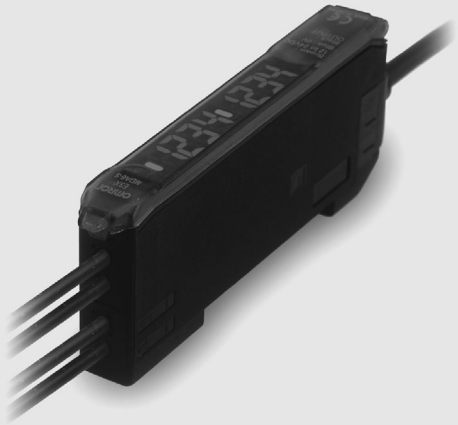
2-Channel Fiber Sensors

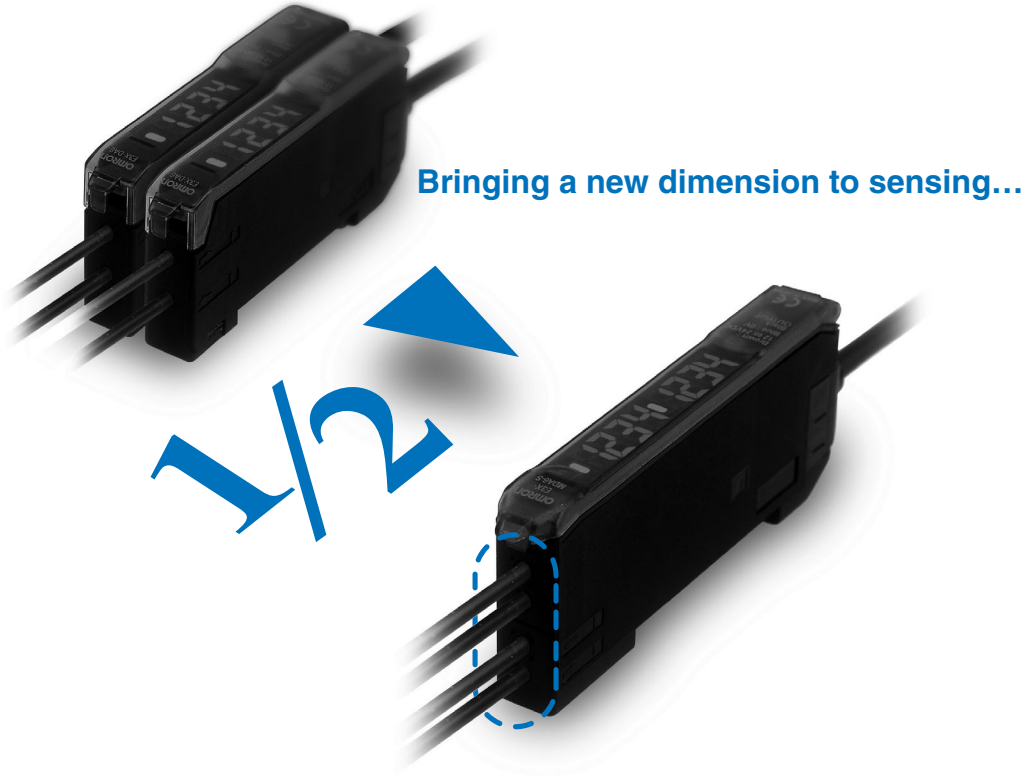
E3X-MDA

- The thinnest profile in the industry, with only 5 mm per channel.
- AND/OR control output.
- Flexible control from the Mobile Console.
- The industry's first power tuning function in a digital amplifier
- Stable long term performance due to Omrons's APC function.
- Two large easy to read displays

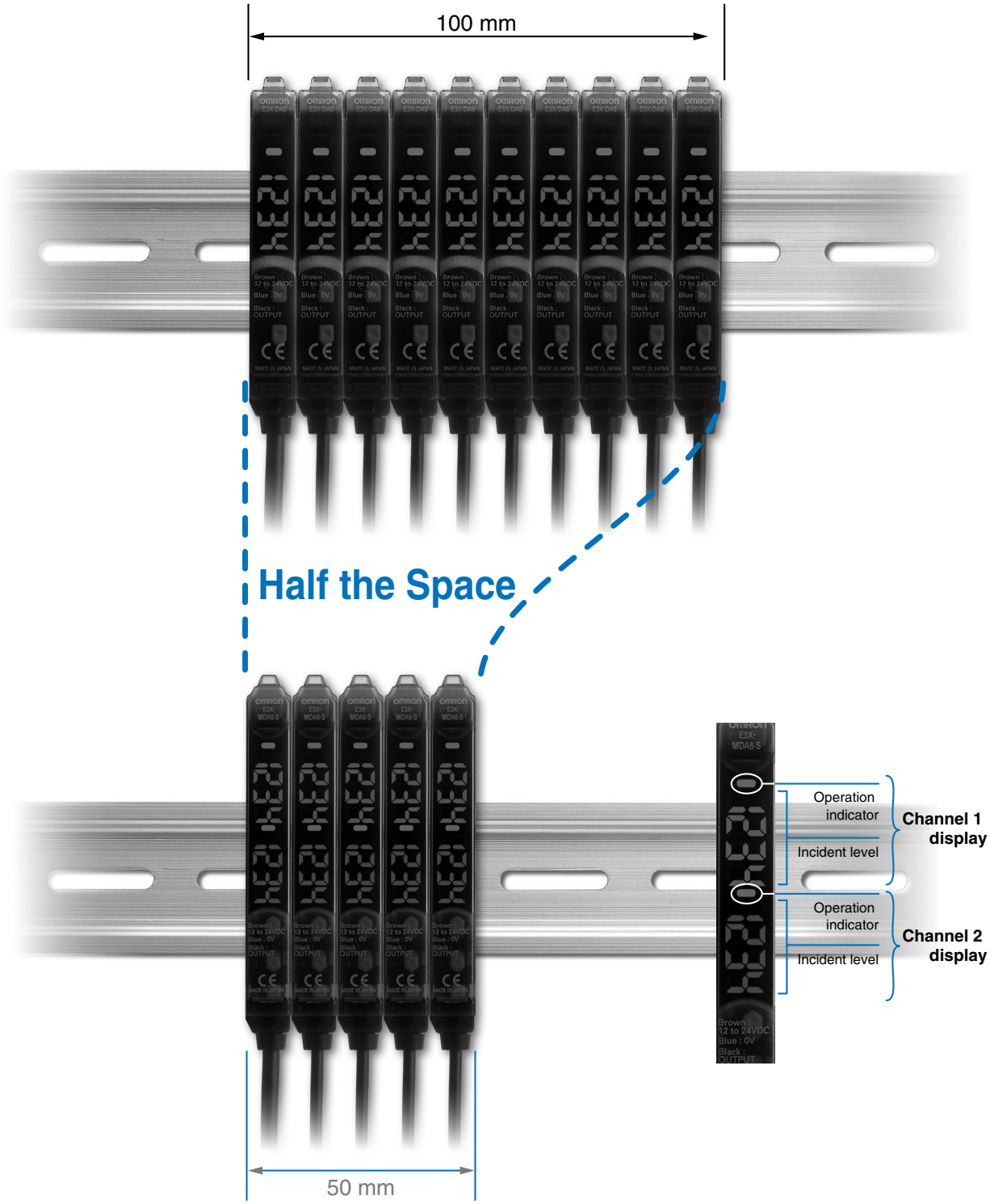
The remarkable new 2-channel amplifiers. The Ultimate space saver!! Only 5mm for one channel



Features

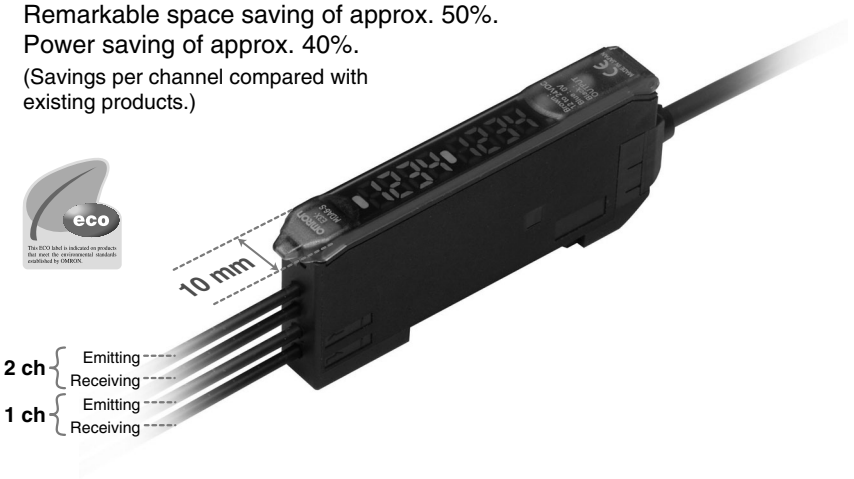


Having problems gang-mounting Fiber Sensor Amplifier Units in tight spaces?



Slimmest in the industry — 5 mm per channel. Patent pending

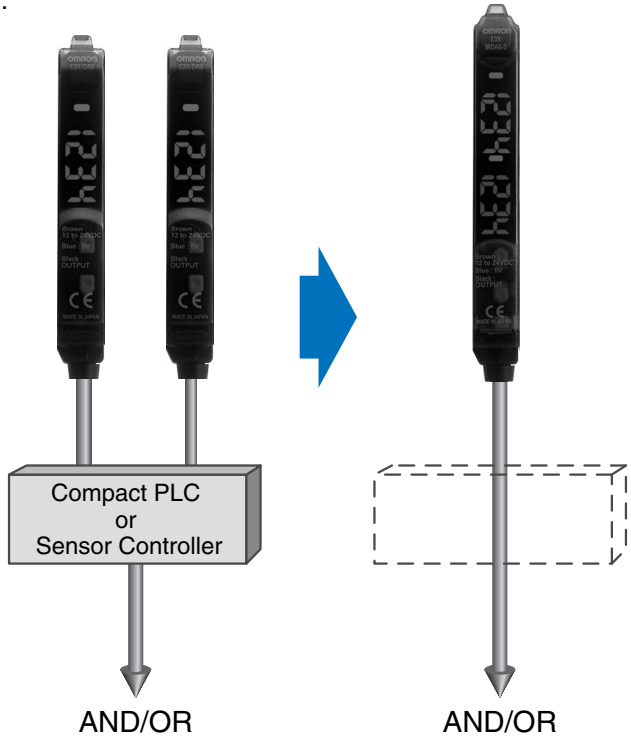
Two Amplifiers squeezed into a body of width 10 mm.
Remarkable space saving of approx. 50%.
Power saving of approx. 40%.
(Savings per channel compared with existing products.)



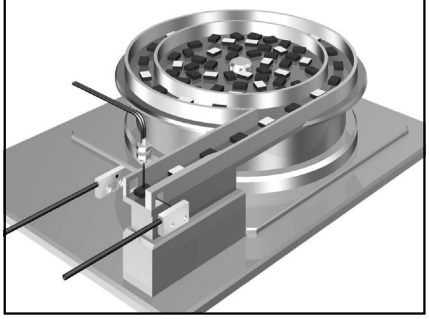
Checking alignment and mounting of LCD substrates

Equipped with AND/OR control output. Patent pending

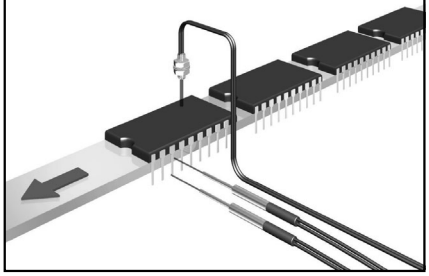
Two types of control output possible with one Sensor (AND/OR).
Compact PLCs and Sensor Controllers no longer required.



Detection and front/back discrimination of parts



Detection of bends in electronic component leads

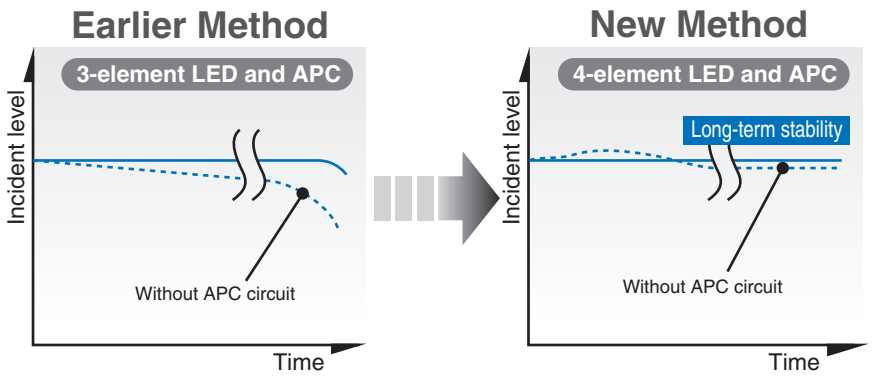


Stable, long-term performance with OMRON's APC function

OMRON provides the industry's most stable long-term detection by using new 4-element LEDs and an APC (Auto Power Control) circuit.

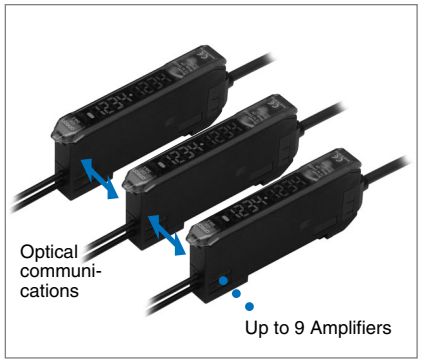
Highest Level of Stability

In addition to our unique APC circuit used in the E3X-DA-N Amplifiers to compensate for the deterioration of the LED, the E3X-DA-S uses 4-element LEDs to counteract the deterioration of the light-emitting elements over time and achieve the industry's most stable long-term detection performance.
Furthermore, the circuit is designed with excess light capacity, so the Sensors can be used with high stability regardless of whether the APC circuit is ON or OFF.



Optical communications prevents mutual interference.

With optical communications, up to 9 Amplifiers (18 channels) can be mounted together.



Flexible control with Mobile Console.

The Mobile Console, which can also be used with the E3X-DA-S, allows handheld operation of the Fiber Head even when it is separated from the Amplifier.

Ordering Information

Amplifier Units

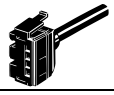
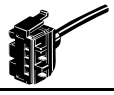
Amplifier Units with Cables

Item	Appearance	Functions	Model	
			NPN output	PNP output
2-channel models		AND/OR output	E3X-MDA11	E3X-MDA41

Amplifier Units with Connectors

Item	Appearance	Functions	Model	
			NPN output	PNP output
2-channel models		AND/OR output	E3X-MDA6	E3X-MDA8

Amplifier Unit Connectors (Order Separately)

Item	Appearance	Cable length	No. of conductors	Model
Master Connector		2 m	3	E3X-CN11
			4	E3X-CN21
Slave Connector			1	E3X-CN12
			2	E3X-CN22

Combining Amplifier Units and Connectors

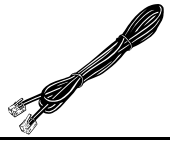
Amplifier Units and Connectors are sold separately. Refer to the following tables when placing an order.

Amplifier Unit				Applicable Connector (Order Separately)	
Model	NPN output	PNP output		Master Connector	Slave Connector
2-channel models	E3X-MDA6	E3X-MDA8	+	E3X-CN21 (4-wire)	E3X-CN22 (2-wire)

When Using 5 Amplifier Units

Amplifier Units (5 Units)	+	1 Master Connector + 4 Slave Connectors

Mobile Console (Order Separately)

Appearance	Model	Remarks
	E3X-MC11-SV2-EU E3X-MC11-SV2-UK (model number of set)	Mobile Console with Head, Cable, and AC adapter provided as accessories
	E3X-MC11-C1-SV2	Mobile Console
	E3X-MC11-H1	Head
	E39-Z12-1	Cable (1.5 m)

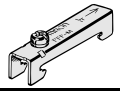
Note: Use the E3X-MC11-S Mobile Console for the E3X-DA-S/MDA-series Amplifier Units. Other Mobile Consoles cannot be used.

Accessories (Order Separately)

Mounting Bracket

Appearance	Model	Quantity
	E39-L143	1

End Plate

Appearance	Model	Quantity
	PFP-M	1

Specifications

Ratings/Characteristics

Amplifier Units

Model / Item		Type	2-channel models	
		NPN output	E3X-MDA11	E3X-MDA6
		PNP output	E3X-MDA41	E3X-MDA8
Light source (wavelength)			Red LED (650 nm)	
Supply voltage			12 to 24 VDC ±10%, ripple (p-p) 10% max.	
Power consumption			1,080 mW max. (current consumption: 45 mA max. at power supply voltage of 24 VDC)	
Control output			Load power supply voltage: 26.4 VDC; open collector; load current: 50 mA max.; residual voltage: 1 V max.	
Circuit protection			Reverse polarity for power supply connection, output short-circuit	
Response time	Super-high-speed mode	NPN	130 μs*1 for operation and reset respectively	
		PNP		
	Standard mode		1 ms for operation and reset respectively	
	High-resolution mode		4 ms for operation and reset respectively	
Sensitivity setting			Teaching or manual method	
Functions	Power tuning		Light emission power and reception gain, digital control method	
	Timer function		Select from OFF-delay, ON-delay, or one-shot timer. 1 ms to 5 s (1 to 20 ms set in 1-ms increments, 20 to 200 ms set in 10-ms increments, 200 ms to 1 s set in 100-ms increments, and 1 to 5 s set in 1 s-increments)	
	Automatic power control (APC)		High-speed control method for emission current	
	Zero-reset		Display can be reset to zero when required (negative values can be displayed).	
	Initial reset		Settings can be returned to defaults as required.	
	Mutual interference prevention		Possible for up to 9 Units (18 channels)*2, *3	
	I/O settings		Output setting (Select from channel 2 output, AND, OR, leading edge sync, falling edge sync, or differential output)	
Display			Operation indicator for channel 1 (orange), Operation indicator for channel 2 (orange)	
Digital display			Select from the following: Incident level for channel 1 + incident level for channel 2, Incident level + threshold, incident level percentage + threshold, incident light peak level + no incident light bottom level, minimum incident light peak level + maximum no incident light bottom level, long bar display, incident level + peak hold, incident level + channel	
Display orientation			Switching between normal/reversed display is possible.	
Ambient illumination (receiver side)			Incandescent lamp:10,000 lux max. Sunlight:20,000 lux max.	
Ambient temperature			Operating:Groups of 1 to 2 Amplifiers: -25°C to 55°C Groups of 3 to 10 Amplifiers: -25°C to 50°C Groups of 11 to 16 Amplifiers: -25°C to 45°C (with no icing or condensation) Storage: -30°C to 70°C (with no icing or condensation)	
Ambient humidity			Operating and storage: 35% to 85% (with no condensation)	

Model / Item		2-channel models	
Type			
	NPN output	E3X-MDA11	E3X-MDA6
	PNP output	E3X-MDA41	E3X-MDA8
Insulation resistance		20 MΩ min. (at 500 VDC)	
Dielectric strength		1,000 VAC at 50/60 Hz for 1 minute	
Vibration resistance (destruction)		10 to 55 Hz with a 1.5-mm double amplitude for 2 hrs each in X, Y and Z directions	
Shock resistance (destruction)		500 m/s^2, for 3 times each in X, Y and Z directions	
Enclosure rating		IEC 60529 IP50 (with Protective Cover attached)	
Connection method		Prewired cable	Standard connector
Weight (packed state)		Approx. 100 g	Approx. 55 g
Materials	Case	Polybutylene terephthalate (PBT)	
	Cover	Polycarbonate (PC)	
Accessories		Instruction sheet	

***1:** When differential output is selected for the output setting, the second channel output is 200 μs for operation and reset respectively.

***2:** Communications are disabled if the detection mode is selected during super-high-speed mode, and the communications functions for mutual interference prevention and the Mobile Console will not function.

***3:** Mutual interference prevention can be used for up to 5 Units (10 channels) if power tuning is enabled.

Amplifier Unit Connectors

Item		E3X-CN11/21/22	E3X-CN12
Rated current		2.5 A	
Rated voltage		50 V	
Contact resistance		20 mΩ max. (20 mVDC max., 100 mA max.) (The figure is for connection to the Amplifier Unit and the adjacent Connector. It does not include the conductor resistance of the cable.)	
No. of insertions (destruction)		50 times (The figure for the number of insertions is for connection to the Amplifier Unit and the adjacent Connector.)	
Materials	Housing	Polybutylene terephthalate (PBT)	
	Contacts	Phosphor bronze/gold-plated nickel	
Weight (packed state)		Approx. 55 g	Approx. 25 g

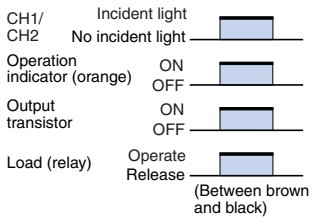
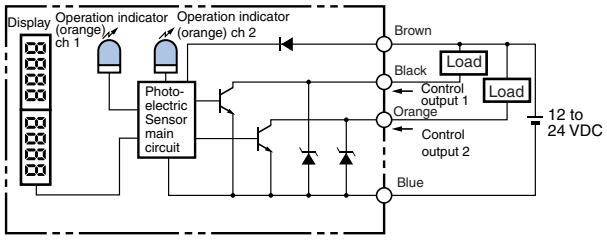
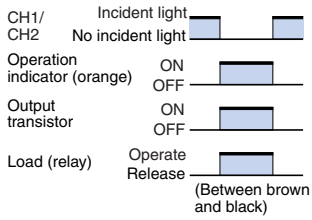
Mobile Console

Item	E3X-MC11-S
Supply voltage	Charged with AC adapter
Connection method	Connected via adapter
Weight (packed state)	Approx. 580 g (Console only: 120 g)

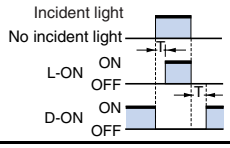
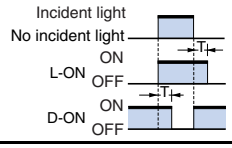
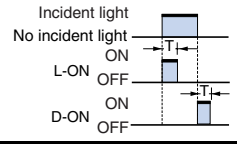
Refer to *Operation Manual* provided with the Mobile Console for details.

Output Circuits

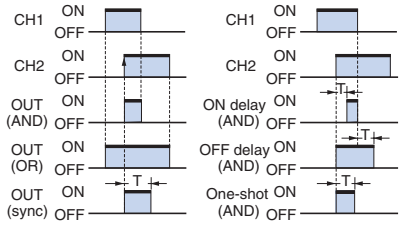
NPN Output

Model	Mode selector	Timing chart	Mode selector	Output circuit
E3X-MDA11 E3X-MDA6	LIGHT ON (L/ON)		Light ON	
	DARK ON (D/ ON)		Dark ON	

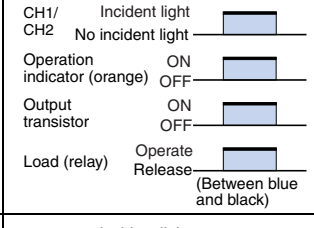
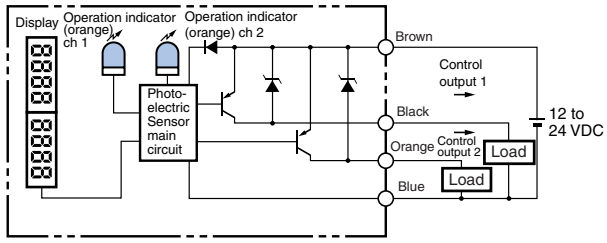
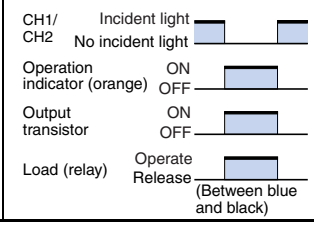
Note: 1 . Time Charts for Timer Settings (T: Set Time)

ON delay	OFF delay	One-shot
		

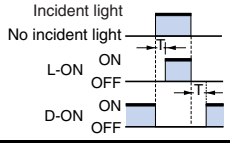
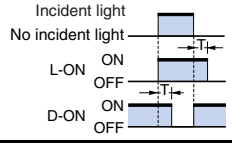
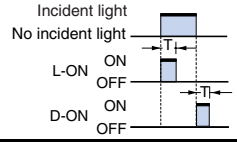
2 . Control Output (AND, OR, Sync) and Time Chart for Timer Settings (T: Set Time)



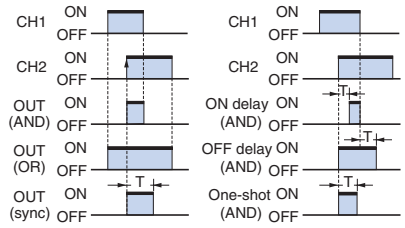
PNP Output

Model	Mode selector	Timing chart	State of output transistor	Output circuit
E3X-MDA41 E3X-MDA8	LIGHT ON (L/ON)		Light ON	
	DARK ON (D/ ON)		Dark ON	

Note: 1 . Time Charts for Timer Settings (T: Set Time)

ON delay	OFF delay	One-shot
		

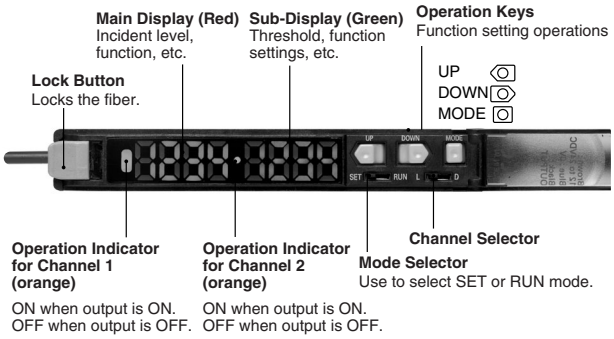
2 . Control Output (AND, OR, Sync) and Time Chart for Timer Settings (T: Set Time)



Nomenclature

Amplifier Units

E3X-MDA□



Adjustment Methods

1. Setting the Operation Mode

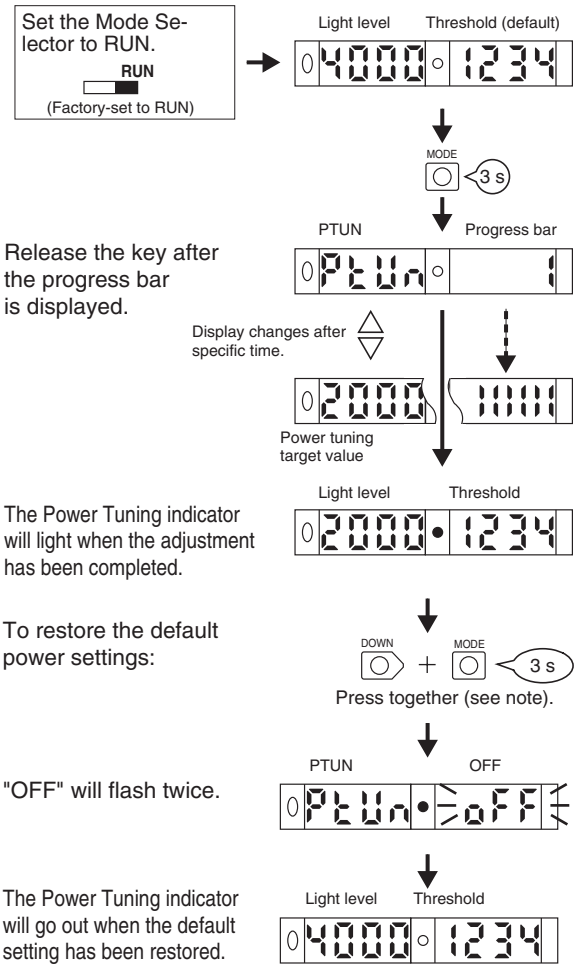
The operation mode is set in SET mode. Refer to *page A-388 5. Setting Functions in SET Mode*.

Set the Channel Selector to the desired channel before making any adjustments or settings. This is true for all adjustments and settings.

2. Adjusting the Power (RUN Mode)

The current incident light level can be adjusted to near the power tuning target value (default: 2,000).

Confirm that the MODE key setting is PTUN (power tuning). The default setting is PTUN. Refer to *page A-388 5. Setting Functions in SET Mode*



*** Setting Errors**

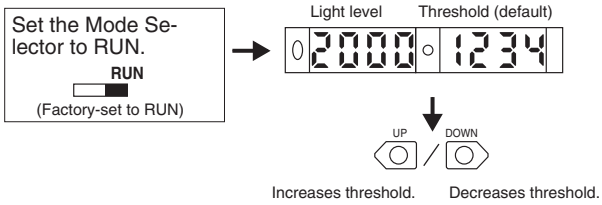
An error has occurred if one of the following displays appears after the progress bar is displayed.

Display	Error	Action
Flashes twice PtUn / oUEr PTUN OVER	**Over Error** The incident light level is too low for the power tuning target value.	The power will not be tuned. The power can be increased up to approximately 5 times the incident light value.
Flashes twice PtUn / botn PTUN BOTM	**Bottom Error** The incident light level is too high for the power tuning target value.	The power will be tuned to the minimum level. The power can be decreased down to approximately 1/25th the incident light value.

Note: Press the DOWN key right after pressing the MODE key.

3.Setting Thresholds Manually (RUN Mode)

A threshold can be set manually. A threshold value can also be fine-tuned using manual setting after teaching.



* Even if the display method for display switching is changed, the threshold will appear on the sub-display when the key is pressed.

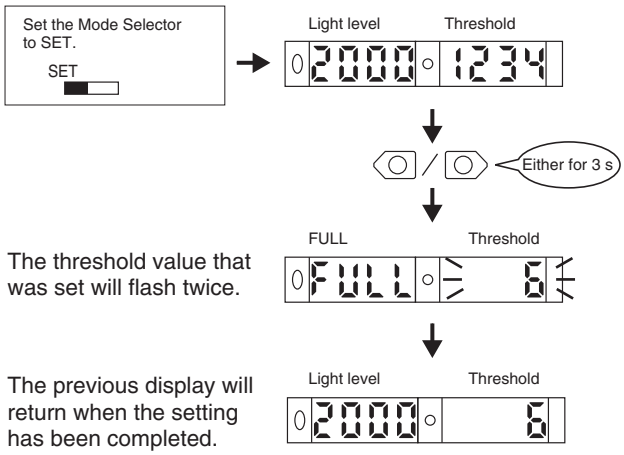
4. Teaching the Threshold Value (SET Mode)

* There are four methods that can be used for teaching, as described below. Use the method most suitable for the application.

* An error has occurred if OVER, LO, or NEAR is displayed on the sub-display. Repeat the operation from the beginning.

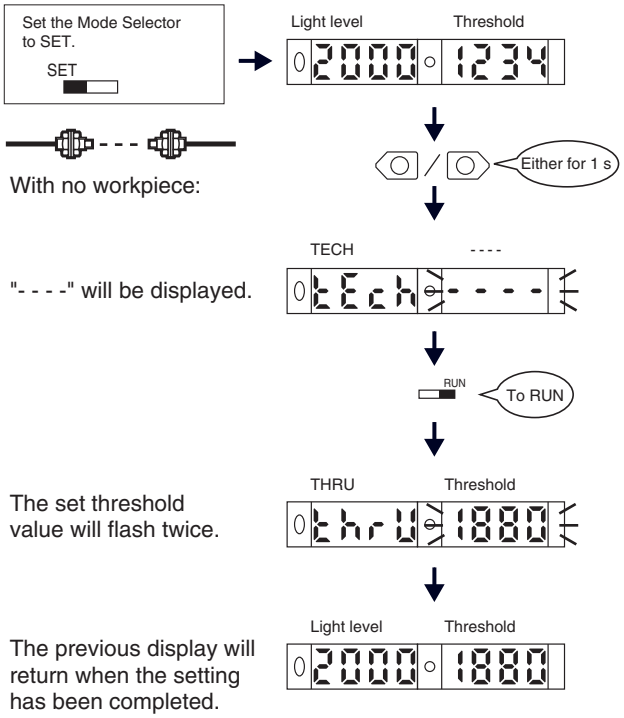
4-1.Setting the Threshold at Maximum Sensitivity

The threshold can be set at the maximum sensitivity. This method is ideal when using a Through-beam Fiber Unit to detect workpieces so that detection is not influenced to any great degree by dust and other environmental factors.



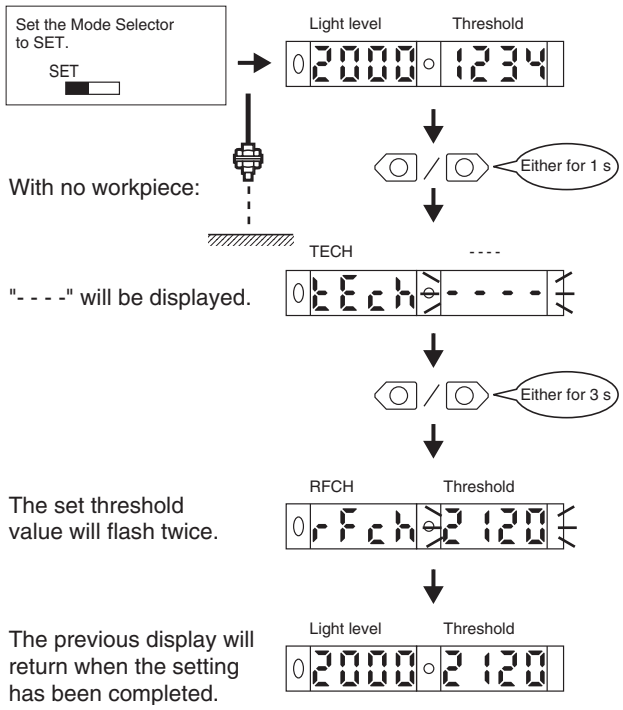
4-2. Teaching a Through-beam Fiber Unit without a Workpiece

A value about 6% less than the incident light level can be set as the threshold value. This method is ideal when detecting very small differences in light level, such as when detecting very fine workpieces or transparent workpieces like transparent fibers.



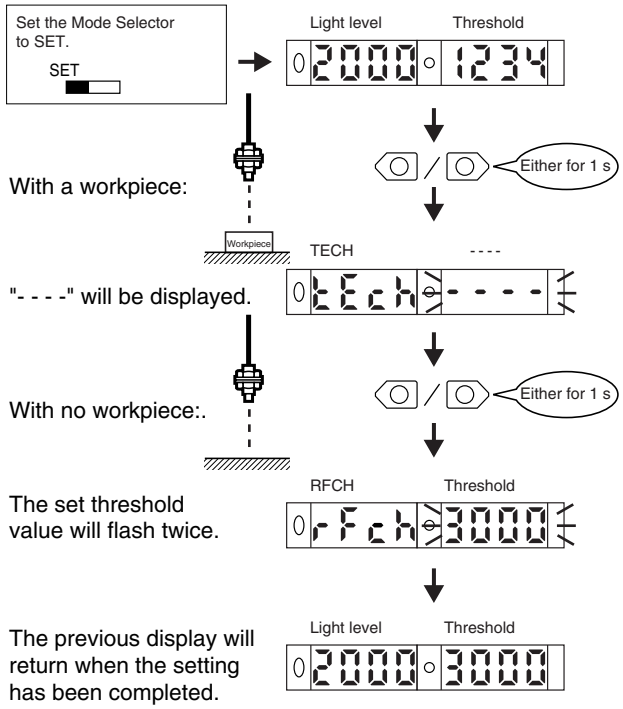
4-3. Teaching a Reflective Fiber Unit without a Workpiece

A value about 6% greater than the incident light level can be set as the threshold value. This method is ideal when using a Reflective Fiber Unit to detect workpieces so that detection is not influenced to any great degree by dust and other environmental factors.



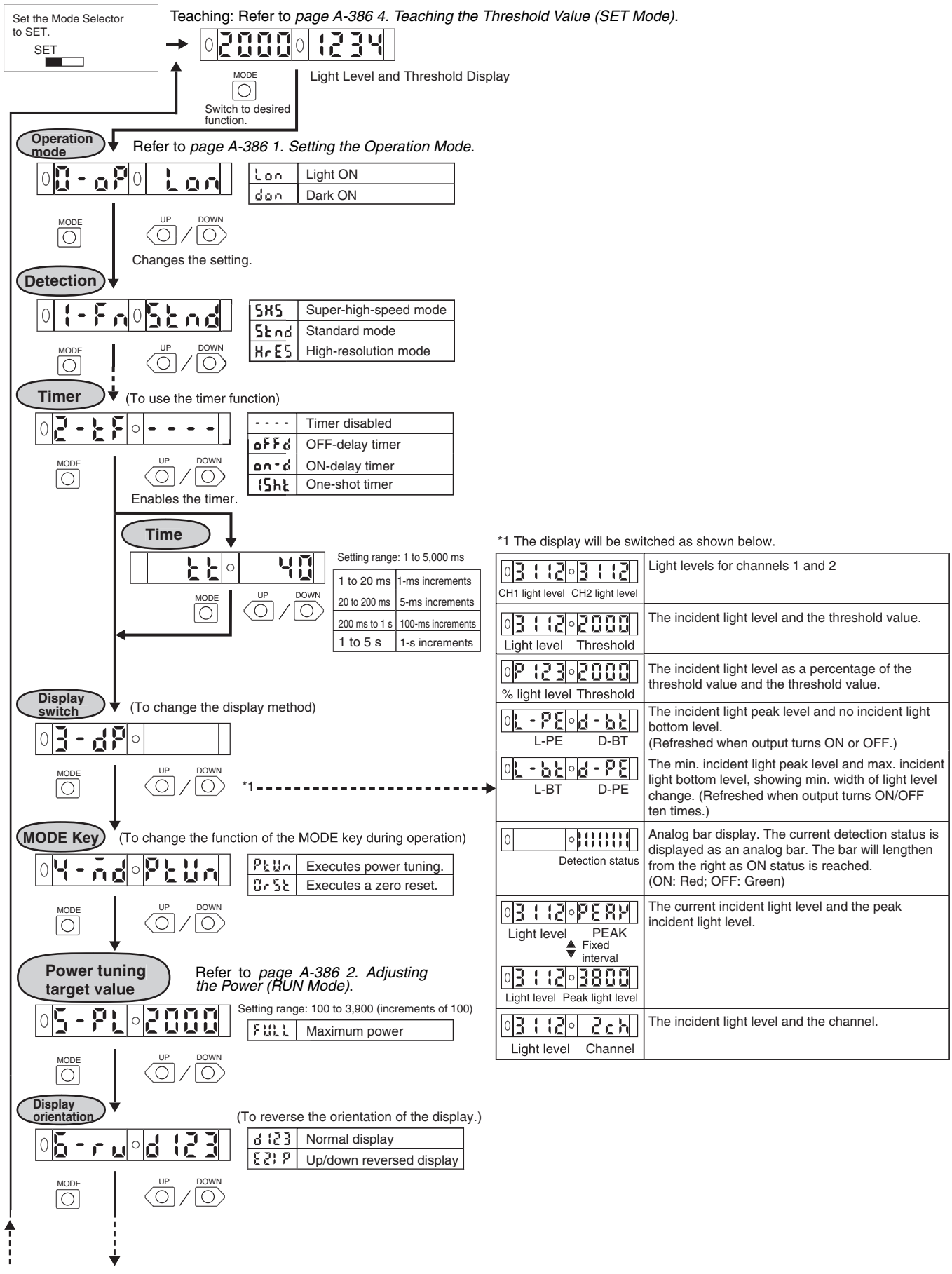
4-4. Teaching With and Without a Workpiece

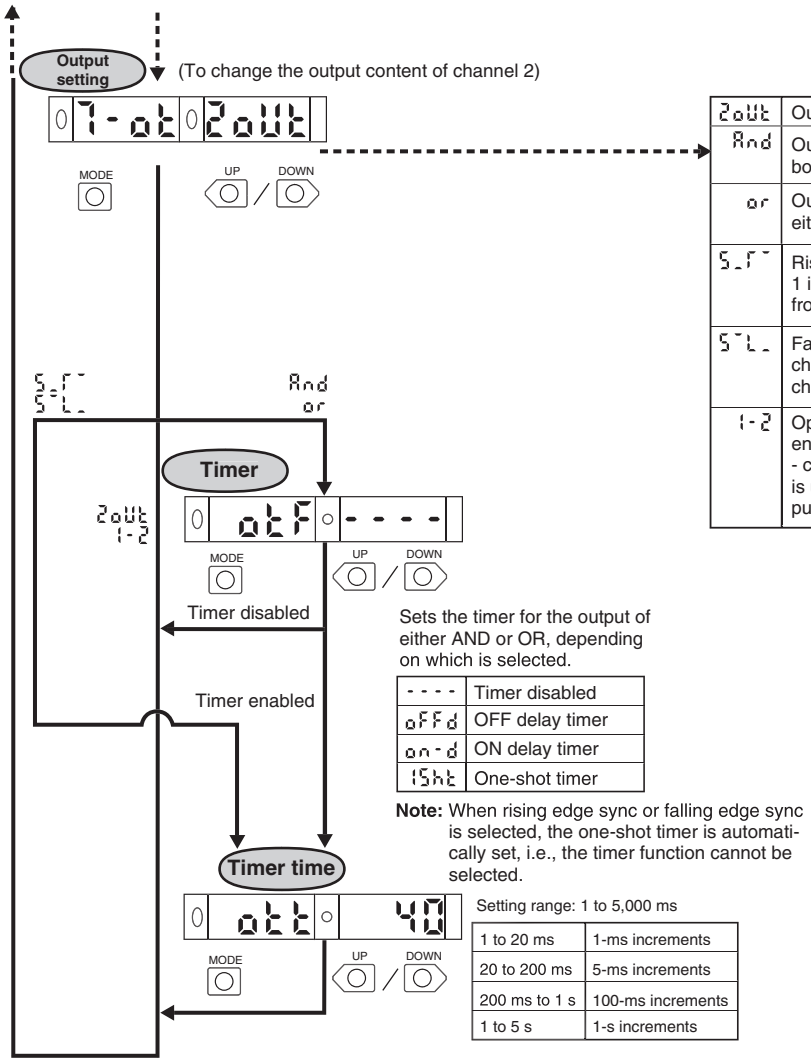
Teaching can be performed twice, once with and once without a workpiece, and the value between the two measured value can be set as the threshold.



5. Setting Functions in SET Mode

* The default settings are shown in the transition boxes between functions.





2out	Output for each channel
And	Output when the output is ON for both channels 1 and 2.
or	Output when the output is ON for either channel 1 or channel 2.
S_r	Rising edge sync. Output if channel 1 is ON when channel 2 changes from OFF to ON.
S_L	Falling edge sync. Output if channel 1 is ON when channel 2 changes from ON to OFF.
1-2	Operates according to the difference between channels (channel 1 - channel 2). The difference value is used for both threshold and output judgement execution.

Sets the timer for the output of either AND or OR, depending on which is selected.

----	Timer disabled
oFFd	OFF delay timer
on-d	ON delay timer
1Sht	One-shot timer

Note: When rising edge sync or falling edge sync is selected, the one-shot timer is automatically set, i.e., the timer function cannot be selected.

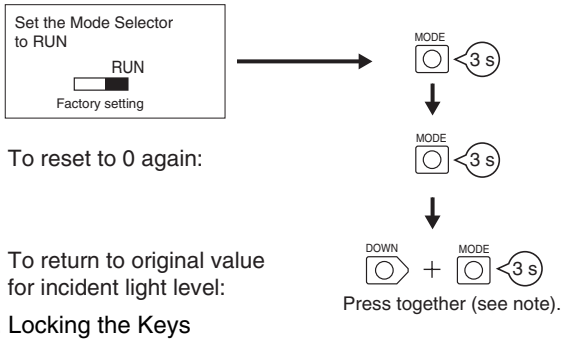
1 to 20 ms	1-ms increments
20 to 200 ms	5-ms increments
200 ms to 1 s	100-ms increments
1 to 5 s	1-s increments

6. Convenient Functions

6-1. Zeroing the Digital Display

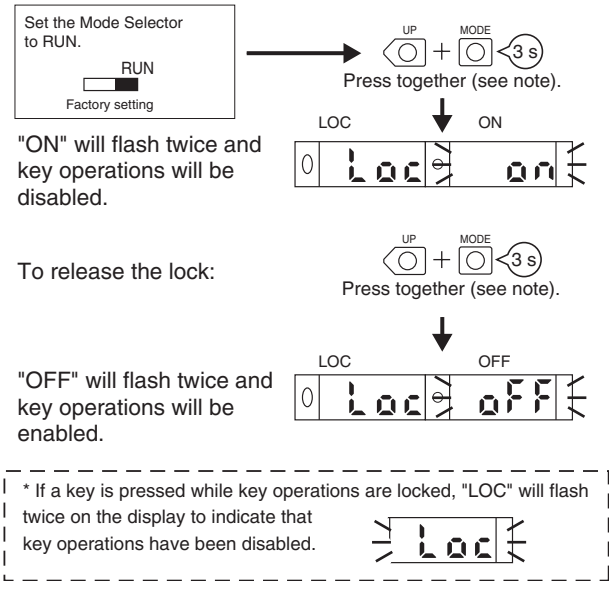
The incident light level on the digital display can be set to 0.

* Change the function to 0rst (zero reset) with the MODE key. The default setting is PTUN.



6-2. Locking the Keys

All key operations can be disabled.

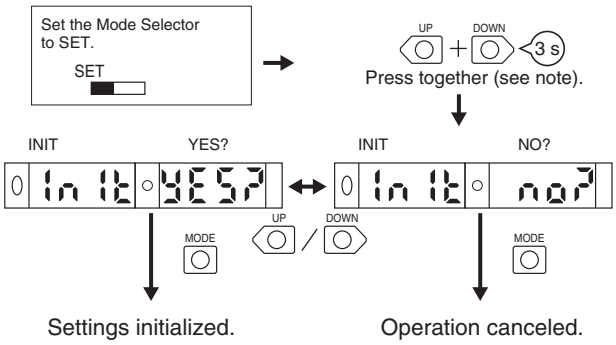


* If a key is pressed while key operations are locked, "LOC" will flash twice on the display to indicate that key operations have been disabled.

Note: Press the DOWN or UP key right after pressing the MODE key.

6-3. Initializing Settings

All settings can be returned to their original default settings.



Safety Precautions

Note: In addition to the following precautions, please read and observe the common precautions for the instructions included with the product.

Precautions for Correct Use

Amplifier Unit

Installation

- Operation after Turning Power ON

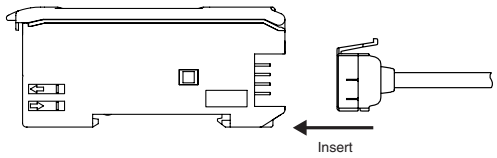
The Amplifier Unit is ready to operate within 200 ms after the power supply is turned ON. If the Sensor and load are connected to power supplies separately, be sure to turn ON the power supply to the Sensor first.

Mounting

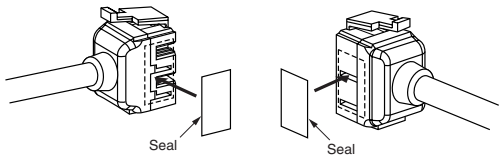
- Connecting and Disconnecting Connectors

Mounting Connectors

1. Insert the Master or Slave Connector into the Amplifier Unit until it clicks into place.



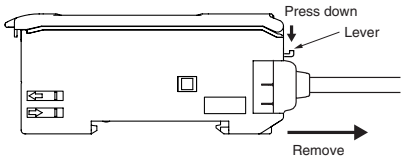
2. Attach the protector seals (provided as accessories) to the sides of master and slave connectors that are not connected.



Note: Attach the seals to the sides with grooves

Removing Connectors

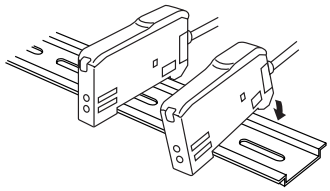
1. Slide the slave Amplifier Unit(s) for which the Connector is to be removed away from the rest of the group.
2. After the Amplifier Unit(s) has been separated, press down on the lever on the Connector and remove it. (Do not attempt to remove Connectors without separating them from other Amplifier Units first.)



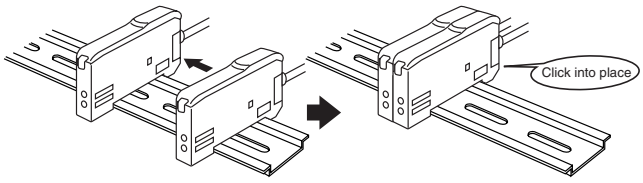
- Joining and Removing Amplifier Units

Joining Amplifier Units

1. Mount the Amplifier Units one at a time onto the DIN track.



2. Slide the Amplifier Units together, line up the clips, and press the Amplifier Units together until they click into place.



Separating Amplifier Units

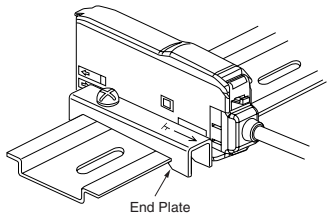
Slide Amplifier Units away from each other, and remove from the DIN track one at a time. (Do not attempt to remove Amplifier Units from the DIN track without separating them first.)

Note 1. The specifications for ambient temperature will vary according to the number of Amplifier Units used together. For details, refer to *Ratings/Characteristics*.

2. Always turn OFF the power supply before joining or separating Amplifier Units.

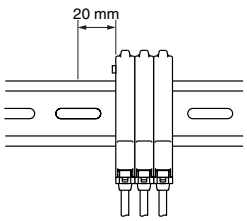
- Mounting the End Plate (PFP-M)

An End Plate should be used if there is a possibility of the Amplifier Unit moving, e.g., due to vibration. If a Mobile Console is going to be mounted, connect the End Plate in the direction shown in the following diagram.



- Mounting the Mobile Console Head

Leave a gap of at least 20 mm between the nearest Amplifier Unit and the Mobile Console head.

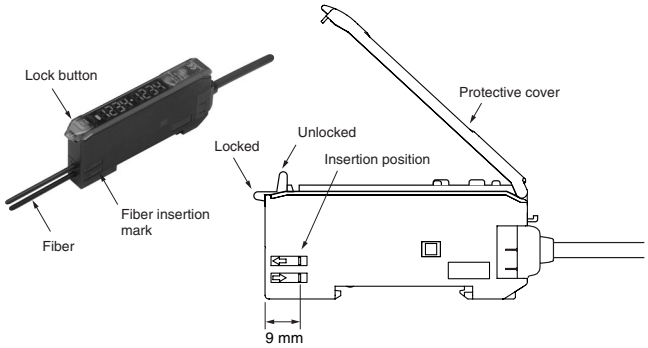


- Fiber Connection

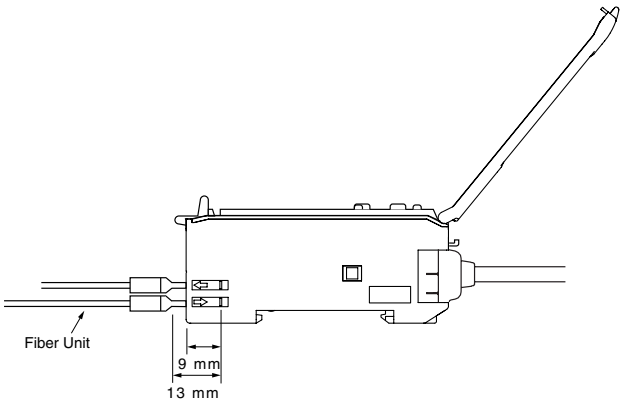
The E3X Amplifier Unit has a lock button for easy connection of the Fiber Unit. Connect or disconnect the fibers using the following procedures:

1. Connection

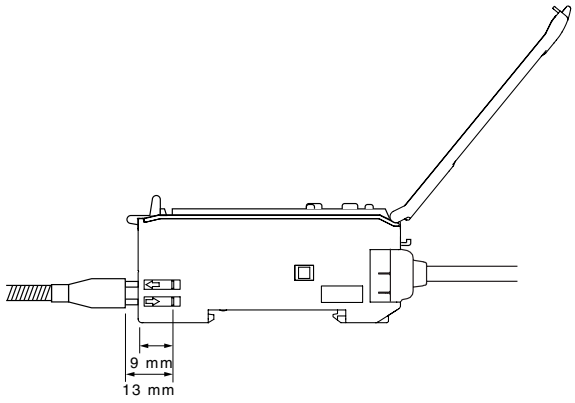
Open the protective cover, insert the fibers according to the fiber insertion marks on the side of the Amplifier Unit, and lower the lock button.



Fibers with E39-F9 Attachment

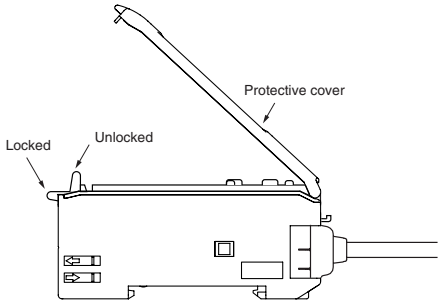


Fibers That Cannot Be Free-Cut (with Sleeves)



2. Disconnecting Fibers

Remove the protective cover and raise the lock button to pull out the fibers.



Note 1. To maintain the fiber properties, confirm that the lock is released before removing the fibers.

2. Be sure to lock or unlock the lock button within an ambient temperature range between −10°C and 40°C.

Adjustments

- Mutual Interference Protection Function

There may be some instability in the digital display values due to light from other sensors. If this occurs, decrease the sensitivity (i.e., decrease the power or increase the threshold) to perform stable detection.

- EEPROM Writing Error

If the data is not written to the EEPROM correctly due to a power failure or static-electric noise, initialize the settings with the keys on the Amplifier Unit. ERR/EEP will flash on the display when a writing error has occurred.

- Optical Communications

Several Amplifier Units can be slid together and used in groups. Do not, however, slide the Amplifier Units or attempt to remove any of the Amplifier Units during operation.

Other Precautions

- Protective Cover

Always keep the protective cover in place when using the Amplifier Unit.

- Mobile Console

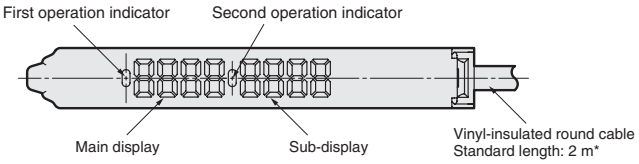
Use the E3X-MC11-S Mobile Console for the E3X-DA-S-series and the E3X-MDA series Amplifier Units. Other Mobile Consoles, such as the E3X-MC11, cannot be used.

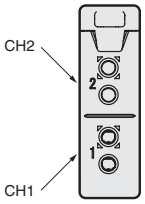
Dimensions

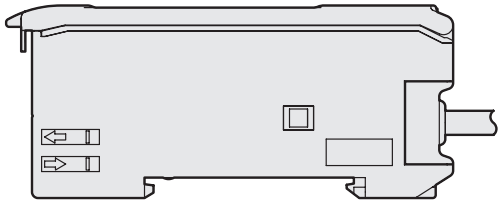
Amplifier Units

Amplifier Units with Cables

E3X-MDA11
E3X-MDA41



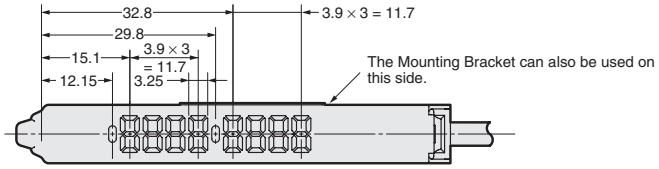


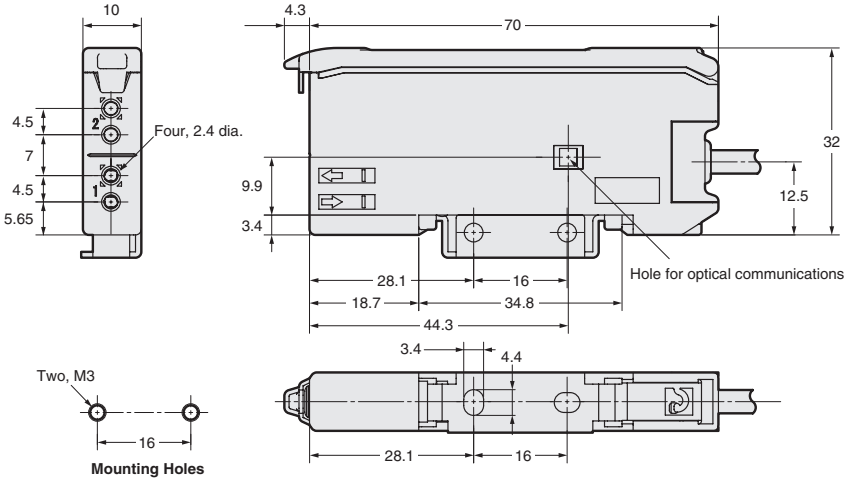


*Cable Specifications

E3X-MDA11 MDA41	A 4-dia., 2-conductor (conductor cross-sectional area: 0.2 mm^2; insulation diameter: 1.1 mm)

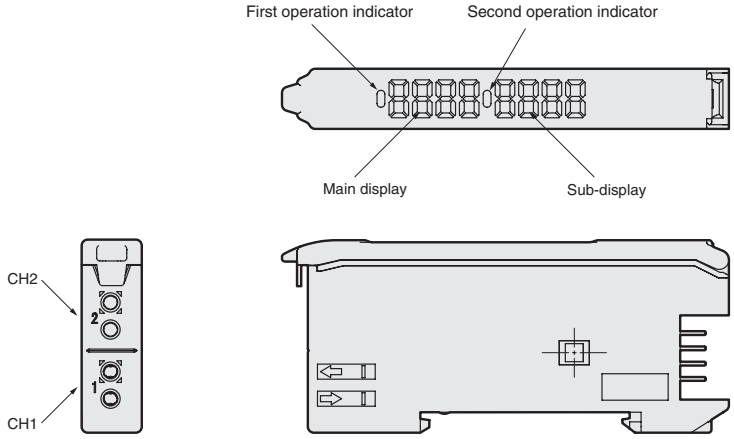
With Mounting Bracket Attached

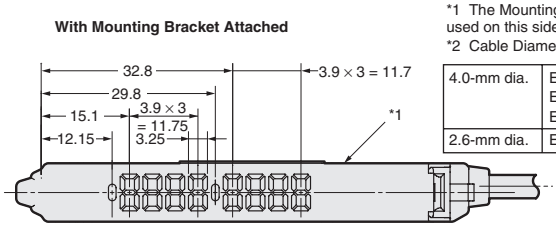




Amplifier Units with Connectors

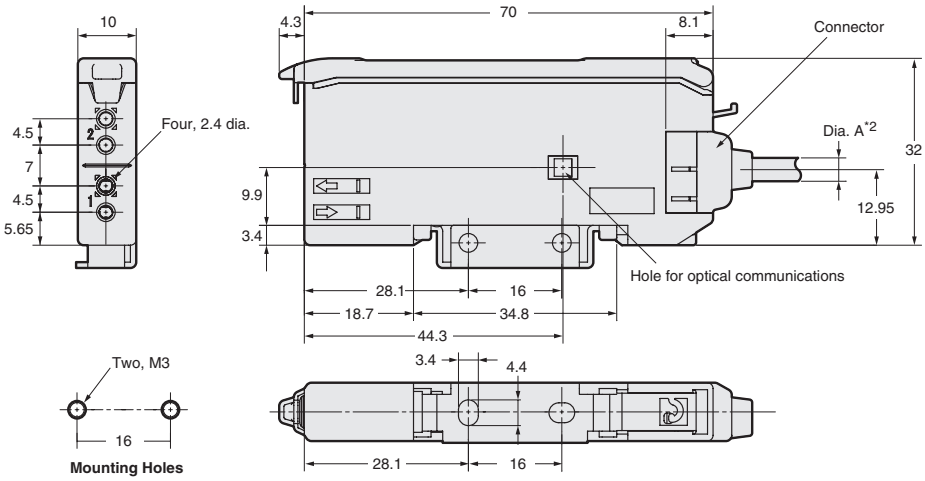
E3X-MDA6
E3X-MDA8





*1 The Mounting Bracket can also be used on this side.
*2 Cable Diameters

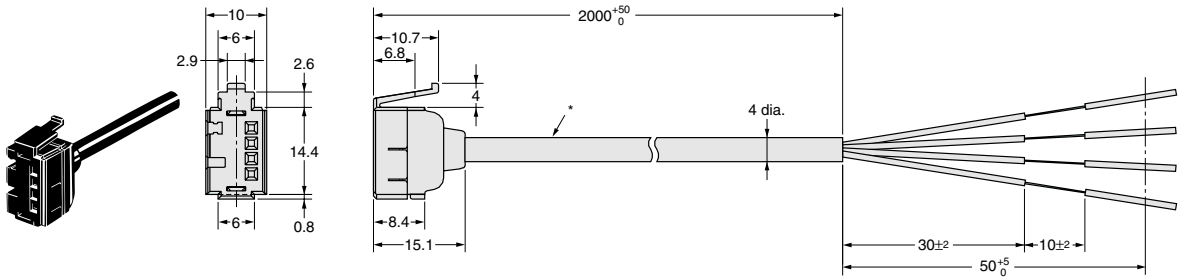
4.0-mm dia.	E3X-CN11 (3 conductors) E3X-CN21 (4 conductors) E3X-CN22 (2 conductors)
2.6-mm dia.	E3X-CN12 (1 conductor)



Amplifier Unit Connectors

Master Connectors

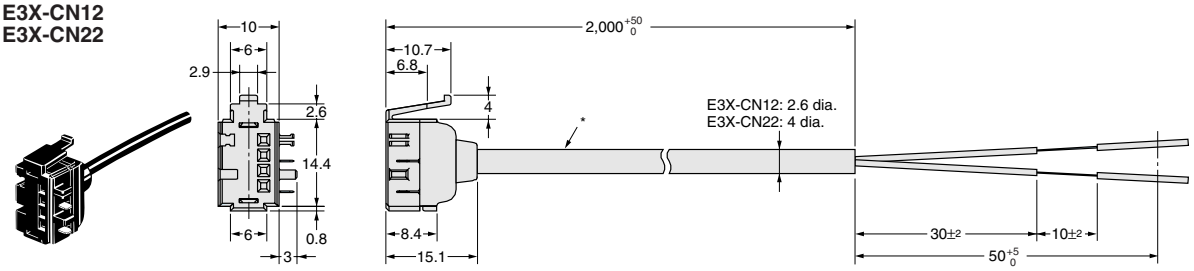
E3X-CN11
E3X-CN21



*E3X-CN11: A 4-dia., 3-conductor, vinyl-insulated round cable (conductor cross-sectional area: 0.2 mm^2; insulation diameter: 1.1 mm) is used.
E3X-CN21: A 4-dia., 4-conductor, vinyl-insulated round cable (conductor cross-sectional area: 0.2 mm^2; insulation diameter: 1.1 mm) is used.

Slave Connectors

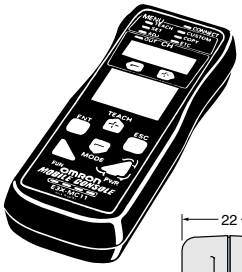
E3X-CN12
E3X-CN22



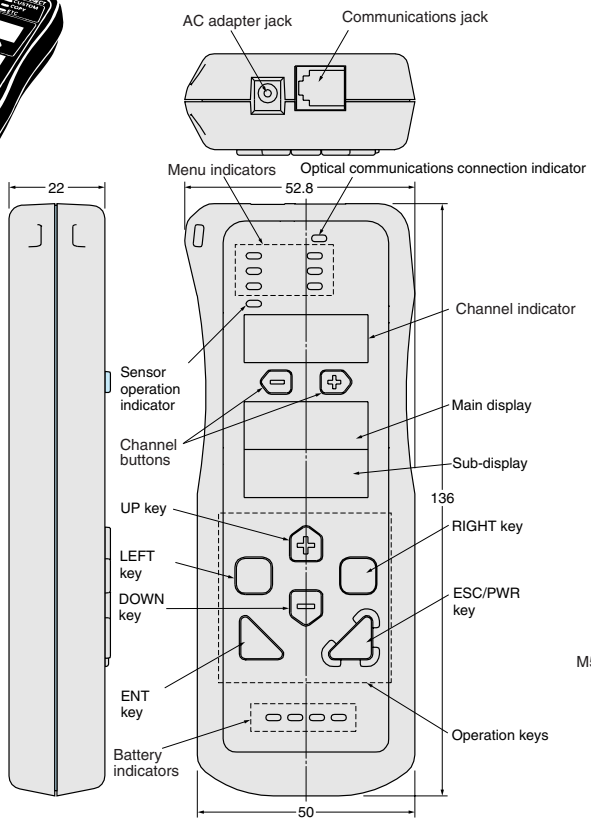
*E3X-CN12: A 2.6-dia., single-conductor, vinyl-insulated round cable (conductor cross-sectional area: 0.2 mm^2; insulation diameter: 1.1 mm) is used.
E3X-CN22: A 4-dia., 2-conductor, vinyl-insulated round cable (conductor cross-sectional area: 0.2 mm^2; insulation diameter: 1.1 mm) is used.

Mobile Console

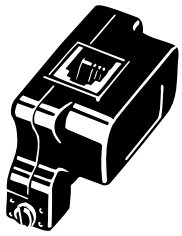
E3X-MC11-S

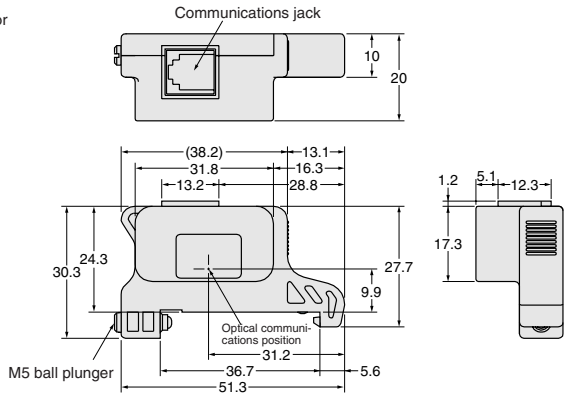


Mobile Console



Mobile Console Head





ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. E11E-EN-02 In the interest of product improvement, specifications are subject to change without notice.