SensorsX

SX-OCCNB Series

High-Precision Intelligent Digital RGB Color Sensor — Amplifier

Industrial Optical Sensor — Color Sensor Amplifier



3000+ colors Precise Color Recognition	**200 µs** Fastest Response Time (HSP)	**8 channels** 8 Colors Stored, 4 Outputs
NPN / PNP Open-Collector Control Output	**R / G / B LED** Light Source (665 / 520 / 465 nm)	**12 – 24 V DC** Power Supply

Color Discrimination | Registration Mark Detection | Chip Orientation in Embossed Tape

■ PRODUCT OVERVIEW

The SensorsX SX-OCCNB series is a digital RGB color sensor amplifier for detecting fine color differences. It uses red, green and blue LED illumination with 16-bit signal processing to distinguish more than 3,000 colors. Four response-time settings are available, with a minimum response time of 200 µs in HSP mode. In C and C+I modes, the amplifier stores up to eight reference colors in two banks of four channels, with four control outputs. Super I mode provides four channels based on received light intensity. One-button teaching and digital threshold adjustment simplify setup. NPN and PNP output models are available.



■ KEY FEATURES

◆ **Precise Color Recognition** Fine color-difference recognition; identifies more than 3000 colors	◆ **8-Channel Design** Stores 8 colors simultaneously, 4 signal outputs, saving space and cost
◆ **Easy Sensitivity Adjustment** Intelligent, digital setting; one-button teaching	◆ **Strong Probe Compatibility** Besides dedicated color probes, compatible with all types of fiber probes

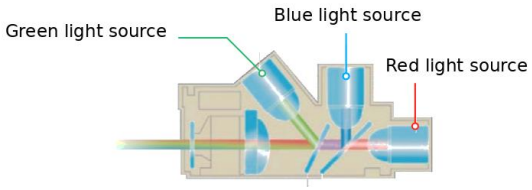
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◆ **One-button teaching** Just press one key to calibrate — simple and fast.

◆ **RGB Light Source with 16-bit Signal Processing**

RGB Light Source with 16-bit Signal Processing

The optical assembly combines the red, green and blue light into a single beam.



One-button teaching

One-button teaching: just press one key to calibrate — simple and fast.



■ TYPICAL APPLICATIONS

- Detecting cups of different colors
- Detecting different color registration marks on material tape
- Detecting front / back of chips in embossed carrier tape

■ PERFORMANCE SPECIFICATIONS

Response	
Response Time	200 µs (HSP) / 1 ms (FINE) / 4 ms (TURBO) / 8 ms (SUPER)
Detection	
Light Source	Red LED (665 nm) / Green LED (520 nm) / Blue LED (465 nm)
Channels	C / C+I mode: 8 channels (4 channels × 2 banks); Super I mode: 4 channels
Functions	
Timer Function	Timer OFF / OFF-delay / ON-delay / one-shot; timer time adjustable from 1 to 1,000 ms (set separately for each bank)

■ ELECTRICAL SPECIFICATIONS

Power	
Power Supply	12 – 24 V DC, ripple (P-P): 10 % max.
Power Consumption	Normal mode: 1.5 W (62.5 mA max.); Eco mode: 1 W (42.0 mA max.)
Output Signal	
Control Output	NPN (PNP) open collector × 4 channels, max. 40 V DC (30 V DC); 100 mA per output, 200 mA total for 4 outputs; residual voltage: 1.0 V max.
Inputs	
External teach input	Input time: 20 ms min.
External Switching Input (C / C+I mode) / External Shift Input (Super I mode)	Input time: 20 ms min.
Protection	
Protection Circuits	Reverse polarity protection, overcurrent protection, overvoltage protection

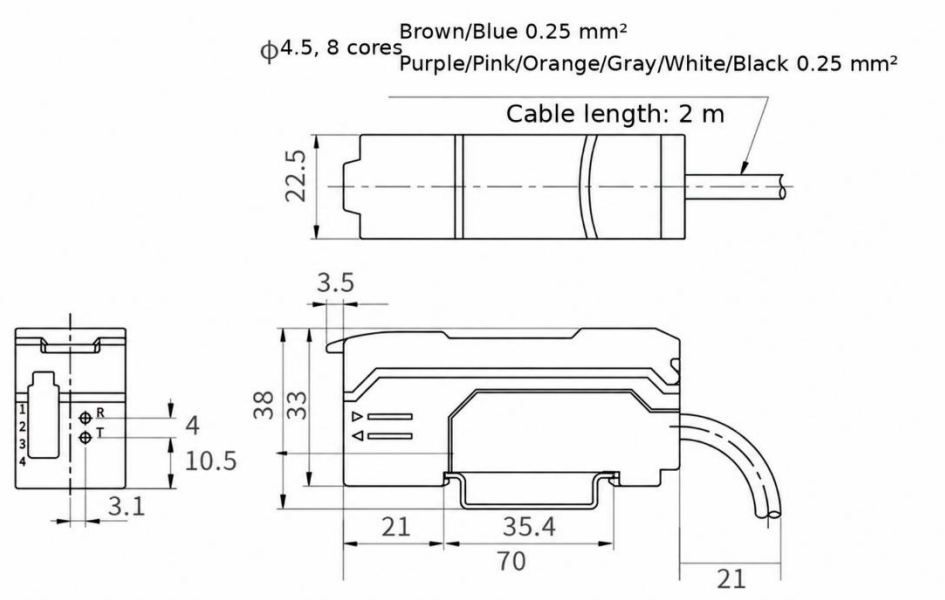
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Electrical Connection	
Cable	Φ4.5 mm (Φ0.18 in), 8 cores; brown / blue 0.25 mm², purple / pink / orange / gray / white / black 0.25 mm²; length 2 m (6.56 ft)

■ ENVIRONMENTAL SPECIFICATIONS

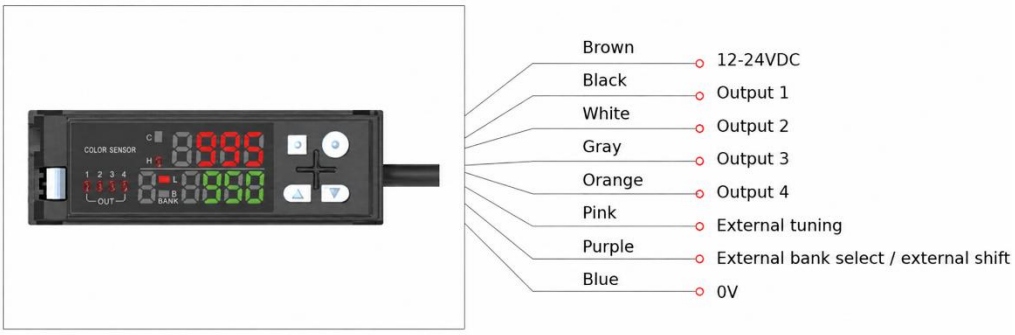
Temperature	
Ambient Temperature	−10 to +55 °C (14 to 131 °F), no condensation
Mechanical & Environmental	
Vibration Resistance	10 to 55 Hz, 1.5 mm (0.06 in) double amplitude, 2 h each in X, Y, Z directions
Weight & Housing	
Housing / Cover Material	PC
Weight (with 2 m cable)	Approx. 150 g (5.29 oz)

■ MECHANICAL DIMENSIONS



※ All dimensions in mm.
※ When the SX-OCCNB amplifier is used with the SX-OCPSB-C35 sensing head and the target is a reflective surface, use the sensing head with a filter film and mount it tilted at approx. 15 – 45°.

■ WIRING DIAGRAM



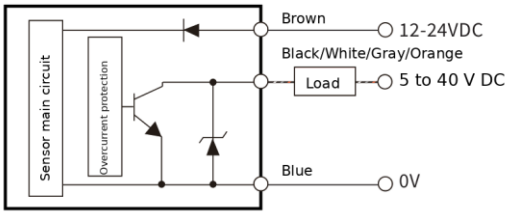
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Terminal Assignment

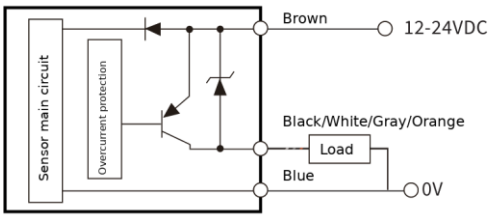
Brown	12 – 24 V DC
Black	Output 1
White	Output 2
Gray	Output 3
Orange	Output 4
Pink	External tuning
Purple	External bank selection / external shift
Blue	0 V

Output Circuit

NPN
SX-OCCNB21N

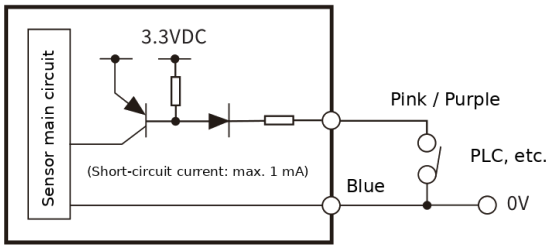


PNP
SX-OCCNB21P



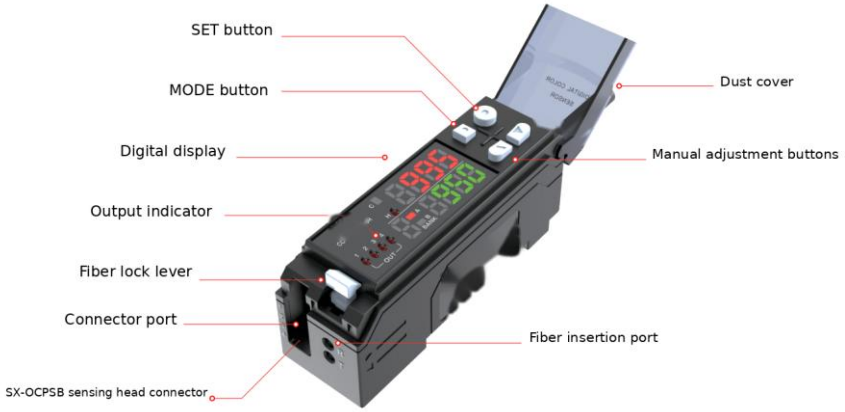
Input Circuit

External tuning (pink); external bank selection / external shift (purple).



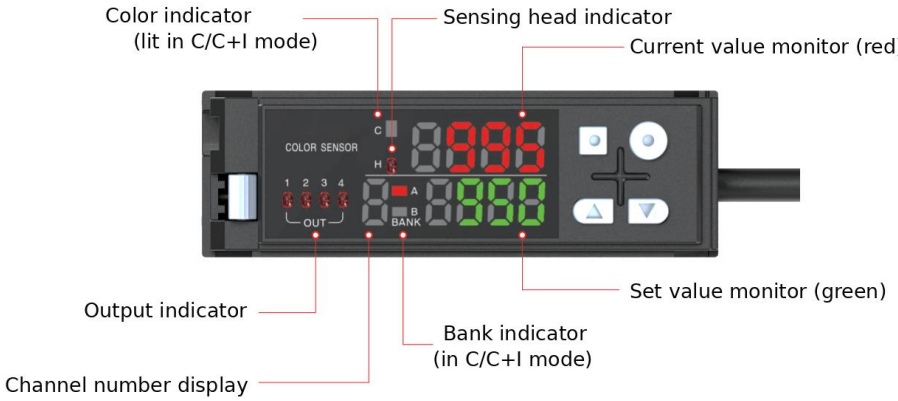
■ INSTALLATION, OPERATION & SETTINGS

Amplifier Module — Part Names



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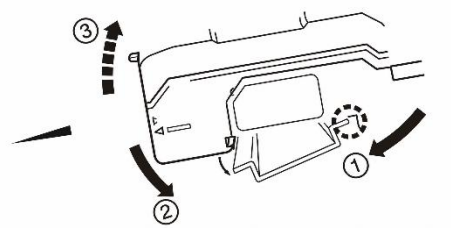
Display



Mounting the Amplifier Module

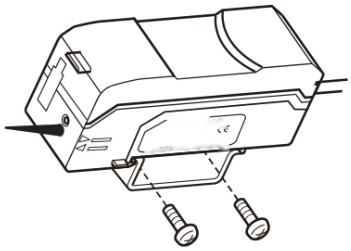
Mounting on a DIN rail

Hook the claw on the bottom of the amplifier module onto the DIN rail. While pushing the amplifier module in the direction of arrow ①, push it down in the direction of arrow ②. To remove the amplifier module, push the body in the direction of arrow ① while lifting it in the direction of arrow ③.



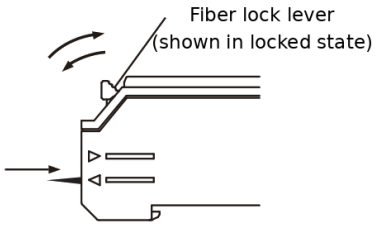
Mounting on a bracket

Mount the amplifier module using the supplied mounting bracket as shown in the figure below.



Inserting the connector and fiber

1. Tilt the fiber lock lever and insert the fiber cable. When using standard fiber probes, insert the corresponding fiber cable into both holes; when using the SX-OCPSB-C35 / SX-OCPSB-C37 sensing heads, insert the fiber cable into the emitting hole only. Make sure the fiber reaches the bottom at 20 mm (insertion length approx. 20 mm / 0.79 in), then lock the fiber with the lock lever.
2. When using the SX-OCPSB-C35 / SX-OCPSB-C37 sensing heads, insert the sensing head connector into the corresponding connector port; standard fiber probes do not use the connector.



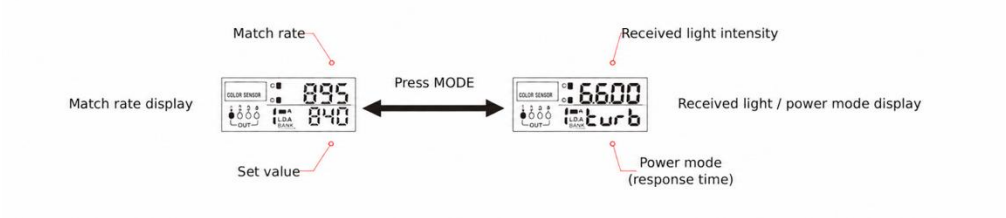
Detection Modes — Three Modes for Various Targets

C mode	
Calibration standard	RGB comparison
Calculation method (brief)	Compares the RGB values of the reference color with the identified color and calculates the change; similarity = 1000 − (average change of R, G and B)
Advantages	Good handling of workpiece movement and vibration
Disadvantages	Not suitable for identifying neutral colors such as white, black or gray

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C+I mode	
Calibration standard	RGB comparison + brightness comparison (received light intensity)
Calculation method (brief)	In addition to the C mode calculation, also compares the received light intensity of the reference color and calculates the difference; similarity = (C mode similarity) − (average change of R, G and B)
Advantages	Detects subtle differences
Disadvantages	Affected by workpiece vibration
Super I mode	
Calibration standard	Brightness comparison (received light intensity)
Calculation method	Compares received light intensity (brightness).
Advantages	Can identify neutral colors (black and white)
Disadvantages	Affected by workpiece vibration

Operating Procedure — C / C+I Mode

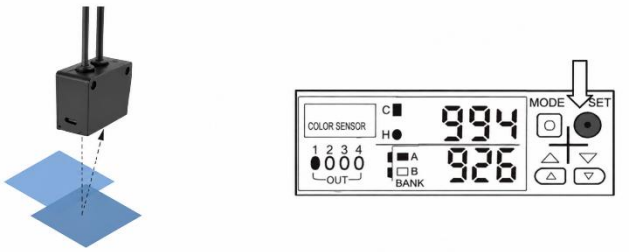


- Match rate: displays the degree of match between the target color tuned as reference and the target color currently being detected. Setting range: 0 to 999 (the larger the value, the higher the match rate).
- Set value: displays the threshold of the degree of match between the current target color and the reference target color at which they are judged to be the same color.
- Received light intensity: displays the amount of light currently received.
- Power mode (response time): displays the currently selected power mode.

Setting sensitivity

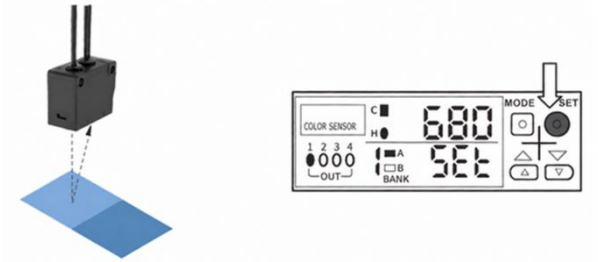
1-point tuning (detecting a single specified color):

Place the target whose color is used as reference at the focal position of the light spot emitted by the sensing head. Press the SET button once. • The set value is displayed in green.



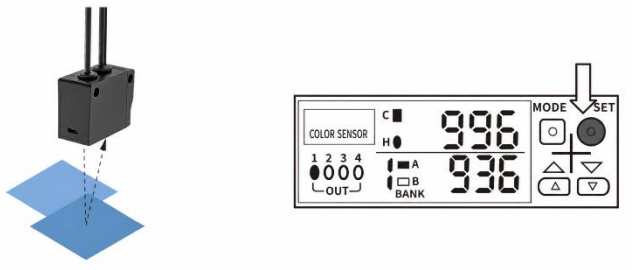
2-point tuning (distinguishing two colors):

1. Place the target whose color is used as reference at the focal position of the light spot emitted by the sensor. Press the SET button once. • “SET” is displayed in green on the set value monitor.



2. Place the target whose color is to be distinguished. Press the SET button once. • The set value is displayed in green. Note: if the sensitivity difference is insufficient, the set value monitor displays a green “——”.

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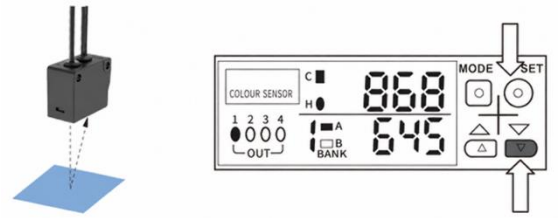
Fine tuning (1-point tuning with stricter criteria): Used for stricter detection than 1-point tuning. The setting method is the same as 1-point tuning. • Even with the same tuning target, the set value is larger than with 1-point tuning.

Fine adjustment of sensitivity

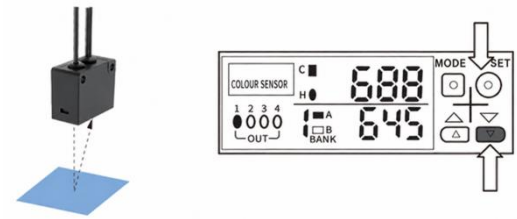
By changing the set value: The larger the set value, the stricter the detection; the smaller the set value, less selective detection. To change the set value (digits shown in green), press the UP or DOWN button.



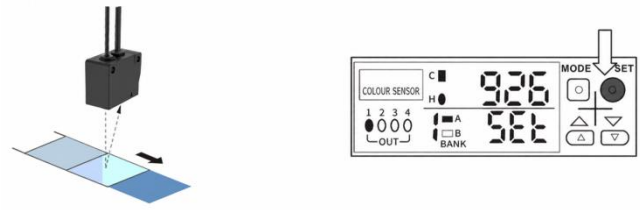
Using the target: Fine adjustment of the set value is possible by adding or removing tuning.



Remove tuning (tuning that increases the set value): Sets an undetected target as the same color. Press the UP button while holding the SET button.



Allowing color unevenness: During 1-point tuning or fine tuning, the sensor continues sampling while the SET button is held. • The sampled colors are judged as the same color.



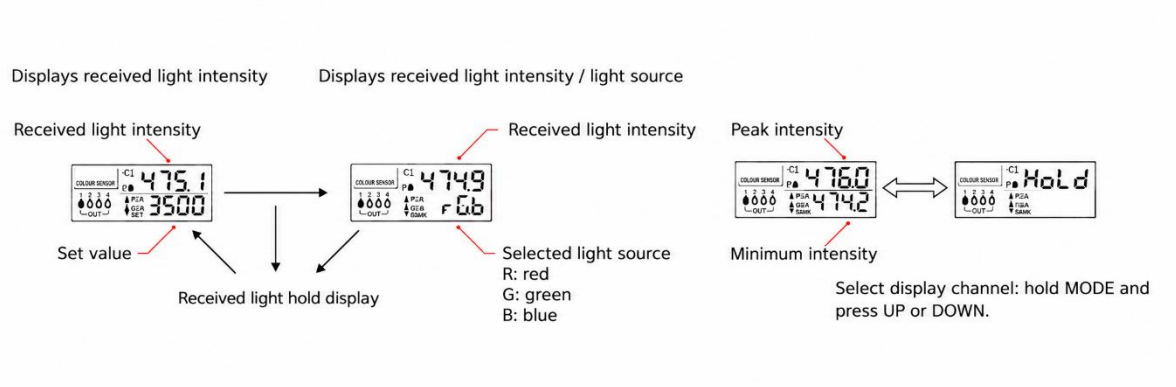
Set value: When sensitivity is set, the sensor determines the set value automatically. The set value can also be preset manually to a fixed value; in this case, press and hold the UP and DOWN buttons simultaneously for at least 3 s. • “F” is displayed in green on the left of the set value monitor; the cancel method is the same as the fixing method. While “F” is displayed, the set value remains fixed and does not change even if sensitivity setting is performed.



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Operating Procedure — Super I Mode

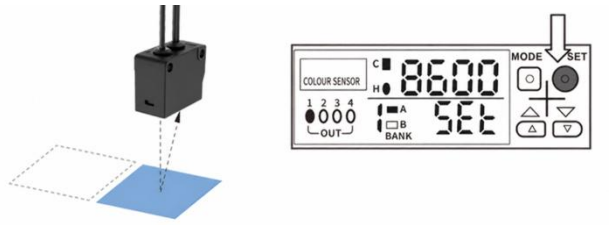
Display description



Setting sensitivity

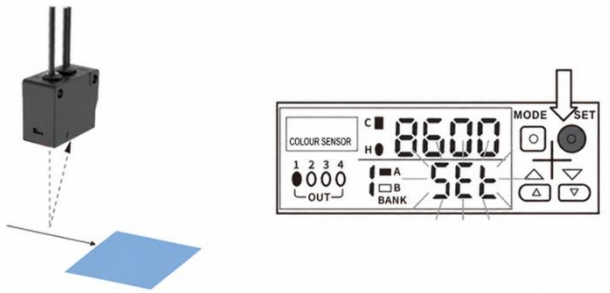
2-point tuning (basic):

1. Place the target at the focal position of the light spot emitted by the sensor and press the SET button once. • “SET” is displayed in green on the set value monitor.
2. Press the SET button once with no target. • The set value is displayed in green. Note: if the sensitivity difference is insufficient, the set value monitor displays a green “……”.



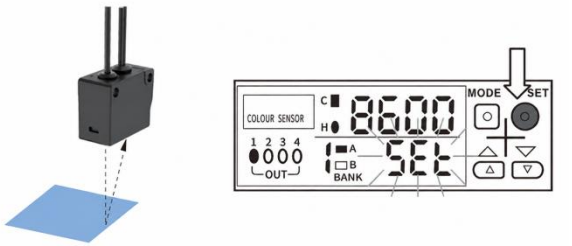
Target passing through the optical axis while SET is held:

1. While holding the SET button, let the target pass through the optical axis.
2. After “SET” flashes, release the SET button.



Positioning tuning (when positioning the target):

1. Press the SET button with no target. • “SET” is displayed in green on the set value monitor.
2. Place the target at the desired position, then press and hold the SET button for at least 3 s.
3. After “SET” flashes, release the SET button.



Maximum sensitivity setting:

1. With no target, press and hold the SET button for at least 3 s.
2. While checking “SET”, let the target pass through the optical axis.

Fine adjustment of sensitivity by changing the set value: To change the set value (digits shown in green), press the UP or DOWN button.

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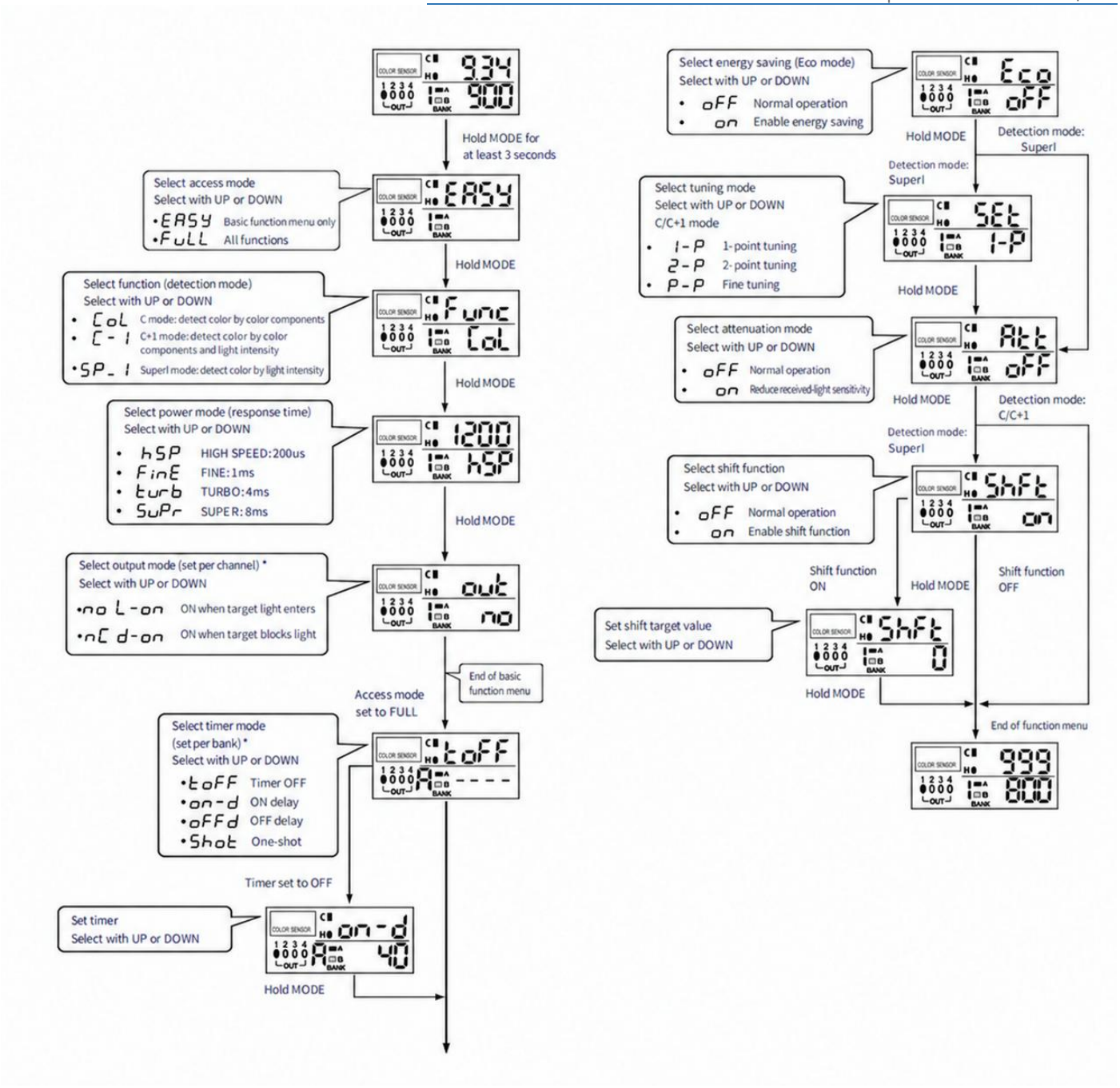
Shift function: Forces the received light intensity to synchronize with a preset value. A fixed shift input from a PLC or other device stabilizes detection of targets with small light intensity differences. The synchronization function can be used when the shift function is set to ON. Note: after power-off, values updated after the zero-shift input are cleared.
Selecting the light source: When sensitivity is set, the sensor automatically selects the optimal RGB light source for detection. The light source can be selected for each channel. Note: regardless of the selected light source, the actually emitted light appears whitish.
Manual light source selection:
1. While the received light intensity / light source is displayed, press and hold the UP and DOWN buttons simultaneously for at least 3 s. • "F" appears on the left of the set value monitor.
2. Select the light source with the UP or DOWN button. After manual selection, the light source remains fixed even if the sensitivity value changes. • To return to automatic light source selection, press and hold the UP and DOWN buttons simultaneously for at least 3 s.



Function Menu Selection

Press and hold the MODE button for at least 3 s to display the function menu. Each mode can be configured from the function menu. To exit the function menu during setting, press and hold the MODE button again for at least 3 s.

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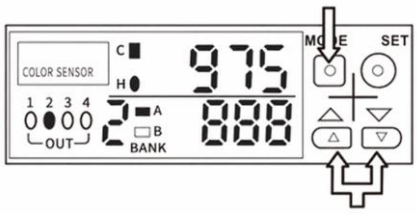


Channel Setting Function

Depending on the detection mode, sensitivity can be set for each of the following numbers of channels:

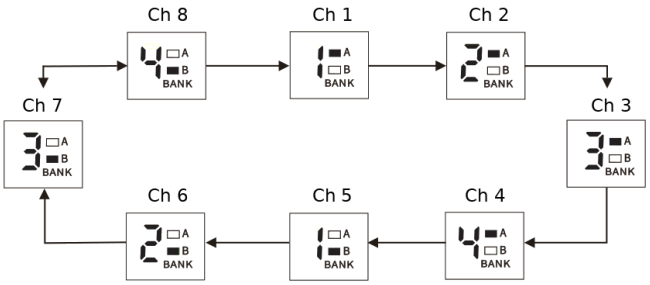
- C / C+I mode: 8 channels (4 channels × 2 banks)
- Super I mode: 4 channels (no bank selection)

To select the display channel, press the UP or DOWN button while holding the MODE button.

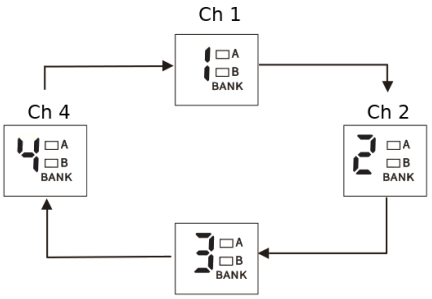


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C / C+I mode



Super I mode

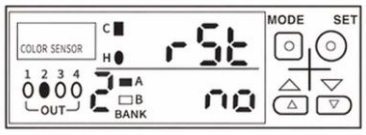


Key lock
Prevents settings from being changed by key operation. Press and hold the UP button together with the MODE button for at least 3 s. Repeat the same operation to cancel locking.

Default Settings (Initialization)

Access mode	EASY
Function (detection function)	C mode
Tuning mode	1-point tuning
Power mode (response time)	TURBO
Output mode	no (L-on)
Timer mode	OFF (timer value 20 ms)
Energy saving (Eco mode)	OFF
Shift function	OFF (shift value 0)

Restoring default settings
1. Press the SET button five times while holding the MODE button. • The monitor displays “rSt / no”.



2. Press the UP button. • The monitor displays “rSt / YES”.



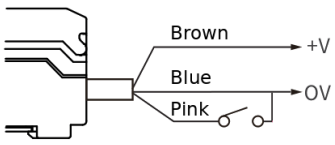
3. Press the MODE button. • The sensor returns to the default state. To cancel the reset, select “no” in step 2 and press the MODE button.

Channel Setting Function — External Inputs

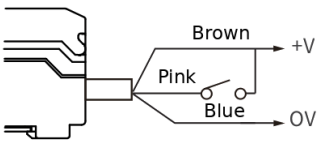
Setting sensitivity by external input (external tuning)
1. Enable the key lock function. 2. Connect the pink wire to an external device such as a switch or PLC. 3. Short the pink wire as shown below; for each model this is equivalent to pressing the SET button.

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SX-OCCNB21N



SX-OCCNB21P

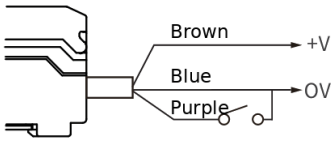


Min. input time 20ms

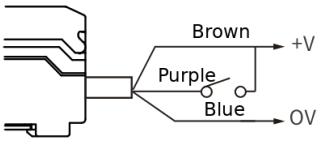
Selecting the bank by external input (in C / C+I mode)

1. Enable the key lock function. 2. Connect the purple wire to an external device such as a switch or PLC. 3. Short the purple wire as shown below to switch the bank from A to B for each model (when the input signal is ON, the bank is set to B).

SX-OCCNB21N



SX-OCCNB21P

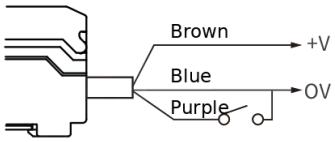


Min. input time 20 ms

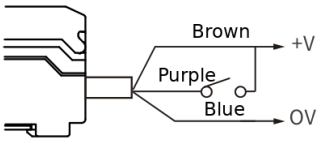
External shift input (in Super I mode setting)

1. Connect the purple wire to an external device such as a switch or PLC. 2. Short the purple wire as shown below to start the shift input for each model (shift input is executed on the rising edge of the input signal).

SX-OCCNB21N



SX-OCCNB21P



Min. input time 20ms

■ ORDERING INFORMATION — SX-OCCNB

Complete model number example: SX-OCCNB21N

Output	
21N	NPN
21P	PNP
Customized (Optional)	
D	Customized — specify requirements in order remarks

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