OMRON

E3X-DA□□TW-S
E3X-DA□□RM-S

Digital Fiber Amplifier Unit

Instruction Sheet

Thank you for choosing an OMRON product.
To ensure safety, read these instructions and be sure that you understand the information provided before attempting to use the product.
Keep these instructions in an accessible location for future reference.

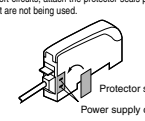
1620912-5B

Precautions for Safe Use

Please observe the following precautions for safe use of the product.
1) Do not use the Amplifier Unit in environments subject to flammable or explosive gases.
2) Do not use the Amplifier Unit in the water.
3) Do not attempt to disassemble, repair, or modify the Amplifier Unit in any way.
4) Do not apply voltages or currents that exceed the rated ranges.
5) Wire the Amplifier Unit correctly; e.g., do not reverse the polarity of the power supply.
6) Connect the load correctly.
7) Do not short both ends of the load.
8) Do not use the Amplifier Unit if the case is damaged.

Precautions for Correct Use

Please observe the following precautions to prevent failure to operate, malfunction, or undesiable effects on product performance.
1) The optical fibers are made out of methacrylic resin. Do not use them in atmospheres where organic solvents are present.
2) 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.
3) Do not extend the cable to more than 100 m, and use a wire size of 0.3 mm^2 or larger for the extension cable.
4) 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.
5) Always keep the protective cover in place when using the Amplifier Unit.
6) 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.



7) Always turn OFF the power supply before connecting, separating, or adding Amplifier Units.
8) 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.
9) Using a Mobile Console
Use the E3X-MC11-S Mobile Console for the E3X-DA-S-series Amplifier Units. Other Mobile Consoles, such as the E3X-MC11, cannot be used.
10) Optical communications are not possible with an E3X-DA-N Amplifier Unit.
11) Depending on the application environment, time may be required for the incident light level to stabilize after the power supply is turned ON.
12) Do not pull or apply excessive pressure or force (exceeding 9.8 N • m) **on the Fiber Unit when it is mounted to the Amplifier Unit.**
13) 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.

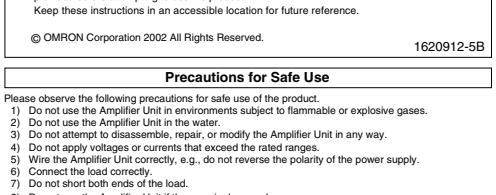
■ Confirming the Package Contents
- Amplifier Unit: 1
- Instruction Sheet (this sheet): 1

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	E3X-DA11TW-S	E3X-DA6TW-S	E3X-DA11RM-S	E3X-DA6RM-S
	PNP	E3X-DA41TW-S	E3X-DA8TW-S	E3X-DA41RM-S	E3X-DA8RM-S
Supply voltage		12 to 24 VDC ±10%, ripple (p-p) 10% max.			
Power consumption		1,080 mW max. (45 mA max. at 24 V)			
Control output		Open collector (26.4 VDC max.); load current: 50 mA max.; residual voltage: 1 V max.			
Timer		OFF, OFF-delay, ON-delay, or one-shot			
Timer time		1 ms to 5 s			
Differential detection mode		Supported			
Power tuning		Supported			
APC function		Supported			
Mutual interference prevention*2		Supported (optical communications sync method)			
		10 *3			
I/O settings		Output setting (channel 2 output, area output, or self-diagnosis output)		External input setting (teaching method, power tuning, zero reset, light OFF, or counter reset)	

*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.
*3: Mutual interference prevention can be used for only up to 6 Units if power tuning is enabled.

2. Nomenclature



① Lit when the output is ON.
E3X-DA□TW-S: Lit when the output for channel 1 is ON.
② Displays the incident light level or the function name.
③ E3X-DA□TW-S: Lit when the output for channel 2 is ON.
E3X-DA□RM-S: Lit when power tuning is set.
④ Displays supplemental detection information, the setting of a function, etc.
⑤ Used to switch the mode.
⑥ E3X-DA□TW-S: Used to select the channel to display or set.
E3X-DA□RM-S: Used to select dark-ON or light-ON operation.
⑦ Used to change the display, set functions, etc.
⑧ Used to connect and disconnect the Fiber Unit.

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, etc.
RUN	Select for actual detection operation or to set the following: Manual adjustment of thresholds, power adjustment, 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 reverse.
MODE key	Depends on the MODE key setting. • Executes power tuning (default setting). • Executes a zero reset. • Resets the counter.	Switches the function to be set on the display.

CHECK! **Time to Press Keys**
If a specific time for pressing a key is not given in a procedure, press the key for approximately 1 second. For example, if the procedure says "press the UP key," then press the UP key for approximately 1 second and then release it.

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 incident light level,* function name, or other information depending on the key operation. *The incident light 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 incident light level will be displayed if DIFF (differential operation) is set for the detection method.
RUN (See note.)	For the default setting, the current incident light level will be displayed. The change in the incident light 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 incident light 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

1 Setting the Operation Mode

Select either light-ON or dark-ON operation.

Selection	Description
LON (light-ON) (default)	The output will turn ON when the incident light 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.
DON (dark-ON)	The output will turn ON when the incident light 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
E3X-DA□TW-S	Set as the operation mode in SET mode. Refer to *5. Detailed Settings*.
E3X-DA□RM-S	Set using the operation mode selector. L D

2 Adjusting the Power (as Required)

Power tuning can be used to adjust the incident light level that is currently being received to the power tuning target value (default: 2,000). Before tuning ON the power, always secure the detection object and Head and be sure that the incident light level is stable.

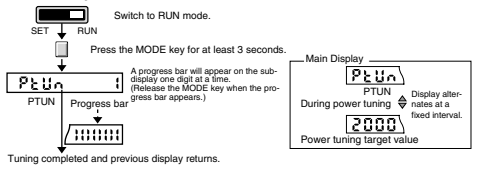
CHECK! The power tuning target value can be changed. Refer to *5. Detailed Settings*.

CHECK! If power is tuned when SHS is selected for the detection method, the power will be set to the minimum value.

CHECK! Power tuning will be cleared whenever the detection method is changed from STND, HRES, or SHS.

■ Setting Method

Confirm that the MODE key setting is PTUN (power tuning) in advance. PTUN is the default setting. Refer to *5. Detailed Settings*.

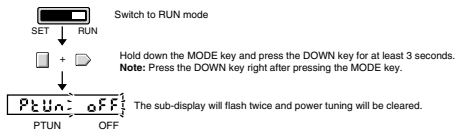


Tuning completed and previous display returns.

● **Setting Errors**
An error has occurred if one of the following displays appears after the progress bar is displayed.

Flashes twice: PTUN OVER	**Over Error** The incident light level is too low for the power tuning target value. The power can be increased up to approximately 5 times the incident light level without power tuning.
Flashes twice: PTUN BOTM	**Bottom Error** The incident light level is too high for the power tuning target value. The power can be decreased down to approximately 1/25th the incident light level without power tuning.
Flashes twice: PTUN TOUT	**Timeout Error** An error occurred because the incident light level was not stable during power tuning. Make sure that the workpiece and Head are secured and retune the power.

■ Clearing Method



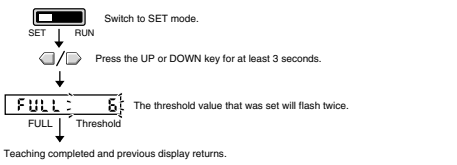
3 Setting Thresholds

Setting the Threshold at the Maximum Sensitivity

The threshold can be set at the maximum sensitivity. This is convenient when using the longest sensing distance. It does not matter whether or not there is a workpiece. The value that is set will depend on the detection method and power adjustment settings.

CHECK! This method cannot be used to set the threshold when the detection method has been set to DIFF (differential operation).

■ Setting Method

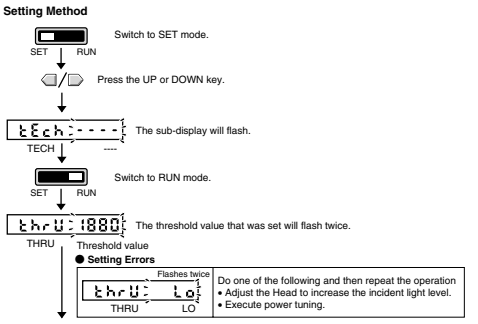


Teaching for Through-beam Sensor Heads

Teaching for a Through-beam Sensor Head is performed without a workpiece. A value about 6% less than the incident light level with no workpiece is set as the threshold value. This method is ideal to stably detect very small differences in light level.

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

■ Setting Method



● **Setting Errors**

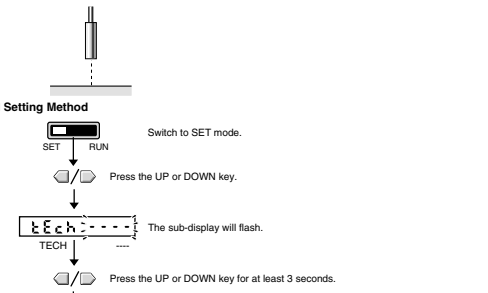
Flashes twice: THRU LO	Do one of the following and then repeat the operation • Adjust the Head to increase the incident light level. • Execute power tuning.

Teaching for Reflective Sensor Heads

Teaching for a Reflective Sensor Head is performed without a workpiece (i.e., for the background). A value about 6% greater than the incident light level is set as the threshold value. This method is ideal to stably detect very small differences in light level.

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

■ Setting Method



● **Setting Errors**

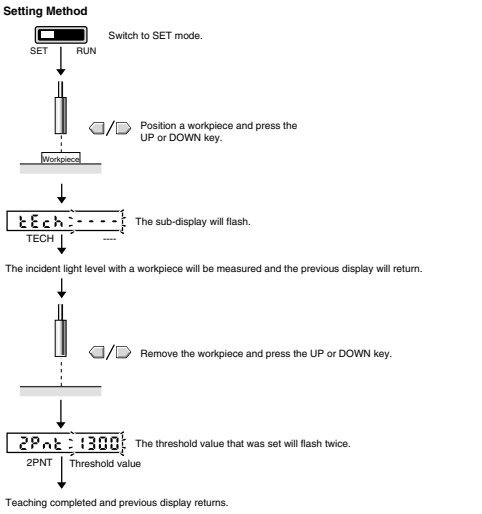
Flashes twice: RFCT OVER	Do one of the following and then repeat the operation • Adjust the Head to decrease the incident light level. • Execute power tuning.

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.

CHECK! 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



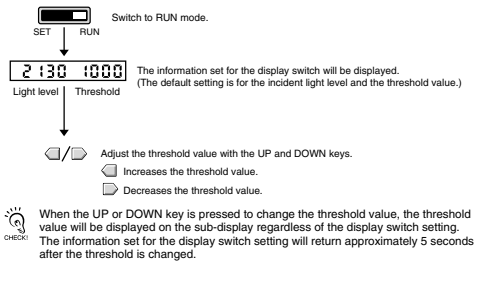
● **Setting Errors**
An error has occurred if any of the following is display when the UP or DOWN key is pressed without a workpiece.

Flashes twice: 2PNT OVER	Do one of the following and then repeat the operation • Adjust the Head to decrease the incident light level. • Execute power tuning.
Flashes twice: 2PNT LO	Do one of the following and then repeat the operation • Adjust the Head to increase the incident light level. • Execute power tuning.
Flashes twice: 2PNT NEAR	Do the following and then repeat the operation • Adjust the Head to increase the difference between the two incident light levels.

Manually Setting Threshold Values

A threshold value can be set manually.

■ Setting Method

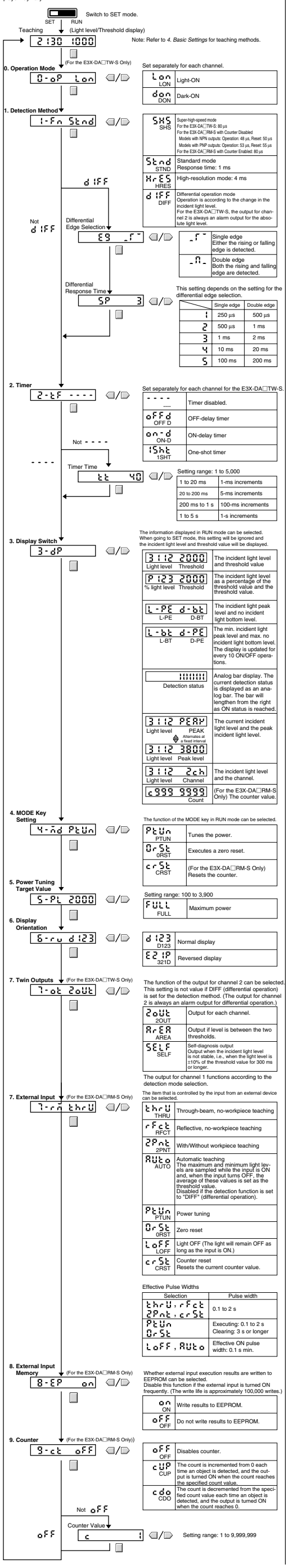


CHECK! When the UP or DOWN key is pressed to change the threshold value, the threshold value will be displayed on the sub-display regardless of the display switch setting. The information set for the display switch setting will return approximately 5 seconds after the threshold is changed.

5. Detailed Settings

The following functions can be set in SET mode. The default settings are shown in the transition boxes between functions.
For the E3X-DA□TW-S, all settings except for the operation mode and timer settings are the same for both channels.

*: The values shown for thresholds, incident light levels, percentages, etc., are examples only. Actual displays may vary.



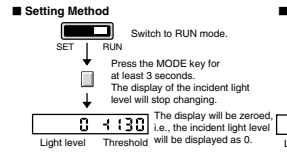
6. Convenient Functions

Zeroing the Main Display

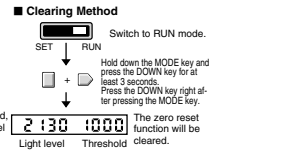
The incident light level displayed on the main display can be zeroed. The threshold displayed in the sub-display is shifted by an amount corresponding to the amount the incident light level was changed.
Confirm that the MODE key setting is 0RST (zero reset) in advance. PTUN (power tuning) is the default setting. Refer to *5. Detailed Settings*.

CHECK! Zero-reset is not possible if the detection function is set to "DIFF" (differential operation).

■ Setting Method



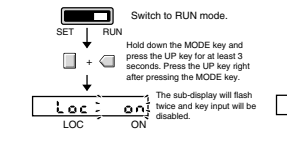
■ Clearing Method



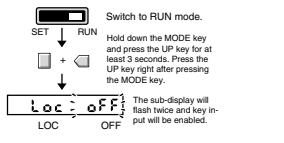
Key Lock

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



■ Clearing Method

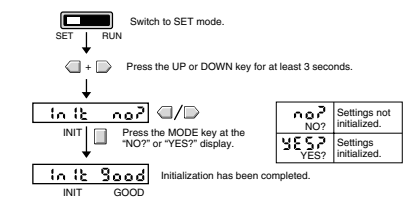


If a key is pressed while key operations are locked, "LOC" will flash twice on the display to indicate that key operations have been disabled.

Initializing Settings

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

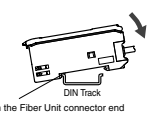
■ Setting Method



7. Installing the Amplifier Unit

■ Mounting Units

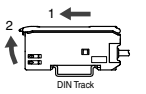
Catch the hook on the Fiber Unit connector end of the Unit on the DIN Track and then press down on the other end of the Unit until it locks into place.



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

■ Removing Units

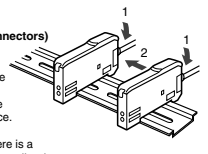
Press the Unit in the direction indicated by "1" and then lift up on the Fiber Unit connector end of the Unit in the direction indicated by "2."



■ Joining Amplifier Units (for Units with Connectors)

Up to 16 Units can be joined.

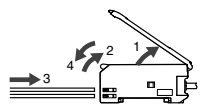
1. Mount the Amplifier Units one at a time onto the DIN Track.
2. Slide the Amplifier Units together and press the Amplifier Units together until they click into place.



Secure the Units with an End Plate (PFP-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 the Fiber Unit

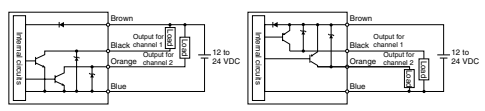


1. Open the protective cover
2. Press up the lock button.
3. Insert the fibers all the way to the back of the connector insertion opening.
4. Return the lock button to its original position to secure the fibers.

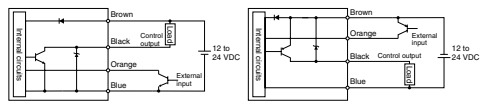
Reverse the above procedure to disconnect the Fiber Unit.

9. I/O Circuits

■ E3X-DA11TW-S and E3X-DA6TW-S (NPN Models) ■ E3X-DA41TW-S and E3X-DA8TW-S (PNP Models)



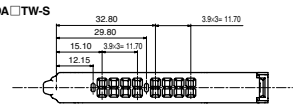
■ E3X-DA11RM-S and E3X-DA6RM-S (NPN Models) ■ E3X-DA41RM-S and E3X-DA8RM-S (PNP Models)



10. Dimensions

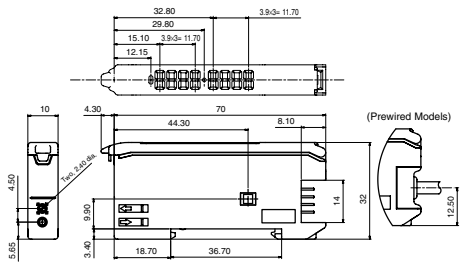
(Unit: mm)

■ E3X-DA□TW-S



■ E3X-DA□RM-S

(Unit: mm)



Application Precaution

Before using the product under conditions which are not described in the Instruction Sheet or applying the product to nuclear control systems, railroad systems, aviation systems,vehicles, combustion systems, medical equipment, amusement machines, safety equipment, and other systems, machines, and equipment that may have a serious influence on lives and property if used improperly, consult your OMRON representative.

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