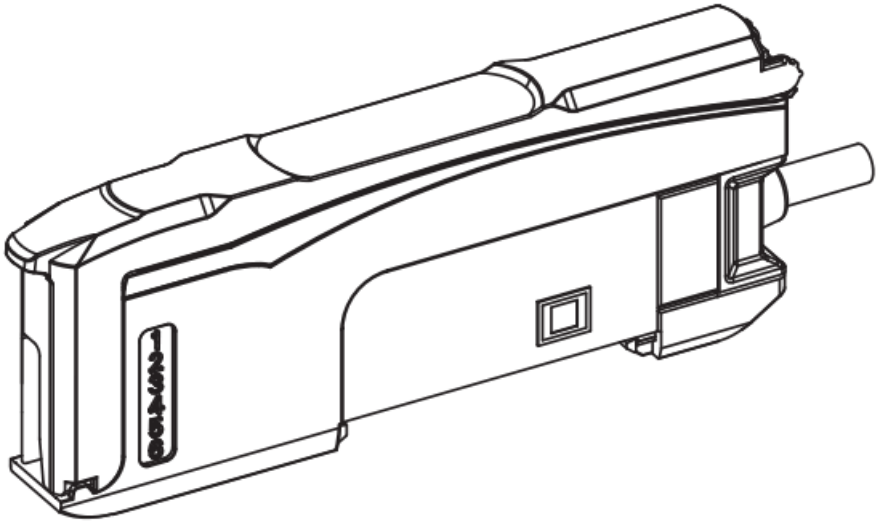
OMRON E3C-LDA N Series Photoelectric Sensor with Separate Digital Amplifier Instruction Manual

Photoelectric Sensors with Separate Digital Amplifiers
Laser-type Amplifier Units
E3C-LDA N Series



Instruction Manual

Contents

1 INSTRUCTION SHEET
2 Warning Indications
3 PRECAUTIONS FOR SAFE USE
4 PRECAUTIONS FOR CORRECT USE
5 Checking the Package Content
6 Installation
6.1 Dimensions
6.2 Input / Output Circuit Diagram
6.3 Mounting the Amplifier Unit
6.4 Mounting the sensor head
7 Settings
7.1 Setting and Display Overview
7.2 Sensor Head Display
7.3 Output switching
7.4 Minute Adjustment of Threshold Level
7.5 Channel switching
7.6 Smart Tuning [Easy Sensitivity Setting]
8 Convenient Setting Features
9 Preventing Malfunction
10 Maintenance
10.1 Troubleshooting
10.2 Ratings and Specifications
11 Detailed Settings
12 Suitability for Use
13 Documents / Resources
14 Related Posts

INSTRUCTION SHEET

Thank you for selecting an OMRON product. This sheet primarily describes precautions required in installing and operating the product.

- A specialist who has the knowledge of electricity must treat the product.
- Please read this manual carefully, and use it correctly after thoroughly understanding the product.
- Please keep this manual properly for future reference whenever it is necessary.

The following notice applies only to products that carry the CE mark:
NOTICE
In a residential environment, this product may cause radio interference, in which case the user may be required to take adequate measures.

5710590-3A

WARNING
Indicates a potentially hazardous situation which, if not avoided, will result in minor or moderate injury, or may result in serious injury or death. Additionally there may be significant property damage.

Warning Indications

This product is not designed or rated for ensuring safety of persons either directly or indirectly. Do not use it for such purpose.	
Do not use the product with voltage in excess of the rated voltage. Excess voltage may result in malfunction or fire.	
Never use the product with an AC power supply. Otherwise, explosion may result.	

PRECAUTIONS FOR SAFE USE

The following precautions must be observed to ensure safe operation of the product. Doing so may cause damage or fire.

- Do not install the product in the following locations.

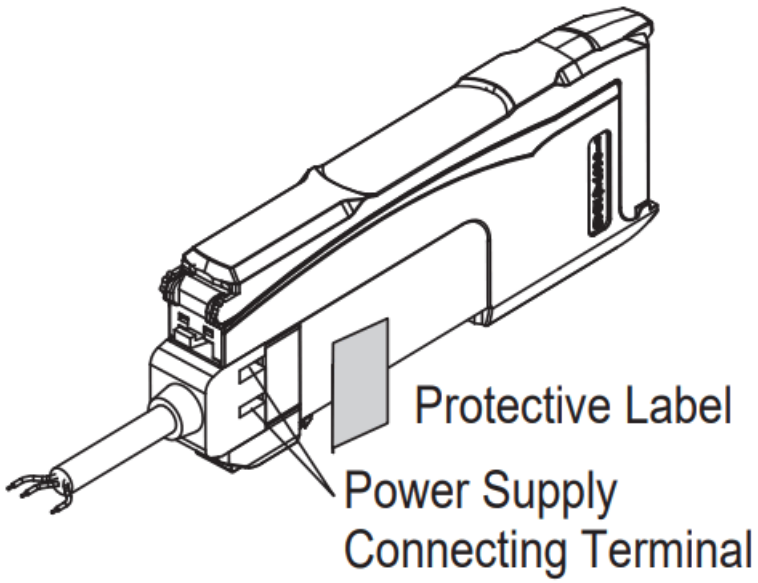
1. Locations subject to direct sunlight
2. Locations subject to condensation due to high humidity
3. Locations subject to corrosive gas
4. Locations subject to vibration or mechanical shocks exceeding the rated values
5. Locations subject to exposure to water, oil, chemicals
6. Locations subject to steam
7. Locations subjected to strong magnetic field or electric field

- Do not use the product in environments subject to flammable or explosive gases.
- Do not use the product in any atmosphere or environment that exceeds the ratings.
- To secure the safety of operation and maintenance, do not install the product close to high-voltage devices and power devices.
- High-Voltage lines and power lines must be wired separately from this product. Wiring them together or placing them in the same duct may cause induction, resulting in malfunction or damage.
- Do not apply any load exceeding the ratings. Otherwise damage or fire may result.
- Do not short the load. Otherwise damage or fire may result.
- Connect the load correctly.
- Do not use the product if the case is damaged.
- Burn injury may occur. The product surface temperature rises depending on application conditions, such as the ambient temperature and the power supply voltage. Attention must be paid during operation or cleaning.
- When setting the sensor, be sure to check safety such as by stopping the equipment.
- Be sure to turn off the power supply before connecting or disconnecting wires.
- Do not attempt to disassemble, repair, or modify the product in any way.
- When disposing of the product, treat it as industrial waste.
- Do not use the Sensor in water, rainfall, or outdoors.
- When joining the product, ensure to connect them to the same power supply and turn the power on at the same time. The joined unit may not function fully if a separate power supply is used.

- If you notice an abnormal condition such as a strange odor, extreme heating of the unit, or smoke, immediately stop using the product, turn off the power, and consult your dealer.
- Sensor heads other than E3C-LDAN are not usable. If other models are connected, there is a risk of damage.

PRECAUTIONS FOR CORRECT USE

- Do not miswire such as the polarity of the power supply.
- Be sure to mount the unit to the DIN track until it clicks.
- When using a connector type product, place a protective label (provided with the E3X-CN series) on the power supply connecting terminals that are not used, to prevent electric shock or short circuit.
- The length for the cable extension must be 30 m or less.
  Be sure to use a cable of at least 0.3 mm^2 for extension.
- Do not apply the forces on the cord exceeding the following limits:
  Pull: 40 N; torque: 0.1 N·m; pressure: 20 N; bending: 29.4 N



- Do not apply excessive force such as tension, compression or torsion to the connector of the sensor head that is fixed to the amplifier unit.
- Always keep the protective cover in place when using the product. Not doing so may cause malfunction.
- It may take time until the received light intensity and measured value become stable immediately after the power is turned on depending on use environment.
- The product is ready to operate 300 ms after the power supply is turned ON.
- The Mobile Console E3X-MC11, E3X-MC11-SV2 and E3X-MC11-S cannot be connected.
- The mutual interference prevention function operates for E3C-LDAN. For other models, the product results in mutual interference.
- Optical communication cannot be performed with a model other than E3C-LDAN. If other models are connected and used, the product may malfunction.
- If the unit receives excessive sensor light, the mutual interference prevention function may not work properly, resulting in malfunction of the unit. In such case, increase the threshold.
- The Communication Unit E3X-DRT21-S, E3X-CRT, E3X-ECT and E3NW cannot be connected.
- Do not use thinner, benzine, acetone, and lamp oil for cleaning.
- The amplifier unit uses EEPROM memory to save the configuration information. If the memory rewritable time exceeds its limit (100,000 times), the memory error will be displayed and the amplifier unit needs to be

replaced. Memory data is rewritten, for each operation, three times when tuning, processing zero reset, and changing the hysteresis width, and ten times when initializing the settings.

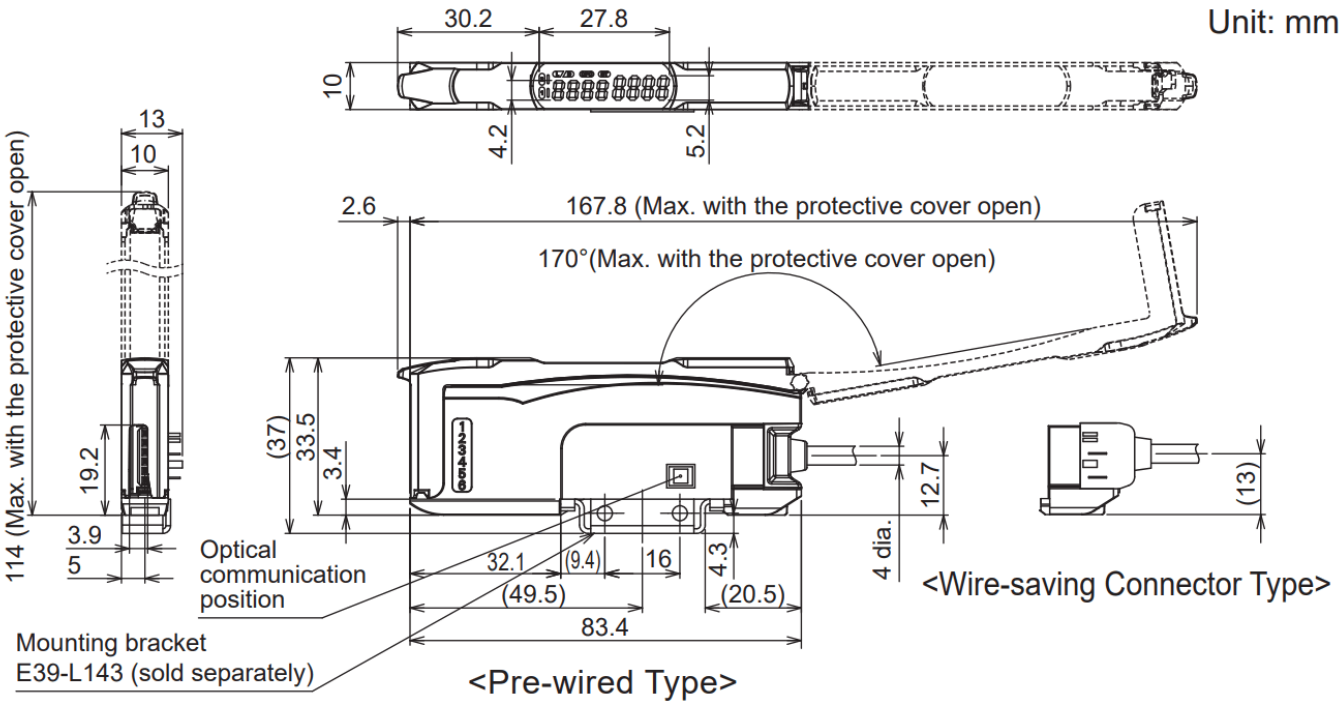
-  If a crossed out wheelie bin symbol is labeled on the amplifier unit, dispose in accordance with applicable regulations.

Checking the Package Content

- Amplifier Unit: 1
- Instruction Sheet, Compliance sheet

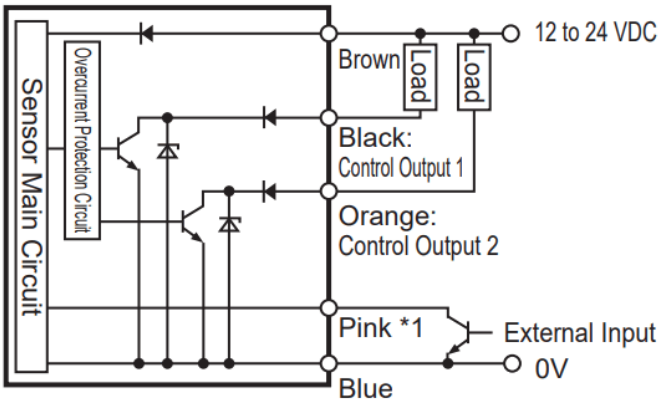
Installation

Dimensions

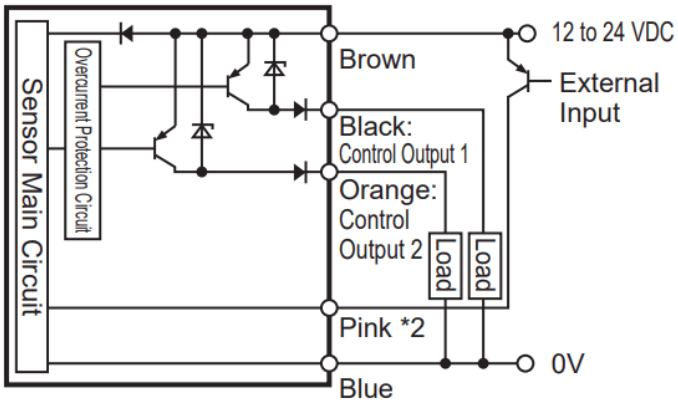


Input / Output Circuit Diagram

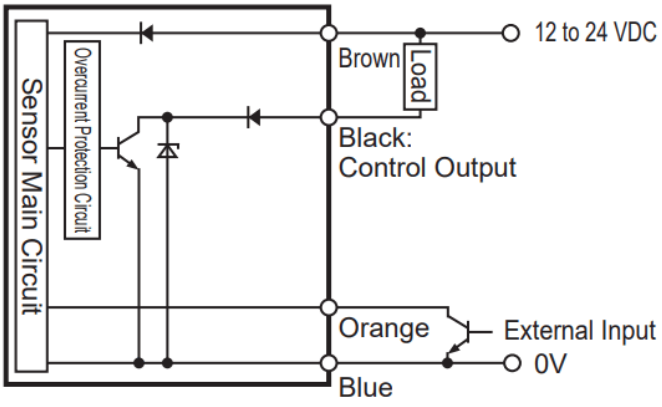
E3C-LDA21N/LDA6N (NPN)



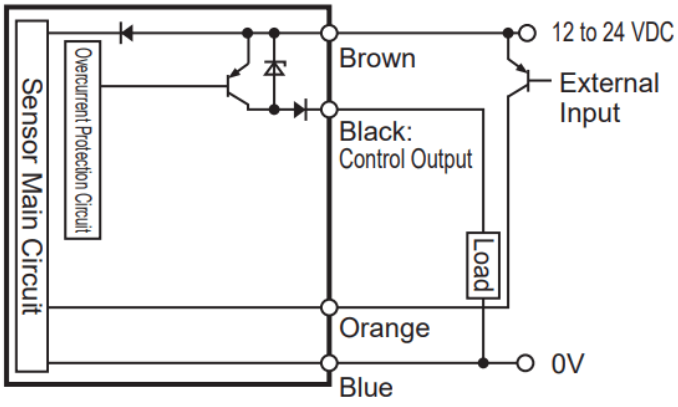
E3C-LDA51N/LDA8N (PNP)



E3C-LDA7N (NPN)



E3C-LDA9N (PNP)

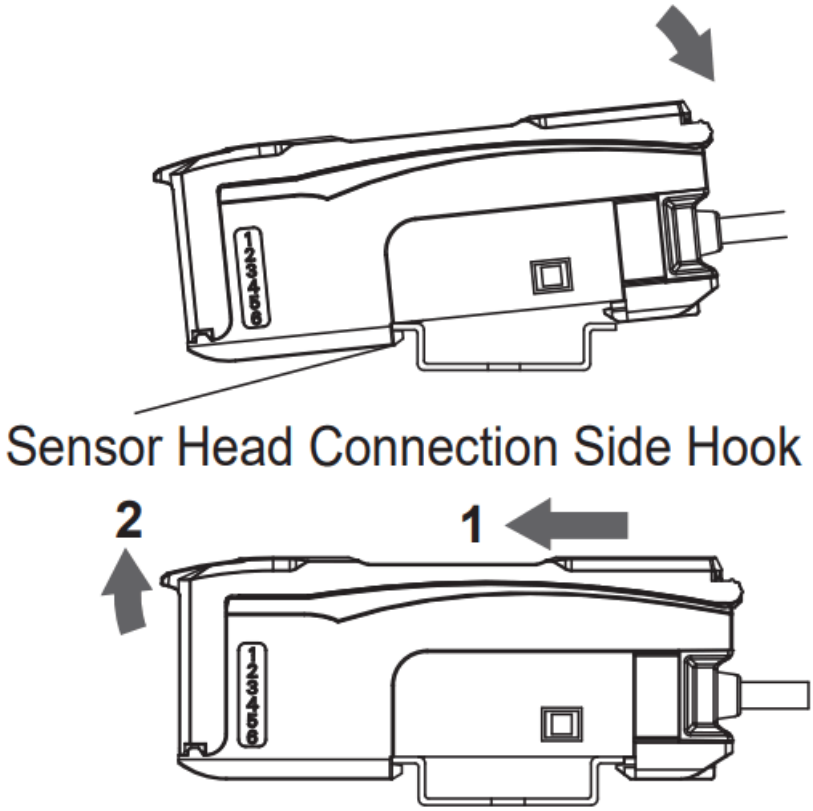


Mounting the Amplifier Unit

Mounting on DIN Track

1. Let the hook on the Amplifier Unit's Sensor Head connection side catch the track.
2. Push the unit until the hook clicks into place.

CHECK! DIN track (PFP- N) is sold separately.



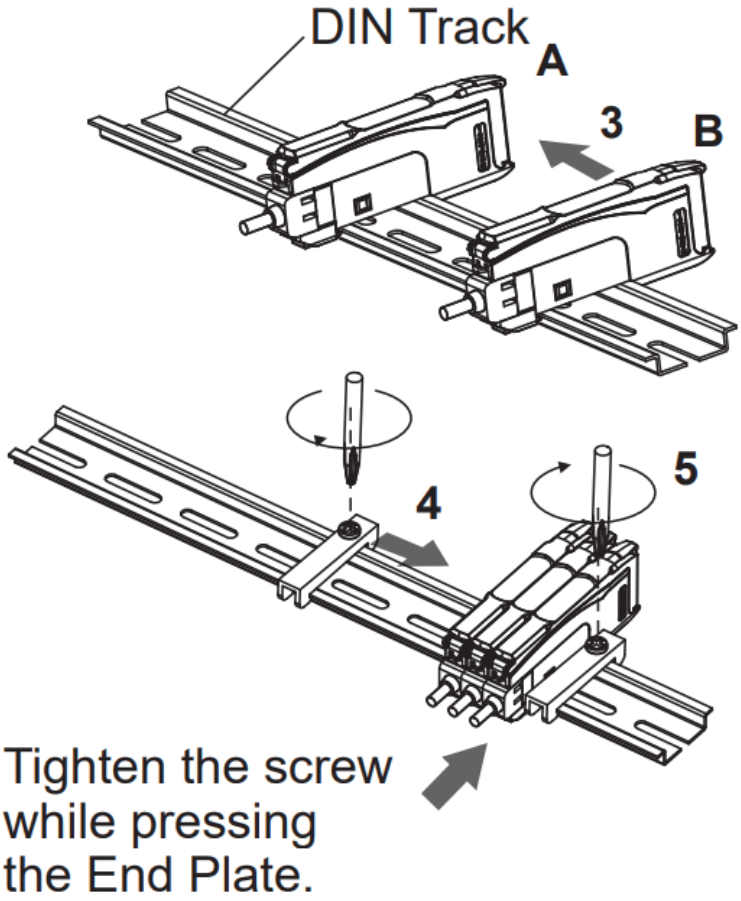
Removing from DIN Track

1. Push the unit in the direction 1.
2. Lift the unit in the direction of arrow 2 while performing step (1).

Joining Amplifier Units

1. Mount the Amplifier Units one at a time onto the DIN track.
2. When using a wire-saving connector, mount the master connector to A and slave connector to B.
3. Slide the Amplifier Unit until the Amplifier Unit is closely attached.(Arrow 3) (For the wire-saving connector type, be sure that a master connector and a slave connector, or a slave connector and a slave connector are connected.)
4. Use End Plates (PFP-M: separately sold) at the both ends of the grouped Amplifier Units to prevent them from separating due to vibration or other cause.(Arrow 4)
5. Tighten the screw on the End Plates using a driver.(Arrow 5)

CHECK! Up to 16 Amplifier Units can be joined. Under environments such as vibration, use an End Plate even with a single amplifier unit. If mounting the product without joining the amplifier unit, seal the side optical communication part with lightproof tape.



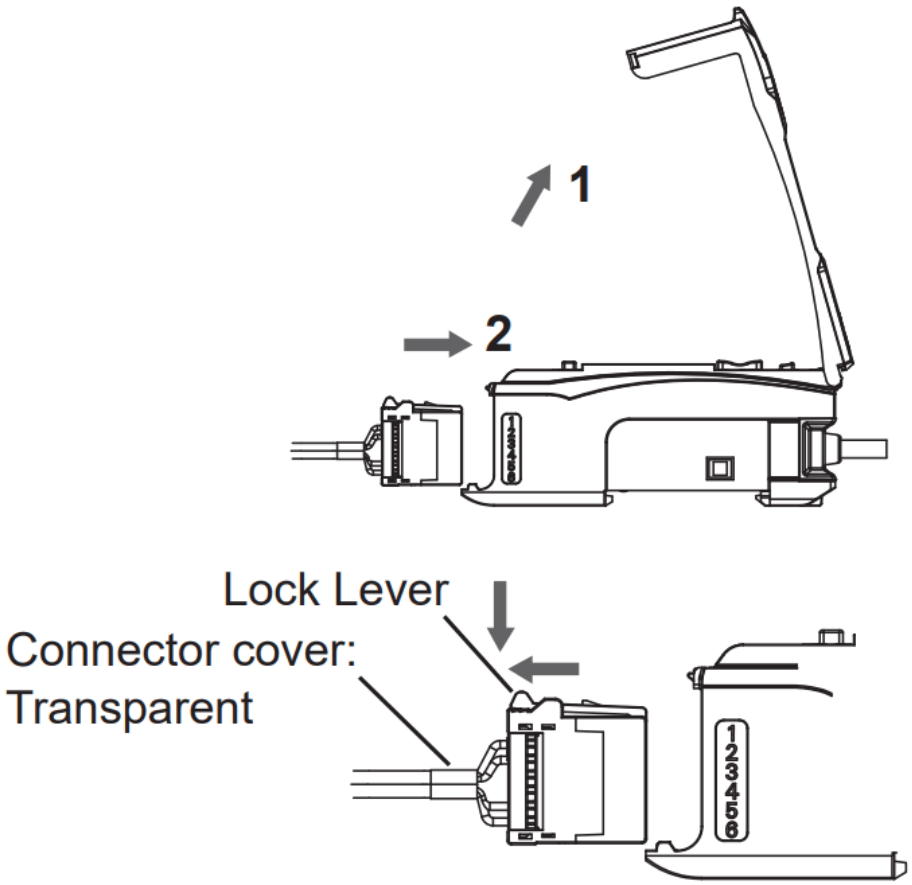
Mounting the sensor head

1. Open the protection cover.
2. Insert the sensor head, with the lock lever on its connector area facing upward, all the way into the connector port.

   To remove it, press and hold the lock lever then pull the sensor head out.

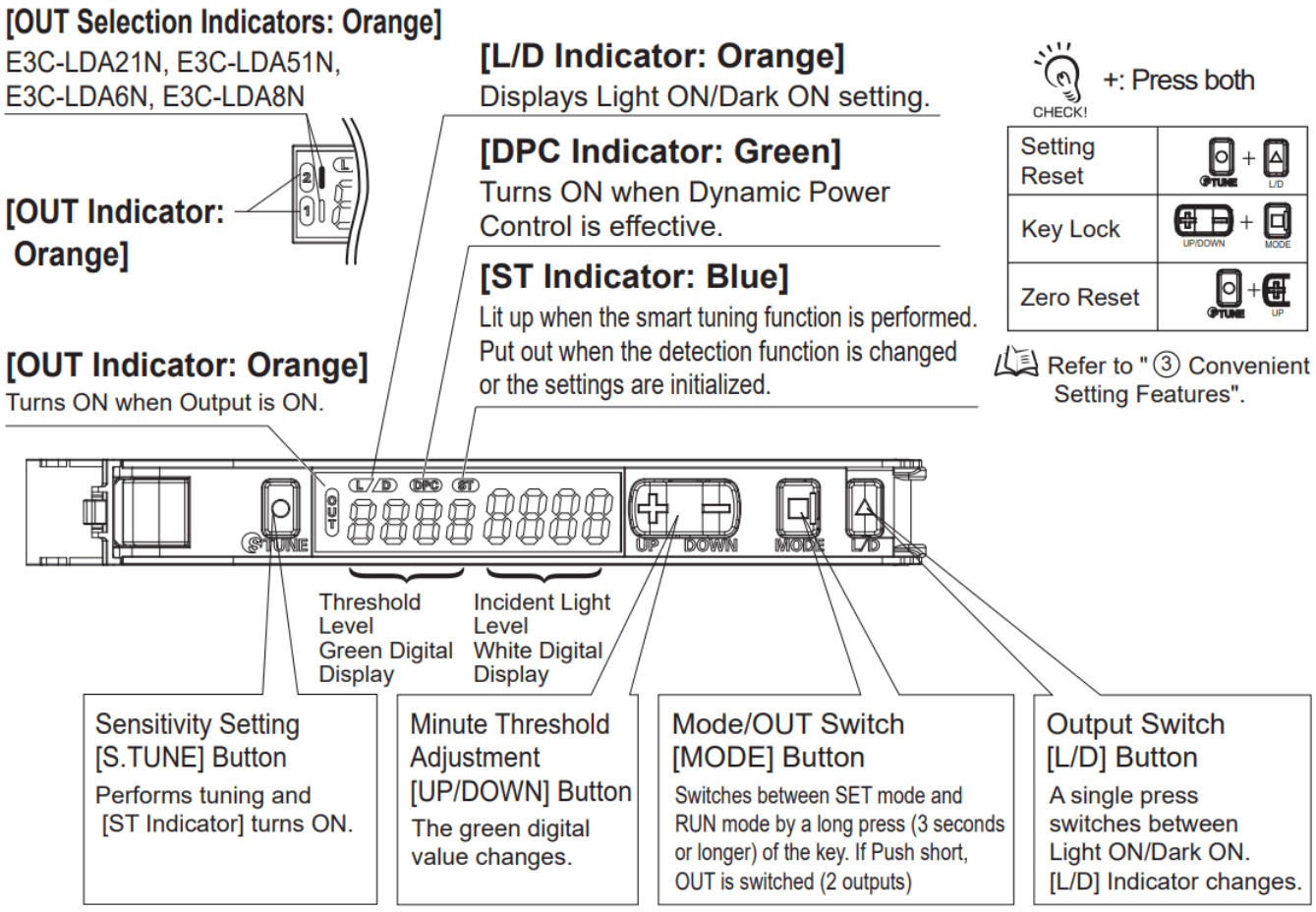
- Do not touch the emitter and receiver areas of the sensor head. A fingerprint may prevent proper measurement.

  If you accidentally touch it, use a soft cloth to wipe it out.
- Fix the connector area so that it should not be affected by oscillation and impact.

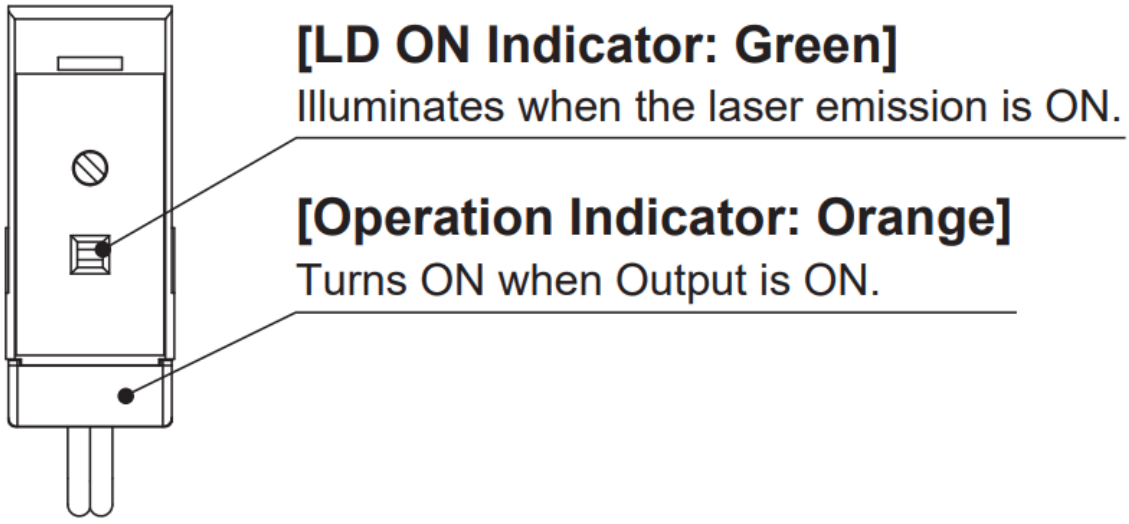


Settings

Setting and Display Overview



Sensor Head Display



CHECK! In the case of a 2-output type, the operation indicator on Sensor Head Display turns ON when Output, whose OUT Selection Indicator is lit up, is ON. (Refer to 2-5)

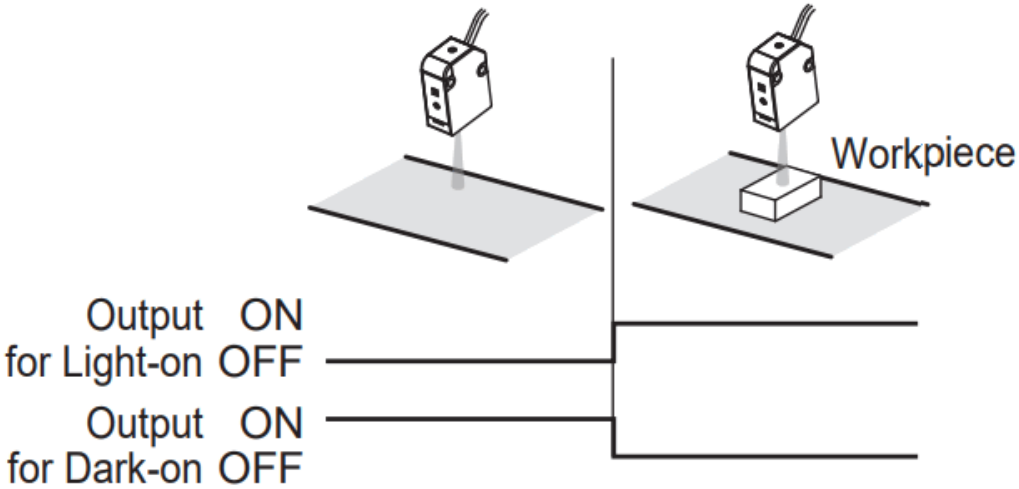
Output switching

Press L/D button.
Set to “Light ON” to turn the output ON with a workpiece in the detection area.

[L/D Indicator] turns L ON.

Set to “Dark ON” to turn ON the output without a sensing object [L/D Indicator] turns D ON.

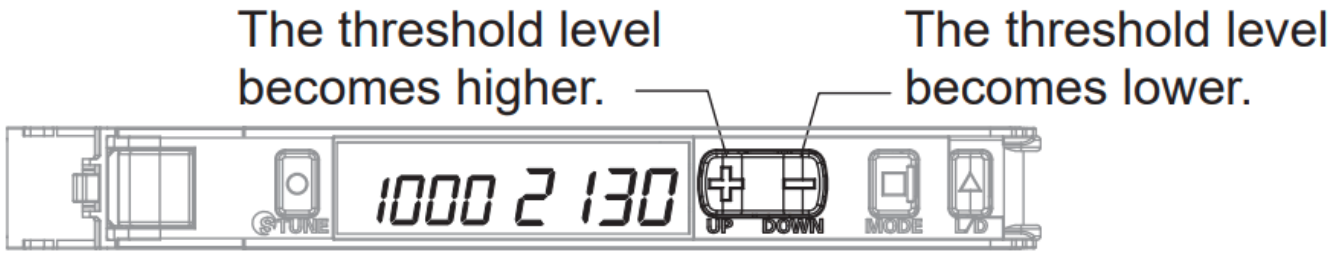
CHECK! Blocking ON or Unblocking ON can be set on output 1 and 2 individually.



Minute Adjustment of Threshold Level

Press UP/DOWN button to adjust the threshold level.

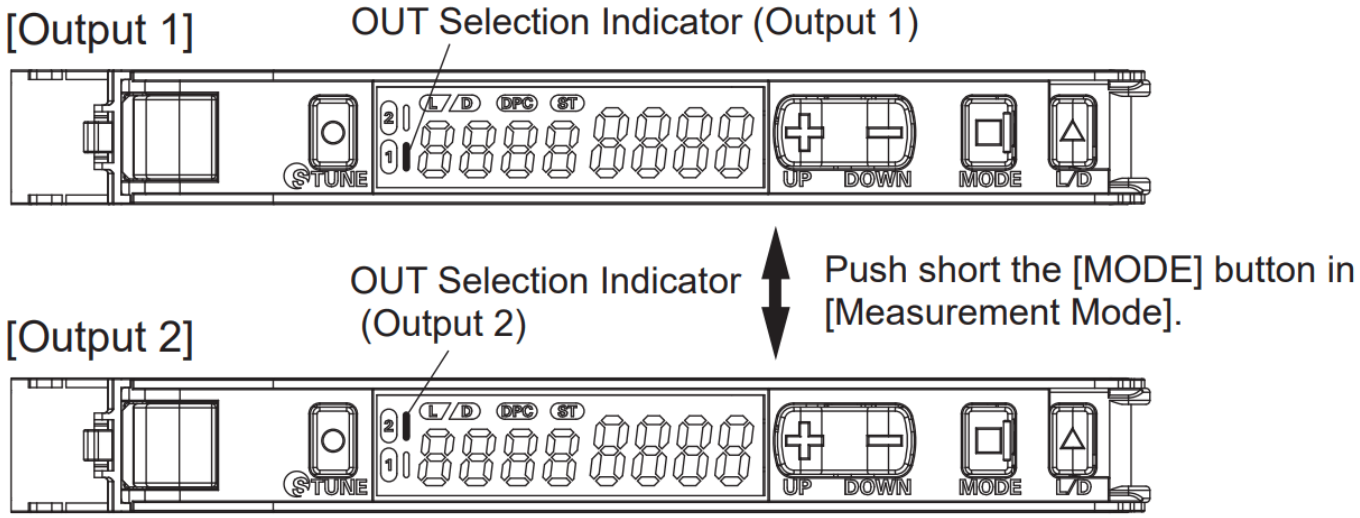
CHECK! Hold the key for high-speed level adjustment.



Channel switching

(2-output type:E3C-LDA21N, E3C-LDA51N, E3C-LDA6N, E3C-LDA8N)
OUT Selection Indicator switches to switch the settings.

1. Push short the [MODE] button in [Measurement Mode].
2. OUT Selection Indicators (Output 1/Output 2) switch.



CHECK! L/D switching can be performed on Output 2 as well. (Refer to 2-3)

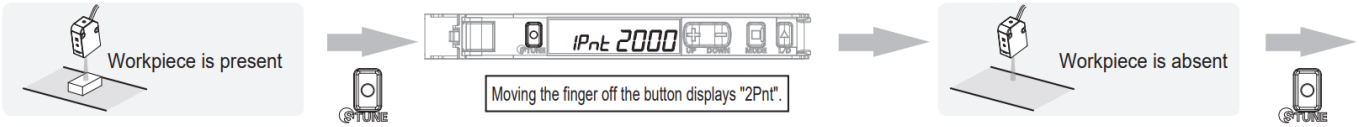
Smart Tuning [Easy Sensitivity Setting]

CHECK! For Output 2, light intensity is not adjusted during tuning. To adjust light intensity to the power tuning level, switch to Output 1. (Only the model with two-output type)

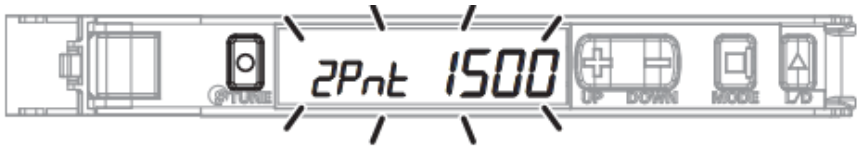
Basic Setting

2-point Tuning

Received light intensity setting: Adjust the higher one out of Point 1 and Point 2 to the power tuning level.
Threshold setting: Set to the middle between Point 1 and Point 2 received light intensity values.



CHECK! Execution can be done even if the order of workpiece exists/not exist is reversed.



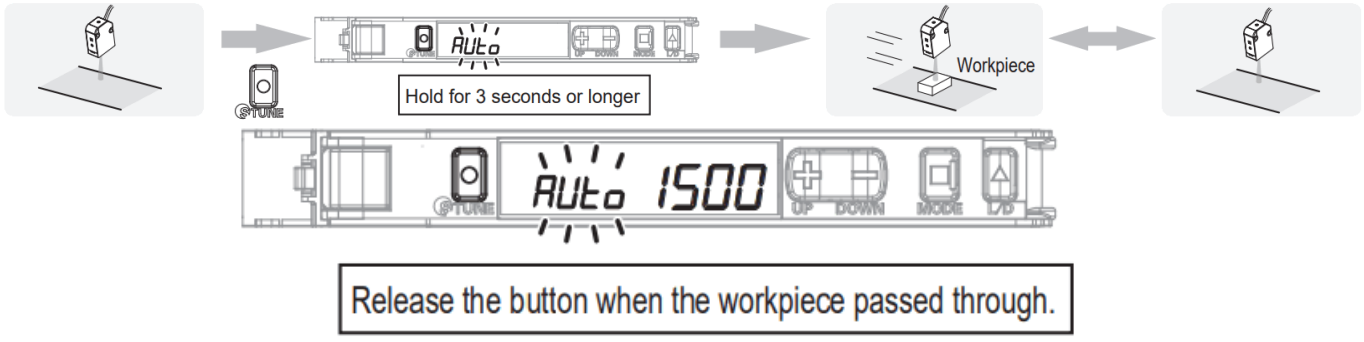
➡ **Setting is Completed**

Adjusting with a Passing Workpiece

Full Auto Tuning

Received light intensity setting: Adjust the maximum received light amount when the button is pressed to the power tuning level.

Threshold setting: Set to the middle between the maximum and minimum received light amount values when the button is pressed.



➡ **Setting is Completed**

Detecting a Transparent or Microscopic Object (Setting a Threshold with Received Light Intensity Ratio)

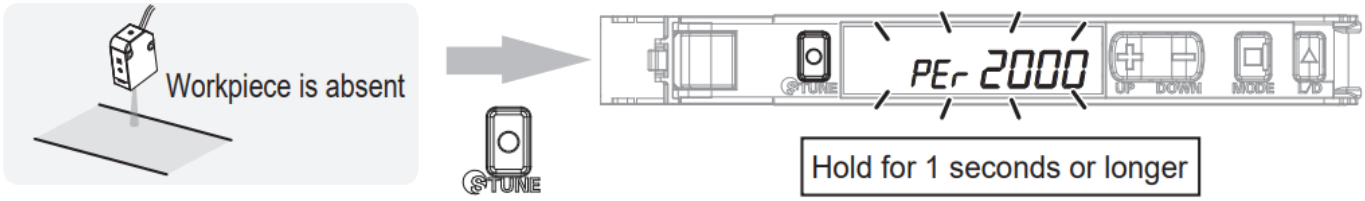
● Percentage Tuning

Percentage tuning setting **ON**

Refer to ” Detailed Settings”.

Received light intensity setting: Adjust the received light amount without workpiece to the power tuning level.

Threshold setting: Light intensity level that has been set according to the setting above x (1 + Percentage tuning level)

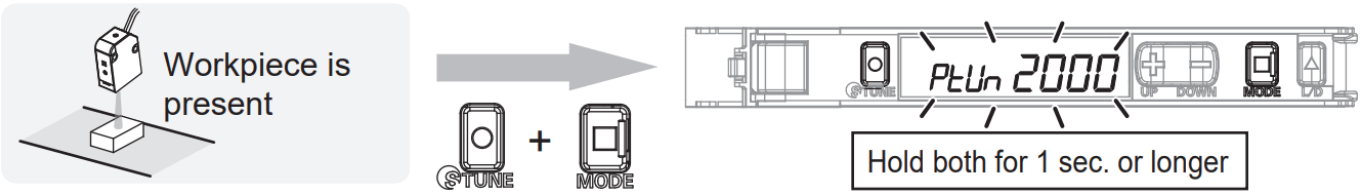


CHECK! When percent tuning setting is ON, only power tuning can be performed.
Other tunings cannot be performed.

Restoring the Received Light Intensity Weakened due to Dust or Dirt / Restoring the Saturated Received Light Intensity

Power Tuning

Received light intensity setting: Adjust the received light amount when the button is pressed to the power tuning level.
Threshold setting: Not changed.



CHECK!

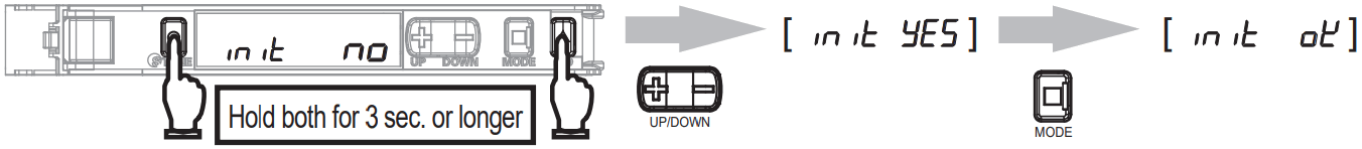
Diffuse reflection: Perform tuning with the presence of a sensing object.
Regressive reflection: Perform tuning without the presence of a sensing object.
Setting is Completed

Smart Tuning Error

Error / Display	**Cause**	**Remedy**
Near Error nEAr Err	The light level difference between Points 1 and 2 are extremely small.	•Change the detection function to the mode of slower response time. •Move the Sensor Head closer to the sensing object.
Over Error ouEr Err	Threshold set by the tuning is too high.	•Lower the power tuning level or the percentage tuning level.
Low Error Lo Err	Incident light level is too low.	•Move the Sensor Head closer to the sensing object. •Increase the percentage tuning level.

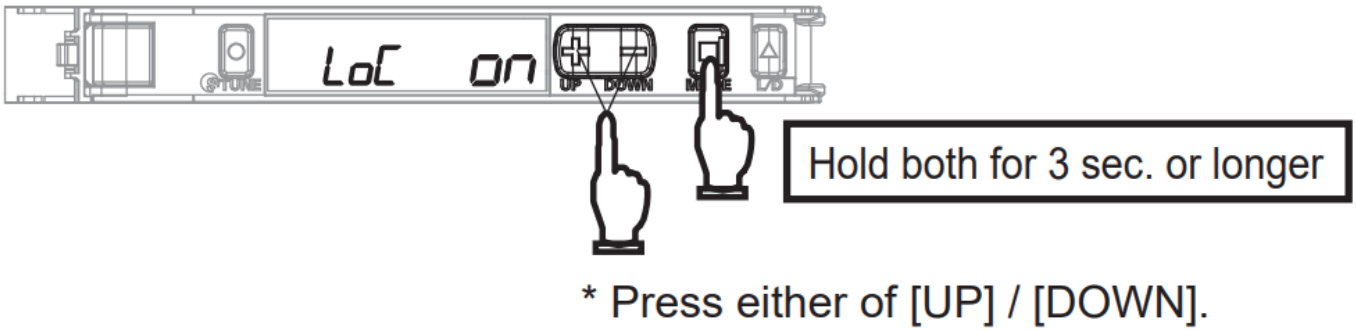
Convenient Setting Features

Initializing Settings
Setting Reset Initialize all settings to the factory-set defaults.



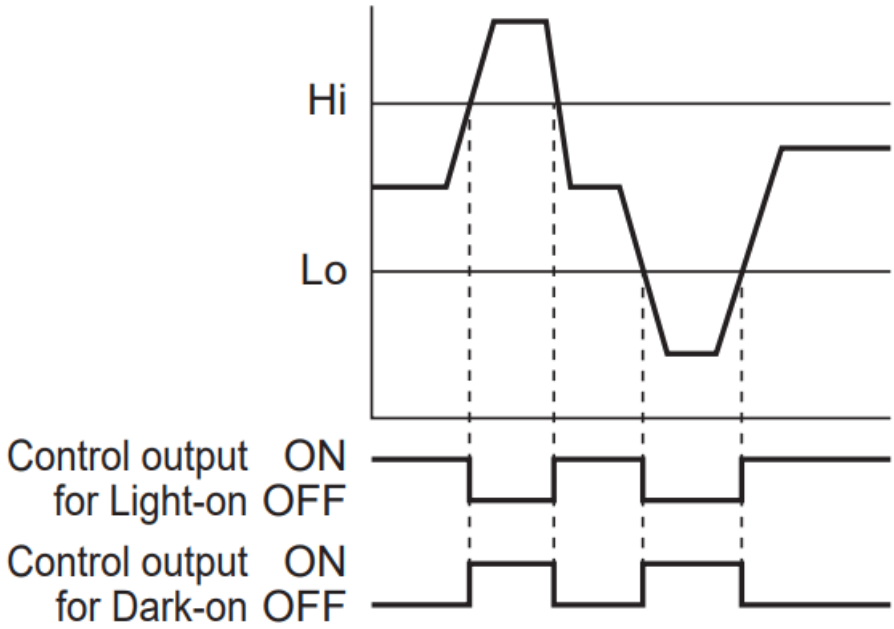
Preventing Malfunction

Key Lock Function Disables all the button operations.
Enable/Cancel (The same procedure)



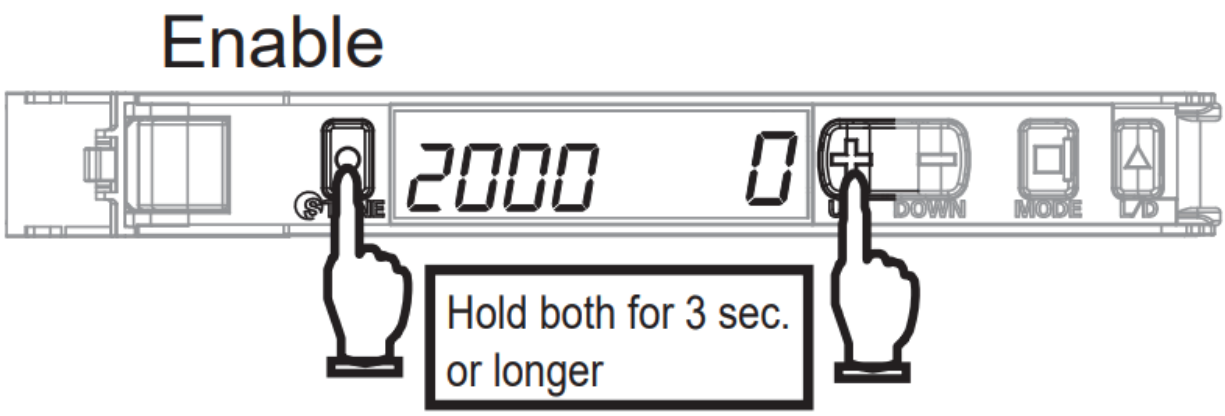
For Output When Received Light Intensity is Within the Area
Area Detection Mode

1. Select [Setting Mode] – [OUT1 Mode] – [Area Detection Mode].
   Pressing the [MODE] button for 3 seconds or longer exits the [SET mode].
2. Press the [MODE] button in [Measurement Mode] to display “OUT1 HIGH” and “OUT1 LOW”. Green digital indicator shows HIGH and LOW.
3. Provide Smart Tuning to each of HIGH/LOW thresholds by pressing the [S.TUNE] button.

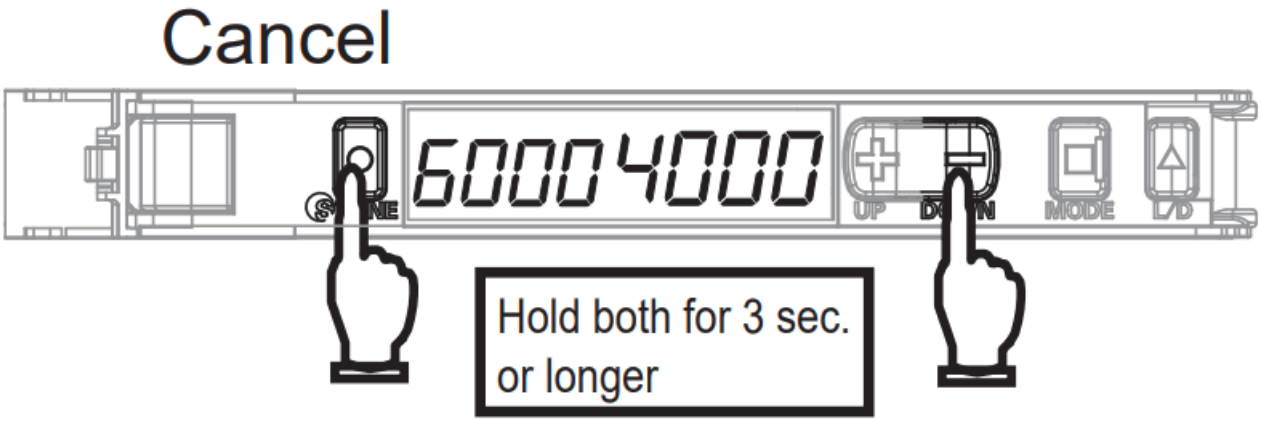


In tuning by percent, the thresholds are set as follows:
HIGH: Received light intensity in 3. + Received light intensity in 3. × Absolute value of percent tuning level
LOW: Received light intensity in 3. – Received light intensity in 3. × Absolute value of percent tuning level
Set HIGH/LOW thresholds HIGH > LOW.

Returning Received Light Intensity Display to “0”
Zero Reset Function

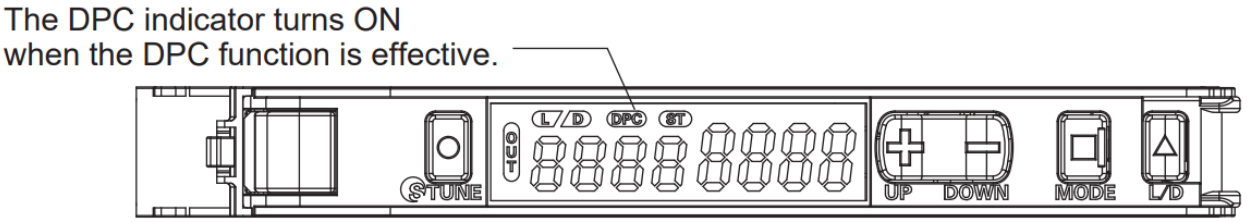


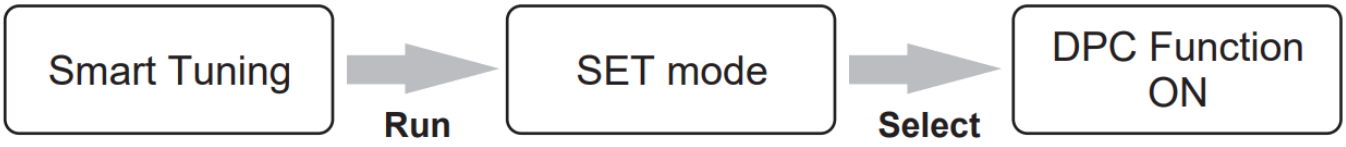
CHECK! The zero reset is cancelled when smart tuning is executed. Do not enable the DPC function in the zero reset state.

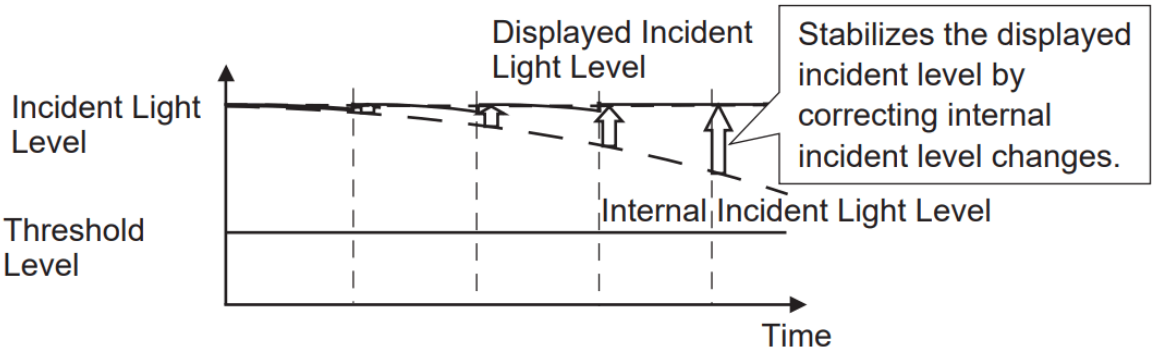


CHECK! The threshold also changes accordingly.
The lower threshold limit is -1999.

For Stable Detection Regardless of Received Light Intensity Changed due to Dust or Dirt
DPC Function
Use of the DPC function with regressive reflection model is recommended.







Refer to  " Settings".

When smart tuning is in error / output 1 is Area Detection Mode / Detection Function is changed / power tuning adjustment is turned OFF, the DPC function is disabled.
When the DPC function is disabled from the enabled state, perform the tuning again or reset the threshold.

Maintenance

Troubleshooting

Problem	Cause	Remedy
Nothing is shown on the indication.	No power supplied or the cable broken	Check the wiring, connector connection, power supply voltage and power supply capacity again.  Refer to “1-2 Input/Output Circuit Diagram”
Sensing / Detection not possible despite the minimum threshold level	Dust or dirt influences.	Wipe off any dirt on the light emitting/receiving surface of the sensor head.  Refer to ” ® Detailed Settings”.
The OUT indicator blinking	Mutual interference or other reason.	Check the Amplifier Units mounted in a group and turn ON the power again.  Refer to “1-3 Mounting Amplifier Unit”
Incident light level displayed in a negative value.	The zero reset function is enabled.	Cancel the zero reset function.  Refer to ” 0 Convenient Setting Features”
Laser is not emitted.	The sensor head is not properly connected. The external input is short-circuited in “emission OFF” condition.	Check the wiring and external input settings. Refer to “1-2  Input/Output Circuit Diagram”  Refer to ” ® Detailed Settings”.
i [LoFF [appears in the display.		
Lost tracking of the settings made.	–	Reset the settings.  Refer to ” 0 Convenient Setting Features”
The light intensity level does not change	The sensor head cable may be disconnected or broken.	Check the sensor head connection.  Refer to “1-4 Mounting the sensor head”
Laser light flashes		

Error Display

Error Name / Display	Cause	Remedy
DPC Error *	The incident light level ha s deteriorated due to dust or dirt.	Wipe the dust off the sensor head detection surface or other relevant areas and recover the original incident l ight level. Then, perform Smart Tuning. Refer to “2-6 Smart Tuning “
EEPROM Error * Represents a number	Failed internal data read/o ut.	Turn ON the power again. Reset the settings if the err or is not corrected. If the problem still remains, replac e the amplifier unit; this is memory malfunction such as rewritable time exceedance. Ref er to “® Convenient Setting Features”
Lock ON	The key lock function ena bled	Cancel the key lock function. Refer to “®s Convenient Setting Features”
Load short circuit detectio n error	Overcurrent is carried to t he control output.	Check wiring and connector connection again. Refer to “1-2 Input/Output Circuit Diagram” and “4-2 R atings and Specifications”

* The DPC indicator blinks.

Ratings and Specifications

Model	NPN output	E3C-LDA21N	E3C-LDA6N E3C-LDA7N
	PNP output	E3C-LDA51N	E3C-LDA8N E3C-LDAM
Applicable sensor head		E3C-L000N	
Control output		2	21
External input .1		1	1
Connection method .2		Pre-wired type	Wire-saving connector type
Power supply voltage		12 to 24 VDC ±10%, ripple (p-p) 10% max.	
Power consumption		Power consumption: 1080 mW max. (when the power supply voltage is 24 V, the current consumption is 45 mA max.)	
Control output		Load power supply voltage: 26.4 VDC, open collector output type (depends on t he NM/1,NR output) Load current: . mA max. for 1 to 3 units use, 20 mA max. fo r 4 or more units joined. Residual voltage: Load current less than 10 mA: 1V ma x., load current 10 to 100 mA: 2 V max. Off-state current: 0.1 mA max.	
Protection circuit		Power supply reverse polarity protection, output short-circuit protection and outp ut incorrect connection protection	
Maximum connectable Units		16 units	
	Super-high-speed mode (SHS)	0 (The communication and mutual interference prevention functions are disable d if the SHS mode is selected for detection function.)	

H=berof interfere. vevemon 3	HigGspeed mode (HS)	10 units
	Standard mode (Stud)	10 units
	Giga mode (GIGA)	10 units
Surrounding air Temperature range		Operating: 1 to 2 amplifiers connected: -25°C to 55°C, 3 to 10 amplifiers connected: -25°C to 50°C, 11 to 16 amplifiers connected: -25°C to 45°C Storage: -30°C to 70°C (with no icing or condensation)
Ambient humidity range		35 to 85% (with no condensation) within the surrounding Operating and storage: 35 above air
Altitude		2000m max.
Installation environment		Pollution degree 3 (as per IEC60947-1)
Insulation resistance		20 MO min. (at 500 VDC)
Dielectric strength		1,000 VAC, 50/60 Hz, 1 minute
Vibration resistance		10 to 55 Hz with a 1.5mm double amplitude for 2 hrs each in X, Y and Z directions
Shock resistance		500 m/s2, for 3 times each in X, Y and Z directions
Weight (packed state/sensor)		Approx. 115 g/Approx. 75 g 1 Approx. 60 g/Approx. 20 g
Materials		Case and cover: Polycarbonate (PC), Cable covering: PVC

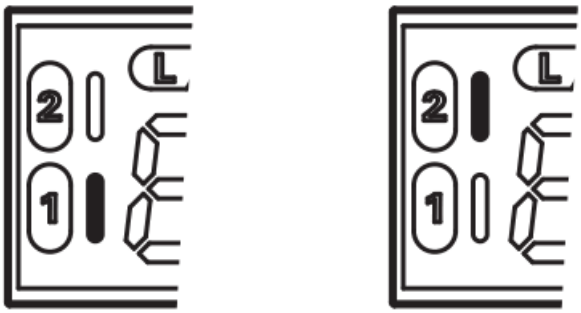
*1. Details on external inputs are as follows:

	Contact input (Relay or switch)	**Non-contact input (Transistor)**	**Input time *1-1**
NPN output	ON: Short circuit to OV (Outflow current: 1 mA max.)	ON: 1.5 V max. (Outflow current: 1 mA max.)	ON: 9 ms min. OFF: 20 ms min.
	OFF: Open or short circuit to Vcc	OFF: Vcc-1.5 V to Vcc (Leakage current: 0.1 mA max.)	
PNP output	ON: Short circuit to Vcc (Sink current: 3mA max.)	ON: Vcc-1.5 V to Vcc (Sink current: 3 mA max.)	
	OFF: Open or short circuit to OV	OFF: 1.5 V max. (Leakage current: 0.1 mA max.)	

*1-1 Input time is 25 ms or more for both ON/OFF only when tuning (tUnE) is selected in the external input.
*2. Separately purchase the E3X-CN21 Master Connector (4-conductor) when using this product as a single unit or as a master unit, or the E3X-CN22 Slave Connector (2- conductor) when using as a slave unit. Either Connector can be used.
*3. Even if tuning is implemented, the number of units will not change.
In standard mode and giga mode, set the threshold level to 400 or more.

Detailed Settings

Hold button for 3 seconds or longer to enter SET mode.
SET mode provides the following function settings. The initial display shown after transition from one function to another represents the factory default.
The OUT Selection Indicators show items for Output1/Output 2 individually for each output.



A

1. Function Selection Enabling 6 to 16

FUnC dFLt — Basic setting

FUnC oPt — Detailed setting

2. Detection Function Changing Incident Light Level and Response Time

(Incident Light Level Example)

Detection function	STND	GIGA	SHS	HS
Response time	1 ms	4 ms	80 µs	250 µs

Stnd2000 — STND Standard Mode

GIGA2000 — GIGA Giga Mode

SHS2000 — SHS Super High-speed Mode

HS2000 — HS High-speed Mode

3. DPC Function Stable Detection Regardless of Incident Light Level Change

dPC oFF — DPC OFF

dPC on — DPC ON

Refer to "③ Convenient Setting Features ● DPC Function".

4. Timer Function Setting Output Timer (Two outputs are displayed for the two-output type)

toFF ---- — Time Off

After pressing the MODE button, use UP/DOWN button to set the power tuning level.

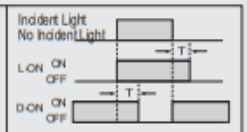
(1 to 9999ms in 1ms steps; the initial value: 10ms)

oFFd — (a)Off-delay Timer

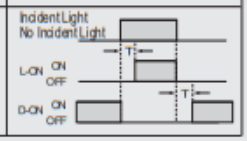
on-d — (b)On-delay Timer

SHot — (c)One shot

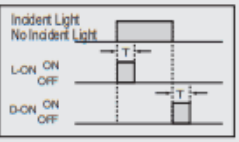
(a) Off-delay Timer
Holds the output ON for detection by PLC when the detection time is too short.



(b) On-delay Timer
Delays the output ON after detection.

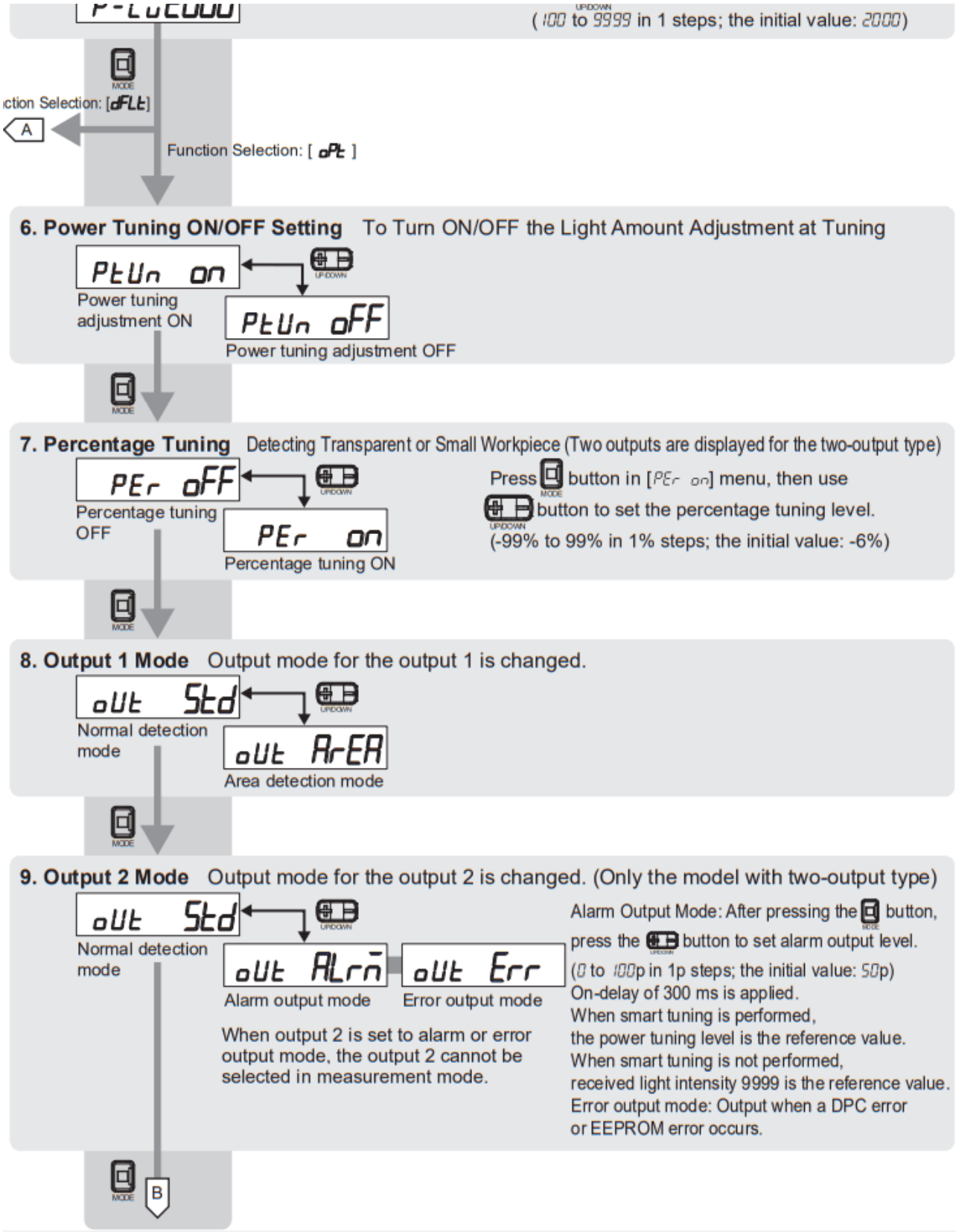


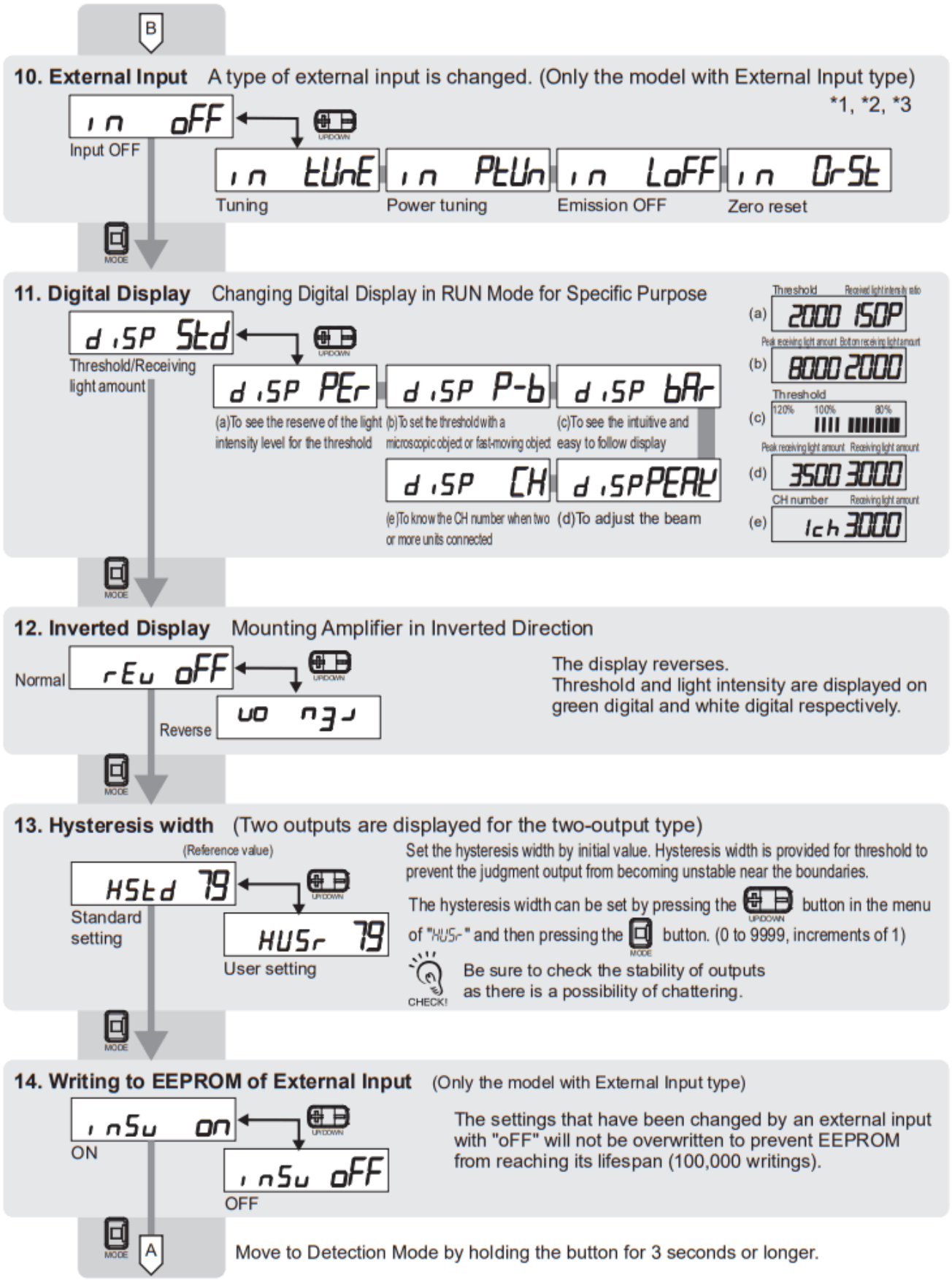
(c) One-shot Timer
Keeps the output ON for a specified time regardless of the workpiece size variations.



5. Power Tuning Level Changing the Target Incident Light Level (Power Tuning Level)

Use UP/DOWN button to set the power tuning level.


P-LoE000
(100 to 9999 in 1 steps; the initial value: 2000)
ıction Selection: [dFLt]
A
Function Selection: [oPt]
6. Power Tuning ON/OFF Setting To Turn ON/OFF the Light Amount Adjustment at Tuning
PtUn on
Power tuning adjustment ON
PtUn oFF
Power tuning adjustment OFF
7. Percentage Tuning Detecting Transparent or Small Workpiece (Two outputs are displayed for the two-output type)
PEr oFF
Percentage tuning OFF
PEr on
Percentage tuning ON
Press button in [PEr on] menu, then use button to set the percentage tuning level.
(-99% to 99% in 1% steps; the initial value: -6%)
8. Output 1 Mode Output mode for the output 1 is changed.
oUt Std
Normal detection mode
oUt ArEA
Area detection mode
9. Output 2 Mode Output mode for the output 2 is changed. (Only the model with two-output type)
oUt Std
Normal detection mode
oUt ALrn
Alarm output mode
oUt Err
Error output mode
When output 2 is set to alarm or error output mode, the output 2 cannot be selected in measurement mode.
Alarm Output Mode: After pressing the button, press the button to set alarm output level.
(0 to 100p in 1p steps; the initial value: 50p)
On-delay of 300 ms is applied.
When smart tuning is performed, the power tuning level is the reference value.
When smart tuning is not performed, received light intensity 9999 is the reference value.
Error output mode: Output when a DPC error or EEPROM error occurs.
B



*1. The signal input time is as follows:
External input setting: tuning

	Point 1	Point 2
2-point tuning	Less than 3 sec.	Less than 3 sec.
Full Auto Tuning	3 sec. or longer	–

- Signal input time when tuning(in tUnE) is selected is the same as the button input time.
  External input setting: Tuning starts with the signal input time of 25 ms or more during power tuning.
  External input setting: At the time of zero reset

	Enable	Cancel
Zero reset	Less than 3s	3s or longer

- Enable / Cancel of Zero reset is the timing when input is turned off.
  External input setting: Operation starts with the signal input time of 25 ms or more with emitter OFF, and stops by releasing the signal.
  2. When performing a percentage tuning on the external input, turn it ON as described in “7. Percentage Tuning Setting”
  *3. When changing the type of external input, release the external input signal before changing it.

Suitability for Use

Omron Companies shall not be responsible for conformity with any standards, codes or regulations which apply to the combination of the Product in the Buyer’s application or use of the Product. At Buyer’s request, Omron will provide applicable third party certification documents identifying ratings and limitations of use which apply to the Product. This information by itself is not sufficient for a complete determination of the suitability of the Product in combination with the end product, machine, system, or other application or use. Buyer shall be solely responsible for determining appropriateness of the particular Product with respect to Buyer’s application, product or system. Buyer shall take application responsibility in all cases.

NEVER USE THE PRODUCT FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCT(S) IS PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.
OMRON Corporation Industrial Automation Company Contact: **www.ia.omron.com**
Kyoto, JAPAN

Regional Headquarters
OMRON EUROPE B.V.
Wegalaan 67-69, 2132 JD Hoofddorp
The Netherlands
Tel: (31)2356-81-300/Fax: (31)2356-81-388

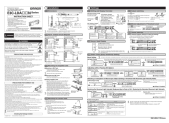
OMRON ELECTRONICS LLC
2895 Greenspoint Parkway, Suite 200
Hoffman Estates, IL 60169 U.S.A.
Tel: (1) 847-843-7900/Fax: (1) 847-843-7787

OMRON ASIA PACIFIC PTE. LTD.
No. 438A Alexandra Road # 05-05/08 (Lobby 2),

Alexandra Technopark,
Singapore 119967
Tel: (65) 6835-3011/Fax: (65) 6835-2711

OMRON (CHINA) CO., LTD.
Room 2211, Bank of China Tower,
200 Yin Cheng Zhong Road,
PuDong New Area, Shanghai, 200120, China
Tel: (86) 21-5037-2222/Fax: (86) 21-5037-2200

Documents / Resources

	**OMRON E3C-LDA N Series Photoelectric Sensor with Separate Digital Amplifier** [pdf] Instruction Manual E3C-LDA N Series Photoelectric Sensor with Separate Digital Amplifier, E3C-LDA N Series, Photoelectric Sensor with Separate Digital Amplifier, E3C-LDA N Series Photoelectric Sensor, Photoelectric Sensor, Sensor