Panasonic® INSTRUCTION MANUAL

Digital Fiber Sensor Amplifier **FX-551** Series

ME-FX551 No.0058-72V

Thank you very much for purchasing Panasonic products.
Please read this Instruction Manual carefully and thoroughly for the correct and optimum use of this product.
Kindly keep this manual in a convenient place for quick reference.

⚠WARNING

- Never use this product as a sensing device for personnel protection.
- In case of using sensing devices for personnel protection, use products which meet laws and standards, such as OSHA, ANSI or IEC etc., for personnel protection applicable in each region or country.
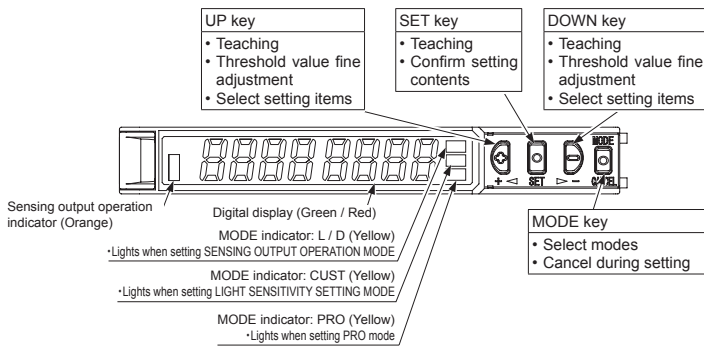
This product is not equipped with an automatic interference prevention function. By setting different frequencies, interference can be prevented for up to four units. For the setting method, refer to <PRO3> in "**12 PRO MODE**."

1 INTENDED PRODUCTS FOR CE MARKING

- This product complies with the following standards / regulations.
  <EU Directive>
  EMC Directive

CE

2 PART DESCRIPTION

UP key	SET key	DOWN key
• Teaching	• Teaching	• Teaching
• Threshold value fine adjustment	• Confirm setting contents	• Threshold value fine adjustment
• Select setting items		• Select setting items

Sensing output operation indicator (Orange)

Digital display (Green / Red)

MODE indicator: L / D (Yellow)
・Lights when setting SENSING OUTPUT OPERATION MODE

MODE indicator: CUST (Yellow)
・Lights when setting LIGHT SENSITIVITY SETTING MODE

MODE indicator: PRO (Yellow)
・Lights when setting PRO mode

MODE key
• Select modes
• Cancel during setting

<Reference>
Pressing down SET key + MODE key for 3 sec : Set key lock or release key lock

3 MOUNTING

How to mount

1. Fit the rear part of the mounting section of the amplifier on a DIN rail.
2. Press down the rear part of the mounting section of the unit on the DIN rail and fit the front part of the mounting section to the DIN rail.

2. Press down
1. Fit
35mm width DIN rail
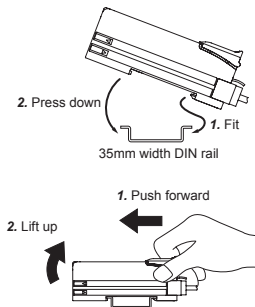
How to remove

1. Push the amplifier forward.
2. Lift up the front part of the amplifier to remove it.

1. Push forward
2. Lift up

How to connect the fiber cable

- Mount the fiber cables in the state power is not supplied.
- Be sure to fit the attachment to the fibers first before inserting the fibers to the amplifier. For details, refer to the instruction manual enclosed with the fibers.
- Insert the fiber cables slowly into the inlets until they stops. Excessive force may damage the product.

1. Snap the fiber lock lever down till it stops completely.
2. Insert the fiber cables slowly into the inlets until they stops. (Note)
3. Return the fiber lock lever to the original position till it stops.

1. Snap   *3.* Return
Fiber lock lever
Fiber for emitter
2. Insert
Fiber for receiver
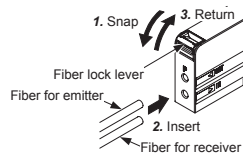
Note: With the coaxial reflective type fiber, insert the single core fiber cable into the beam-emitting inlet "P" and the multi-core fiber cable into the beam-receiving inlet.
If they are inserted in reverse, the sensing performance will deteriorate.

4 INSTALL MORE AMPLIFIER OF SERIES CONNECTION TYPE (Connection type only)

- Make sure that the power supply is OFF while adding or removing the series connection type.
- This product is not equipped with an automatic interference prevention function. By setting different frequencies, interference can be prevented for up to four units. For the setting method, refer to <PRO3> in "**12 PRO MODE**."
- In case 2 or more the series connection types are connected in cascade, make sure to mount them on a DIN rail.
- In case installing additional amplifier of series connection type, the maximum 15 the series connection types using sub cables (optional) can be added to an amplifier using a main connection cable. (optional)
- When connecting 2 or more the series connection types in cascade, use the sub cable (optional) for the second series connection type onwards.

For mounting and removing the amplifier, refer to "**3 MOUNTING**."

How to cascade

1. Mount the amplifiers, one by one, on the DIN rail.
2. Slide the amplifiers next to each other, and connect the quick-connection cables.
3. Mount the end plates **MS-DIN-E** (optional) at both the ends to hold the amplifiers between their flat sides.
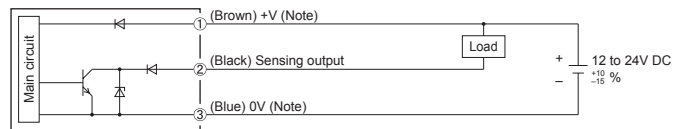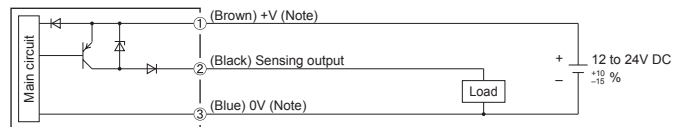4. Tighten the screws to fix the end plates.
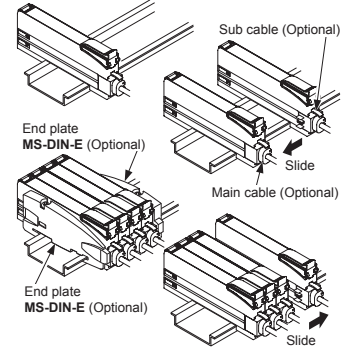
How to Remove

1. Loosen the screws of the end plates.
2. Remove the end plates.
3. Slide the amplifiers and remove them one by one.

Sub cable (Optional)
End plate **MS-DIN-E** (Optional)
Slide
Main cable (Optional)
End plate **MS-DIN-E** (Optional)
Slide

5 I/O CIRCUIT DIAGRAMS

< NPN output type >

Main circuit
① (Brown) +V (Note)
② (Black) Sensing output — Load
③ (Blue) 0V (Note)
+ − 12 to 24V DC $^{+10}_{-15}$ %

< PNP output type >

Main circuit
① (Brown) +V (Note)
② (Black) Sensing output
③ (Blue) 0V (Note) — Load
+ − 12 to 24V DC $^{+10}_{-15}$ %
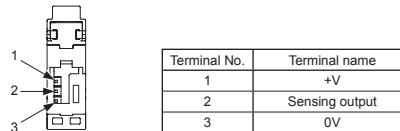
Note: The quick-connection sub cable does not incorporate +V (brown) and 0V (blue). The power is supplied from the connector of the main cable.

< FX551□ terminal arrangement >

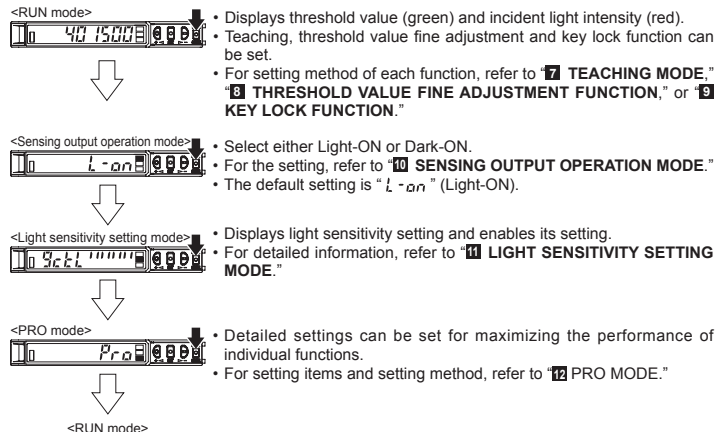| Terminal No.	Terminal name
1	+V
2	Sensing output
3	0V

6 OPERATION PROCEDURE

The changed settings are not stored if turning the power OFF while setting. Therefore, confirm the settings by pressing the SET key before turning the power OFF.

- When turning ON the power, RUN mode is displayed and the digital display shows the threshold value (green) and the incident light intensity (red).

<RUN mode>
40 1500
• Displays threshold value (green) and incident light intensity (red).
• Teaching, threshold value fine adjustment and key lock function can be set.
• For setting method of each function, refer to "**7 TEACHING MODE**," "**8 THRESHOLD VALUE FINE ADJUSTMENT FUNCTION**," or "**9 KEY LOCK FUNCTION**."

<Sensing output operation mode>
L-on
• Select either Light-ON or Dark-ON.
• For the setting, refer to "**10 SENSING OUTPUT OPERATION MODE**."
• The default setting is " L -on " (Light-ON).

<Light sensitivity setting mode>
SctL
• Displays light sensitivity setting and enables its setting.
• For detailed information, refer to "**11 LIGHT SENSITIVITY SETTING MODE**."

<PRO mode>
Pro
• Detailed settings can be set for maximizing the performance of individual functions.
• For setting items and setting method, refer to "**12 PRO MODE**."
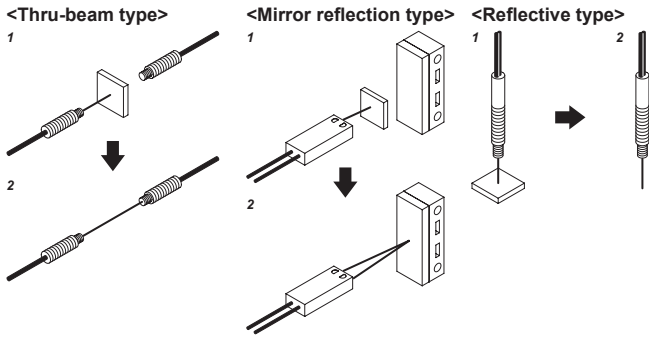
<RUN mode>

7 TEACHING MODE

Be sure that detection may become unstable depending on the use environment in teaching if less margin is applied.

● Teaching can be set in RUN mode.

Useful when sensing object can be set
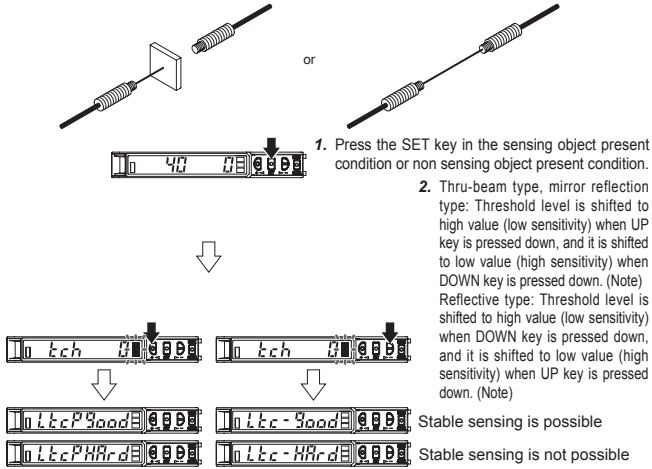
2-point teaching   This is basic teaching method.

<Thru-beam type>   **<Mirror reflection type>**   **<Reflective type>**

🔲 40 0	**1.** Press the SET key in the sensing object present condition.
🔲 tch 1000	**2.** Press the SET key in the sensing object absent condition.
🔲 2tch good	Stable sensing is possible
🔲 2tch HArd	Stable sensing is not possible

Useful when sensing object cannot be set

Limit-teaching   This is teaching method in case small object or object in back ground are existing.

<Common to thru-beam type, mirror reflection type and reflective type>

1. Press the SET key in the sensing object present condition or non sensing object present condition.

2. Thru-beam type, mirror reflection type: Threshold level is shifted to high value (low sensitivity) when UP key is pressed down, and it is shifted to low value (high sensitivity) when DOWN key is pressed down. (Note)
Reflective type: Threshold level is shifted to high value (low sensitivity) when DOWN key is pressed down, and it is shifted to low value (high sensitivity) when UP key is pressed down. (Note)

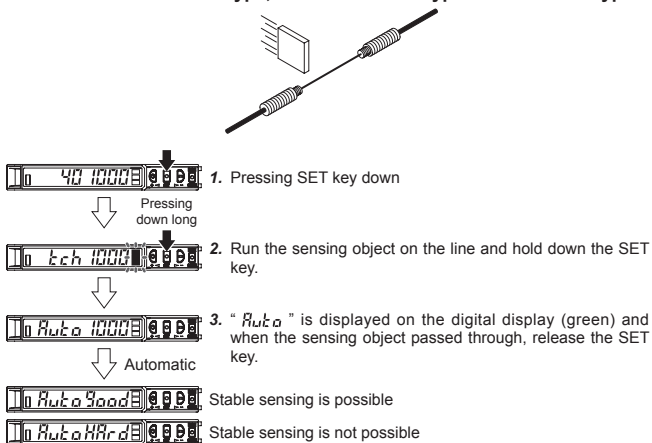|	
🔲 tch 0	🔲 tch 0
🔲 Ltc good	🔲 Ltc -good	Stable sensing is possible
🔲 Ltc HArd	🔲 Ltc -HArd	Stable sensing is not possible

Note: The shift value of approx. 15% is an initial value. Display of the shift value can be changed to percentage [approx. 0 to 999% (unit 1 %)] or incident light intensity [0 to 9999 (unit 1)].
For setting the shift amount, refer to <PRO1> in "**12 PRO MODE**."

Useful when not want to stop production line and to keep the sensing object move
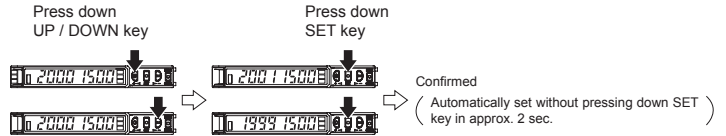
Full-auto teaching   This is method to conduct teaching doing sensing object is moving.

<Common to thru-beam type, mirror reflection type and reflective type>

🔲 40 1000	**1.** Pressing SET key down
↓ Pressing down long	
🔲 tch 1000	**2.** Run the sensing object on the line and hold down the SET key.
🔲 Auto 1000	**3.** " Auto " is displayed on the digital display (green) and when the sensing object passed through, release the SET key.
↓ Automatic	
🔲 Auto good	Stable sensing is possible
🔲 Auto HArd	Stable sensing is not possible

8 THRESHOLD VALUE FINE ADJUSTMENT FUNCTION

● Set the fine adjustment of threshold value in RUN mode.

Press down UP / DOWN key   Press down SET key

Confirmed
(Automatically set without pressing down SET key in approx. 2 sec.)
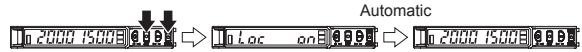
9 KEY LOCK FUNCTION

● The key lock function prevents key operations so that the conditions set in each setting mode are not inadvertently changed.
● If operating key switch after key lock is set, " Loc   on " is indicated on the digital display.

<Set key lock>

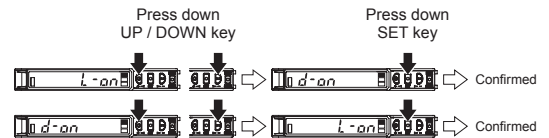Press down SET + MODE keys simultaneously for 3 sec or longer

Automatic

<Release key lock>

Press down SET + MODE keys simultaneously for 3 sec or longer

Automatic

(Loc   on , 2000 1500 are displayed)

10 SENSING OUTPUT OPERATION MODE

● When MODE indicator: L / D (yellow) lights up, sensing output operation can be set.

Press down UP / DOWN key   Press down SET key

11 LIGHT SENSITIVITY SETTING MODE

● When the MODE indicator: CUST (yellow) lights up, light sensitivity setting can be displayed.
● By pressing down UP key or DOWN key, light sensitivity setting can be changed.
● Press SET key to confirm the setting.

SET key   DOWN key
UP key   MODE key

MODE indicator
CUST (Yellow)

Press down UP / DOWN key   Press down SET key
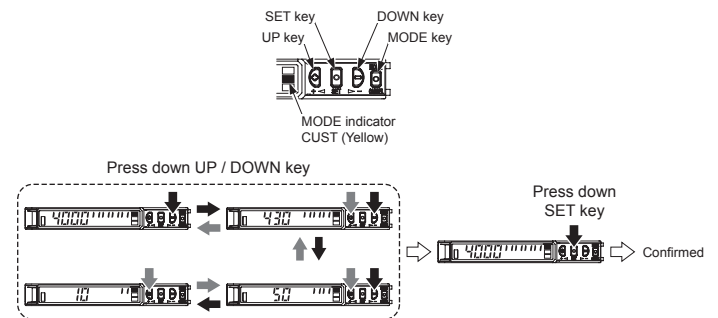
Confirmed

12 PRO MODE

● When MODE indicator: PRO (yellow) lights up, PRO mode can be set.
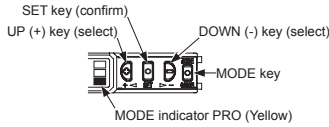
SET key (confirm)
UP (+) key (select)   DOWN (-) key (select)
— MODE key
MODE indicator PRO (Yellow)

Procedure

The changed settings are not stored if turning the power OFF while setting. Therefore, confirm the settings by pressing the SET key before turning the power OFF.
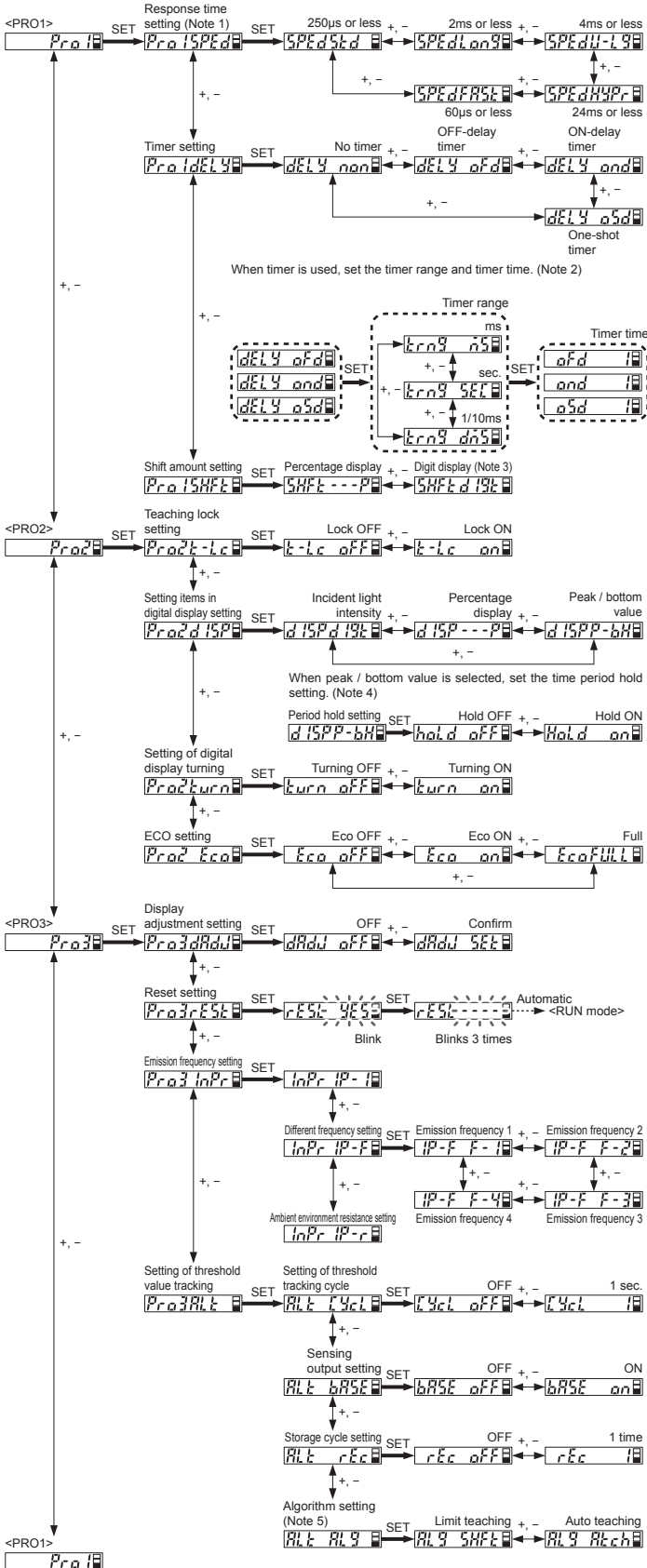
Notes: 1) Display of incident light intensity depends on the response time.

Response time	Incident light intensity
"Std", "FASt"	Max. 4,000
"Lon9"	Max. 8,000
"U-L9", "HYPr"	Max. 9,999

Notes: 2) When timer is used, set the timer time. The timer time differs depending on the timer range, as shown in the table below. Set the timer time after setting the timer range. When setting "Lon9", "U-L9", "HYPr", "IP-F" and "IP-r", the timer time of the timer range "1/10ms" cannot be carried out.

Timer range	Timer time
"ms"	Approx. 1 to 9,999ms
"sec."	Approx. 1 to 32 sec.
"1/10ms"	Approx. 0.1 to 999.9ms

Notes: 3) When setting the shift value using the digit display, the setting range differs depending on the response time, as shown in the table below.

Response time	Shift value setting range
"Std", "FASt"	Max. 4,000
"Lon9"	Max. 8,000
"U-L9", "HYPr"	Max. 9,999

Notes: 4) To clear the value, turn off the time period holding function. Turning off the power switch also clears the value.
Notes: 5) When "SHFt" is set, limit teaching is conducted according to the change in the incident light intensity, and then the threshold value is reset. Shift direction of the threshold value differs depending on the combination of sensing output status and sensing output operation, as shown in the table below.

Sensing output status	Sensing output operation	Shift direction of threshold value
Sensing output ON	Light-ON	Limit teaching is conducted for the negative (-) side of the threshold value.
Sensing output ON	Dark-ON	Limit teaching is conducted for the positive (+) side of the threshold value.
Sensing output OFF	Light-ON	Limit teaching is conducted for the positive (+) side of the threshold value.
Sensing output OFF	Dark-ON	Limit teaching is conducted for the negative (-) side of the threshold value.

	Item	Default setting	Description
PRO1 mode	Response time setting	SPEd Std	Set response time.
	Timer setting	dELY non	Set timer operation.
	Timer range setting	trn9 nS	Set timer range and timer time.
	Shift amount setting	SHFt ---P	Set shift amount of threshold value in limit teaching.
PRO2 mode	Teaching lock setting	t-Lc oFF	Be able to prevent from wrong operation of teaching. "oFF": Teaching mode is valid "on": Teaching mode is invalid
	Digital display item setting	dISP dl9t	Incident light intensity can be displayed in percentage or the peak / bottom value can be displayed on the digital display (red).
	Period hold setting	Hold oFF	"oFF": Peak / bottom value in the digital display refreshing condition can be displayed. "on": Peak / bottom value in the hold condition can be displayed.
	Digital display turning on setting	turn oFF	Sets the viewing orientation of the digital display.
	ECO setting	Eco oFF	Power consumption can be lowered. "oFF": ECO OFF "on": If any key operation is not carried out for 20 sec. in RUN mode, the digital display turns OFF. "FULL": If key operation is not done in 20 sec. or setting the key lock function in Run mode, all indicators turns OFF.
PRO3 mode	Display adjustment setting	dAdJ oFF	Incident light intensity can be set to "0." When the correction amount is large, "OUEr" is blinked as the setting cannot be conducted normally. "oFF": Display adjustment OFF "SEt": Incident light intensity is offset (in the negative direction) to cancel sneaking light.
	Reset setting	–	If setting to "YES" returns to default settings (factory settings).
	Emission frequency setting	InPr IP-1	"IP-1": Interference prevention function is disabled. "IP-F": Set this when emission frequency is changed and interference prevention function is used. The maximum number of sensor heads for adherence mounting is 4 units when 4 types of emission frequency are set. "IP-r": Set this to minimize the effect of ambient environment. When this setting is set, mutual interference prevention function is disabled. Response time is as follows when "IP-F" or "IP-r" is selected.
			"IP-F" Response time: F-1: 0.8ms or less, F-2: 0.9ms or less F-3: 1.0ms or less, F-4: 1.7ms or less * Not affected by "Pro1SPEd" setting. (Response time setting)
			"IP-r" Response time: FAST: 120µs or less, STD: 500µs or less LONG: 4ms or less, U-LG: 8ms or less, HYPR: 48ms or less (selectable)
	Setting of threshold value tracking	CYcL oFF	This mode can change the threshold value depending on the cycle (1 to 9,999 sec.) that is set with the variations of the incident light intensity. The tracking shift amount is the one which is set at the shift setting.
	Sensing output setting	bASE oFF	Selects whether tracking threshold when the output is OFF or when the output is ON.
	Storage cycle setting	rEc oFF	Selects a threshold storage cycle in EEPROM from 1 to 250 times.
	Algorithm setting	AL9 SHFt	"SHFt": Limit teaching Threshold value is followed up on the basis of shift amount. (recommended when using thru-beam-type fiber or mirror-reflection-type fiber) "Atch": Auto teaching Threshold value is followed up on the basis of each cycle. (recommended when using reflective-type fiber)

13 ERROR INDICATION

- In case of errors, attempt the following measures.

Error indication	Description	Remedy
Er01	EEPROM is broken or reached the end of its working life.	Please replace the product.
Er02	EEPROM writing error	
Er11	Load of the sensing output is short-circuited causing an over-current to flow.	Turn OFF the power and check the load.

14 SPECIFICATIONS

Type		Connection type		Cable type	
		NPN output	PNP output	NPN output	PNP output
Model No.		FX-551	FX-551P	FX-551-C2	FX-551P-C2
Supply voltage		12 to 24V DC $^{+10}_{-15}$ % Ripple P-P10% or less			
Power consumption		Normal operation: 960mW or less (current consumption 40mA or less at 24V supply voltage) Eco mode: 680mW or less (current consumption 28mA or less at 24V supply voltage)			
Sensing output		< NPN output type > NPN open-collector transistor • Maximum sink current: 100mA (Note 1) • Applied voltage: 30V DC or less (Between sensing output and 0V) • Residual voltage: 2V or less (Note 2) [At 100mA (Note 1) sink current]		< PNP output type > PNP open-collector transistor • Maximum source current: 100mA (Note 1) • Applied voltage: 30V DC or less (Between sensing output and +V) • Residual voltage: 2V or less (Note 2) [At 100mA (Note 1) source current]	
	Output operation	Switchable either Light-ON or Dark-ON			
	Short-circuit protection	Incorporated			
Response time (Note 3)		FAST: 60µs or less, STD: 250µs or less, LONG: 2ms or less, U-LG: 4ms or less, HYPR: 24ms or less, Selectable			
Interference revention function		Incorporated Emission frequency selection method (Functions at emission frequency 1, 2, 3 or 4)			
Protection		IP40 (IEC)			
Ambient temperature (Note 4)		-10 to +55°C (when 4 to 7 units are installed: -10 to +50°C, when 8 to 16 units are installed: -10 to +45°C) (No dew condensation or icing allowed), Storage: -20 to +70°C			
Ambient humidity		35 to 85% RH, Storage: 35 to 85% RH			
Material		Enclosure: Polycarbonate, Key: Polyacetal, Protective cover: Polycarbonate			
Cable		(Note 5)		0.2-mm^2 3-core cabtire cable (2 m) provided	
Weight (Main body only)		Approx. 15 g		Approx. 60 g	

Notes: 1) 50mA in the case 5 or more connection-type units are connected in series.
2) When 5-m-long one-touch cable (optional) is used with connection-type units
3) Response tisme varies depending on the emission frequency setting. Regarding the response time in the case " *IP-F* " or " *IP-r* " is selected, refer to <PRO3> in " 12 PRO MODE."
4) In the case of connection type: When connected in series.
In the case of cable type: When adherence-mounted.
5) Cable is not provided with the connection-type product. Be sure to use the following cables (optional).

< Connection type >

	Cable					
	Cable length 1m		Cable length 2m		Cable length 5m	
	Main cable	Sub cable	Main cable	Sub cable	Main cable	Sub cable
FX-551□	CN-73-C1	CN-71-C1	CN-73-C2	CN-71-C2	CN-73-C5	CN-71-C5

15 CAUTIONS

- This product has been developed / produced for industrial use only.
- Make sure that the power supply is OFF while adding or removing the amplifiers.
- Take care that if a voltage exceeding the rated range is applied, or if an AC power supply is directly connected, the product may get burnt or be damaged.
- Take care that short-circuit of the load or wrong wiring may burn or damage the product.
- Do not run the wires together with high-voltage lines or power lines, or put them in the same raceway. This can cause malfunction due to induction.
- The specification may not be satisfied in a strong magnetic field.
- Verify that the supply voltage variation is within the rating.
- If power is supplied from a commercial switching regulator, ensure that the frame ground (F.G.) terminal of the power supply is connected to an actual ground.
- In case noise generating equipment (switching regulator, inverter motor, etc.) is used in the vicinity of this product, connect the frame ground (F.G.) terminal of the equipment to an actual ground.
- The ultra long distance (U-LG, HYPR) mode is more likely to be affected by extraneous noise since the sensitivity of that is higher than the other modes. Make sure to check the environment before use.
- Do not use during the initial transient time (FAST, STD: 0.5 sec., LONG, U-LG, HYPR: 1 sec.) after the power supply is switched ON.
- When extending the cable length, use a cable with a conductor cross-sectional area of 0.3 mm^2 or more. Note that the maximum allowed cable length is 100 m. However, in order to reduce noise, make the wiring as short as possible.
- Set the power supply voltage by considering the voltage drop resulting from the conduction resistance of the cable.
- Make sure that the cable joint is not applied with stress, such as strain caused by forcible bending or pulling.
- This product is suitable for indoor use only.
- Avoid dust, dirt, and steam.
- Take care that the product does not come into contact with organic solvents such as thinner.
- Take care that the product does not come into contact with strong acids or alkalis.
- Take care that the product does not come into contact with oil or grease.
- This product cannot be used in an environment containing inflammable or explosive gasses.
- Never disassemble or modify the product.
- This product adopts EEPROM. Settings cannot be done 100 thousand times or more because of the EEPROM's lifetime.

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