

# Professional Color Area Sensor CVS1-□R Operation Manual

- Thank you for purchasing the color vision sensor series Color Area Sensor (CVS1R).  
 - Before operating the product, read this manual thoroughly.  
 - Keep this manual handy for the future reference.  
 - This product cannot be used as safety device for human body protection.  
 - The warranty period of the product is one year from purchase. However, any malfunction due to natural disaster, improper conversion or maintenance shall be excluded from the warranty scope.

## 1 Before Operation

### What is Color Area Sensor?

The Color Area Sensor detects the pixels that contain the same color information as the pre-set color, and measures their number (area). It outputs signal when the number of pixel falls within the specified range. The sensor is suitable for various types of detecting application such as with/without printing detection, mark detection, foreign object detection, and the detection of delicate color difference that is not possible with the color sensor.

### Setup Procedure

You can proceed with the CVS1 setup in the following order.

#### 1) Optimum initialization for applications (Section 3)

Select the optimum INITIAL setting for your application.

#### 2) Teaching (Section 4)

Register the detection color. You can reduce the capture area to eliminate undesired objects.

#### 3) Setting customization (Section 5)

Select settings such as color margin percentage and input/output signals.

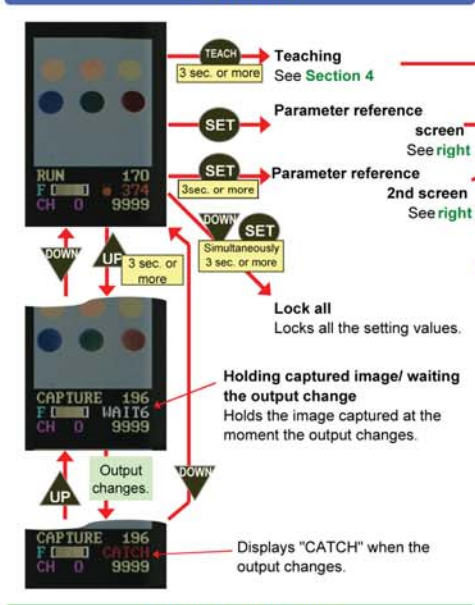
Learn the basic operations in Section 2, and start the setup in the order of 1 to 3 above.

## 2 Descriptions of LCD display

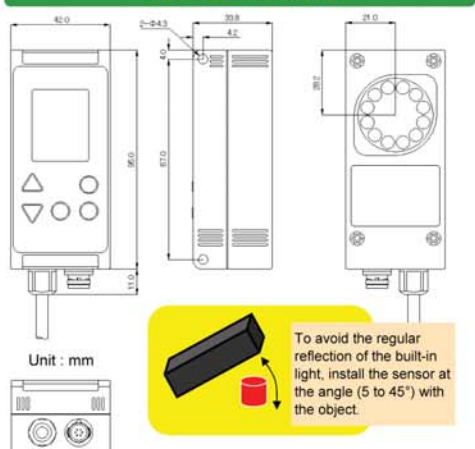
- 1) Captured image**  
The image captured by the camera is displayed.
- 2) Mode display**  
"RUN" mode is selected in the main menu.
- 3) Screen display mode**  
Indicates the current screen mode. (see right)
- 4) Bank number**  
Indicates the selected bank number (0 to 15).
- 5) Detection color**  
Displays the colors to be detected. Left: Darkest color, Middle: Middle tone, Right: Brightest color
- 6) Color area lower limit**  
Indicates the lower limit of the detection color area.
- 7) Color area**  
Indicates the current area of the detection color.  
Orange : Within the specified range  
Green : Out of the specified range
- 8) Color area upper limit**  
Indicates the upper limit of the detection color area.
- 9) Output status**  
● : Output ON ✕ : Output OFF

In the parameter reference screen and the parameter selection screen, items No. 2, 6 and 8 above are respectively replaced with:  
 10) Parameter 11) Parameter value  
 12) Response time (unit : 0.1ms)

### Main menu



### External Dimensions



### Connection of Power Supply and Input/Output Cable

The line colors and signal allocations of power supply and input output cable are as follows.

No.	Color	Signal
1	Brown	12 - 24V DC
2	Blue	0V
3	Orange/Black	Bank selection 0 input
4	Yellow/Black	Bank selection 1 input
5	Pink	Bank selection 2/ Teaching input
6	Purple	Bank selection 3/ Synchronous input
7	Black	Output
8	Red/Black	Lower limit out / AuxIn

## 3 Optimum Initialization for the application

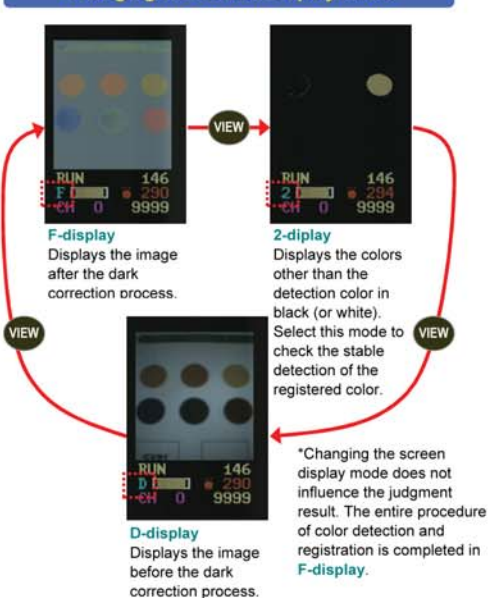
Select the INITIAL setting to initialize the parameter settings using the optimum values for your application.

Application	With/without print	Print on lustered/ transparent material	Delicate color difference	With/without luster
	Expiry date 2004.8.25	2004.8.25	2004.8.25	2004.8.25
INITIAL setting	1	2	3	4
COLR FIL	1	1	0	0
KIL BLK	27	27	27	20
LIGHT	3	2+	3	3
RESOLUT	0	0	0	1
TEACHMD	1	1	0	2
Resolution	200x120	200x120	200x240	200x240
Teaching window	Normal	Normal	Small	Small

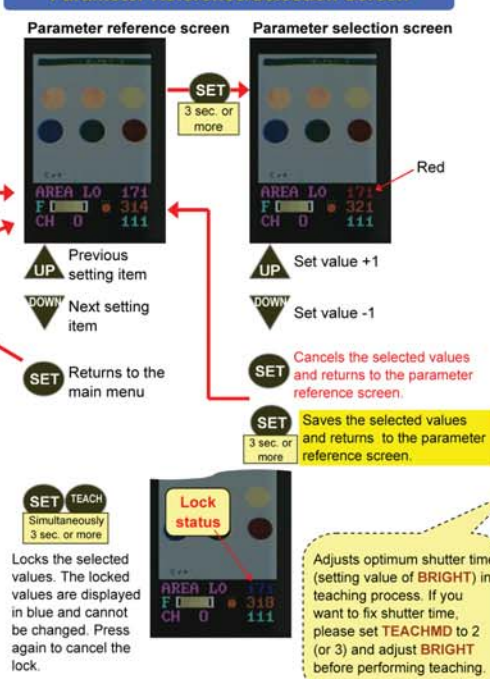
Application	White/Black (on white)	White/Black (on black)	Difference between dark colors	With/without print (on unstable background)
	Expiry date 2004.8.25	2004.8.25	2004.8.25	2004.8.25
INITIAL setting	5	6	7	8
COLR FIL	1	0	0	0
KIL BLK	27	15	30	15
LIGHT	3	3	3	3
RESOLUT	1	1	0	0
TEACHMD	0	0	0	1
Resolution	200x120	200x120	200x240	200x120
Teaching window	Normal	Normal	Small	Normal

\*All other settings are initialized together.  
 † Enables stable detection of printing by using diffused lighting or back lighting to eliminate the influence of luster.

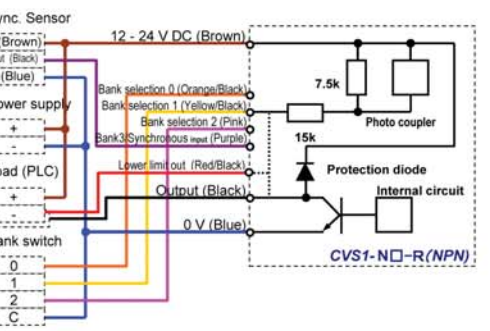
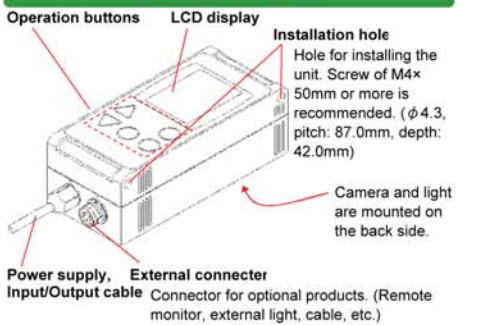
### Changing the Screen Display Mode



### Parameter Reference/Selection Screen



### Parts Identification

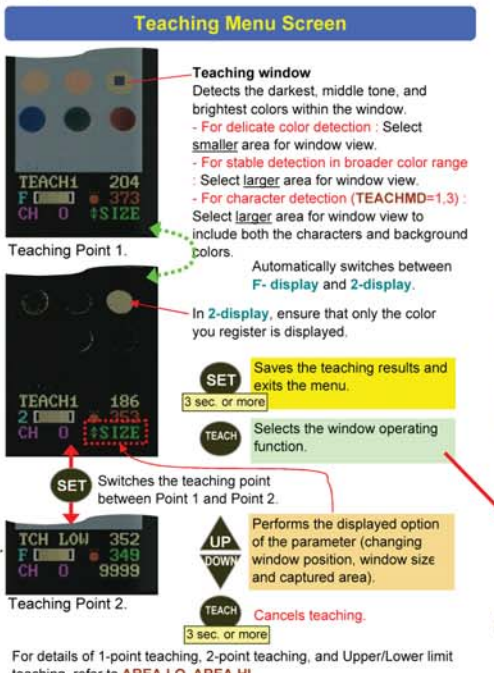


## 5 Settings

Select the settings before teaching.  
 Adjust the settings after teaching to optimize the detection performance.  
 Parameter reference 2nd screen

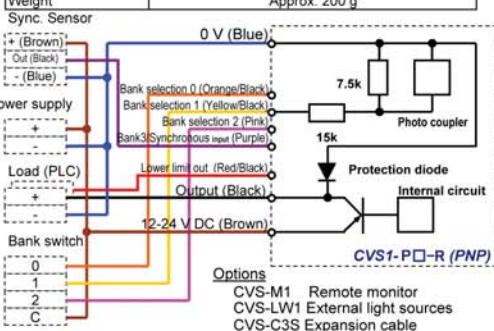
Function	Setting range (initial value)	Description
LCD display	0 to 3 (0)	0: Normal display 1: Reverses the LCD display vertically. Select 1 when installing the unit upside-down. 2, 3: Functions as 0 and 1 on the condition that the remote monitor (CVS-M1) is connected. LCD display turns off if no button operation is detected for a minute. NTSC composite video signal is output from the external connection port.
LCD up/down reverse	0 to 3 (0)	0: Normal display 1: Reverses the LCD display vertically. Select 1 when installing the unit upside-down. 2, 3: Functions as 0 and 1 on the condition that the remote monitor (CVS-M1) is connected. LCD display turns off if no button operation is detected for a minute. NTSC composite video signal is output from the external connection port.
LCD VIEW	0 to 3 (0)	0: Normal display 1: Reverses the LCD display vertically. Select 1 when installing the unit upside-down. 2, 3: Functions as 0 and 1 on the condition that the remote monitor (CVS-M1) is connected. LCD display turns off if no button operation is detected for a minute. NTSC composite video signal is output from the external connection port.
Light ON/OFF	0 to 3 (1)	0: Internal light-OFF, External light-ON 1: Internal light-ON, External light-ON 2, 3: Functions as 0 and 1. When "SYNCHRO=1,3" is selected, the light turns ON only during image capture.
Maximum display area	0 to 9999 (9999)	Selects the maximum area. Use the function to directly read the displayed value in AREA LO or AREA HI as the area.
OFF delay time	0 to 5000 (0)	Delays turning OFF of the output. Allows it to turn off when the judgment result remains in OFF condition continuously for over the selected delay time (unit: ms).
ON delay time	0 to 5000 (0)	Delays turning ON of the output. Allows it to turn on when the judgment result remains in ON condition continuously for over the selected delay time (unit: ms).
One-shot	0, 1 (0)	Select "1" to keep the output ON for the off-delay time after the output turns on.
Outside area range	0 to 3 (0)	0: Output ON within the specified area range. 1: Output ON outside the specified area range. 2, 3: Functions as 0 and 1. "Bank selection 1 input" performs detection when the area exceeds the lower limit.
Resolution	0, 1 (1)	Select the number of pixels taken out from the image sensor. 0: High resolution (240 x 200) Suitable to detect delicate color difference and thin characters. 1: High speed (240 x 100) Suitable to shorten the response time retaining the current capture area.
Synchronization input delay time	0 to 255 (0)	Selects the delay time of synchronization input. The synchronization signal input (bank selection 3 input) delays for the period of the setting value x 64μs. Suitable for fine adjustment of image capture timing.
Synchronization input	0 to 4 (4)	Selects the synchronization input setting. When set to 0 to 3, "bank selection 3 input" is assigned to the synchronization input. The capturing conditions are as follows: 0: While the synchronization input is Off 1: When the synchronization input is switched from On to Off 2: While the synchronization input is On 3: When the synchronization input is switched from Off to On 4: Captures images independently.
Teaching enable	0 to 3 (0)	0: Enables changing the teaching window and its position, and the capture area. 1: Prohibits changing the capture area. 2: Prohibits changing the teaching window and the capture area. 3: Prohibits entering the teaching mode.
Teaching mode	0 to 3 (0)	0: Normal teaching. Determines the darkest and brightest colors in the teaching window, and selects the detection color within the range between them. 1: Stain and character detection teaching. Selects a dark color in the teaching window as the detection color. 2, 3: Functions as 0 and 1. Performs teaching without changing the brightness (BRIGHT).
Teaching color margin	0 to 30 (15)	Selects the color detection margin in teaching. (Refer for the details to COLOR%).
Temperature compensation level	0 to 255 (30)	Adjusts the setting against the deviation in color detection due to variable temperature. (Available only when both COLR FIL=0.2 and RESOLUT=1 are selected.) Perform teaching at low temperature and adjust the setting at high temperature to obtain the optimum value.
Language selection	0/1 (0)	Selects a display language. 0: English / 1: Japanese
Lighting brightness	0 to 255 (170)	Adjusts the brightness of the internal lighting. 0 is the switching-off state. 255 is the brightest state.
Lighting brightness difference	0 to 100 (50)	Changes the ratio of the brightness of the upper lighting to the lower lighting of the internal lighting. 0: Only the upper lighting is turned on. 50: The upper and lower lightings are turned on at the same brightness. 100: Only the lower lighting is turned on.
Communication speed	0 to 3 (3)	Selects the communication speed. 0: 9600bps/1: 14400bps/2: 57600bps/3: 115200bps
Bank Copy	0 to 15 (0)	Select a destination bank. Copy the current bank to the destination bank.
Expansion display	0 to 3 (0)	Displays the internal state only on the body LCD. 0: Not displayed/1: Blue color display/2: Green color display/3: Red color display
Img Select	0 to 7 (0)	Select the input image. 0: Original / 1: Exponential / 2: Red color / 3: Green / 4: Blue color / 5: Low intensity / 6: Mid intensity / 7: Special

## 4 Descriptions of Teaching Menu



### Specifications

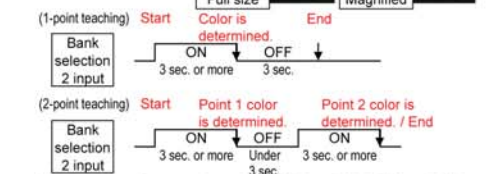
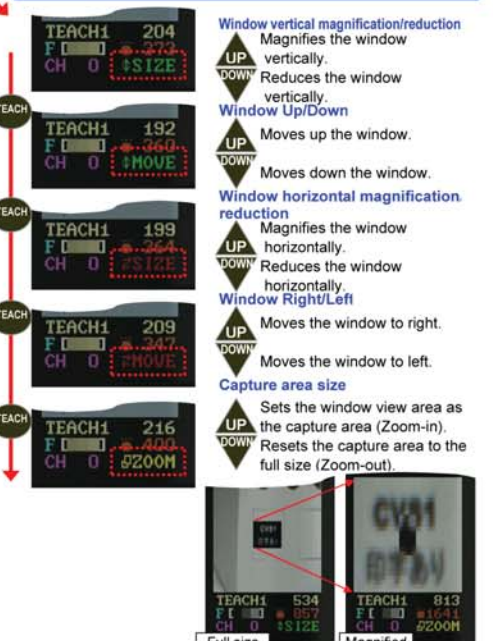
Model	CVS1	-N10-R	-N20-R	-N21-R	-N40-R	-P10-R	-P20-R	-P21-R	-P40-R
Detection angle	10°	20°	31 to 39 mm	40°	50 to 100 mm	50 to 100 mm	50 to 100 mm	50 to 100 mm	50 to 100 mm
Capture range	210 to 270 mm	90 to 150 mm	31 to 39 mm	50 to 100 mm	50 to 100 mm	50 to 100 mm	50 to 100 mm	50 to 100 mm	50 to 100 mm
Capture area (±10%)	40x50 to 55x65 mm	40x50 to 65x75 mm	17x20 mm	50x65 to 100x115 mm	50x65 to 100x115 mm	50x65 to 100x115 mm	50x65 to 100x115 mm	50x65 to 100x115 mm	50x65 to 100x115 mm
Light source	White LED, 12 pcs								
Supply voltage	12 - 24 V DC±10%								
Power consumption	Max. 140 mA/24V DC								
Resolution	8x16 to 208x236								
Lamp duration	Approx. 50000 hrs (in normal temperature and humidity. Brightness level down by 1/2 of the initial level)								
Response time	11 ms (Factory setting), 0.6 ms (Min.), 22 ms (Max.)								
Output signal	NPN/PNP open collector output 2 points Max. 100 mA. Residual voltage 1.0 V or less								
Input	Bank selection/Synchronous/External teaching input 4points								
Operating temperature	0 °C to 40 °C								
Ambient humidity	35 % to 85 %/RH								
Storage temperature/humidity	-20 °C to 70 °C, 35 % to 95%/RH								
Vibration/shock resistance	10 to 55 Hz Amplitude 1.5 mm, 500m/s <sup>2</sup> (10 times)								
Material	ABS / Acryl / Polycarbonate								
Protection structure	IP67								
Weight	Approx. 200 g								



Function	Setting range (initial value)	Description
LCD display	0 to 3 (0)	0: Normal display 1: Reverses the LCD display vertically. Select 1 when installing the unit upside-down. 2, 3: Functions as 0 and 1 on the condition that the remote monitor (CVS-M1) is connected. LCD display turns off if no button operation is detected for a minute. NTSC composite video signal is output from the external connection port.
LCD up/down reverse	0 to 3 (0)	0: Normal display 1: Reverses the LCD display vertically. Select 1 when installing the unit upside-down. 2, 3: Functions as 0 and 1 on the condition that the remote monitor (CVS-M1) is connected. LCD display turns off if no button operation is detected for a minute. NTSC composite video signal is output from the external connection port.
LCD VIEW	0 to 3 (0)	0: Normal display 1: Reverses the LCD display vertically. Select 1 when installing the unit upside-down. 2, 3: Functions as 0 and 1 on the condition that the remote monitor (CVS-M1) is connected. LCD display turns off if no button operation is detected for a minute. NTSC composite video signal is output from the external connection port.
Light ON/OFF	0 to 3 (1)	0: Internal light-OFF, External light-ON 1: Internal light-ON, External light-ON 2, 3: Functions as 0 and 1. When "SYNCHRO=1,3" is selected, the light turns ON only during image capture.
Maximum display area	0 to 9999 (9999)	Selects the maximum area. Use the function to directly read the displayed value in AREA LO or AREA HI as the area.
OFF delay time	0 to 5000 (0)	Delays turning OFF of the output. Allows it to turn off when the judgment result remains in OFF condition continuously for over the selected delay time (unit: ms).
ON delay time	0 to 5000 (0)	Delays turning ON of the output. Allows it to turn on when the judgment result remains in ON condition continuously for over the selected delay time (unit: ms).
One-shot	0, 1 (0)	Select "1" to keep the output ON for the off-delay time after the output turns on.
Outside area range	0 to 3 (0)	0: Output ON within the specified area range. 1: Output ON outside the specified area range. 2, 3: Functions as 0 and 1. "Bank selection 1 input" performs detection when the area exceeds the lower limit.
Resolution	0, 1 (1)	Select the number of pixels taken out from the image sensor. 0: High resolution (240 x 200) Suitable to detect delicate color difference and thin characters. 1: High speed (240 x 100) Suitable to shorten the response time retaining the current capture area.
Synchronization input delay time	0 to 255 (0)	Selects the delay time of synchronization input. The synchronization signal input (bank selection 3 input) delays for the period of the setting value x 64μs. Suitable for fine adjustment of image capture timing.
Synchronization input	0 to 4 (4)	Selects the synchronization input setting. When set to 0 to 3, "bank selection 3 input" is assigned to the synchronization input. The capturing conditions are as follows: 0: While the synchronization input is Off 1: When the synchronization input is switched from On to Off 2: While the synchronization input is On 3: When the synchronization input is switched from Off to On 4: Captures images independently.
Teaching enable	0 to 3 (0)	0: Enables changing the teaching window and its position, and the capture area. 1: Prohibits changing the capture area. 2: Prohibits changing the teaching window and the capture area. 3: Prohibits entering the teaching mode.
Teaching mode	0 to 3 (0)	0: Normal teaching. Determines the darkest and brightest colors in the teaching window, and selects the detection color within the range between them. 1: Stain and character detection teaching. Selects a dark color in the teaching window as the detection color. 2, 3: Functions as 0 and 1. Performs teaching without changing the brightness (BRIGHT).
Teaching color margin	0 to 30 (15)	Selects the color detection margin in teaching. (Refer for the details to COLOR%).
Temperature compensation level	0 to 255 (30)	Adjusts the setting against the deviation in color detection due to variable temperature. (Available only when both COLR FIL=0.2 and RESOLUT=1 are selected.) Perform teaching at low temperature and adjust the setting at high temperature to obtain the optimum value.
Language selection	0/1 (0)	Selects a display language. 0: English / 1: Japanese
Lighting brightness	0 to 255 (170)	Adjusts the brightness of the internal lighting. 0 is the switching-off state. 255 is the brightest state.
Lighting brightness difference	0 to 100 (50)	Changes the ratio of the brightness of the upper lighting to the lower lighting of the internal lighting. 0: Only the upper lighting is turned on. 50: The upper and lower lightings are turned on at the same brightness. 100: Only the lower lighting is turned on.
Communication speed	0 to 3 (3)	Selects the communication speed. 0: 9600bps/1: 14400bps/2: 57600bps/3: 115200bps
Bank Copy	0 to 15 (0)	Select a destination bank. Copy the current bank to the destination bank.
Expansion display	0 to 3 (0)	Displays the internal state only on the body LCD. 0: Not displayed/1: Blue color display/2: Green color display/3: Red color display
Img Select	0 to 7 (0)	Select the input image. 0: Original / 1: Exponential / 2: Red color / 3: Green / 4: Blue color / 5: Low intensity / 6: Mid intensity / 7: Special

\*1 The maximum value is adjustable using the MAXAREA setting.  
 \*2 The bank selection input specifies the bank number using binary digit. (Ex. For Bank 10, set the bank selection 1 and 3 to ON.)  
 \*3 Time setting longer than the response time is ignored.  
 \*4 Immediately after a button operation, the light does not turn off even during the image capture.  
 \*5 When ON delay time, OFF delay time, and One-shot are activated together, Area hysteresis is deactivated (HYSTRSY=0).  
 \*6 When "SYNCHRO=1,3" is selected, the color area judgment is properly proceeded while the LCD does not display the image captured immediately after any button operation. An array of the right end of the image may appear at left end of the display, but does not interfere with the performance.

### Teaching Procedure



Ramco Innovations  
 800.280.6933  
 www.Optex-Ramco.com