DIGITAL FIBER SENSOR
FX-100 SERIES
Operation Guide
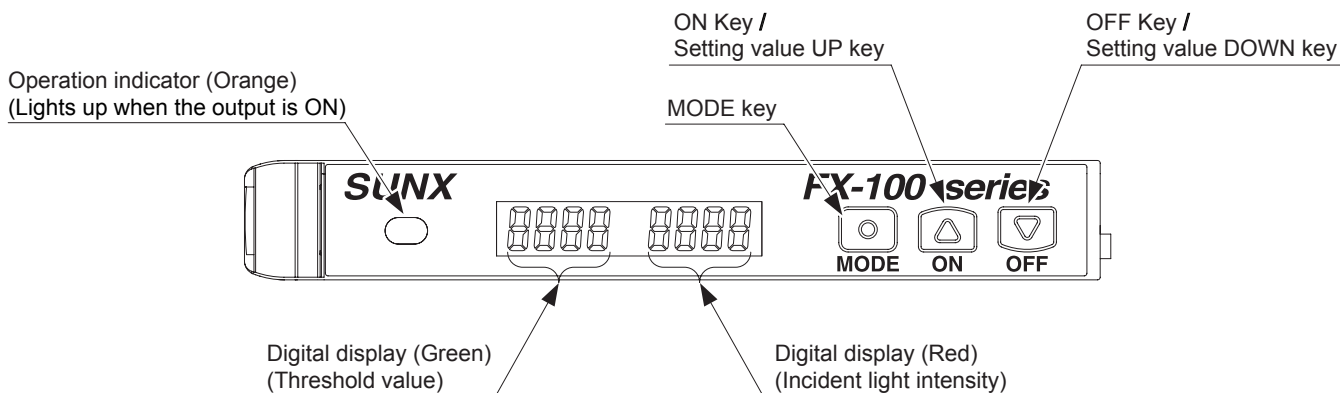
INDEX

1 Functional Description

1-1. Functional Description

ON Key /
Setting value UP key

OFF Key /
Setting value DOWN key

Operation indicator (Orange)
(Lights up when the output is ON)

MODE key

SUNX

FX-100 series

MODE ON OFF

Digital display (Green)
(Threshold value)

Digital display (Red)
(Incident light intensity)

1-2. Operating Portion

Three keys [⊙ (MODE key), △ (ON key / setting value UP key) and ▽ (OFF key / setting value DOWN key)]
are used to carry out all settings.

MODE key	ON key / Setting value UP key	OFF key / Setting value DOWN key
⊙	△	▽

· Selection of setting items
· Confirmation of set contents
· RUN Mode
  Press for 2 sec.: To SET mode
  Press for 4 sec.: To PRO mode
<When using the GETA function (Refer to p.20)>
 Press once (1 sec. or less):
    The incident light intensity before
    the GETA function is set is indicated
    for approx. 2 sec.
· Other than RUN mode
  Press for 2 sec. or more: To RUN mode
                 or Cancel
	· Selection of setting contents
	· Threshold value settings in teaching mode
	· Fine adjustments to the threshold value
	  (When pressed and held, the value will change more rapidly.)	

In addition, the keys can be used in combination to carry out the following.

⊙ and ▽	△ and ▽

· Key lock setting / release
  (Refer to p.4)
  Press simultaneously for 2 sec.
	· Quick setting function (Refer to p.25)
	  Press simultaneously for 2 sec.
	· Code setting function (Refer to p.26)
	  Press simultaneously for 4 sec.

2 | Diagram of Functions and Settings

2-1. Diagram of Functions and Settings

The amplifier features and settings can be generally classified into three main modes: the 'RUN mode' for normal sensing operation, the 'SET mode' for basic settings, and the 'PRO mode' that contains more detailed settings.

PRO Mode ◄ SET Mode ◄► RUN Mode ► QUIC ► CODE

Press for 4 sec. during RUN mode.
(Keep pressing until 'Pro' is displayed.)

Press for 2 sec. during RUN mode.

Press simultaneously for 2 sec. during RUN mode.

Press simultaneously for 4 sec. during RUN mode.
(Keep pressing until 'CodE' is displayed.)

RUN Mode   P.4

This indicates normal sensing operation.

Threshold value fine adjustment function
Fine adjustment of the threshold value can be done when in RUN mode.
Details: P.4 | Procedure: P.4

Loc — Key Lock Function
The key lock function prevents key operations so that the conditions set in each setting mode are not inadvertently changed.
Details: P.4 | **Procedure: P.4**

QUIC — Quick Setting Function
Allows various settings (output operation settings, timer operation settings, light-emitting amount selection settings and emission frequency settings) to be made in SET mode simply by selecting a setting number.
Details: P.25 | **Procedure: P.25**

CodE — Code Setting Function
Settings for output operation, timer operation, light-emitting amount selection, emission frequency, ECO, external input, and shift amount are possible by selecting codes discretionary.
Details: P.26 | **Procedure: P.26**

SET Mode   P.5

This mode is used for carrying out basic settings.

tEch — Teaching
Threshold value can be set in 2-level teaching, limit teaching [＋, －], or full-auto teaching.
Details: P.5 | **Procedure: P.7～**

L_d — Output Operation Setting
Light-ON or Dark-ON can be set.
Details: P.5 | **Procedure: P.10**

dLY — Timer Operation Setting
Configures timer operation and timer period.
Details: P.6 | **Procedure: P.10**

FrEq — Emission Frequency Setting
When fiber heads are used side-by-side, the emission frequencies for each amplifier can be set to different emission frequencies in order to prevent interference.
Details: P.6 | **Procedure: P.12**

Pctl — Light-emitting Amount Selection Setting
Allows light reduction to be set for the light-emitting amount. This is useful if sensing is difficult because the incident light intensity is saturated.
Details: P.6 | **Procedure: P.11**

PRO Mode   P.13

This mode is used for carrying out detailed settings.

SHFt — Shift Setting
Allows the shift amount for limit teaching [＋, －] and for threshold value follow-up cycle setting to be set within the range of 0 to 80 %.
Details: P.13 | **Procedure: P.18**

InPt — External Input Setting
External input can be selected from emission halt, limit teaching [＋], limit teaching [－], full-auto teaching, and ECO.
Details: P.13～ | **Procedure: P.18**

CYcl — Threshold Value Follow-up Cycle Setting
Allows follow-up of the threshold value to be carried out within a set range (shift amount) in response to fluctuations in the incident light intensity.
Details: P.15 | **Procedure: P.19**

turn — Digital Display Inversion Setting
Allows the viewing orientation of the digital display to be inverted in accordance with the setting direction of the amplifier.
Details: P.17 | **Procedure: P.22**

Eco — ECO Setting
Sets the digital display to turn off in order to reduce power consumption (current consumption).
Details: P.17 | **Procedure: P.21**

GETA — GETA Function Setting
Allows the display value for the incident light intensity to be offset by the desired value (target value).
Details: P.16 | **Procedure: P.20**

MArt — Threshold Value Margin Setting
Margin for threshold value to the present incident light intensity can be checked.
Details: P.17 | **Procedure: P.22**

CoPY — Setting Copy
The settings of the master side amplifier can be copied to the slave side amplifier.
Details: P.17 | **Procedure: P.23**

rSEt — Reset
Allows all settings to be returned to the factory settings.
Details: P.17 | **Procedure: P.24**

3 Others

3-1. Precautions When Selecting Settings

If ⌥ (MODE key) is pressed for 2 sec. while setting is in progress in a mode other than RUN mode, the mode will switch to RUN mode. When this occurs, the settings which had been changed before ⌥ (MODE key) was pressed for 2 sec. will be confirmed.

Setting protection

You can use the 'key lock function' to protect settings. (Refer to p.4)
Key lock function can be used to prevent the operator from accidentally changing the sensor settings.

3-2. Factory Settings

Factory settings for the **FX-100** series are indicated below:
If the unit is reset using the 'Reset' from 'PRO Mode' on p.24, the resulting settings will be those indicated below:

SET Mode

Item		Factory Setting	
		Settings	Digital display
Threshold value		40	`40`
Output operation setting		Dark-ON	`L.d  d.on`
Timer operation setting		Without timer	`dELY  non`

Timer period setting		ON-delay timer : 10 ms
		OFF-delay timer : 10 ms
			`ond   10`
			`oFd   10`
			*When timer is not set, this mode is not displayed.

Light-emitting amount selection setting		OFF	`PctL  oFF`
Emission frequency setting	**FX-101☐**	0 (Response time: 250 μs or less)	`FrE9 F- 0`
	FX-102☐	1 (Response time: 2.5 ms or less)	`FrE9 F-01`

PRO Mode

Item	Factory Setting	
	Settings	Digital display
Shift setting	Shift amount 15 %	`SHFt   15P`
External input setting	Emission halt	`InPt  E-oF`
Threshold value follow-up cycle setting	OFF	`CYcL  oFF`
GETA function setting	OFF	`GEtA  oFF`
ECO setting	OFF	`Eco   oFF`
Digital display inversion setting	OFF	`turn  oFF`
Threshold value margin setting	OFF	`ALrt  oFF`
Setting copy	NO	`CoPY   no`
Reset	NO	`rSEt   no`

3-3. Error Display Indicator Readings

In case of errors, attempt the following measures:

Digital display	Error description	Measures
`Er-0`	EEPROM writing error	Contact our office.
`Er-1`	The load has short-circuited and excess current is flowing.	Turn off the power, then check the load.
`Er-5`	Communication error. (Disconnection, connection failure, etc.)	Turn off the power, and then check the wiring for using the setting copy function.

4 RUN Mode

4-1. RUN Mode

Digital display

●When turn ON the power, the Model No. is displayed in the green digital display, and the emission frequency is displayed in the red digital display. Then switch into RUN mode [digital display (green: threshold value, red: incident light intensity.)]

When the power is ON

`101    F-01`

(Model No.) (Emission frequency)

→ Automatic →

RUN mode

`2000   3000`

(Threshold value) (Incident light intensity)
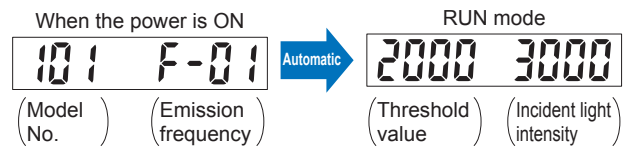
●'E-oF' is displayed in the red digital display when emission halt is selected in the external input setting and externally received the signal.

When external input

`2000   E-oF`

Caution   Displays blink alternately

`2000   E-oF` → ← `2000      0`

If 'E-oF' and '0' (incident light intensity) are blinking alternately in the digital displays, check if there is a contact between the output wire (black) and the external input wire (white).

For the setting of external input, refer to ' 6 **PRO MODE 6-3. External input setting** (P.18).'

●When ECO setting mode is ON, the digital display turns off in 20 sec. approx. in RUN mode. To light up the digital display again, press any key for 2 sec. or more.

After approx. 20 sec.

`2000   3000` →Automatic→ `Eco` Blinks →Automatic→ (blank) Turns off
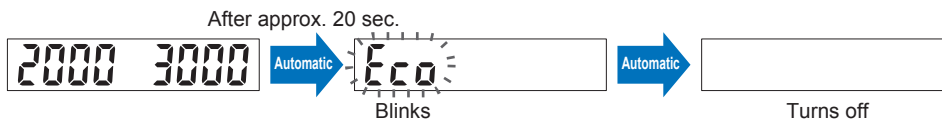
For the setting of ECO, refer to ' 6 **PRO MODE 6-6. ECO setting** (P.21).'

4-2. Threshold Value Fine Adjustment Function

●Fine adjustment of the threshold value can be done when in RUN mode.

●The threshold value changes when △ (setting value UP key) or ▽ (setting value DOWN key) is pressed. (when the key is pressed long, the value is accelerated.)

●The threshold value is stored after 3 sec.

`1999   3000` ← △ / ▽ → When in RUN mode `2000   3000` (Threshold value) (Incident light intensity) ← △ / ▽ → `2001   3000`
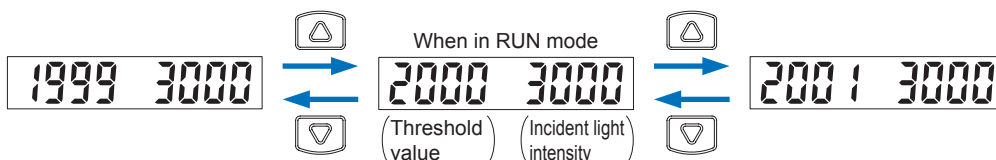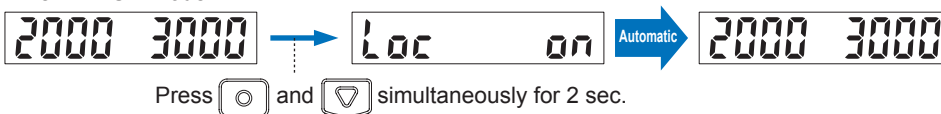
4-3. Key Lock Function

●The key lock function prevents key operations so that the conditions set in each setting mode are not inadvertently changed.

●In the key lock condition, 'Loc on' is displayed when any key is pressed.

Key lock set

When in RUN mode

`2000   3000` → `Loc      on` →Automatic→ `2000   3000`

Press ⊙ and ▽ simultaneously for 2 sec.

Key lock released

When in RUN mode

`2000   3000` → `Loc      on` →Automatic→ `Loc     oFF` →Automatic→ `2000   3000`

Press ⊙ and ▽ simultaneously for 2 sec. or more.
(Keep pressing until 'Loc oFF' is displayed.)

4
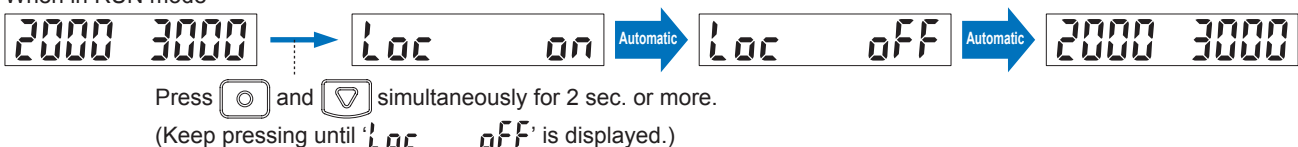
5 SET Mode

5-1. SET Mode Functions and Settings

SET mode is the mode used for making basic settings. Settings for five functions can be configured.
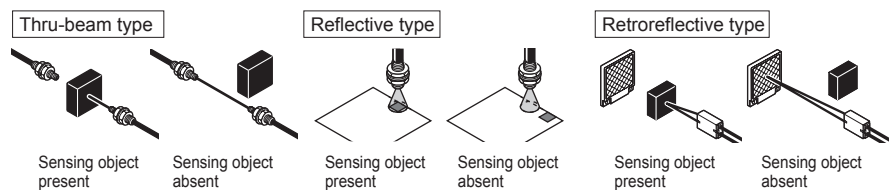
tЯch : Teaching

Refer to p.7～ for setting procedure

The 'threshold value' can be set by utilizing three kinds of teaching, whichever '2-level teaching', 'limit teaching [＋ , －]' or 'full-auto teaching'.

> Make sure that detection may become unstable if less margin is applied in the use environment when teaching.

2-level Teaching   P.7

2-level teaching is a method of setting the threshold value by teaching the amplifier unit two different status conditions - sensing object present and sensing object absent. The 'threshold value' is normally set using this method.

Thru-beam type		Reflective type		Retroreflective type	
Sensing object present	Sensing object absent	Sensing object present	Sensing object absent	Sensing object present	Sensing object absent

Limit Teaching [＋ , －]   P.8～

Teaches only the status condition in which no sensing object is within sensing range (status in which incident light intensity is stable). This method is used to set a 'threshold value' for conducting sensing in the presence of a background, or when extremely small objects are to be detected.

Thru-beam type	Reflective type	Retroreflective type
Minute object	Background	Minute object
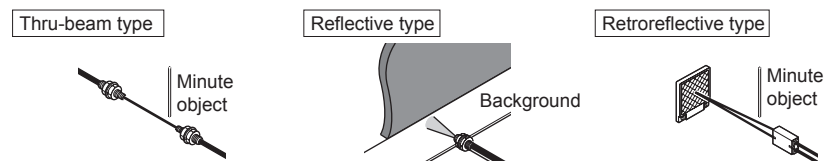
Full-auto Teaching   P.9

This method is used to set the threshold value while the sensing objects are still moving on the production line, without stopping the production line.

Thru-beam type	Reflective type	Retroreflective type
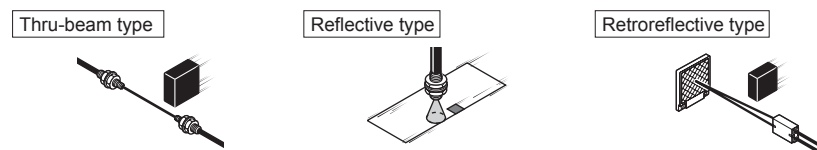
L▪d : Output Operation Setting

Refer to p.10 for setting procedure

This mode allows the selection of output operation from either L-ON (Light-ON), or D-ON (Dark-ON).
When set to 'L-ON', the output will be ON if the incident light intensity becomes greater than the 'threshold value'.
When set to 'D-ON', the output will be ON if the incident light intensity becomes less than the 'threshold value'.

Output operation

L-ON	OFF	ON
D-ON	ON	OFF

Incident light intensity

0   Threshold value   4,000
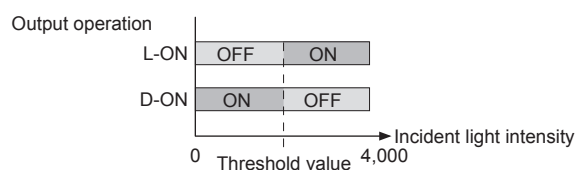
* The factory setting is 'Dark-ON (D-ON)'.

5

dELY : Timer Operation Setting

Refer to p.10 for setting procedure

This sets timer operation and timer period.
Without timer, ON-delay timer, or OFF-delay timer can be set.
In case of setting ON-delay timer or OFF-delay timer in the timer operation setting mode, timer period can be set.
Select timer period from 1 ms, 5 ms, 10 ms, 20 ms, 40 ms, 50 ms, 100 ms, 500 ms, and 1,000 ms.
* The factory setting is 'Without timer'.

PctL : Light-emitting Amount Selection Setting

Refer to p.11 for setting procedure

Allows light reduction to be set for the light-emitting amount.
When the setting is ON, the light-emitting amount is reduced.
Use this setting if sensing is difficult because the incident light intensity is saturated (4,000 or higher).
* The factory setting is 'OFF'.

> If the incident light intensity is still saturated (4,000 or higher) even when the light reduction setting is used, make the distance between the sensing objects and the fiber head longer.

FrEq : Emission Frequency Setting

Refer to p.12 for setting procedure

When fiber heads are used side-by-side, the emission frequencies for each amplifier can be set to different frequencies in order to prevent interference.
For the **FX-101□**, this function is activated by setting the emission frequency to 1, 2 or 3.
For the **FX-102□**, this function is activated by setting the emission frequency to 1, 2, 3 or 4.
<Number of units for interference prevention>
• Combination of **FX-101□** only: Maximum 3 units
• Combination of **FX-102□** only: Maximum 4 units
• Combination of **FX-101□** and **FX-102□**: Maximum 4 units

> • For the **FX-101□**, the interference prevention function will not operate for emission frequency 0 (factory setting).
> • The response time will change when the emission frequency is changed.

The beam-emitting part and the operation indicator (orange) will blink while the emission frequency is being set. (They light up steadily when emission frequency 0 is set.) The blinking cycle will change depending on the emission frequency which is selected. (Refer to the table below.)

Emission frequency	FX-101□		FX-102□		Combination for interference prevention function to be enabled	Light-emitting operation during setting (Note)
	Display	Response time	Display	Response time		
0	F- 0	250 µs or less	—	—	None	Lights up
1	F-01	450 µs or less	F-01	2.5 ms or less	F-02 , F-03 , F-04	Blinks extremely quickly
2	F-02	500 µs or less	F-02	2.8 ms or less	F-01 , F-03 , F-04	Blinks quickly
3	F-03	600 µs or less	F-03	3.2 ms or less	F-01 , F-02 , F-04	Blinks slowly
4	–	–	F-04	5.0 ms or less	F-01 , F-02 , F-03	Blinks extremely slowly

Note: The operation indicator (orange) will operate in the same way.

* The factory setting is emission frequency 0 for the **FX-101□** and emission frequency 1 for the **FX-102□**.

5-2. Teaching

The 'threshold value' can be set by utilizing three kinds of teaching, whichever '2-level teaching', 'limit teaching [+, −]' or 'full-auto teaching'.

> Make sure that detection may become unstable if less margin is applied in the use environment when teaching.

2-level Teaching   This is the method of setting the threshold value by teaching two levels, corresponding to object present and object absent conditions. Normally, setting is done by this method.
The output operation setting of Light-ON or Dark-ON is reflected automatically.

For output ON when in object present condition

`2000 3000`

Press MODE key for 2 sec.

`SEt`

Automatic

`tAch 2000`

Press ON key in object present condition.

`2000`

Automatic

`2000 3000`

Press OFF key in object absent condition.

`2500 25P` (Threshold value : 2,500 / Margin : 25 %)

Automatic

`tAch 3000`

Press MODE key for 2 sec. or 5 times.

`2500 3000`

Thru-beam type	Reflective type
Sensing object present	Sensing object present
Retroreflective type	
	Sensing object present

Thru-beam type	Reflective type
Sensing object absent	Sensing object absent
Retroreflective type	
	Sensing object absent

① Press the (MODE key) for 2 sec. to select 'SET mode'.

② Press (ON key) in object present condition.

③ The first incident light intensity is set and indicated on the green digital display.
(Cancellation of the setting for the first incident light intensity is possible when (MODE key) is pressed.)

④ The present incident light intensity is indicated on the red digital display with blinking.

⑤ Press (OFF key) in object absent condition.

⑥ The threshold value which is set between the first and the second incident light intensity is indicated on the green digital display. Margin (%) for the threshold value to the first or the second incident light intensity is indicated on the red digital display. When the margin is 200 % or more, 'FuLL' is displayed.

⑦ Press the (MODE key) 5 times or keep it pressed for 2 sec. or more, the amplifier will return to 'RUN mode' (normal sensing operation).

For output ON when in object absent condition

`2000 3000`

Press MODE key for 2 sec.

`SEt`

Automatic

`tAch 3000`

Press ON key in object absent condition.

`3000`

Automatic

`3000 2000`

Press OFF key in object present condition.

`2500 25P` (Threshold value : 2,500 / Margin : 25 %)

Automatic

`tAch 2000`

Press MODE key for 2 sec. or 5 times.

`2500 3000`

Thru-beam type	Reflective type
Sensing object absent	Sensing object absent
Retroreflective type	
	Sensing object absent

Thru-beam type	Reflective type
Sensing object present	Sensing object present
Retroreflective type	
	Sensing object present

① Press the (MODE key) for 2 sec. to select 'SET mode'.

② Press (ON key) in object absent condition.

③ The first incident light intensity is set and indicated on the green digital display.
(Cancellation of the setting for the first incident light intensity is possible when (MODE key) is pressed.)

④ The present incident light intensity is indicated on the red digital display with blinking.

⑤ Press (OFF key) in object present condition.

⑥ The threshold value which is set between the first and the second incident light intensity is indicated on the green digital display. Margin (%) for the threshold value to the first or the second incident light intensity is indicated on the red digital display. When the margin is 200 % or more, 'FuLL' is displayed.

⑦ Press the (MODE key) 5 times or keep it pressed for 2 sec. or more, the amplifier will return to 'RUN mode' (normal sensing operation).

This is the method of setting the threshold value by teaching only the object absent condition (stable incident light condition.) This is used for detection in the presence of a background body or for detection of minute objects.

When using thru-beam / retroreflective type fiber

Limit teaching [－] is carried out.
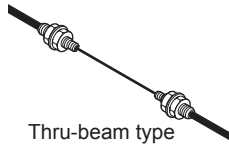
Thru-beam type
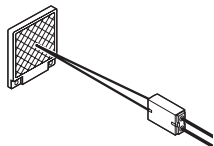
Retroreflective type

<Limit teaching [－] operations>

Operation 1 :
Press ▽ (OFF key) in object absent condition.
(Reference incident light intensity setting)

Operation 2 :
Press ▽ (OFF key) once more.
(Automatic threshold value setting)
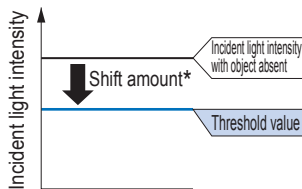
Incident light intensity

Shift amount*

Incident light intensity with object absent

Threshold value

The reference incident light intensity is set in operation 1.

In operation 2, the threshold value is set to the reference incident light intensity with the shift amount* subtracted.

When using reflective fiber

Limit teaching [＋] is carried out.

Background

Reflective type

<Limit teaching [＋] operations>
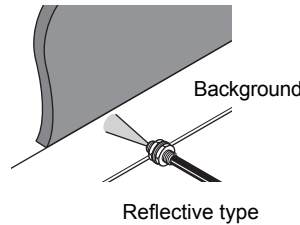
Operation 1 :
Press △ (ON key) in object absent condition.
(Reference incident light intensity setting)

Operation 2 :
Press △ (ON key) once more.
(Automatic threshold value setting)
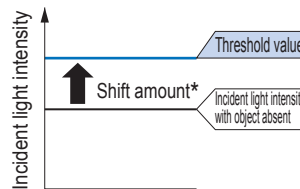
Incident light intensity

Shift amount*

Threshold value

Incident light intensity with object absent

The reference incident light intensity is set in operation 1. In operation 2, the threshold value is set to the reference incident light intensity with the shift amount* subtracted.

* Shift amount: The factory setting is '15 %'. For the shift amount, refer to '**Shift Setting** (P.13, P.18)'.

In case of limit teaching [－]
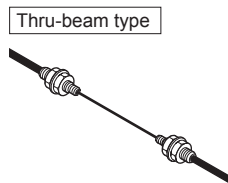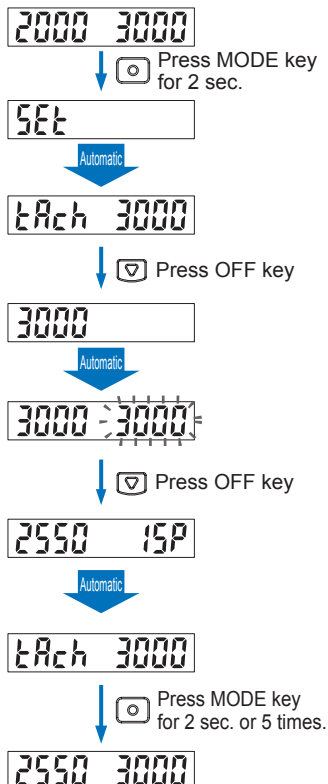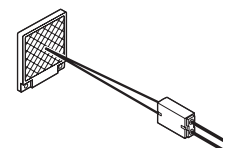
2000 3000

Press MODE key for 2 sec.

SEt

Automatic

tAch 3000

Press OFF key

3000

Automatic

3000 3000

Press OFF key

2550 15P

Automatic

tAch 3000

Press MODE key for 2 sec. or 5 times.

2550 3000

Thru-beam type

Retroreflective type

Incident light intensity

Shift amount*

Incident light intensity with object absent

Threshold value
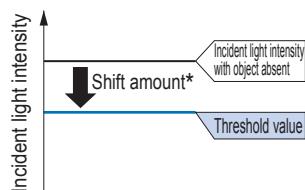
* The factory setting is '15 %'.

① Press the ⊙ (MODE key) for 2 sec. to select 'SET mode'.

② Press ▽ (OFF key) in object absent condition.
Reference incident light intensity is set and indicated on the green digital display. The present incident light intensity is indicated on the red digital display with blinking.
(Cancellation of the setting for the reference incident light intensity is possible when ⊙ (MODE key) is pressed.)

③ Press ▽ (OFF key) once more.
The incident light intensity at this time has no relationship to the threshold value.
The set threshold value is indicated on the green digital display. Margin (%) for the threshold value to the incident light intensity is indicated on the red digital display. When the margin is 200 % or more, 'FuLL' is displayed.

④ Press the ⊙ (MODE key) 5 times or keep it pressed for 2 sec. or more, the amplifier will return to 'RUN mode' (normal sensing operation).

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`2000  3000`

↓ Press MODE key for 2 sec.

`SEt`

→ Automatic

`tAch  1000`

↓ Press ON key

`1000`

→ Automatic

`1000 →1000←`

↓ Press ON key

`1150   15P`

→ Automatic

`tAch  1000`

↓ Press MODE key for 2 sec. or 5 times.

`1150  3000`

Reflective type

Background

Incident light intensity

Threshold value

↑ Shift amount*

Incident light intensity with object absent

* The factory setting is '15 %'.

① Press the ⊙ (MODE key) for 2 sec. to select 'SET mode'.

② Press △ (ON key) in object absent condition.
Reference incident light intensity is set and indicated on the green digital display. The present incident light intensity is indicated on the red digital display with blinking.
[Cancellation of the setting for the reference incident light intensity is possible when ⊙ (MODE key) is pressed.]

③ Press △ (ON key) once more.
The incident light intensity at this time has no relationship to the threshold value.
The set threshold value is indicated on the green digital display. Margin (%) for the threshold value to the incident light intensity is indicated on the red digital display. When the margin is 200 % or more, 'FuLL' is displayed.

④ Press the ⊙ (MODE key) 5 times or keep it pressed for 2 sec. or more, the amplifier will return to 'RUN mode' (normal sensing operation).

Full-Auto Teaching   Full-auto teaching is used when it is desired to set the threshold value without stopping the assembly line, with the object in the moving condition.

`2000  3000`

↓ Press MODE key for 2 sec.

`SEt`

→ Automatic

`tAch  2000`

↓ ON key or OFF key Press long.

`Auto  3000`

↓ Release ON key or OFF key.

`2500   25P`

→ Automatic

`tAch  3000`

↓ Press MODE key for 2 sec. or 5 times.

`2000  3000`

Thru-beam type

Reflective type

Retroreflective type

① Press the ⊙ (MODE key) for 2 sec. to select 'SET mode'.

② Press △ (ON key) or ▽ (OFF key) long.

③ 'Auto' appears in the green digital display after 2 sec. approx., and starts sampling incident light intensity from that point.
The threshold value is set when △ (ON key) or ▽ (OFF key) is released.
The set threshold value is indicated on the green digital display. Margin (%) for the threshold value to the incident light intensity is indicated on the red digital display. When the margin is 200 % or more, 'FuLL' is displayed.

④ Press the ⊙ (MODE key) 5 times or keep it pressed for 2 sec. or more, the amplifier will return to 'RUN mode' (normal sensing operation).

5-3. Output Operation Setting

Factory setting: `L_d  d_on`

Light-ON or Dark-ON can be set.

`2000  3000`

↓ Press MODE key for 2 sec.

`SEt`

Automatic ↓

`tAch  3000`

↓ Press MODE key once.

The current output operation `L_d  d_on` (Dark-ON)

Press △ or ▽ to select the output operation to be set.

`L_d  d_on` ⬌ `L_d  L_on`
(Dark-ON)   (Light-ON)

↓ Press MODE key to confirm.

The current timer operation `dELY  non` (Without timer)

↓ Press MODE key for 2 sec. or 3 times.

`2000  3000`
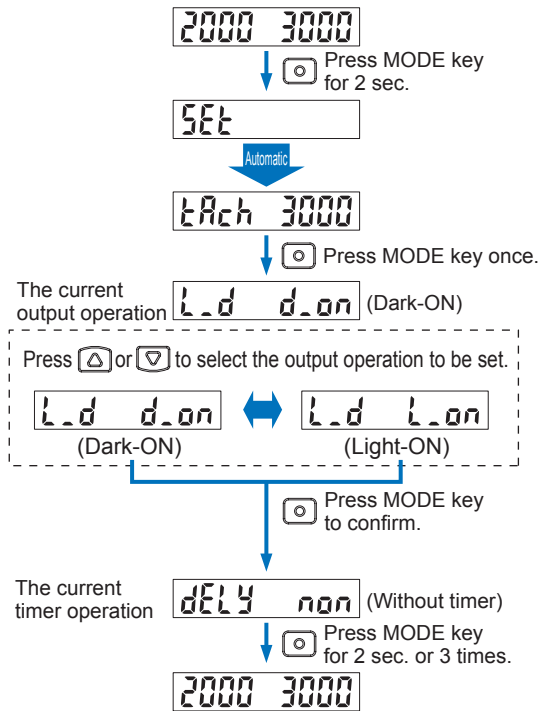
① Press the ⊙ (MODE key) for 2 sec. to select 'SET mode'.

② Press the ⊙ (MODE key) once to select 'output operation setting mode'.

③ Press △ (setting value UP key) or ▽ (setting value DOWN key) to select the output operation to be set.

④ Press ⊙ (MODE key) to confirm the setting.
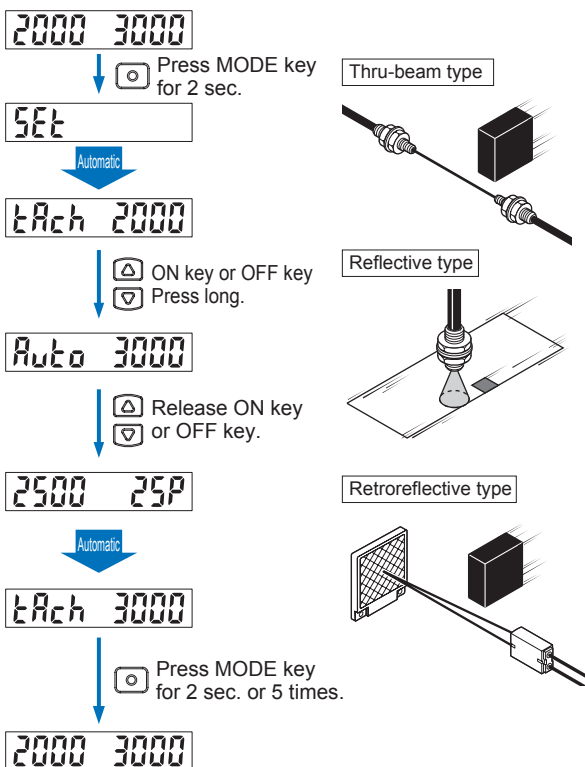   * After the setting is confirmed, operation will move to 'timer operation setting'. To continue with setting timer operation, carry out the procedure from step ③ of '**5-4. Timer Operation Settings**' (p.10). In addition, to carry out any other basic settings, press ⊙ (MODE key) to select the setting item.

⑤ Press the ⊙ (MODE key) 3 times or keep it pressed for 2 sec. or more, the amplifier will return to 'RUN mode' (normal sensing operation).

5-4. Timer Operation Setting

Factory setting: `dELY  non`

This mode sets the timer operation and timer period. Without timer, ON-delay timer, or OFF-delay timer can be set. In case of setting ON-delay timer or OFF-delay timer in the timer operation setting mode, timer period can be set.

`2000  3000`

↓ Press MODE key for 2 sec.

`SEt`

Automatic ↓

`tAch  3000`

↓ Press MODE key 2 times.

The current timer operation `dELY  non` (Without timer)

Press △ or ▽ to select the timer operation to be set.

`dELY  non` ⬌ `dELY  ond` ⬌ `dELY  oFd`
(Without timer)   (ON-delay timer)   (OFF-delay timer)

Press MODE key to confirm.   Press MODE key to confirm.

<Timer period setting>

`ond  10`   `oFd  10`
(ON-delay timer period)   (OFF-delay timer period)

Press △ or ▽ to select the timer period from 1 ms, 5 ms, 10 ms, 20 ms, 40 ms, 50 ms, 100 ms, 500 ms or 1,000 ms.

↓ Press MODE key to confirm.

The current light-emitting amount setting `PctL  oFF` (OFF)

↓ Press MODE key for 2 sec. or 2 times.

`2000  3000`
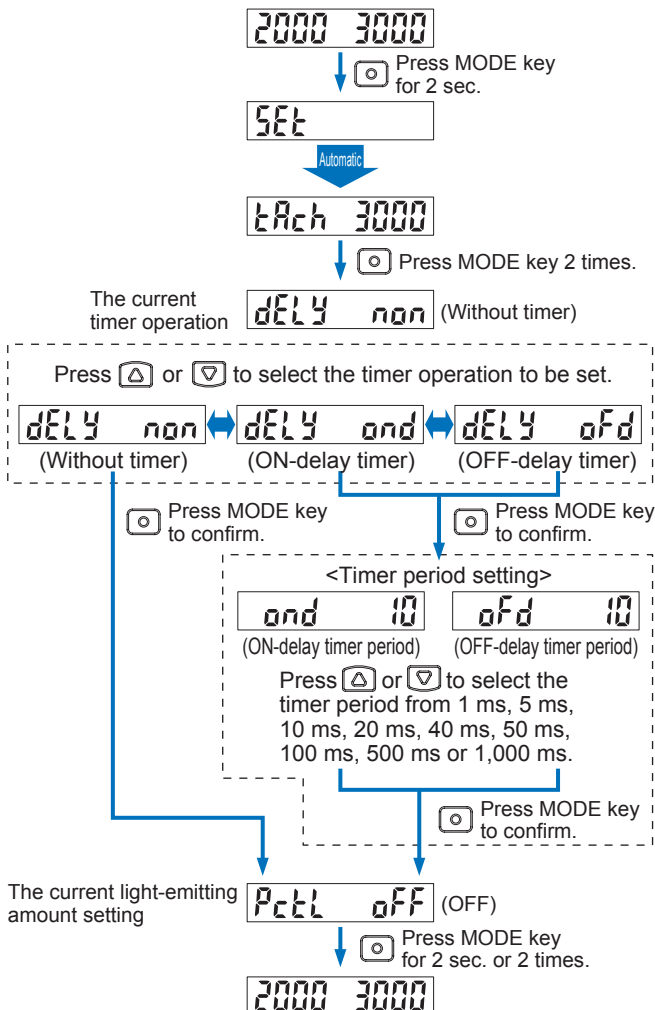
① Press the ⊙ (MODE key) for 2 sec. to select 'SET mode'.

② Press the ⊙ (MODE key) 2 times to select 'timer setting mode'.

③ Press △ (setting value UP key) or ▽ (setting value DOWN key) to select the timer operation to be set.

④ Press ⊙ (MODE key) to confirm the setting.

<In case of setting ON-delay timer or OFF-delay timer>
The current timer period will be indicated.

⑤ Press △ (setting value UP key) or ▽ (setting value DOWN key) to select the timer operation to be set.

⑥ Press ⊙ (MODE key) to confirm the setting.
   * After the setting is confirmed, operation will move to 'light-emitting amount selection setting'. To continue with setting light-emitting amount selection, carry out the procedure from step ③ of '**5-5. Light-emitting Amount Selection Settings**' (p.11). In addition, to carry out any other basic settings, press ⊙ (MODE key) to select the setting item.

⑦ Press the ⊙ (MODE key) 2 times or keep it pressed for 2 sec. or more, the amplifier will return to 'RUN mode' (normal sensing operation).

5-5. Light-emitting Amount Selection Setting

Factory setting: `PctL  oFF`

Allows light reduction to be set for the light-emitting amount.
Use this setting if sensing is difficult because the incident light intensity is saturated (4,000 or higher).

> If the incident light intensity is still saturated (4,000 or higher) even when the light reduction setting '`PctL  on`' is used, make the distance between the sensing objects and the fiber head longer.

`2000  3000`

↓ Press MODE key for 2 sec. or 5 times.

`SEt`

Automatic

`tAch  3000`

↓ Press MODE key 3 times.*

The current light-emitting amount selection setting `PctL  oFF` (OFF)

Press △ or ▽ to select the light-emitting amount selection setting to be set.

`PctL  oFF` ⬌ `PctL  on`

(Setting for reduced intensity: OFF)　(Setting for reduced intensity: ON)

↓ Press MODE key to confirm.

In case of **FX-101☐**
The current emission frequency setting `FrE9 F- 0` Emission frequency 0

In case of **FX-102☐**
`FrE9 F-01` Emission frequency 1

↓ Press MODE key for 2 sec. or once.

`2000  3000`

① Press the ◎ (MODE key) for 2 sec. to select 'SET mode'.

② Press the ◎ (MODE key) 3 times* to select 'light-emitting amount selection setting'.
  * Press 4 times when setting the ON-delay timer or the OFF-delay timer.

③ Press △ (setting value UP key) or ▽ (setting value DOWN key), and then select '`PctL  on`' (setting for reduced intensity: ON) to set light reduction.

④ Press ◎ (MODE key) to confirm the setting.
  * After the setting is confirmed, operation will move to 'emission frequency setting'. To continue with setting emission frequency, carry out the procedure from step ③ of '**5-6. Emission Frequency Setting**' (p.12). In addition, to carry out any other basic settings, press ◎ (MODE key) to select the setting item.

⑤ Press the ◎ (MODE key) once or keep it pressed for 2 sec. or more, the amplifier will return to 'RUN mode' (normal sensing operation).
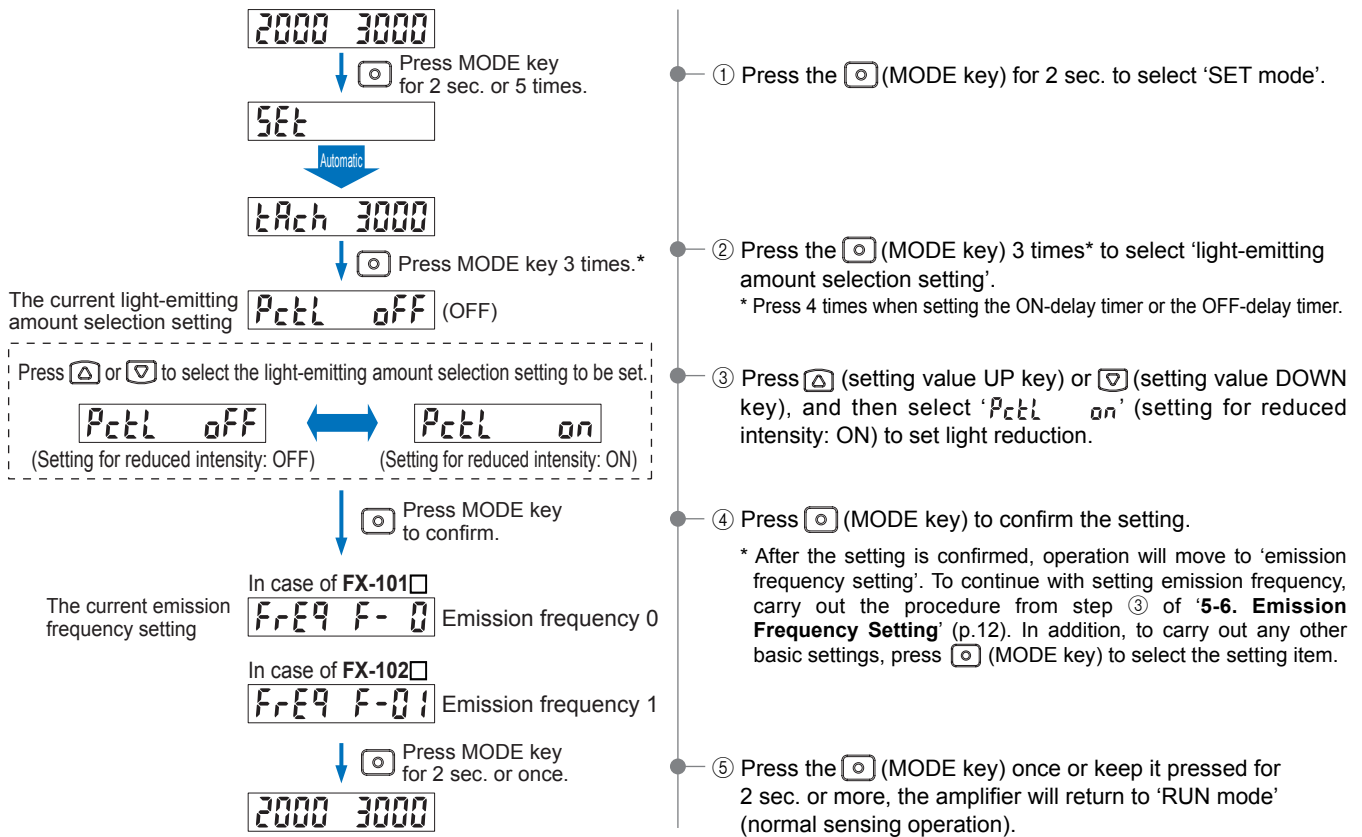
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5-6. Emission Frequency Setting

Factory setting: **FX-101□** `FrE9 F- 0`, **FX-102□** `FrE9 F-01`

When fiber heads are used side-by-side, the emission frequencies for each amplifier can be set to different frequencies in order to prevent interference.

> • For the **FX-101□**, the interference prevention function will not operate for emission frequency 0 (factory setting).
> • The response time will change when the emission frequency is changed.

`2000  3000`

↓ Press MODE key for 2 sec.

`SEt`

Automatic ↓

`tAch  3000`

↓ Press MODE key 4 times.*

In case of **FX-101□**

The current emission frequency setting `FrE9 F- 0` Emission frequency 0

In case of **FX-102□**

`FrE9 F-01` Emission frequency 1

Press △ or ▽ to select the emission frequency to be set.

In case of **FX-101□** : Select emission frequency from 'F- 0', 'F-01', 'F-02', 'F-03'

In case of **FX-102□** : Select emission frequency from 'F-01', 'F-02', 'F-03', 'F-04'

Emission frequency	FX-101□		FX-102□		Combination for interference prevention function to be enabled	Light-emitting operation during setting
	Display	Response time	Display	Response time		
0	F- 0	250 μs or less	—	—	None	Lights up
1	F-01	450 μs or less	F-01	2.5 ms or less	F-02, F-03, F-04	Blinks extremely quickly
2	F-02	500 μs or less	F-02	2.8 ms or less	F-01, F-03, F-04	Blinks quickly
3	F-03	600 μs or less	F-03	3.2 ms or less	F-01, F-02, F-04	Blinks slowly
4	–	–	F-04	5.0 ms or less	F-01, F-02, F-03	Blinks extremely slowly

Note: The operation indicator (orange) will operate in the same way.

↓ Press MODE key to confirm.

`2000  3000`

---

① Press the ⊙ (MODE key) for 2 sec. to select 'SET mode'.

② Press the ⊙ (MODE key) 4 times* to select the 'emission frequency setting'.
* Press 5 times when setting the ON-delay timer or the OFF-delay timer.

③ Press △ (setting value UP key) or ▽ (setting value DOWN key) to select the emission frequency to be set.

The operation indicator and the beam-emitting part blink while setting emission frequency. (When emission frequency 0 is set, they light up.) The blinking cycle depends on each emission frequency. (Refer to the table at left.)

④ Press ⊙ (MODE key) to confirm the setting.
After the setting is confirmed, operation will return to 'RUN mode' (normal sensing operation).

6 PRO Mode

6-1. PRO Mode Functions and Settings

PRO mode is the mode used for making detailed settings. There are nine items that can be set.

`SHFL` : **Shift Setting**	Shift amount can be selected from 0 to 80 % (1 % intervals) in the limit teaching [＋, －] and the threshold value follow-up cycle setting.

Refer to p.18 for setting procedure

Shift amount can be selected from 0 to 80 % (1 % intervals) in the limit teaching [＋, －] and the threshold value follow-up cycle setting.
Select 0 % when it is desired to set the present incident light intensity as a threshold value.
* The factory setting is '15 %'.

`InPL` : **External Input Setting**

Refer to p.18 for setting procedure

External input can be selected from emission halt, limit teaching [＋], limit teaching [－], full-auto teaching, and ECO.
* The factory setting is 'emission halt'.

> • Note that when set to ECO, key operations are disabled during external input.
> • If '`E-oF`' and '　`0`' (incident light intensity) are blinking alternately in the digital displays, check if there is a contact between the output wire (black) and the external input wire (white).

[I/O circuits and external input conditions]

<NPN output type>

※1
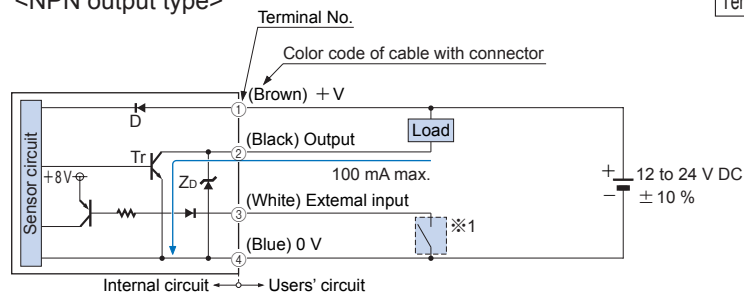
Non-voltage contact or NPN open-collector transistor
or
High (＋8 V to ＋V DC or open): Ineffective
Low [0 to ＋2 V DC (source current 0.5 mA or less)] : Effective
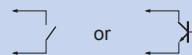
• External input
  Input impedance: 10 kΩ approx.

<PNP output type>

※1
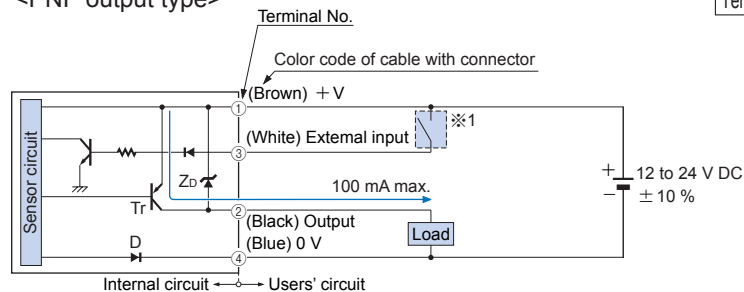
Non-voltage contact or PNP open-collector transistor
or
High [＋4 V to ＋V DC (sink current 0.5 to 3 mA)]: Effective
Low (0 to ＋0.6 V DC or open): Ineffective
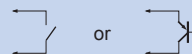
• External input
  Input impedance: 10 kΩ approx.

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Time chart

If emission halt (`E_oF`) is selected
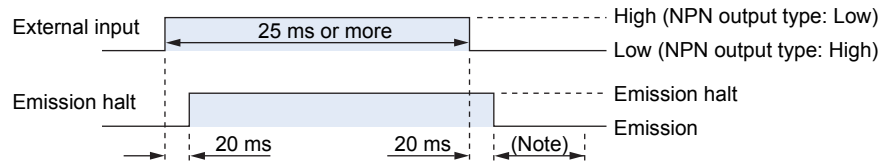
External input — 25 ms or more — High (NPN output type: Low) / Low (NPN output type: High)

Emission halt — 20 ms — 20 ms — (Note) — Emission halt / Emission

Note: Output operation will be undetermined only during the response time.
If the output signal is received by something such as a PLC, set the timer to a value of 20 ms＋fiber sensor response time or greater.
Example: For the **FX-101□** with emission frequency 0 (response time 250 μs or less)
Timer period: 20 ms ＋ 0.25 ms (250 μs) ＝ 20.25 ms

If limit teaching (`LtrP`, `Ltr-`) is selected

External input — 25 ms or more — High (NPN output type: Low) / Low (NPN output type: High)

Limit teaching — 20 ms — (Note) — Teaching in progress / Normal operation
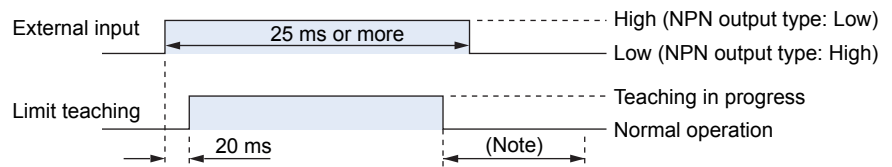
Note: After teaching is complete, output operation will be undetermined only during the response time.
If the output signal is received by something such as a PLC, set the timer to the fiber sensor response time or greater.
The threshold value will be set based on the incident light intensity at the instant when teaching is verified.

If full-auto teaching (`Auto`) is selected

External input — 25 ms or more (Note 1) — High (NPN output type: Low) / Low (NPN output type: High)

Full-auto teaching — Sampling in progress — Teaching in progress — 20 ms — 20 ms — (Note 2) — Normal operation
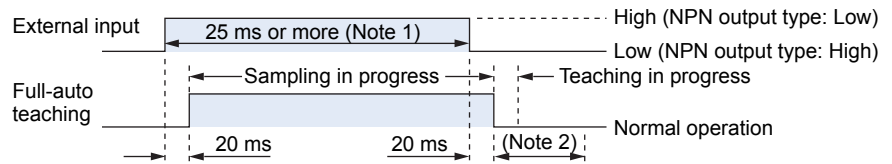
Notes: 1) Move the sensing object past once during the time that the input signal is being input.
2) After teaching is complete, output operation will be undetermined only during the response time.
If the output signal is received by something such as a PLC, set the timer to the fiber sensor response time or greater.

If ECO (`Eco`) is selected

External input — 25 ms or more — High (NPN output type: Low) / Low (NPN output type: High)

ECO — 20 ms — 20 ms — (Note) — For ECO / Normal operation

Note: Output operation will be undetermined only during the response time.
If the output signal is received by something such as a PLC, set the timer to a value of 20 ms ＋ fiber sensor response time or greater.
Example: For the **FX-101□** with emission frequency 0 (response time 250 μs or less)
Timer period: 20 ms ＋ 0.25 ms (250 μs) ＝ 20.25 ms

Follow-up of the threshold value can be carried out within a set range (shift amount) in response to fluctuations in the incident light intensity. The threshold value follow-up operation functions by setting the time for refreshing of the threshold value. At this time, the threshold value at the time of the refresh is indicated on the green digital display.

However, the threshold value is not stored. (The threshold value returns to the original value when the power is turned off.)

[Usage conditions]

This is enabled when thru-beam type fibers or retroreflective type fibers are being used and output operation is set to Dark-ON.

| Thru-beam type fiber | Retroreflective type fiber |

Output operation: Dark-ON   Output operation: Dark-ON
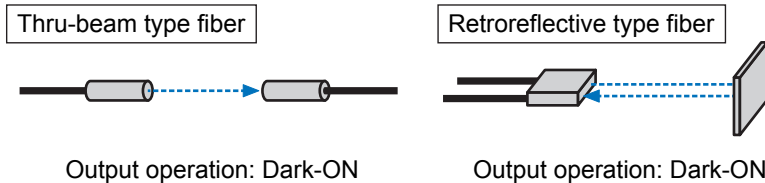
* If output operation is set to Light-ON, the threshold value is not refreshed.

The threshold value follow-up cycle can be set to between 1 to 59 sec. (1-sec. intervals), 1 to 9 min. (1-min. intervals) and 10 to 60 min. (10-min. intervals).

The incident light intensity is checked and the threshold value is reset each time after the threshold value follow-up cycle which has been set.

However, the threshold value is not stored.

The shift amount for follow-up is the shift amount which has been set according to '**6-2. Shift setting**' (p.18).

Shift amount: Can be set to between 0 to 80 % (1 % intervals).

(The factory setting is '15 %'.)
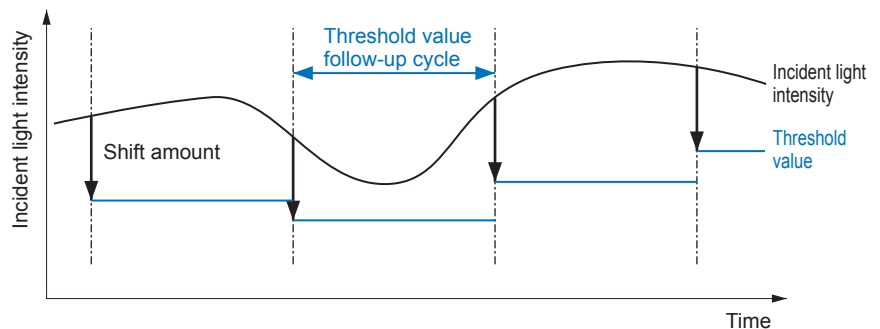
When threshold value follow-up operation is being carried out, the follow-up operation stops when the incident light intensity drops to 300 or lower.
At this time, the threshold value blinks in the digital display (green).

<Graph showing long-term follow-up>
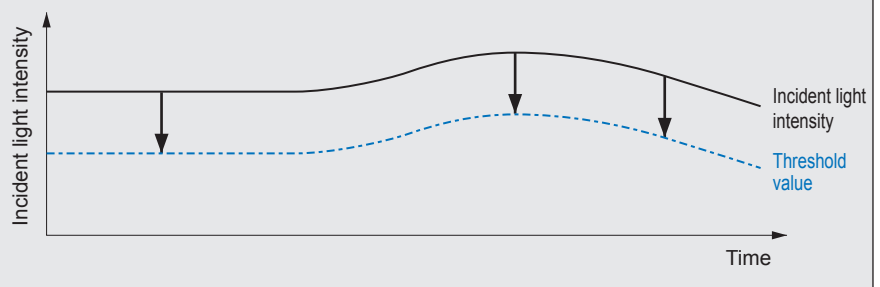
* The factory setting is 'OFF'.

⌂⌂⌂⌂ : GETA Function Setting

Refer to p.20 for setting procedure

The display value for the incident light intensity can be offset by the desired value (target value).
The target value can be set to between 0 and 2,000 (in intervals of 100).
For example, if the incident light intensity is 1,500 and the target value is set to 2,000, then the value appearing in the digital display will be 2,000.

> • If you press ⊙ (MODE key) during RUN mode when using the GETA function, the incident light intensity before the GETA function was used will be indicated on the red digital display for 2 sec.
> • If this function is used while the incident light intensity is saturated (4,000 or higher), ' HArd ' will be indicated on the red digital display. The maximum offset value is 4,000.

| Normal | When using the GETA function |

Incident light intensity display

2000
1900
1800
•
•
•
300
200
100
0

Setting possible in intervals of 100
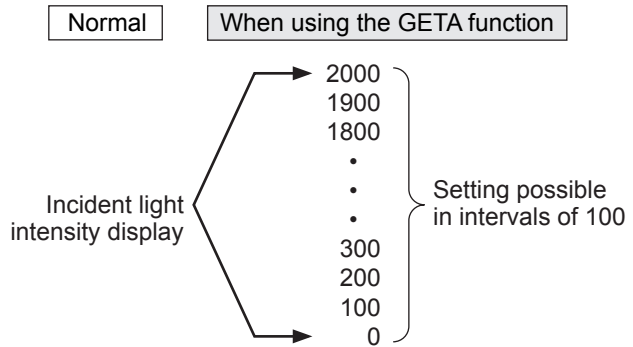
Example 1: Setting an incident light intensity display of ' 500 ' to display as ' 1000 '

4,000 [digits]

Incident light intensity

500

0

4,000 [digits]

1,000

500

Not displayed

0

Because the original value is 500, the displays for the lower limit value will be 500 and the upper limit value will be 4,000.
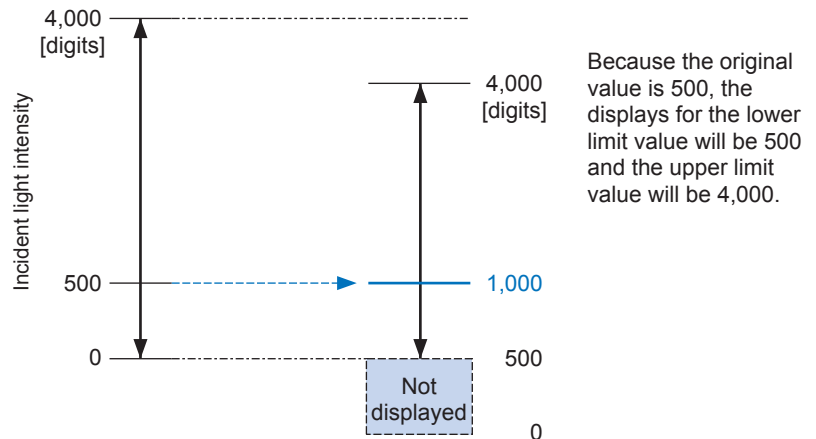
Example 2: Setting an incident light intensity display of ' 500 ' to display as ' 0 ' (0-adjust)

4,000 [digits]

4,000 [digits]

3,500

Incident light intensity

500

0

0

Because the original value is 0, the displays for the lower limit value will be 0 and the upper limit value will be 4,000.
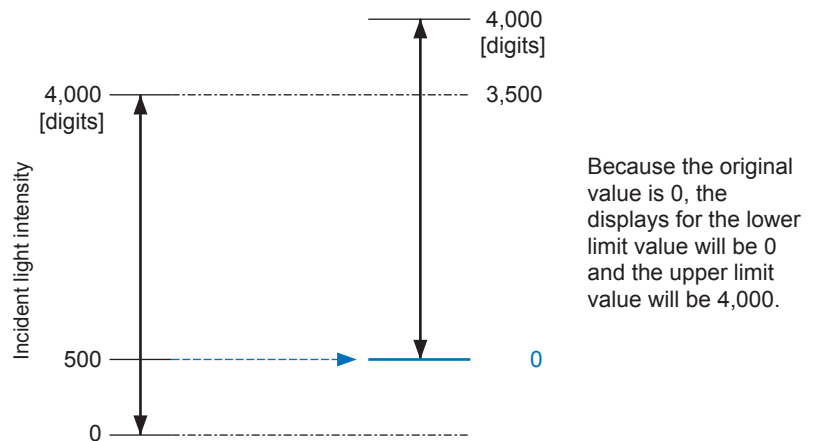
* The factory setting is 'GETA OFF'.

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Eco : ECO Setting

Refer to p.21 for setting procedure

The digital display can be set to turn off in order to reduce power consumption (current consumption). When the ECO setting has been set to ON, 'Eco' will blink if no keys have been pressed for approx. 20 sec. while in RUN mode, and then the digital display will switch off.
To switch the digital display back on again, press and hold any one of the three keys for 2 sec. or more.
* The factory setting is 'ECO OFF'.

Note that key operations will be invalid if the ECO setting has been set by means of external input.

●ECO OFF

FX-100 series
2006 3940
MODE ON OFF

Power consumption

720 mW or less
(Current consumption 30 mA or less at 24 V supply voltage)

●ECO ON

FX-100 series
MODE ON OFF

Power consumption

600 mW or less
(Current consumption 25 mA or less at 24 V supply voltage)

turn : Digital Display Inversion Setting

Refer to p.22 for setting procedure

The viewing orientation of the digital display can be inverted in accordance with the mounting direction of the amplifier.
* The factory setting is 'Turn OFF'.

●Turn OFF

FX-100 series
2006 3940
MODE ON OFF

●Turn ON

FX-100 series
9002 0h6E
MODE ON OFF

ALrt : Threshold Value Margin Setting

Refer to p.22 for setting procedure

Margin for threshold value to the present incident light intensity can be checked. When there is no margin, it is possible to make the digital display blink. The incident light intensity when the display starts blinking will be approximately half of the shift amount. [For the shift amount, refer to '**Shift setting** (p.13, p.18)'.]

<If using a shift amount of 20 % and a threshold value of 1,000>

The incident light intensity range that will cause the digital display to blink will be from approx. 900 to approx. 1,100.
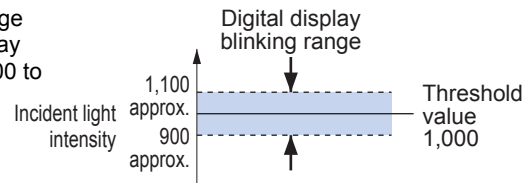
Digital display blinking range

Incident light intensity
1,100 approx.
900 approx.

Threshold value
1,000

The blinking method for the digital display can be selected from blinking green (threshold value blinks), blinking red (incident light intensity blinks) and blinking green and red simultaneously (threshold value and incident light intensity blink simultaneously).
* The factory setting is 'OFF'.

CoPY : Setting Copy

Refer to p.23 for setting procedure

The settings of the master side amplifier can be copied to the slave side amplifier.
The copying method used is data communication by means of connected wiring. For details on the setting procedure and wiring, refer to p.23.
* The factory setting is 'Do not copy settings (Copy NO)'.

• Be sure to use the setting copy function between the identical models (for all **FX-101□** units or all **FX-102□** units). This function cannot be used between different models.
• Only one amplifier can be connected on slave side with a master side amplifier for the setting copy function. If copying to more than one unit, make the settings for one unit at a time.
• 'Threshold value', 'output operation setting', 'timer operation setting', 'timer period setting', 'light-emitting amount selection setting', 'shift setting', 'ECO setting', 'digital display inversion setting', and 'threshold value margin setting' can be copied.

rSEt : Reset

Refer to p.24 for setting procedure

All settings can be returned to factory settings.
For details on the default values for factory settings, refer to p.3.
* The factory setting is 'Do not reset (Reset NO)'.

6-2. Shift Setting

Shift amount during limit teaching [＋, －] and threshold value follow-up cycle setting can be selected from 0 to 80 % (1 % intervals). Select 0 % when it is desired to set the present incident light intensity as a threshold value.

`2000  3000`

↓ Press MODE key for 4 sec.

`Pro`

Automatic

The current shift amount `SHFt    15P` (15 %)

┌───┐
Press △ or ▽ to set the shift amount to between 0 % and 80 % (1 % intervals).
└───┘

↓ Press MODE key to confirm.

The current external input `InPt  E-oF` (Emission halt)

↓ Press MODE key for 2 sec. or 8 times.

`2000  3000`
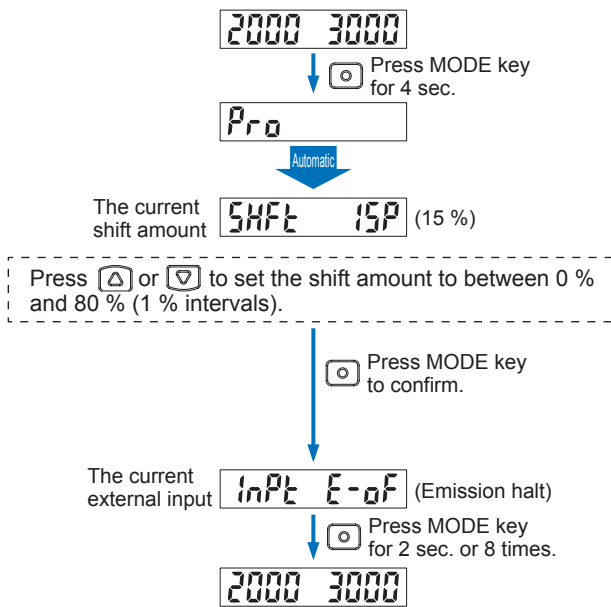
① Press the ◎ (MODE key) for 4 sec. to select 'PRO mode'.

② Press △ (setting value UP key) or ▽ (setting value DOWN key) to select the shift amount to be set.

③ Press ◎ (MODE key) to confirm the setting.

* After the setting is confirmed, operation will move to 'external input setting'. To continue with setting external input, carry out the procedure from step ③ of '**6-3. External Input Setting**' (p.18). In addition, to carry out any other basic settings, press ◎ (MODE key) to select the setting item.

④ Press the ◎ (MODE key) 8 times or keep it pressed for 2 sec. or more, the amplifier will return to 'RUN mode' (normal sensing operation).

6-3. External Input Setting

External input can be selected from emission halt, limit teaching [＋], limit teaching [－], full-auto teaching, and ECO.

┌───┐
• Note that when set to ECO, key operations are disabled during external input.
• If '`E-oF`' and '`0`' (incident light intensity) are blinking alternately in the digital displays, check if there is a contact between the output wire (black) and the external input wire (white).
└───┘

`2000  3000`

↓ Press MODE key for 4 sec.

`Pro`

Automatic

`SHFt    15P` (15 %)

↓ Press MODE key once.

The current external input `InPt  E-oF` (Emission halt)

┌───┐
Press △ or ▽ to select the external input to be set.

`InPt  E-oF` ↔ `InPt  LtcP` ↔ `InPt  Ltc-`
(Emission halt) (Limit teaching [＋]) (Limit teaching [－])

`InPt  Eco` ↔ `InPt  Auto`
(ECO) (Full-auto teaching)
└───┘

↓ Press MODE key to confirm.

The current threshold value follow-up cycle setting `CYcL    oFF` (OFF)

↓ Press MODE key for 2 sec. or 7 times.

`2000  3000`
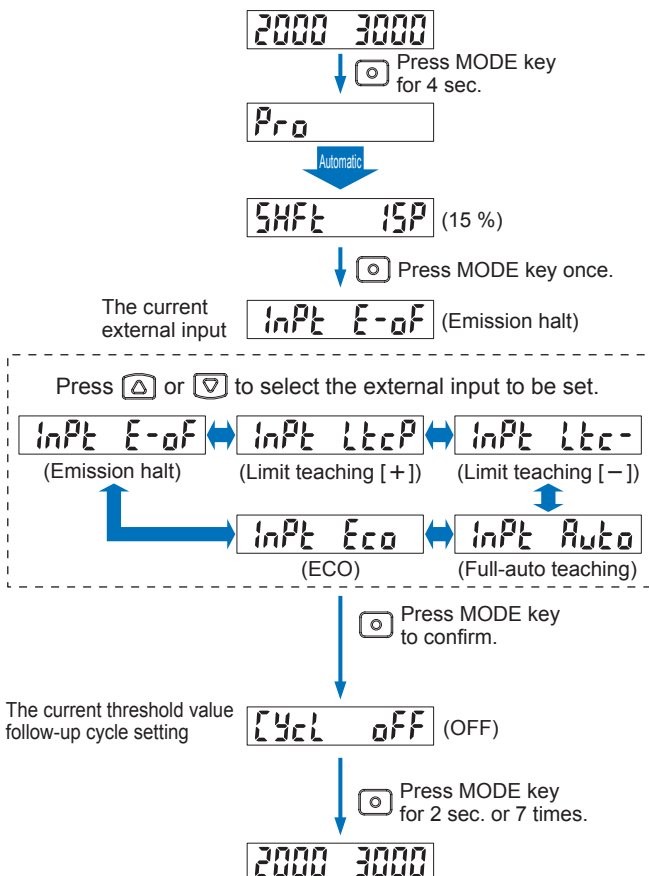
① Press the ◎ (MODE key) for 4 sec. to select 'PRO mode'.

② Press the ◎ (MODE key) once to select 'external input setting'.

③ Press △ (setting value UP key) or ▽ (setting value DOWN key) to select the external input to be set.

④ Press ◎ (MODE key) to confirm the setting.

* After the setting is confirmed, operation will move to threshold value 'follow-up cycle setting'. To continue with setting threshold value follow-up cycle, carry out the procedure from step ③ of '**6-4. Threshold Value Follow-up Cycle Setting**' (p.19). In addition, to carry out any other basic settings, press ◎ (MODE key) to select the setting item.

⑤ Press the ◎ (MODE key) 7 times or keep it pressed for 2 sec. or more, the amplifier will return to 'RUN mode' (normal sensing operation).

6-4. Threshold Value Follow-up Cycle Setting

Factory setting: `CYcL    oFF`

Follow-up of the threshold value can be carried out within a set range (shift amount) in response to fluctuations in the incident light intensity. The threshold value follow-up operation functions by setting the time for refreshing of the threshold value. However, the threshold value is not stored.

The shift amount for follow-up is the shift amount which has been set according to '**6-2. Shift Setting**' (p.18).

> When threshold value follow-up operation is being carried out, the follow-up operation stops when the incident light intensity drops to 300 or lower.
> At this time, the threshold value blinks in the digital display (green).

`2000 3000`

Press MODE key for 4 sec.

① Press the (MODE key) for 4 sec. to select 'PRO mode'.

`Pro`

Automatic

`SHFt    15P` (15 %)

Press MODE key 2 times.

② Press the (MODE key) 2 times to select 'Threshold value follow-up cycle setting'.

The current threshold value follow-up cycle setting `CYcL    oFF` (OFF)

Press △ or ▽ to select the threshold value follow-up cycle to be set.

③ Press △ (setting value UP key) or ▽ (setting value DOWN key) to select the threshold value follow-up cycle to be set.

`CYcL    oFF` ↔ `CYcL    1"` ↔ `CYcL    1'0"`

(OFF) (1 to 59 sec. <1-sec. intervals>) (1 to 9 min. <1-min. intervals>)

`CYcL    10'`

(1 to 60 min. <10-min. intervals>)

Press MODE key to confirm.

④ Press (MODE key) to confirm the setting.
 * After the setting is confirmed, operation will move to 'GETA function setting'. To continue with setting GETA function, carry out the procedure from step ③ of '**6-5. GETA Function Setting**' (p.20). In addition, to carry out any other basic settings, press (MODE key) to select the setting item.

The current GETA function setting `GETA    oFF` (OFF)

Press MODE key for 2 sec. or 6 times.

⑤ Press the (MODE key) 6 times or keep it pressed for 2 sec. or more, the amplifier will return to 'RUN mode' (normal sensing operation).

`2000 3000`

19

6-5. GETA Function Setting

Factory setting: $GEtA\ \ oFF$

The display value for the incident light intensity can be offset by the desired value (target value).

The target value can be set to between 0 and 2,000 (100 intervals).

For example, if the incident light intensity is 1,500 and the target value is set to 2,000, then the value appearing in the digital display will be 2,000.

- If you press ⊙ (MODE key) during RUN mode when using the GETA function, the incident light intensity before the GETA function was used will be indicated on the red digital display for 2 sec.
- If this function is used while the incident light intensity is saturated (4,000 or higher), '$HArd$' will be indicated on the red digital display. The maximum offset value is 4,000.

$2000\ \ 3000$

⊙ Press MODE key for 4 sec.

Pro

Automatic

$SHFt\ \ 15P$ (15 %)

⊙ Press MODE key 3 times.

The current GETA function setting $GEtA\ \ oFF$ (OFF)

$GEtA\ \ 100$ (When current target value is 100)

⬌ : When set to OFF

⬌ : When target value is set

Press △ or ▽ to select the GETA function to be set.

$GEtA\ \ oFF$ $GEtA\ \ SEt$ $GEtA\ \ 100$
(OFF)   (SET)   (When current target value is 100)

⊙ Press MODE key to confirm.   ⊙ Press MODE key to confirm.

<For SET setting>

Target value setting $SEt\ \ \ \ 0$ (0)

Press △ or ▽ to select the target value for the incident light intensity offset to between 0 and 2,000 (in intervals of 100).

⊙ Press MODE key to confirm.

The current ECO setting $Eco\ \ oFF$ (OFF)

⊙ Press MODE key for 2 sec. or 5 times.

$2000\ \ 3000$

---

① Press the ⊙ (MODE key) for 4 sec. to select 'PRO mode'.

② Press the ⊙ (MODE key) 3 times to select 'GETA function setting'.

③ Press △ (setting value UP key) or ▽ (setting value DOWN key), and then select '$GEtA\ \ SEt$' (SET) to set the GETA function.

  * If a target value has already been set, the 'Current target value' / 'OFF' / 'SET' displays will appear. Select SET to change the target value.

④ Press ⊙ (MODE key) to confirm the setting.

<For SET setting>
The current target value will be indicated, and the target value can then be changed.

⑤ Press △ (setting value UP key) or ▽ (setting value DOWN key), and then set the desired target value.

⑥ Press ⊙ (MODE key) to confirm the setting.

  * After the setting is confirmed, operation will move to 'ECO setting'. To continue with setting ECO, carry out the procedure from step ③ of '**6-6. ECO Settings**' (p.21). In addition, to carry out any other basic settings, press ⊙ (MODE key) to select the setting item.

⑦ Press the ⊙ (MODE key) 5 times or keep it pressed for 2 sec. or more, the amplifier will return to 'RUN mode' (normal sensing operation).
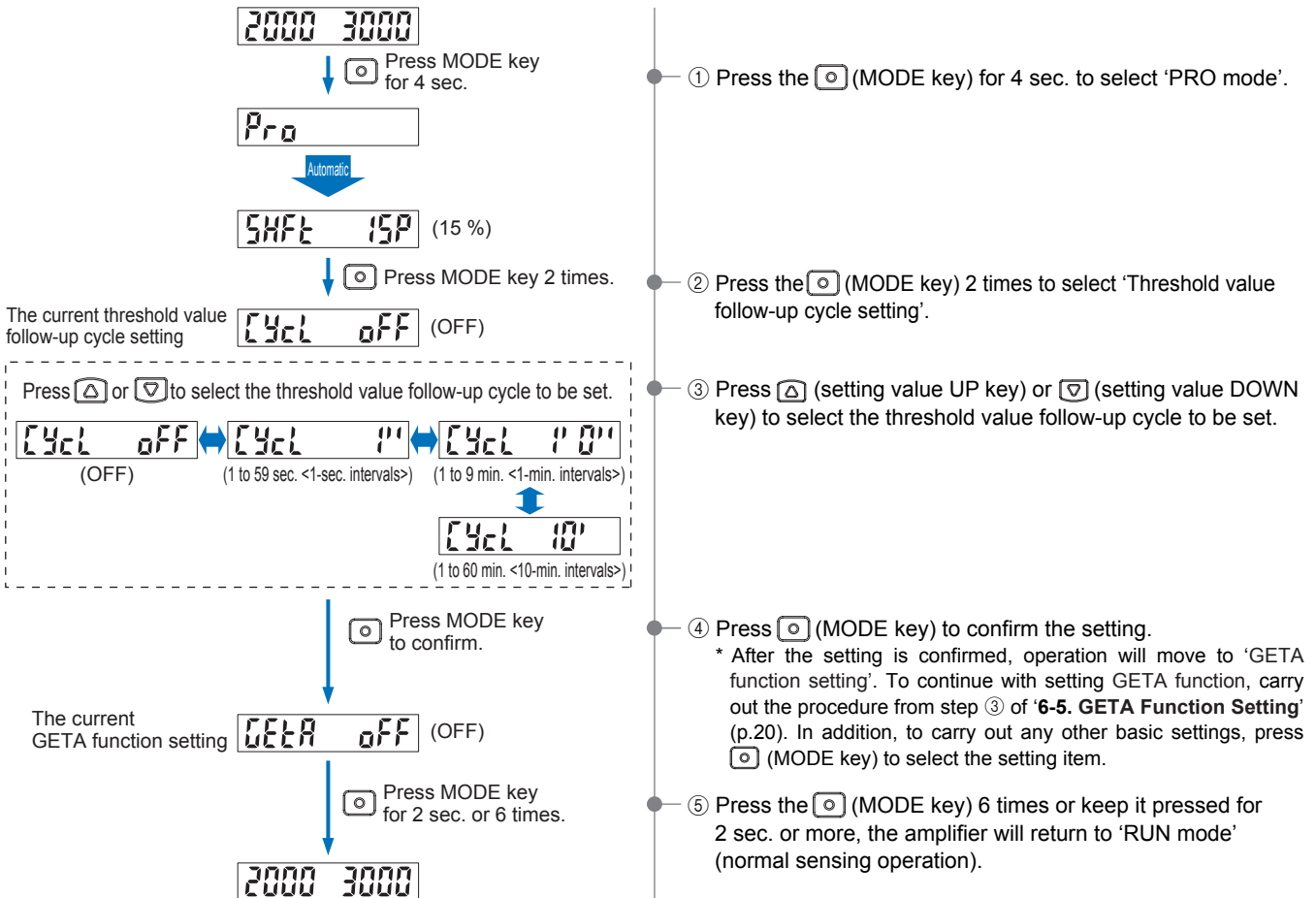
6-6. ECO Setting

Factory setting: `Eco    oFF`

The digital display can be set to turn off in order to reduce power consumption (current consumption). When the ECO setting has been set to ON, '`Eco`' will blink if no keys have been pressed for approx. 20 sec. while in RUN mode, and then the digital display will turn off.

To switch the digital display back on again, press and hold any one of the three keys for 2 sec. or more.

> Note that key operations will be invalid if the ECO setting has been set by means of external input.

`2000  3000`

↓ Press MODE key for 4 sec.

`Pro`

Automatic

`SHFt   15P` (15 %)

↓ Press MODE key 4 times.

The current ECO setting `Eco    oFF` (OFF)

Press △ or ▽ to select the ECO setting to be set.

`Eco    oFF` ⟷ `Eco    on`
(OFF)   (ON)

↓ Press MODE key to confirm.

The current digital display inversion setting `turn   oFF` (OFF)

↓ Press MODE key for 2 sec. or 4 times.

`2000  3000`

<ECO ON>

Automatic No operation has been performed for 20 sec.

`Eco` (blinking)

Automatic

Turns off | Press any of the three keys for 2 sec. or more to switch the display back on.

---

① Press the ⦿ (MODE key) for 4 sec. to select 'PRO mode'.

② Press the ⦿ (MODE key) 4 times to select 'ECO setting'.

③ Press △ (setting value UP key) or ▽ (setting value DOWN key) to select the ECO setting to be set.

④ Press ⦿ (MODE key) to confirm the setting.
   * After the setting is confirmed, operation will move to 'digital display inversion setting'. To continue with setting digital display inversion, carry out the procedure from step ③ of '**6-7. Digital Display Inversion Setting**' (p.22). In addition, to carry out any other basic settings, press ⦿ (MODE key) to select the setting item.

⑤ Press the ⦿ (MODE key) 4 times or keep it pressed for 2 sec. or more, the amplifier will return to 'RUN mode' (normal sensing operation).

⑥ Only when the unit is set to ECO ON and no operations are performed for 20 sec., will the letters '`Eco`' blink and the digital display then turn off.

⑦ If any of the three keys are pressed for 2 sec. or more, the digital display will switch back on.

21

6-7. Digital Display Inversion Setting

Factory setting: `turn  oFF`

The viewing orientation of the digital display can be inverted in accordance with the setting direction of the amplifier. If the digital display inversion setting has been set to ON, the display will be inverted.

`2000 3000`

Press MODE key for 4 sec.

`Pro`

Automatic

`SHFt  15P` (15 %)

Press MODE key 5 times.

The current digital display inversion setting `turn  oFF` (OFF)

Press △ or ▽ to select the digital display inversion setting to be set.

`turn  oFF` ⟷ `turn  on`
(OFF)   (ON)

Press MODE key to confirm.   Press MODE key to confirm.

The current threshold value margin setting `ALrt  oFF` (OFF)   `7-7B 11°` (OFF)

Press MODE key for 2 sec. or 3 times.   Press MODE key for 2 sec. or 3 times.

`2000 3000`   `0002 000E`

① Press the ⊙ (MODE key) for 4 sec. to select 'PRO mode'.

② Press the ⊙ (MODE key) 5 times to select 'digital display inversion setting'.

③ Press △ (setting value UP key) or ▽ (setting value DOWN key) to select the digital display inversion setting to be set.

④ Press ⊙ (MODE key) to confirm the setting.
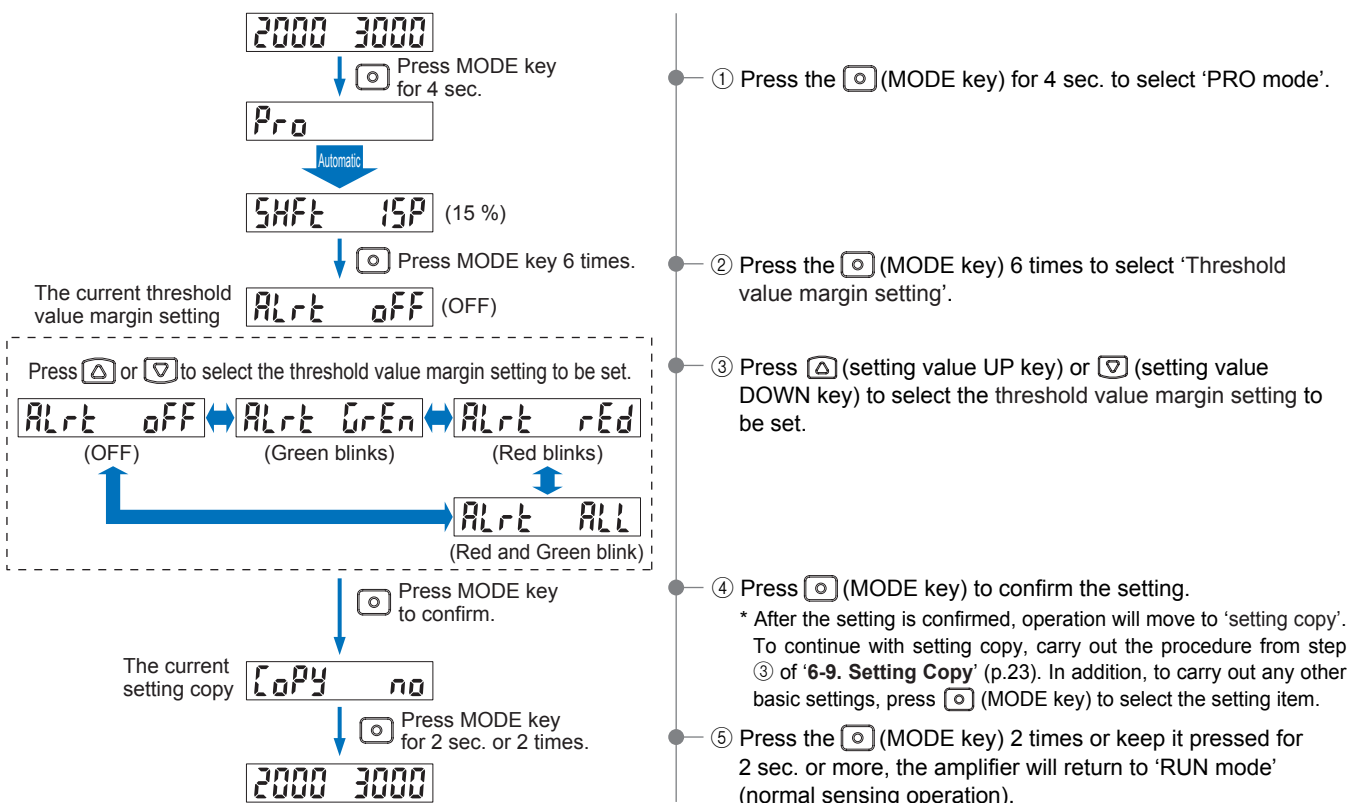If 'turn ON' is set, the display will be inverted.

Display of the threshold value in green and display of the incident light intensity in red will remain unchanged.

* After the setting is confirmed, operation will move to 'threshold value margin setting'. To continue with setting threshold value margin, carry out the procedure from step ③ of '**6-8. Threshold Value Margin Setting**' (p.22). In addition, to carry out any other basic settings, press ⊙ (MODE key) to select the setting item.

⑤ Press the ⊙ (MODE key) 3 times or keep it pressed for 2 sec. or more, the amplifier will return to 'RUN mode' (normal sensing operation).

6-8. Threshold Value Margin Setting

Factory setting: `ALrt  oFF`

Margin for threshold value to the present incident light intensity can be checked. When there is no margin, it is possible to make the digital display blink. The incident light intensity when the display starts blinking will be approximately half of the shift amount. For the shift amount, refer to '**Shift setting** (p.13, p.18)'. The blinking method for the digital display can be selected from blinking green (threshold value blinks), blinking red (incident light intensity blinks) and blinking green and red simultaneously (threshold value and incident light intensity blink simultaneously).
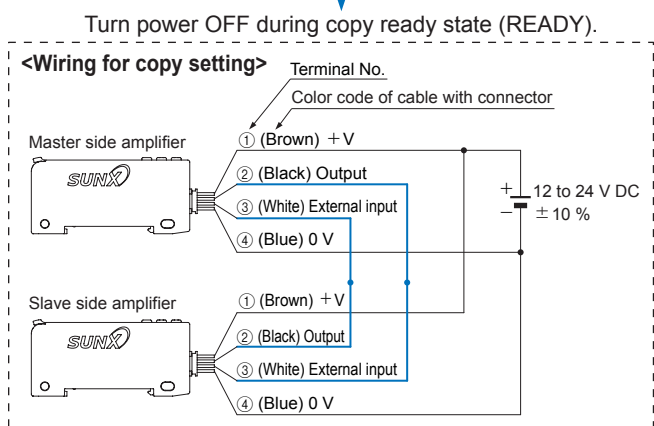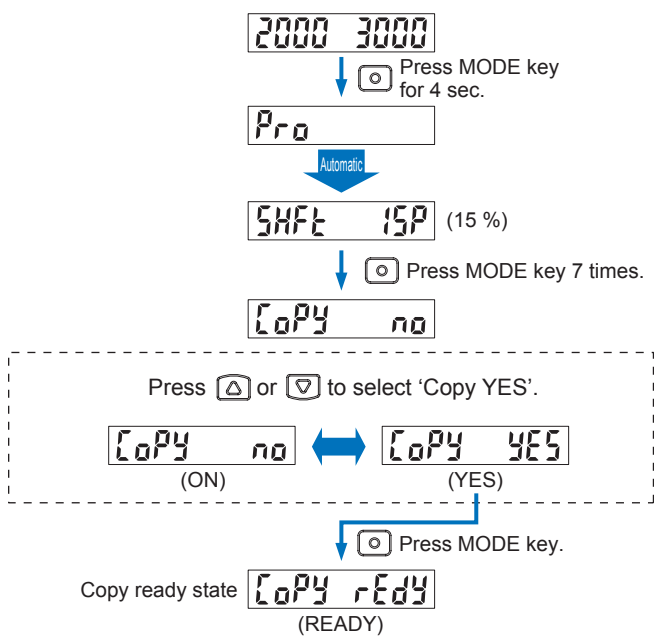
`2000 3000`

Press MODE key for 4 sec.

`Pro`

Automatic

`SHFt  15P` (15 %)

Press MODE key 6 times.

The current threshold value margin setting `ALrt  oFF` (OFF)

Press △ or ▽ to select the threshold value margin setting to be set.

`ALrt  oFF` ⟷ `ALrt  GrEn` ⟷ `ALrt  rEd`
(OFF)   (Green blinks)   (Red blinks)

`ALrt  ALL`
(Red and Green blink)

Press MODE key to confirm.

The current setting copy `CoPY  no`

Press MODE key for 2 sec. or 2 times.

`2000 3000`

① Press the ⊙ (MODE key) for 4 sec. to select 'PRO mode'.

② Press the ⊙ (MODE key) 6 times to select 'Threshold value margin setting'.

③ Press △ (setting value UP key) or ▽ (setting value DOWN key) to select the threshold value margin setting to be set.

④ Press ⊙ (MODE key) to confirm the setting.
* After the setting is confirmed, operation will move to 'setting copy'. To continue with setting copy, carry out the procedure from step ③ of '**6-9. Setting Copy**' (p.23). In addition, to carry out any other basic settings, press ⊙ (MODE key) to select the setting item.

⑤ Press the ⊙ (MODE key) 2 times or keep it pressed for 2 sec. or more, the amplifier will return to 'RUN mode' (normal sensing operation).
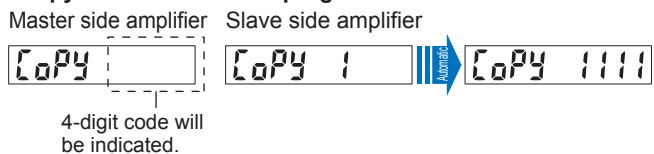
6-9. Setting copy

The settings of the master side amplifier can be copied to the slave side amplifier. Data communication will be carried out by means of connected wiring.

- Be sure to use the setting copy function between the identical models (for all **FX-101□** units or all **FX-102□** units). This function cannot be used between different models.
- Only one amplifier can be connected on slave side with a master side amplifier for the setting copy function. If copying to more than one unit, make the settings for one unit at a time.
- 'Threshold value', 'output operation setting', 'timer operation setting', 'timer period setting', 'light-emitting amount selection setting', 'shift setting', 'ECO setting', 'digital display inversion setting', and 'threshold value margin setting' can be copied.
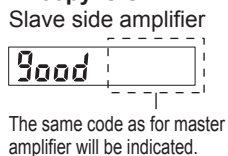
`2000 3000`

Press MODE key for 4 sec.

`Pro`

Automatic

`SHFt 15P` (15 %)

Press MODE key 7 times.

`CoPY no`

Press △ or ▽ to select 'Copy YES'.

`CoPY no` (ON) ⟷ `CoPY YES` (YES)

Press MODE key.

Copy ready state `CoPY rEdY` (READY)

Turn power OFF during copy ready state (READY).

\<Wiring for copy setting\>

Terminal No.
Color code of cable with connector

Master side amplifier
SUNX
① (Brown) +V
② (Black) Output
③ (White) External input
④ (Blue) 0 V

Slave side amplifier
SUNX
① (Brown) +V
② (Black) Output
③ (White) External input
④ (Blue) 0 V

+ 12 to 24 V DC ± 10 %

After wiring, turn power ON.

\<Copy communication in progress\>

Master side amplifier `CoPY` | Slave side amplifier `CoPY 1` Automatic `CoPY 1111`

4-digit code will be indicated.

\<If copy is OK\>
Slave side amplifier `9ood`

The same code as for master amplifier will be indicated.

\<If error during copying\>
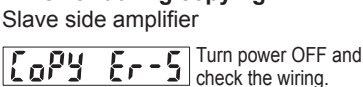Slave side amplifier `CoPY Er-5` Turn power OFF and check the wiring.

Turn power OFF and disconnect wiring.

① Press ⊚ (MODE key) at the master amplifier for 4 sec. to switch to 'PRO mode'.

② Press the ⊚ (MODE key) 7 times to select 'Setting copy'.

③ Press △ (setting value UP key) or ▽ (setting value DOWN key) to select '`CoPY YES`'.

④ Press ⊚ (MODE key) to set to the copy ready state.
If you press ⊚ (MODE key) for 2 sec. or more while in the copy ready state, the copy ready state will be canceled and the amplifier will return to 'RUN mode' (normal sensing operation).

⑤ Turn off the power for the master side amplifier which is in copy ready state.

⑥ Connect the master side amplifier with the slave side amplifier as shown below.

Make sure that the power supply is off while wiring.

⑦ Turn on the master side amplifier and the slave side amplifier at the same time.

Take care that if the power is not turned on at the same time, the setting contents may not be copied.

'`CoPY`' is indicated on the green digital display of the master side amplifier 4-digit code is indicated on the red digital display of it, then the copying starts. While copying is in progress, '`CoPY`' will be indicated on the green digital display of the slave side amplifier and the copy progress indicator ('`1`' → '`11`' → '`111`' → '`1111`') will be indicated on the red digital display.

When the copying is completed, '`9ood`' is indicated on the green digital display of the slave side amplifier. While 4-digit code (the same code as the master side amplifier) is indicated on the red digital display of it.

If communication error '`Er-5`' is displayed, turn off the power and check the wiring.

⑧ Turn off the power of the master side amplifier and the slave side amplifier and disconnect the wire.

Make sure that the power supply is off while wiring.

* If copying settings to more than one amplifier, repeat steps ⑥ to ⑧.
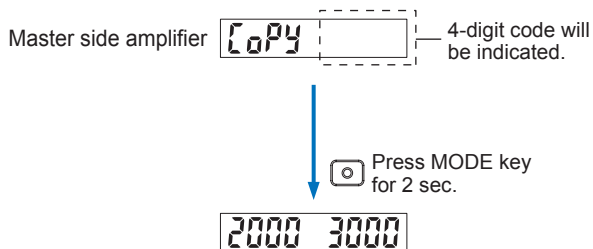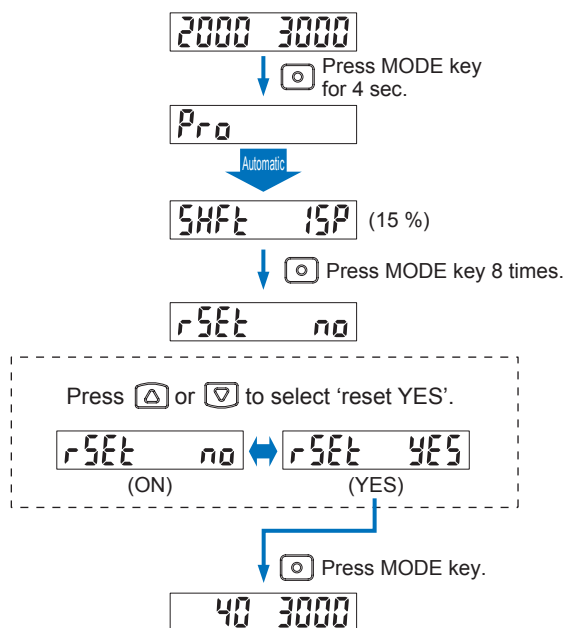
① Disconnect the wiring for both the master side amplifier and the slave side amplifier.

Make sure that the power supply is off while wiring.

Master side amplifier `CoPY` — 4-digit code will be indicated.

② Turn on the power of the master side amplifier.

Check that the output wire (black) and the external input wire (white) for the master side amplifier are not contacting any other wires or terminals, and then turn on the power.

Press MODE key for 2 sec.

`2000  3000`

③ If (MODE key) is pressed for 2 sec., 'Copy Set' will be canceled and the amplifier will return to 'RUN mode' (normal sensing operation).

6-10. Reset

Factory setting: `rSEt    no`

All settings can be returned to factory settings. For details on the default values for factory settings, refer to p.3.
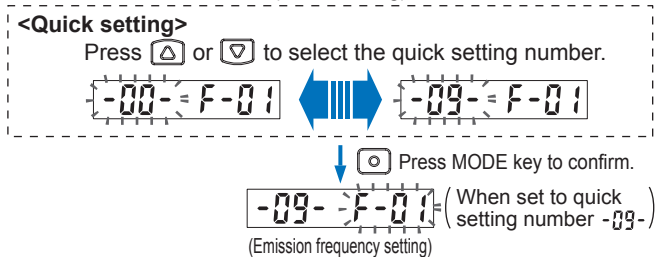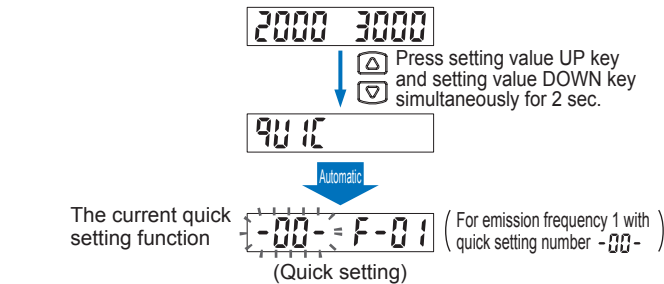
`2000  3000`

Press MODE key for 4 sec.

`Pro`

Automatic

`SHFt    15P` (15 %)

Press MODE key 8 times.

`rSEt    no`

Press △ or ▽ to select 'reset YES'.

`rSEt    no` ⟷ `rSEt    YES`
(ON)　　　　　(YES)

Press MODE key.

`40  3000`

① Press the (MODE key) for 4 sec. to select 'PRO mode'.

② Press the (MODE key) 8 times to select 'reset'.

③ Press △ (setting value UP key) or ▽ (setting value DOWN key) to select '`rSEt    YES`'(YES).

To cancel, be sure to set to '`rSEt    no`' (NO).

③ If (MODE key) is pressed, all settings will return to the factory settings and the amplifier will return to 'RUN mode' (normal sensing operation).

7 Quick Setting Function

The quick setting function allows various settings (output operation setting, timer operation setting, light-emitting amount selection setting and emission frequency setting) to be made in SET mode simply by selecting a setting number. For the setting numbers, refer to '**Table of quick setting numbers**'.
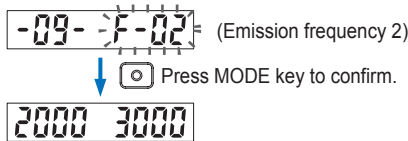
> When the present setting is out of the quick setting range, '$-88-$' is indicated on the green digital display. When '$-88-$' is selected, the set content is not changed.

```
2000 3000
```

Press setting value UP key and setting value DOWN key simultaneously for 2 sec.

```
9U IC
```

Automatic

The current quick setting function → `-00- F-01` (For emission frequency 1 with quick setting number $-00-$)

(Quick setting)

<Quick setting>

Press △ or ▽ to select the quick setting number.

`-00- F-01` ◄═════ `-09- F-01`

Press MODE key to confirm.

`-09- F-01` (When set to quick setting number $-09-$)

(Emission frequency setting)

<Emission frequency setting>

Press △ or ▽ to select the emission frequency to be set.

In case of **FX-101□** : Select emission frequency from '$F- 0$', '$F-01$', '$F-02$', '$F-03$'

In case of **FX-102□** : Select emission frequency from '$F-01$', '$F-02$', '$F-03$', '$F-04$'

Emission frequency	FX-101□		FX-102□		Combination for interference prevention function to be enabled	Light-emitting operation during setting (Note)
	Display	Response time	Display	Response time		
0	$F- 0$	250 μs or less	—	—	None	Lights up
1	$F-01$	450 μs or less	$F-01$	2.5 ms or less	$F-02, F-03, F-04$	Blinks extremely quickly
2	$F-02$	500 μs or less	$F-02$	2.8 ms or less	$F-01, F-03, F-04$	Blinks quickly
3	$F-03$	600 μs or less	$F-03$	3.2 ms or less	$F-01, F-02, F-04$	Blinks slowly
4	–	–	$F-04$	5.0 ms or less	$F-01, F-02, F-03$	Blinks extremely slowly

Note: The operation indicator (orange) will operate in the same way.

`-09- F-02` (Emission frequency 2)

Press MODE key to confirm.

```
2000 3000
```

① Press △ (setting value UP key) or ▽ (setting value DOWN key) for 2 sec. to set to quick setting mode.

> Note that if the button is pressed for 4 sec. or more, the code setting function will be enabled. To cancel, press ○ (MODE key) for 2 sec. or more.

② Press △ (setting value UP key) or ▽ (setting value DOWN key) to select the quick setting number to be set.

> If you press ○ (MODE key) for 2 sec. or more before the quick setting number is confirmed, the setting will be canceled and the mode will return to 'RUN mode'.

③ Press ○ (MODE key) to confirm the quick setting number.

> When the present setting is out of the quick setting range, '$-88-$' is indicated on the green digital display. When '$-88-$' is selected, the set content is not changed.

④ Press △ (setting value UP key) or ▽ (setting value DOWN key) to select the desired emission frequency.

The operation indicator and the beam-emitting part blink while setting emission frequency. (When emission frequency 0 is set, they light up.)
The blinking cycle depends on each emission frequency. (Refer to the table at left.)

> • For the **FX-101□**, the interference prevention function will not operate for emission frequency 0 (factory setting).
> • The response time will change when the emission frequency is changed.

⑤ Press ○ (MODE key) to confirm the emission frequency. After the setting is confirmed, operation will return to 'RUN mode' (normal sensing operation).
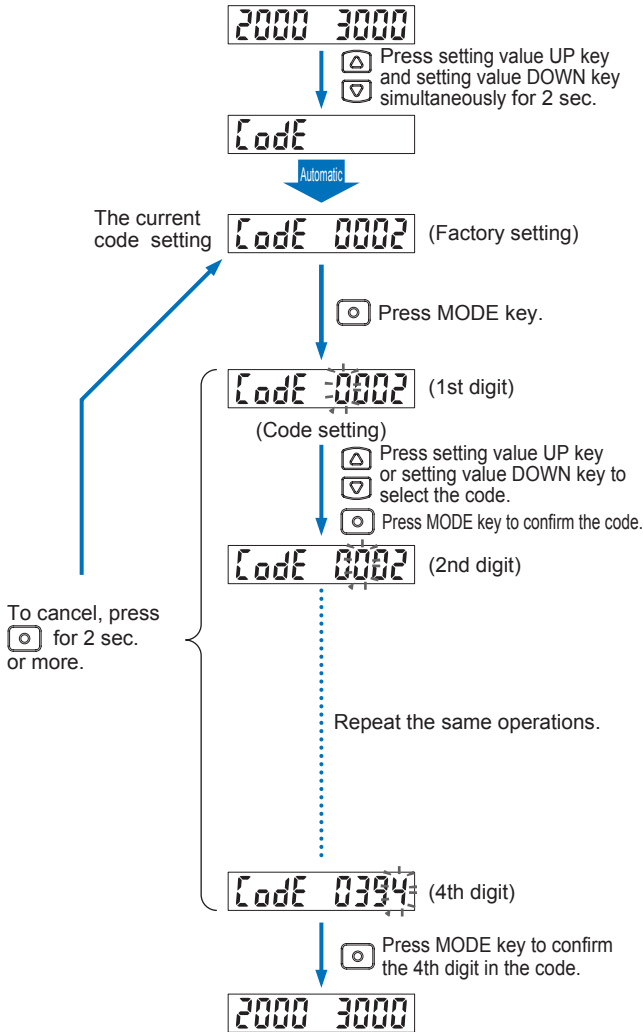
Table of quick setting numbers

No.	Output operation	Timer	Light-emitting amount selection
$-00-$	Dark-ON (D-ON)	non	OFF
$-01-$			ON
$-02-$		OFF-delay 10 ms	OFF
$-03-$			ON
$-04-$		OFF-delay 40 ms	OFF
$-05-$			ON
$-06-$		ON-delay 10 ms	OFF
$-07-$			ON
$-08-$		ON-delay 40 ms	OFF
$-09-$			ON

No.	Output operation	Timer	Light-emitting amount selection
$-10-$	Light-ON (L-ON)	ON-delay 40 ms	ON
$-11-$			OFF
$-12-$		ON-delay 10 ms	ON
$-13-$			OFF
$-14-$		OFF-delay 40 ms	ON
$-15-$			OFF
$-16-$		OFF-delay 10 ms	ON
$-17-$			OFF
$-18-$		non	ON
$-19-$			OFF

8 Code Setting Function

Settings for 'output operation setting', 'timer operation setting', 'light-emitting amount selection setting', 'emission frequency setting', 'ECO setting', 'external input setting', and 'shift setting' are possible by selecting codes discretionary. For the codes, refer to '**Code table**'.

```
2000  3000
```
Press setting value UP key and setting value DOWN key simultaneously for 2 sec.

```
CodE
```
Automatic

The current code setting
```
CodE  0002
```
(Factory setting)

Press MODE key.

```
CodE  0002
```
(1st digit)
(Code setting)

Press setting value UP key or setting value DOWN key to select the code.
Press MODE key to confirm the code.

```
CodE  0002
```
(2nd digit)

To cancel, press ⊙ for 2 sec. or more.

Repeat the same operations.

```
CodE  0394
```
(4th digit)

Press MODE key to confirm the 4th digit in the code.

```
2000  3000
```

① Press ⊿ (setting value UP key) or ▽ (setting value DOWN key) for 4 sec. to set to quick setting mode.

> The mode will change to the quick setting function after ⊿ (setting value UP key) and ▽ (setting value DOWN key) are pressed simultaneously for 2 sec., so keep them pressed for longer.

② The current code setting will be displayed.

> If you press ⊙ (MODE key) for 2 sec. or more in this state, the setting will be canceled and the mode will return to 'RUN mode' (normal sensing operation).

③ If you press ⊙ (MODE key), the 1st digit in the digital display (red) will blink.

④ Press ⊿ (setting value UP key) or ▽ (setting value DOWN key) to select the 1st digit of the code.

⑤ If you press ⊙ (MODE key), the 1st digit will be confirmed and the setting will move to the 2nd digit.

⑥ Press ⊿ (setting value UP key) or ▽ (setting value DOWN key) to select the 2nd digit of the code.

⑦ If you press ⊙ (MODE key), the 2nd digit will be confirmed and the setting will move to the 3rd digit.

⑧ Press ⊿ (setting value UP key) or ▽ (setting value DOWN key) to select the 3rd digit of the code.

⑨ If you press ⊙ (MODE key), the 3rd digit will be confirmed and the setting will move to the 4th digit.

⑩ Press ⊿ (setting value UP key) or ▽ (setting value DOWN key) to select the 4th digit of the code.

> If you press ⊙ (MODE key) for 2 sec. or more while any of the four digits are blinking, the number being set will be canceled and the operation will return to step ② (current code setting display).

⑪ If you press ⊙ (MODE key), the 4th digit will be confirmed and the mode will return to RUN mode (normal sensing operation).

> When the fourth digit is confirmed, the setting are reflected.

Code table

```
CodE  0002
```

1st digit			2nd digit				3rd digit			4th digit	
Code	Output operation	Timer (Note 1)	Code	Light-emitting amount selection	Emission frequency		Code	ECO	External input	Code	Shift amount (Note 1)
					FX-101□	FX-102□					
0	Dark-ON (D-ON)	non	0	OFF	0	1	0	OFF	Emission halt	0	5 %
1		ON-delay 10 ms	1		1	2	1		Limit teaching [+]	1	10 %
2		ON-delay 40 ms	2		2	3	2		Limit teaching [−]	2	15 %
3		OFF-delay 10 ms	3		3	4	3		Full-auto teaching	3	20 %
4		OFF-delay 40 ms	4	ON	0	1	4		ECO	4	25 %
5	Light-ON (L-ON)	non	5		1	2	5	ON	Emission halt	5	30 %
6		ON-delay 10 ms	6		2	3	6		Limit teaching [+]	6	35 %
7		ON-delay 40 ms	7		3	4	7		Limit teaching [−]	7	40 %
8		OFF-delay 10 ms					8		Full-auto teaching	8	45 %
9		OFF-delay 40 ms					9		ECO	9	50 %

Notes: 1) When the present setting is out of the code setting range, '–' is displayed. When '–' is selected, the set content of the digit is not changed.
2) The factory setting is '0002'.

All information is subject to change without prior notice.