle: approx. 25 ms (RS232, equivalent of the response time for the case of controlling slave unit through external input)			
Operating Temp./Humid.	0 - 45°C, 35 - 85%/RH (without condensation)			
Storage Temp./Humid.	-20-70°C, 35-95%/RH (without condensation)			
Vibration resistance	10~55Hz 1.5mm X, Y, Z 2hours			
Shock resistance	10G X, Y, Z 3 times			
Insulation impedance	500V DC, 10 MΩ or more			
Material	Polycarbonate			
Weight	385g		375g	
Protection category	IP20			
Conformity	CE (EN55011 Class-A, EN61000-4-2 - 5, EN61000-4-6 *), RoHS * Test conducted, with the lighting cable passed through a shield tube that is grounded to FG.			
Goods bundled with	Simplified Operation Guide, Instruction Manual CD-ROM			

Part number	OPPF-30MN-TTL	OPPF-30MP-TTL	OPPF-30SN-TTL	OPPF-30SP-TTL
Type	Master unit NPN	Master unit PNP	Slave unit NPN	Slave unit PNP
Input	External synchronous inputs: 2, Analog/Digital switch: 1, Parallel input for brightness control: 10 (4 are used for switching Bank), Write signal for parallel input: 1, Channel switch: 3		External synchronous inputs: 2, Analog/Digital switch: 1	
	Synchronous input (TTL)	Turn-ON voltage: 2 V or over, turn-OFF voltage: 0.9 V or lower, maximum input voltage: 16 V, input impedance: 1k $\Omega$ , insulated Response time (actual) In case of 3 V (OFF $\rightarrow$ ON: 8 $\mu$ s, ON $\rightarrow$ OFF: 70 $\mu$ s) In case of 2 V input (OFF $\rightarrow$ ON: 20 $\mu$ s, ON $\rightarrow$ OFF: 80 $\mu$ s)		
	Other inputs	Turn-ON voltage: 5 V or over, turn-OFF voltage: 1.2 V or lower, maximum input voltage: 30 V Input impedance: 6.8 k $\Omega$ , insulated; response time (actual): 5 - 13 ms		