E3M-V

Adjustment Steps

Step	Operation
1	Install, wire, and turn ON the Sensor.
2	Register (i.e., teach) the marks. ➜Refer to ***Registering Marks*** **on this page to page 21.**
3	Adjust thresholds as required. ➜Refer to ***Adjusting Thresholds*** **on page 22.**
4	Check that the mode selector switch is set to RUN.

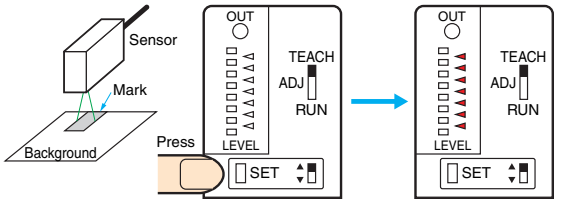
Registering (Teaching) Marks

Select the most appropriate teaching method in reference to the following descriptions.

	1	2	3
Application	Detection of clear color differences between the mark and the background when the background has a color pattern.	Detection of slight color differences between the mark and background when the background has no color pattern.	Remote teaching without positioning when the background has no color pattern.
Teaching method	1 One-point teaching	2 Two-point teaching	1 Automatic teaching
Output ON range	The default value will be set, and the output will turn ON at the mark.	The threshold will be set in the middle between the mark and the background, and the output will turn ON at the mark.	The threshold will be set in the middle between the mark and the background, and the output will turn ON at the mark (which has the shortest passage time).

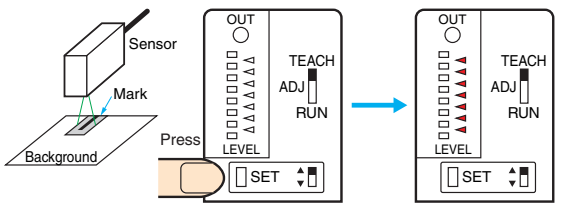
Refer to the following descriptions for each teaching method. One-point teaching and two-point teaching can be controlled remotely. ➜**Refer to** ***Remote Control Function*** **on page 23.**

1 One-point Teaching

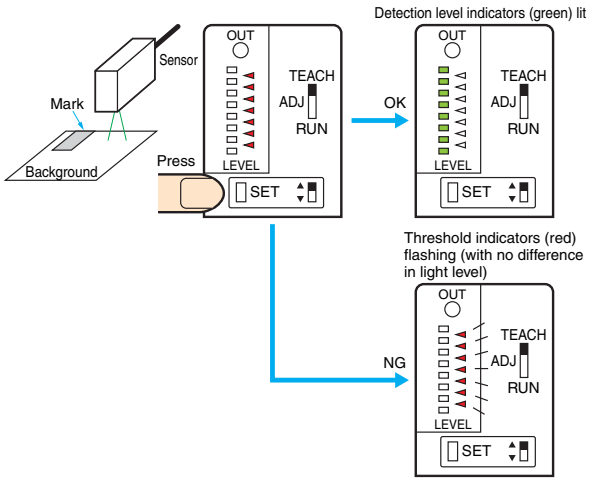
Step	Operation method	Operation condition
1	Set the mode selector switch to TEACH.	
2	Place the mark in the specified location, and press the SET Button. The threshold indicators (red) will light.	 Threshold indicators (red) lit
3	Set the mode selector switch to RUN. The output will turn ON at the set mark.	

Note: The reverse of the output described above (Background: ON, Mark: OFF) can be obtained by teaching using the background.

2 Two-point Teaching

Step	Operation method	Operation condition
1	Set the mode selector switch to TEACH.	
2	Place the mark in the specified location, and press the SET Button. The threshold indicators (red) will light.	 Threshold indicators (red) lit

Continued on next page

Step	Operation method	Operation condition
3	If the teaching is OK, move the mark and press the SET button when the mark is at the position of the background. • If the teaching is OK, the detection level indicators (green) will all be lit. • If the teaching fails, the threshold indicators (red) will all flash.	
4	If the teaching is OK, the setting will be completed. Set the mode selector switch to RUN. If the teaching fails, perform the setting again from step 2.	

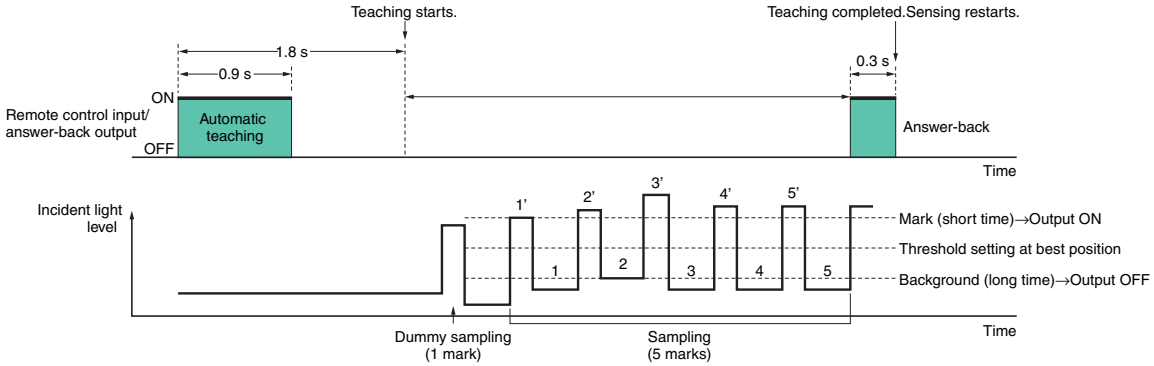
Note: These teaching steps are for turning output ON at the mark. The output can be set to turn On at the background and turn OFF at the mark by reversing the order of teaching.

3 Automatic Teaching

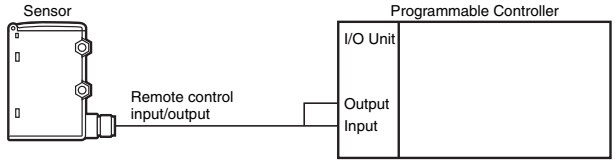
Step	Operation
1	Check that the mode selector switch is set to either RUN or ADJUST.
2	A pulse of 0.9 s (see note) will be input to the remote control input/output.
3	Teaching will be performed automatically when the mark is moved. (Teaching will be completed after the mark passes six times.) • If teaching is OK, answer-back of 0.3 s will be output from the remote control input/output. • If teaching fails, answer-back will not be output. In this case, perform the adjustment again using two-point teaching. (Teaching will not be OK if there is no difference in light levels between the mark and the background.)
4	If answer-back is detected, the setting will be completed. The output will turn ON at the mark (which has the shortest passage time), and measurement will start.

Note: Set input error of each signal pulse to within ±0.1 s.

Automatic Teaching



Example of Connection with Programmable Controller



Note: Connect the Sensor as shown in the figure above when connecting it to a Programmable Controller.

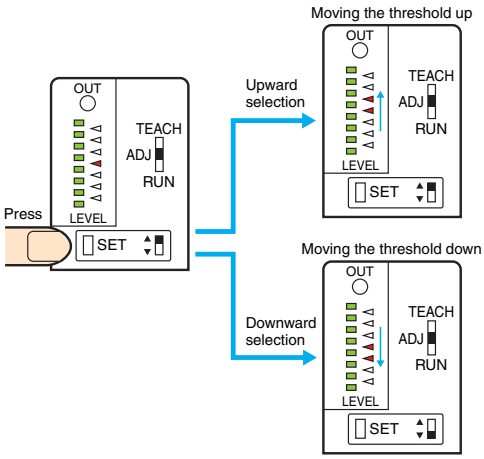
Precautions for Using Automatic Teaching

In the following application conditions, incorrect judgment may occur using automatic tuning. If this occurs, use one-point teaching or two-point teaching.

- The background has a color pattern.
- There is a lot of variation in the samples.
- The surface has height differences or protrusions.

Adjusting Thresholds

Fine adjustment of thresholds can be performed after teaching.
Operation can be performed remotely.
➜Refer to ***Remote Control Function*** **on the next page.**

Step	Operation method	Operation condition
1	Set the mode selector switch to ADJUST.	
2	In the ADJUST mode, specify the direction of adjustment using the Up/Down selector switch. The threshold will transition each time the SET Button is pressed. (Two indicators will be lit at the same time for even-numbered threshold levels.)	
3	After the setting is completed, set the mode selector switch to RUN.	

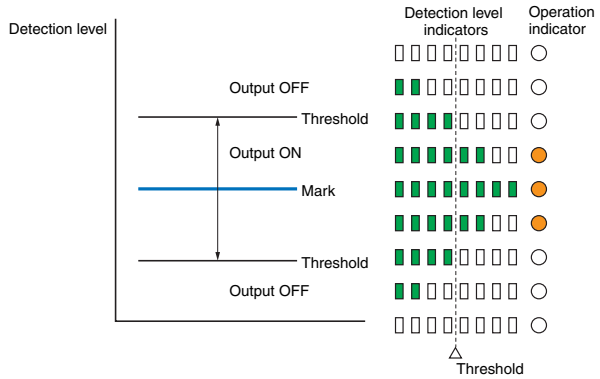
Threshold indicators													
Threshold	1	2	3	4	5	6	7	8	9	10	11	12	13

Detection Level Indicators

The control output will turn ON if the detection level exceeds the threshold level. The detection level display will depend on the teaching method.

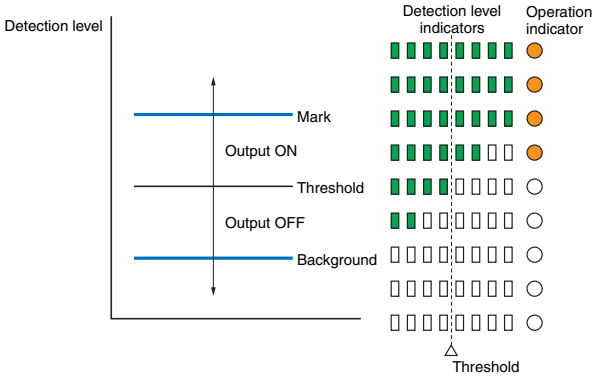
One-point Teaching

Two thresholds (i.e., above and below the mark) are set. The indicators show the degree of match with the mark.



Two-point teaching and Automatic Teaching

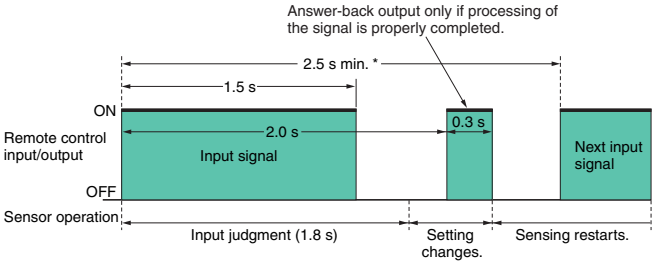
A threshold is set in the middle between the mark (first registration) and background (second registration). The indicators show the level of excess gain between the mark and the background.



Remote Control Function (Bank Selection, Mark Registration, Threshold Adjustment)

In RUN mode and ADJUST mode, remote operation can be performed by inputting the signals in the following table for the remote control input/answer-back output. There will be answer-back output for 0.3 s if the signal is correctly received.
Only one-point teaching can also be operated with manual input.
(Provide input for 1.5 s min.)

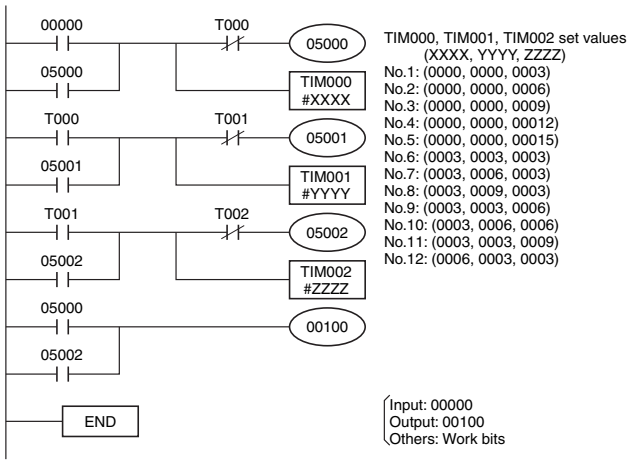
Timing Chart



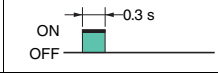
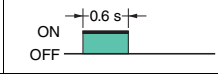
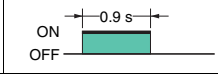
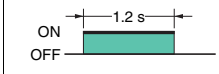
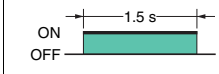
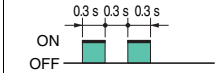
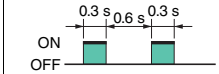
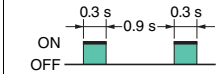
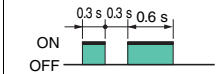
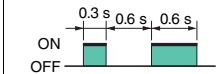
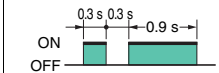
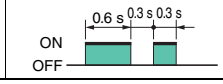
*If consecutive signals are to be sent, allow an interval of at least 2.5 s after the signal is input, as in the figure above.

Example of Ladder Programming

Control signals can be created using the example of ladder programming shown in the following figure.



Control Signals

No.	Control signal	Function
1		Bank 1 selection (Operation indicator OFF in TEACH mode)
2		Bank 2 selection (Operation indicator lit in TEACH mode)
3		Automatic teaching
4		Two-point teaching (first and second)
5		One-point teaching (input of 1.5 s min. also possible)
6		Threshold 1 selection
7		Threshold 3 selection
8		Threshold 5 selection
9		Threshold 7 selection
10		Threshold 9 selection
11		Threshold 11 selection
12		Threshold 13 selection

Note: Set input error of each signal pulse to within ±0.1 s

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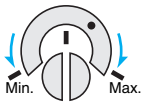
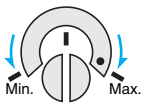
Sensitivity Adjustment

The Sensor and reflector can be moved horizontally and vertically to set them in the center of the illumination area of the red incident light indicator, allowing the operator to check whether the green stability indicator lamp is lit.

Sensing object	Detection state	Sensitivity adjuster	Indicator status		Adjustment procedure
Transparent bottle or glass plate	No sensing object		ON  Stability (green)	ON  Light (red)	Turn the sensitivity adjuster from minimum to maximum and set it at a point where the incident light stabilizes.
Opaque object	Sensing object or no sensing object		ON  Stability (green)	ON  Light (red)	If the object is larger than the lens diameter, set the sensitivity control to the maximum setting.If the object is the same size or smaller, turn the sensitivity control from minimum to maximum and set it at point where the incident light stabilizes.