

E2C-EDA

Proximity Sensors with Separate Digital Amplifier Amplifier Units

Instruction Sheet

Thank you for selecting an OMRON product. This sheet primarily describes precautions required in installing and operating the product. Before operating the product, read the sheet thoroughly to acquire sufficient knowledge of the product. For your convenience, keep the sheet at your disposal.

Precautions for Safe Use

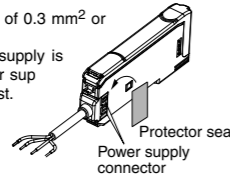
Please observe the following precautions for safe use of the product.

- Do not use the Amplifier Unit in environments subject to flammable or explosive gases.
- Do not use the Amplifier Unit in environments subject to exposure to water, oil, chemicals, etc.
- Do not attempt to disassemble, repair, or modify the Amplifier Unit in any way.
- Do not apply voltages or currents that exceed the rated ranges.
- Wire the Amplifier Unit correctly, e.g., do not reverse the polarity of the power supply.
- Connect the load correctly.
- Do not short both ends of the load.
- Do not use the Amplifier Unit if the case is damaged.
- When disposing of the Amplifier Unit, treat it as industrial waste.

Precautions for Correct Use

Please observe the following precautions to prevent failure to operate, malfunction, or undesirable effects on product performance.

- Wire the Amplifier Unit separately from power supply or high-voltage lines. If the Amplifier Unit wiring is wired together with or placed in the same duct as high-power lines, inductive noise may cause operating errors or damage the Amplifier Unit.
- Do not extend the cable to more than 30 m, and use a wire size of 0.3 mm² or larger for the extension cable.
- The Amplifier Unit is ready to operate 200 ms after the power supply is turned ON. If the Amplifier Unit and load are connected to power supplies separately, turn ON the power supply to the Amplifier Unit first.
- Always keep the protective cover in place when using the Amplifier Unit.
- Connector Short-circuit Protection (for Amplifier Units with Connectors)
 - To prevent electric shock or short-circuits, attach the protector seals provided with E3X-CN-series Connectors to the sides of power supply connectors that are not being used.
- Always turn OFF the power supply before connecting or disconnecting Sensor Heads, joining or separating Amplifier Units, or adding Amplifier Units.
- If the data is not written to the EEPROM correctly due to a power failure or static-electric noise, initialize the settings using the keys on the Amplifier Unit.
- Using a Mobile Console
 - Use the E3X-MC11-SV2 Mobile Console for the E2C-EDA-series Amplifier Units. Other Mobile Consoles, such as the E3X-MC11, E3X-MC11-S, cannot be used.
- Optical communications are not possible with an E3X-DA-N Amplifier Unit.
- Depending on the application environment, time may be required for the detection level to stabilize after the power supply is turned ON.
- Output pulses may occur when the power is interrupted and so turn OFF the power to the load or load line before turning OFF the power to the Sensor.
- The Sensor Head of E3C cannot be used. It may damage, if it connects.
- When mutual interference prevention is confirmed, the execution time of fine positioning becomes long.
- Do not use thinners, benzene, acetone, or kerosene for cleaning the Amplifier Unit.
- A disconnection output may be rarely outputted under the large installation conditions of a detection level also except disconnection.

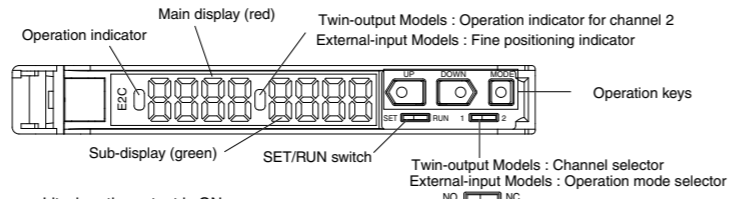


1. Ratings and Specifications

Type		Advanced, twin-output models		Advanced, external-input models	
Connection method		Prewired	Separate connector ¹	Prewired	Separate connector ¹
Model number	NPN PNP	E2C-EDA11 E2C-EDA41	E2C-EDA6 E2C-EDA8	E2C-EDA21 E2C-EDA51	E2C-EDA7 E2C-EDA9
Supply voltage	12 to 24 VDC ± 10% ripple(p-p) 10% max.				
Power consumption	1,080mW max. (45mA max. at 24 VDC)				
Control output	Open collector (26.4 VDC max.); Load current: 50mA max.; residual voltage: 1 V max.				
Timer	OFF, OFF-delay, or one-shot				
Timer time	1 ms to 5 s				
Differential detection mode	Supported				
Fine positioning	Supported				
Mutual interference prevention	Supported (intermittent oscillation system) ² response time = (number of Amplifier Units + 1) × 15 ms The number of setting: 2 to 5				
I/O settings	Output setting (channel 2 output, area output, self diagnosis output, or disconnection output)		External input setting (teaching method, fine positioning, zero reset, or synchronous detection)		
Response time	Refer to 5. Detailed Settings Detection Method				
Ambient temperature	Operation	Groups of 1 to 2 Sensors: -10 to 55	Groups of 6 to 16 Sensors: -10 to 45	Groups of 3 to 5 Sensors: -10 to 50	
	Storage	-20 to 70			
Ambient humidity	Operation/Storage: 35 to 85 %RH				
Vibration	10 to 55 Hz, 1.5mm double amplitude 2 hours each in X, Y, and Z directions				

*1: When using individually or as a master, obtain the E3X-CN21 Master Connector (4-conductor), and when using as a slave, obtain the E3X-CN22 Slave Connector (2-conductor). Either Connector can be used.
*2: Communications are disabled if SHS is selected for the detection mode, and the communications functions for mutual interference prevention and the Mobile Console will not function.

2. Nomenclature



Lit when the output is ON.
Twin-output Models: Lit when the output for channel 1 is ON.
Displays the detection level or the function name.
Twin-output Models: Lit when the output for channel 2 is ON.
External-input Models: Lit when fine positioning is set.
Displays supplemental detection information, the setting of a function, etc.
Used to switch the mode.
Twin-output Models: Used to select the channel to display or set.
External-input Models: Used to select normally-open or normally-close operation
Used to change the display, set functions, etc.

3. Basic Operating Information

Setting the Mode

The mode is set using the SET/RUN switch. Set this switch according to the operation to be performed.

Mode	Description
SET	Select to set detection conditions, to teach the threshold value, to set initializing, etc.
RUN	Select for actual detection operation or set the following: Manual adjustment of thresholds, Positioning teaching, Teaching with and without a workpiece, Fine positioning, Zero reset, or Key lock

Key Operations

The operation keys are used to switch the displays and set detection conditions. The functions of the keys depend on the current mode.

Key	Function	
	RUN mode	SET mode
UP key	Increases the threshold.	Depends on the setting. • Executes teaching. • Changes the setting forward.
DOWN key	Decreases the threshold.	Depends on the setting. • Executes teaching. • Changes the setting in reverse.
MODE key	Depends in the MODE key setting (See note.) • Executes positioning teaching(default setting). • Teaching with and without a workpiece. • Executes fine positioning. • Executes a zero reset.	Switches the function to be set on the display.

Note: Refer to 4. Basic settings for the setting method.

Reading Displays

The information displayed on the main display and sub-display depends on the current mode. For the default settings, the RUN mode displays will appear when the power supply is turned ON for the first time.

Mode	Main display (red)	Sub-display (green)
SET	Displays the detection level,* function name, or other information depending on the key operation. *The detection level will be displayed even if DIFF (differential operation) is set for the detection method.	Displays threshold value* or the setting of the function displayed on the main display depending on the key operation. *The threshold value for the change in the detection level will be displayed if DIFF (differential operation) is set for the detection method.
RUN (See note.)	For the default setting, the current detection level will be displayed. The change in the detection level will be displayed when DIFF (differential operation) is set for the detection mode.	For the default setting, the current threshold value will be displayed. The threshold value for the change in the detection level will be displayed if DIFF (differential operation) is set for the detection method.

Note: The information that appears on the displays can be set using the display switch function. Refer to 5. Detailed Settings.

4. Basic Settings

Setting the Operation Mode

Select either normally-open or normally-close operation.

Selection	Description
NO(normally-open) (default)	The output will turn ON when the detection level is above the threshold. If DIFF (differential operation) is set for the detection method, the output will turn ON when an edge is detected.
NC(normally-close)	The output will turn ON when the detection level is below the threshold. If DIFF (differential operation) is set for the detection method, the output will turn OFF when an edge is detected.

The setting method depends on the type of Amplifier Unit.

Type	Setting method
Twin-output model	Set as the operation mode in SET mode. Refer to 5. Detailed Settings.
External-input model	Set using the operation mode selector. NO NC

Adjusting the sensitivity (as Required)

Fine positioning can be used to adjust the detection level that is currently being received to the fine positioning target value (1,500). Before executes fine positioning, always secure the workpiece and Sensor Head and be sure that the detection level is stable.

Setting method

Confirm that the MODE key setting is FP (fine positioning) in advance. The default is "PPT" (positioning teaching). Refer to 5. Detailed Settings.

Main Display: FP During fine positioning, the display alternates at a fixed interval. Fine positioning target value: 1500

Setting Errors

An error has occurred if one of the following display appears the progress bar is displayed.

Flashes twice 2PNT OVER	Over Error It is the error for the present workpiece position having been too far to the fine positioning possible range. It is adjusted by the maximum sensitivity. The fine positioning possible range is 50 to 150% of measurement range.
Flashes twice FP BOTM	Bottom Error It is the error for the present workpiece position having been too near to the fine positioning possible range. It is adjusted by the minimum sensitivity. The fine positioning possible range is 50 to 150% of measurement range.
Flashes twice FP TOUT	Timeout Error An error occurred because the detection level was not stable during fine positioning. Make sure that the workpiece and Sensor Head are secured and return the sensitivity.

Clearing method

Setting Thresholds

Positioning Teaching
Teaching is performed in the state where a workpiece is in an ON point. A detection level is set up as a threshold value.

Teaching cannot be performed when DIFF (differential operation) is set as the detection method.

Setting method

In the case of a [Method 2], please check that a setup of a "MODE key setting" function is [PPT] (positioning teaching) in advance. Refer to 5. Detailed Settings.

Teaching With and Without a Workpiece

Teaching can be performed twice, once with and once without a workpiece, and the value between the two measured values is set as the threshold.

If DIFF (differential operation) is set for the detection method, the threshold value will be set to half of the difference between the two measured values.

Setting method

In the case of a [Method 2], please check that a setup of a "MODE key setting" function is [2PNT] (teaching with and without a workpiece) in advance. Refer to 5. Detailed Settings.

Setting Errors

An error has occurred if any of the following is display when the UP or DOWN key is pressed without a workpiece.

Flashes twice 2PNT OVER	Do one of the following and then repeat the operation • Adjust the Head to decrease the detection level. • Execute fine positioning.
Flashes twice 2PNT LO	Do one of the following and then repeat the operation • Adjust the Head to increase the detection level. • Execute fine positioning.

No-workpiece Teaching

Teaching is performed in the state where there is no workpiece. It sets up about +6% of a detection level as a threshold value. It is stabilized and a very small difference can be detected.

If DIFF (differential operation) is set for the detection method, the threshold value will be set to the minimum value above the detection level without a workpiece that will enable stable detection.

Manually Setting Threshold Values

A threshold value can be set manually.

A zero point is registered. (zero reset)

The standard position of a workpiece is registered as "detection level = 0", and it judges to the amount of change of a detection level. When there is change of the standard position of a workpiece or change of the detection level by the operating condition, detection stabilized when performing zero reset can be performed. Execution of zero reset shifts to "0" the detection level currently displayed on the main display. The threshold value currently displayed on the sub display is not shifted. Please set "a MODE key settings" as "ORST" in advance. The default is "PPT" (positioning teaching). Refer to 5. Detailed Settings.

5. Detailed Settings

The following functions can be set in SET mode. The default settings are shown in the transition boxes between functions.
 For Twin-output Models, all settings except for the operation mode, timer settings and hysteresis setting are the same for both channels.
 *: The values shown for thresholds, detection levels, percentages, etc., are examples only. Actual displays may vary.

Teaching (Detection levels/Threshold display)
 Note: Refer to 4. Basic Settings for teaching methods.

Switch to SET mode.
 SET RUN

Display alternates at a fixed interval.
 2130 1000
 1234 1000

0. Operation Mode (Twin-output Models only)
 0-OP NO

1. Detection Method
 1-Fn STND

Differential Edge Selection
 dIFF

Differential Response Time
 5P 3

2. Timer
 2-tF ----

Timer Time
 40

3. Twin Outputs (Twin-output Models Only)
 3-out 2out

4. External Input (External-input Models Only)
 3-rn PPT

Set separately for each channel.

NO	NO(normally-open)
NC	NC(normally-close)
STND	Standard mode Response time: 1 ms
HRES	High-resolution mode Response time: 4 mss
dIFF	Differential operation mode Operation is according to the change in the detection level. For Twin-output Models, the output for channel 2 is always an alarm output for the absolute detection level.
SHS	Super-high-speed mode Response time: 150 μs
HS	High-speed mode Response time: 300 μs

Single edge
 Either the rising or falling edge is detected.

Double edge
 Both the rising and falling edge are detected.

This setting depends on the setting for the differential edge selection.

	Single edge	Double edge
1	300 μs	500 μs
2	500 μs	1ms
3	1ms	2ms
4	10ms	20ms
5	100ms	200ms

Setting range: 1 to 5,000

----	Timer disabled
OFFD	OFF-delay timer
ON-D	ON-delay timer
1SHT	One-shot timer

The function of the output for channel 2 can be selected. This setting is not value if dIFF (differential operation) is set for the detection method. (The output for channel 2 is always an alarm output for differential operation.)

2OUT	Output for each channel.
AREA	Output if level is between the two thresholds.
SELF	Self-diagnosis output Output when the detection level is not stable, i.e., when the detection level is ±10% of the threshold value for 300 ms or longer.
HEAD	Disconnection output A disconnection output is outputted, when the Sensor Head is disconnected, or it does not connect.

The output for channel 1 functions according to the detection mode selection.

The item that is controlled by the input from an external device can be selected.

PPT	Positioning teaching
nEAR	No-workpiece teaching
2PNT	Teaching with and without a workpiece
AUTO	Automatic teaching The maximum and minimum detection levels are sampled while the input is ON and, when the input turns OFF, the average of these values is set as the threshold value. Disabled if the detection function is set to "DIFF" (differential operation).

5. Mode Key Setting
 4-nd PPT

6. Display Switch
 5-dP

7. Display Orientation
 6-rv d123

8. Mutual Interference Prevention Number Set up
 7-n: OFF

9. Hysteresis Setup
 8-HY 30

10. External Input Memory (External-input Models Only)
 9-EP ON

FP	Fine positioning
ORST	Zero reset
SYNC	Synchronous detection The function is detected only while the input is ON.

Effective Pulse Widths

Selection	Pulse width
PPT, nEAR, 2PNT	0.1s to 2s
ORST, FP	Executing: 0.1 to 2s Clearing: 3s or longer
AUTO	Effective ON pulse width: 0.1s min.
SYNC	Detection response time 500 μs min.

The function of the MODE key in RUN mode can be selected.

PPT	Executes a positioning teaching
2PNT	Executes a teaching with and without a workpiece
FP	Executes a fine positioning
ORST	Executes a zero reset

The information displayed in RUN mode can be selected. When going to SET mode, this setting will be ignored and the detection level and threshold value will be displayed.

3112 2000	The detection level and threshold value Detection level Threshold value
P123 2000	The detection level as a percentage of the threshold value and the threshold value. % detection level/Threshold value
PEAK BOTM	The peak detection level and bottom detection level of fixed time(2s). Peak level Bottom level
3112 2315	
O-PE C-BT	The peak detection level under detection, and the bottom detection level in un-detecting. A display is updated when detection-un-detecting changes. O-PE C-BT
10000	Analog bar display. The current detection status is displayed as an analog bar. The bar will lengthen from the right as ON status is reached. Detection status
3112 PEAK	The current detection level and the peak detection level. Detection level PEAK
3112 3800	
3112 2ch	The detection level and channel number. Detection level Channel

d123 Normal display
 E21D Reversed display

The number of the amplifier which confirms mutual interference prevention is set up. Only the amplifier which wants to confirm mutual interference prevention is made to connect, and it is set as all amplifier. After a setup should surely re-switch on a power supply. The number of a setting: 2 [2UT] to 5 [5UT]

OFF Mutual interference prevention does not work.

Hysteresis is set up. Hysteresis is adjusted to perform the case where the position of a workpiece is unstable, and finer detection. Adjustment range: 10 to 2000

Twin-output models can be set up for every channel.

Whether external input execution results are written to EEPROM can be selected. Disable this function if the external input is turned ON frequently. (The write life is approximately 100,000 writes.)

ON	Write results to EEPROM.
OFF	Do not write results to EEPROM.

6. Convenient Functions

Key Lock
 All key operations can be disabled to help prevent key operating errors. Only the operation keys are disabled. The switches and selectors will still function.

Setting Method
 Switch to RUN mode.
 Hold down the MODE key and press the UP key for at least 3 seconds. Press the UP key right after pressing the MODE key.

Clearing Method
 Switch to RUN mode.
 Hold down the MODE key and press the UP key for at least 3 seconds. Press the UP key right after pressing the MODE key.

The sub-display will flash twice and key input will be disabled.

If a key is pressed while key operations are locked, "LOC" will flash twice on the display to indicate that key operations have been disabled.

Initializing Settings
 This procedure can be used to return all the settings to the original default values.

Setting Method
 Switch to SET mode.
 Press the UP or DOWN key for at least 3 seconds.

Press the MODE key at the "NO?" or "YES?" display.

NO?	Settings not initialized.
YES?	Settings initialized.

Initialization has been completed.

7. Installing the Amplifier Unit

Mounting Units
 Catch the hook on the Sensor Head connector end of the Unit on the DIN Track and then press down on the other end of the Unit until it locks into place.

Always attach the Sensor Head connector end first. If the incorrect end is attached first, the mounting strength will be reduced.

Removing Units
 Press the Unit in the direction indicated by "1" and then lift up on the Sensor Head connector end of the Unit in the direction indicated by "2"

Joining Amplifier Units (for Units with Connectors)
 Up to 16 Units can be joined.

1. Mount the Amplifier Units one at a time onto the DIN Track.
 2. Slide the Amplifier Units together and press the Amplifier Units together until they click into place.

Secure the Units with an End Plate (PEP-M) if there is a possibility of the Amplifier Units moving, e.g., due to vibration.

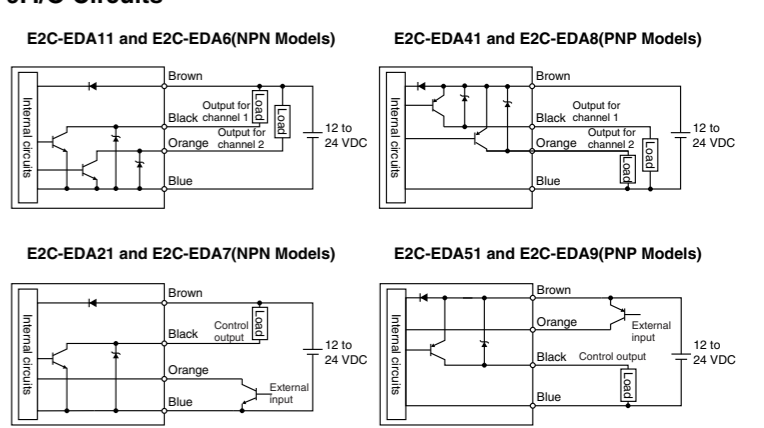
Reverse the above procedure to separate and remove the Units. Do not attempt to remove Amplifier Units from the DIN Track without separating them first.

8. Connecting Sensor Heads

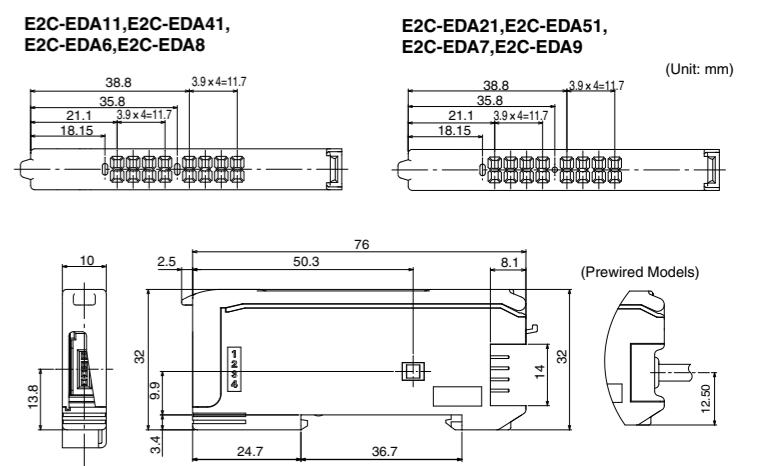
1. Open the protective cover
 2. A connector is turned so that a lock button may turn up, and it inserts to the back.

To disconnect the Sensor Head, pull out the connector while pressing on the lock button.

9. I/O Circuits



10. Dimensions



Suitability for Use

OMRON shall not be responsible for conformity with any standards, codes, or regulations that apply to the combination of the products in the customer's application or use of the product.

Take all necessary steps to determine the suitability of the product for the systems, machines, and equipment with which it will be used. Know and observe all prohibitions of use applicable to this product. NEVER USE THE PRODUCTS 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 IS PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM. See also Product catalog for Warranty and Limitation of Liability.

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