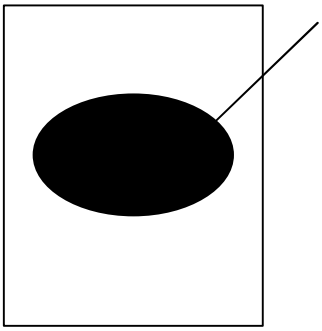
Frequently Asked Questions about Set Values and Their Details **2003.12.8 OPTEX FA**

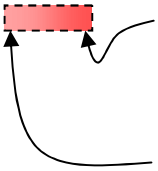
Since the contents explained here extend as far as considerably detailed parts, you do not need to memorize them. It would be enough only if you could explain by referring to this material when you come across a problem.

Contents

(1) Difference between COLOR% and TEACH%



Extract the colors between "the darkest color" and "the brightest color" inside the teaching window.

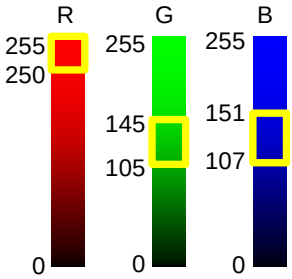


The darkest color
R Red 250
G Green 105
B Blue 107

The brightest color
R Red 255
G Green 145
B Blue 151

※Brightness and Darkness are shown by a value within 0 to 255 for each R, G, and B.

A color in the middle of the brightest color and the darkest color is set as the detection color for each of R, B, and G, respectively.



R = (255+250)/2 = **252**
G = (145+105)/2 = **125**
B = (151+107)/2 = **129**
} Register as detection color.

Calculate the color margin percentage based on a color with the widest range among R, G, and B.

Range R = 255-250 = 5
Range G = 145-105 = 40
Range B = 151-107 = 44
} The widest range is 44.

The result obtained by multiplying TEACH% (Teaching margin percentage) to the widest range 44 will be COLOR% (color margin percentage).

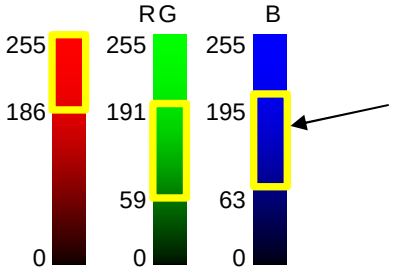
COLOR% = The widest range× TEACH% set value /10

COLOR% will be as follows when supposing that TEACH% is the initial value “15”.

COLOR% = 44×15/10 = **66** → Save as the set value of **COLOR%**.

Now, extraction of colors has completed by the above operation.
Colors to be actually detected are as follows:

R detection color = 252±66 = 318 to 186→255 to 186 since 255 is exceeded.
G detection color = 125±66 = 191 to 59
B detection color = 129±66 = 195 to 63



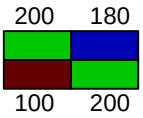
+1 is added to the number of pixels for the colors when they are in the range of this yellow frame.

(2) Relation between operations of COLRFIL and KIL BLK

Operation of “COLRFIL = 0”

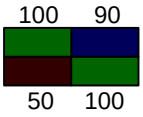
Four pixels of the image sensor are used as one color.
In the operation of “COLRFIL=0”, color ratios of R, G, and B are calculated for each pixel.

KIL BLK regulates the calculation of the ratio at this time.



The following brightness is obtained in case of this example.
R = 100
G = (200+200)/2 = 200
B = 180
← This is the color (slightly dark light blue) seen in D screen.

Let us calculate this color ratio. This result will be the colors of four pixels.
R' = R/(R+B+G)×512 = 100/(100+180+200)×512 = **106**
G' = G/(R+B+G)×512 = 200/(100+180+200)×512 = **213**
B' = B/(R+B+G)×512 = 180/(100+180+200)×512 = **192**
← This is the color seen in F screen (Light blue).



The left example is the image in which the brightness became half of the former example.
R = 50
G = (100+100)/2 = 100
B = 90
← This is the color (dark light blue) seen in D screen.

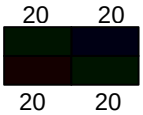
Let us calculate this color ratio.
R' = R/(R+B+G)×512 = 50/(50+90+100)×512 = **106**
G' = G/(R+B+G)×512 = 100/(50+90+100)×512 = **213**
B' = B/(R+B+G)×512 = 90/(50+90+100)×512 = **192**
← This is the color (light blue) seen in F screen.
The result became the same as the previous example. That is, a dark color is converted to a color same as for a bright color.

Operation of KIL BLK

As shown above, the function to correct dark portion can correct shadows and the irregularity of lighting, but it may spoil the capability to distinguish white from black.

In order to solve this problem, the set value of KIL BLK works to keep the value of (R+B+G) in the former equation above the specified value.

If (R+B+G) <255 - (KIL BLK×8), a value obtained by “255 - (KIL BLK×8)” is set as the value of (R+B+G).



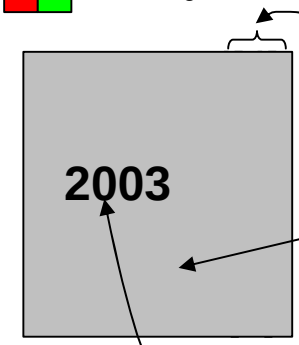
Let us confirm the operation of KIL BLK by using this example.
R = 20
G = (20+20)/2 = 20
B = 20
← This is the color (considerably dark gray) seen in D screen.

Let us calculate this color ratio. In case of “KIL BLK=27”, (R+B+G) of this color is greater since the regulation value of (R+B+G) is 255-(27×8) = 39.
Therefore, (R+B+G) = 60 is used for the calculation.
R' = R/(R+B+G)×512 = 20/(20+20+20)×512 = **170**
G' = G/(R+B+G)×512 = 20/(20+20+20)×512 = **170**
B' = B/(R+B+G)×512 = 20/(20+20+20)×512 = **170**
← This is the color (light gray) seen in F screen.
Although this color is basically dark, it is converted to a brighter color since the darkness correction ratio is high (KIL BLK = 27).

In case of “KIL BLK=5”, (R+B+G) of this color is smaller since the regulation value of (R+B+G) is 255-(5×8) = 215.
Therefore, (R+B+G) = 215 is used for the calculation.
R' = R/215×512 = 20/215×512 = **47**
G' = G/215×512 = 20/215×512 = **47**
B' = B/215×512 = 20/215×512 = **47**
← This is the color (light gray) seen in F screen.
This color can be distinguished from a brighter color since the darkness correction ratio is lowered.

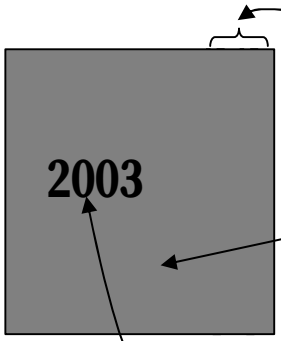
Operation of “COLRFIL=1”

Four pixels of the image sensor are used as one color. (This is the same as in “COLRFIL=0 “.)
The brightness of the screen is corrected based on the brightest color within the rightmost 4 lines.



(e.g.) Suppose the brightest luminance within the right edge in the screen as follows:
R_{max} = 200
G_{max} = 195
B_{max} = 207
Also, suppose the background of the reset part of the screen as follows:
R = 199
G = 193
B = 200
The color is corrected by the following equations:
R' = R/R_{max}×256 = 199/200×256 = **254**
G' = G/G_{max}×256 = 193/195×256 = **253**
B' = B/B_{max}×256 = 200/207×256 = **247**

In addition, if a dark portion of a character is as follows:
R = 40
G = 38
B = 41
The color is corrected as follows:
R' = R/R_{max}×256 = 40/200×256 = **51**
G' = G/G_{max}×256 = 38/195×256 = **49**
B' = B/B_{max}×256 = 41/207×256 = **50**



Next, if the entire screen darkens as follows:
R_{max} = 100
G_{max} = 98
B_{max} = 103
And if the background of the rest part of the screen is as follows:
R = 99
G = 96
B = 100
The color is corrected by the following equations:
R' = R/R_{max}×256 = 99/100×256 = **253**
G' = G/G_{max}×256 = 96/98×256 = **250**
B' = B/B_{max}×256 = 100/103×256 = **248**

Again, if a dark portion of a character is as follows:
R = 20
G = 19
B = 20
The color is corrected as follows:
R' = R/R_{max}×256 = 20/100×256 = **51**
G' = G/G_{max}×256 = 19/98×256 = **49**
B' = B/B_{max}×256 = 20/103×256 = **49**

The values after correction will be the ones before the entire screen darkens. Moreover, the difference between dark part (character) and the background remains as it is unlike the case of “COLRFIL=0”.
Although white portion must remain at the right edge in the screen for this correction, detection is successfully done, distinguishing dark color from bright color and dealing with the change in brightness.

Operation of KIL BLK

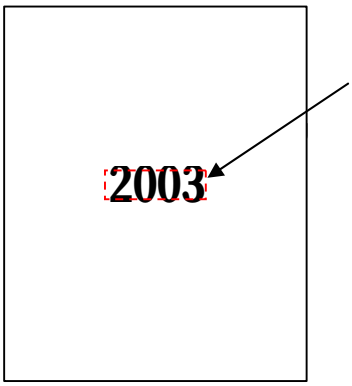
The set value of KIL BLK should be regulated to keep the values of R_{max}, G_{max}, and B_{max} above the value obtained by the equation “255-(KIL BLK×8)”. Therefore, the correction does not work when the screen is too dark when the value of KIL BLK is reduced. In case of “COLRFIL=1”, the initial value “27” can be used as is. “KIL BLK=0” can be used for the inspection of the luminance of LED since darkness correction does not work by this setting.

(3) When to use TEACHMD?

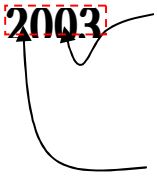
Operation of “TEACHMD=0”

The color range between the darkest color and the brightest color in the teaching window is set as the detection color.
(1) Refer to “Difference between COLOR% and TEACH%” for the details.

Operation of “TEACHMD=1”



The dark side color from "the brightest color" to "the darkest color" inside window is set as the detection color.



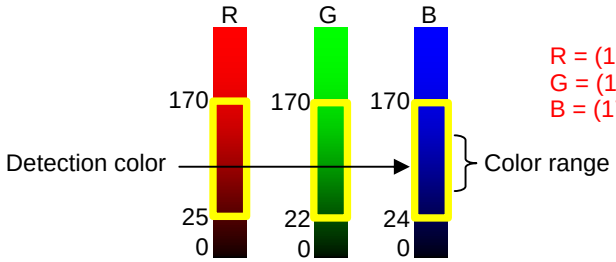
The darkest color (character)

R	Red	25
G	Green	22
B	Blue	24

The brightest color (background)

R	Red	170
G	Green	170
B	Blue	170

The dark side color from R, G, and B is going to be detected respectively.



R = (170-25)/4+25 = 61
G = (170-22)/4+22 = 59
B = (170-24)/4+24 = 60
} Register as the detection color.

Use the maximum value of the half of each of R, B, and G detection color as the margin percentage of color.

Range R = 61/2 = 30
Range G = 59/2 = 29
Range B = 60/2 = 30
} The widest range is 30.

The result of multiplying TEACH% (Teaching margin percentage) to the widest range “30” will be COLOR% (Color margin percentage).

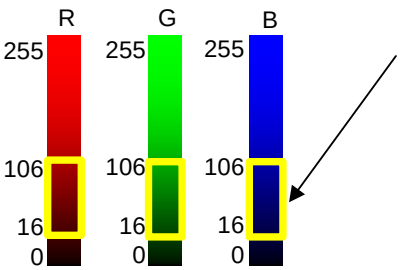
COLOR% = The widest range × TEACH% set value/10

COLOR% will be as follows when TEACH% is “15” (Initial value).

COLOR% = 30×15/10 = 45 → Save as COLOR% set value.

Extraction of colors has completed by the above operation.
The colors to be actually detected are:

R detection color = 61±45 = 106 to 16
G detection color = 59±45 = 104 to 14
B detection color = 60±45 =105 to 15

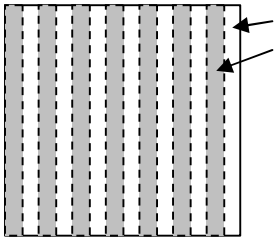


+1 is added to the number of pixels for the colors when they are in the range of this yellow frame.

Since the dark side color is chosen, it is the best for the detection of black characters.

(4) When to use TEMPCMP?

In case of “RESOLUT=1 (Low resolution)”, only the odd lines of the image sensor read data.



Odd lines: Data is read.
Even lines: Data is not read.

In that case, exposure exceeds (a large amount of electric charges are accumulated) since the pixels of the even lines are not reset.
Colors will be lighter if the accumulated electric charges leak to the pixels of the odd lines.

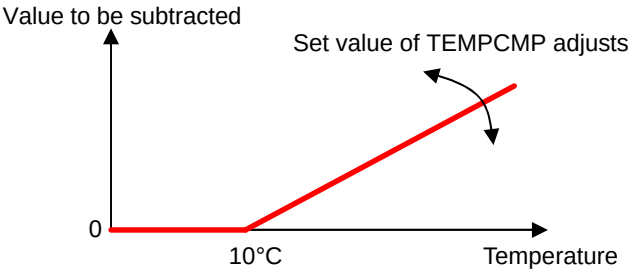
Normal

R=200, G=30, B=50

When electric charge leaks
(D screen)

R=200+20, G=30+20, B=50+20

TEMPCMP functions to correct colors by subtracting the leaked electric charges monitoring the internal temperature since this leak electric changes increase as the temperature increases.



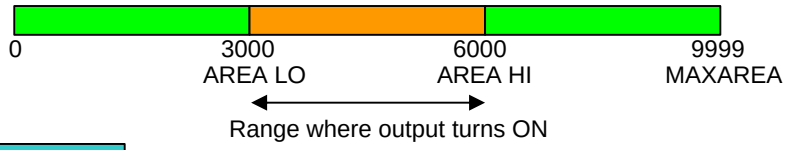
※ When the setting is “RESOLUT=0”, no correction is made since the electric charges do not leak.
※ When the setting is “COLRFIL=1 or 3”, no correction is made since influence is little since the leak of the electric charges is canceled by the function of the brightness correction.

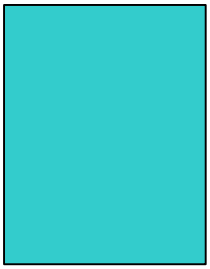
● When adjustment is to be made?
→When the color taught at normal temperature begins to shift due to the rise in temperature for the detection to distinguish the slight difference in colors (at COLOR% = below around 10%).

● How adjustment is to be made?
→Switch the screen display mode to “2”. Adjust the value of TEMPCMP to detect the detection color correctly. Since the detection color, the change in the lighting temperature, and else influence the result, adjust using the actual object.

(5) Relation between MAXAREA and AREA LO or AREA HI

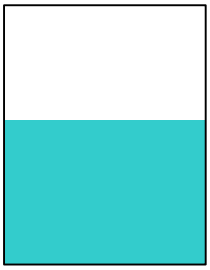
MAXAREA = 9999 (Initial value):





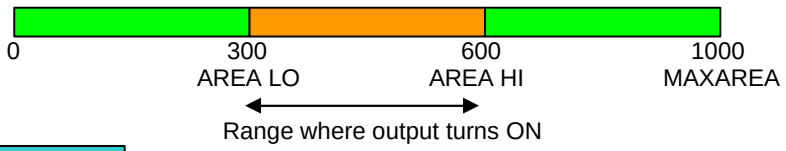
= Detection color

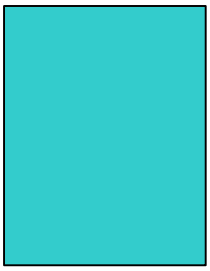
When the detection color occupies the entire screen, the present area is **9999** (MAXAREA set value).



When the detection color occupies the half of the entire screen, the present area is **4999** (half of MAXAREA set value).

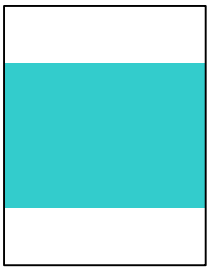
MAXAREA = 1000:





= Detection color

When the detection color occupies the entire screen, the present area is **1000** (MAXAREA set value).



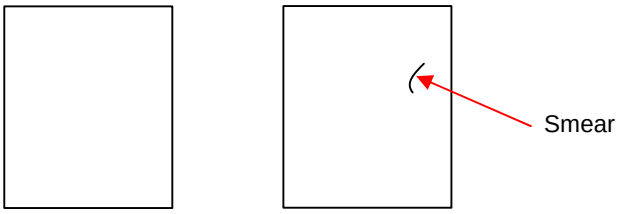
When the detection color occupies the half of the entire screen, the present area is **500** (half of MAXAREA set value).

● When setting is to be made?

Assume that the imaging range of the entire screen is 50×60 mm. In this case, the area of the entire screen is 50×60 = 3000 (mm^2). Therefore, the present area can be displayed by the unit of (mm^2) by setting MAXAREA to “3000”.

(6) When to used HYSTRSY?

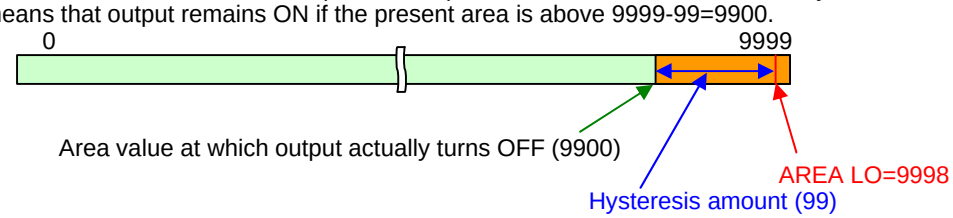
There is no problem even if HYSTRSY (area hysteresis) is not changed.
However, it must be adjusted when detecting smear and irregularity of colors.



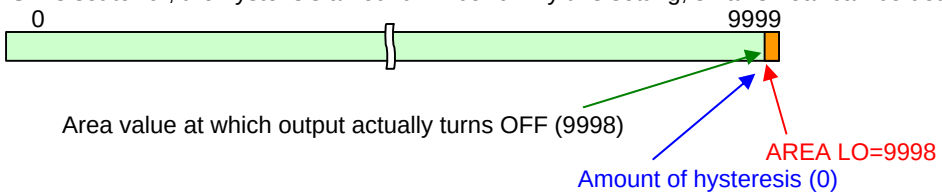
Detection color = white
Present area =9999

Detection color = white
Present area =9997

To distinguish the above two figures, set AREA LO (area lower limit) to “9998” and set so that output turns ON if the present area is 9998 or more.
At this time, when HYSTRSY is “10” (Initial value), “10×0.1%×9999 = 99” is set as hysteresis.
This means that output remains ON if the present area is above 9999-99=9900.



By the above setting, small smear cannot be detected though AREA LO was set to “9998”.
To solve this problem, HYSTRSY changes the hysteresis amount.
If HISTRSY is set to “0”, the hysterisis amount will be “0”. By this setting, small smear can be detected as follows.



(7) Setting when synchronous input is used

When imaging by the synchronous input, sometimes, you may want to turn ON the output only when a work is OK.

Set value to be changed

SYNCHRO	**3**	Make Bank Switch 3 input as the synchronous input and imaging is done at its rise timing.
ONESHOT	**1**	Enter the oneshot output mode
OFF DLY	**50**	Specify the oneshot output time by the unit of ms. (50 ms in this example)
OUTSIDE	**0**	Set this setting to “1” if you want to turn ON the output only when a work is NG.

Timing chart