OCR Sensor (Optical Character Recognition) Instruction Manual

CVS4-□R (Japanese/English)

OPTEX FA

- Thank you for purchasing the CVS4 series OCR Sensor.
- Before using this product, read this instruction manual thoroughly to ensure correct use.
- After reading this instruction manual, store it safely for future reference.
- This device cannot be used as protective equipment for the purpose of protecting the human body.
- When exporting a device in which applicable Optex FA products are embedded to an EU nation*, the EU Battery Directive applies even to embedded devices, so we ask that you provide the following support.
  1) When exporting a product to an EU nation*, include the latest instruction manual of the Optex FA product. If it is not possible to include the instruction manual of the Optex FA product, write the section <Symbol mark explanation>, which is the final section in this manual, in the device's manual.
  2) Even for devices (including those that have been discontinued) manufactured prior to the adoption of the EU's new Battery Directive, 1) listed above must be complied with when exporting such devices to an EU nation* as of September 26, 2008.

  * The term EU nation includes Switzerland, Ireland, Norway, Liechtenstein, and Turkey in addition to the member nations of the EU.

Contents

1. What Is the OCR Sensor CVS4 Series?

- This is a sensor that can use its built-in OCR (Optical Character Reader) to read alphabet characters, numeric values, and symbols. (Other characters cannot be read.)

Date marking (the time is also possible) (For example, best before dates)	Date + character string marking (For example, best before dates and manufacturing plant identification marks)	Character string marking (For example, lot numbers and part numbers)
2006.03	06.03.14 / AB1	AA0054321

Readable characters/symbols	0 to 9, A to Z, ., /, :
Characters/symbols that become readable after registration in the expansion dictionary	!, #, $, %, &, (,), *, +, ;, <, =, >, ?, @, [, \,], ^, `, a to z, ~

* You can use [View NG Log] (see P.5) on the top menu to register NG characters in the expansion dictionary.
* To edit the expansion dictionary, you require the PC communication cable CVS-C2C (standard price: 10,000 yen). You have to use the setup software (which can be downloaded free of charge from the Optex FA website: www.optex-fa.com).

- The read characters are compared against the sensor's built-in dictionary data, and the closest characters are selected. You can configure the sensor so that the judgment is OK if all the selected characters are correct and NG if even one character does not match.

Correct marking: OK	Marking mistake: NG	Missing character: NG
2006.03	2006.04	200 .03

- The judgment is OK if a small part of the character is missing such that the character can still be read by the human eye.

Correct marking: OK	Small part of the character missing: OK	Large part of the character missing: NG
2006.03	2006.03	2006.03

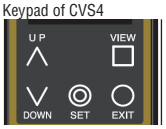
- Updating of date marking is also supported automatically.
  The built-in calendar function automatically handles updates to the dates and times that are marked by a printer. There is no need to reconfigure the settings each time that the printed details change.
  Also, you can set the date tolerance, which makes it possible to prevent erroneous judgments from occurring when the date changes.

2. Parameter Tree and Basic Operation

Top menu (For details, see P.5.)

- Setup Flow
- Parameter
- Date/Time
- ExpertParamtr
- View NG Log
- Calendar
- Auto Teach
- SemiautoTeach
- Date Teach
- String Editor
- Dictnr Editor

Keypad of CVS4



How to select parameters

→ Move from the top menu to Setup Flow. (Enter/execute)	SET
← Move from Setup Flow to the top menu. (Back)	EXIT
↑ ↓ Move up and down. (Loops through the selections)	U P DOWN

Setup Flow	Overview	Details
Language	Switch the language of the LCD between English and Japanese.	P.6
Orienttn	Select the character orientation between normal, vertically inverted, and mirrored.	P.6
Wide	Change the field-of-view and mode.	P.6
Light	Switch the built-in lighting on/off.	P.6
Shading	Correct for uneven brightness on the left and right of the screen.	P.6
Surface	Select whether the surface is white or black.	P.6
Trapezid	Enter the installation angle of the CVS4 in relation to the object.	P.6
ShtrLimt	Enter the upper limit for the shutter speed.	P.6
Synchron	Select the trigger mode.	P.6
DateFrmt	Select the format from YMD, MDY, and DMY.	P.6
Auto Tch	Execute automatic teaching.	P.6
Format 1 Format 2 Format 3 Format 4	Check, correct, and add formats (you can specify up to four) of the characters to capture. The format can be a date, time, or a character string such as a serial number.	P.7
If OK:	The settings are complete if an OK product results in an OK judgment and an NG product results in an NG judgment.	
LightPwr	Adjust the brightness of the built-in lighting.	P.8
Shutter	Enter the shutter speed.	P.8
Luster	Adjust for the influence of the object luster.	P.8
Threshld	Adjust the contrast between the surface and the characters.	P.8
DotCheck	Make the judgment NG if there are no dots within the characters.	P.8
↲Check	Make the device recognize line feed characters (they are handled as dots).	P.8
Semiauto	Execute semiautomatic teaching.	P.8
String	Check and correct character strings such as serial numbers.	P.8
If OK:	The settings are complete if an OK product results in an OK judgment and an NG product results in an NG judgment.	
Bold	Adjust the characters to their optimum width.	P.9
Rotate	Adjust the rotation angle of the characters.	P.9
SlantOfs	Adjust the [Slant] central angle.	P.9
Slant	Adjust the slant of the characters.	P.9
CharWdth	Adjust the width of the characters that you want to detect.	P.9
CharNarw	Make adjustments so that narrow "1" and "." characters are detected.	P.9
CharHght	Adjust the character height.	P.9
Date Tch	Only teach the sensor the contents of characters that should be recognized as OK.	P.9
EXIT	The settings are complete if an OK product results in an OK judgment and an NG product results in an NG judgment.	

Parameter	Overview	Details
Bank	Set the bank selection method.	P.9
BankCopy	Copy the setting details to a different bank number.	P.9
Communic	Select the communication function and baud rate.	P.9
Initializ	Set all the settings to their factory default values.	P.9
LightOut	Controlling the external lighting.	P.9
NG Delay	Output if many times consecutive NG judgments must occur.	P.9
OffDelay	Set the off-delay time in units of 1 ms.	P.9
On Delay	Set the on-delay time in units of 1 ms.	P.9
One-shot	Set this to "ON" to turn the sensor on for the length of time specified by the off-delay time.	P.9
OutSynDl	Set this parameter when the detection point is far from the rejection point.	P.10
Save NG	Set the storage method for NG images.	P.10
String +	Set the input for string addition.	P.10
SyncDely	Delay the time from the trigger timing to the capturing of the image.	P.10
SyncFilt	Eliminate short noise from the trigger signal.	P.10
SyncPuls	Set the synchronous pulse.	P.10
Synchron	Select the trigger mode.	P.10
NG-I/O	Select the function of the NG line (red/black).	P.10
Out Sel	Select the line to use in output (OK line/NG line).	P.10
EXIT	Return to the top menu.	

Date/Time	Overview	Details
1-Date +	This is the difference in the number of days between today's date and the date of the OK product.	P.10
1-Date ±	Set the number of days before and after an OK date for judgment to still be OK.	P.10
2-Date +	This is the difference in the number of days between today's date and the date of the OK product.	P.10
2-Date ±	Set the number of days before and after an OK date for judgment to still be OK.	P.10
1-Time +	This is the difference in the number of minutes between the current time and the time of the OK product.	P.10
1-Time ±	Set the number of minutes before and after an OK time for judgment to still be OK.	P.10
2-Time +	This is the difference in the number of minutes between the current time and the time of the OK product.	P.11
2-Time ±	Set the number of minutes before and after an OK time for judgment to still be OK.	P.11
Format 1 Format 2 Format 3 Format 4	Check and correct formats (you can specify up to four) of the characters to capture. The format can be a date, time, or a character string such as a serial number.	P.11
No.ofCHR	Set this parameter when you want to perform judgments according to the number of characters.	P.11
No.ofTOL	Set how many characters more or less than the target amount will be OK.	P.11
Max Strg	Set this parameter when you select the "STRG" format.	P.11
MonthChr	When capturing images of written-out month names, enter the number of characters to use for these month names.	P.11
StrgLine	Set this parameter when you select the "STRG" format.	P.11
YearOfst	When years are expressed as Japanese eras, enter the difference between these years and years according to the western calendar.	P.11
EXIT	Return to the top menu.	

ExpertParamtr	Overview	Details
CharMrgn	Set how strictly to judge characters.	P.11
ChrSpace	Set the interval between characters.	P.11
ExpDctnr	This is the number of characters that have been additionally registered to the dictionary.	P.11
ExtLgtPw	Set the brightness of the CVS-LW1 external lighting device.	P.11
ExtTeach	Select the teaching input mode.	P.11
FixRtSlt	Set the parameters that will not be rewritten by teaching.	P.11
TchRange	Limit the dates that are automatically added during teaching.	P.11
IntDctnr	Set this to "OFF" when not using the built-in dictionary.	P.11
LCD View	Vertically invert the LCD or rotate it to the right.	P.11
Msk Left	Mask the left side of the screen.	P.11
MskRight	Mask the right side of the screen.	P.11
Msk Up	Mask the upper part of the screen.	P.11
Msk Down	Mask the lower part of the screen.	P.11
PrintSts	Set this parameter according to the printing status.	P.11
Re-Scan	Skip over unrelated characters during reading.	P.11
Re-Slant	When an NG judgment occurs, change the slant of the characters and perform reading again.	P.11
Sprt 123	Enable/disable the splitting of characters from rows 1 to 3.	P.11
Sprt 456	Enable/disable the splitting of characters from rows 4 to 6.	P.11
ZeroChck	Judge dates and times that are a single digit as NG.	P.12
EXIT	Return to the top menu.	

If you forget which parameter you are setting, press EXIT to return to the top menu.

Yellow — Common setting to all banks
Purple — Individual setting on each bank
Green — Execute parameter

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3. Specifications

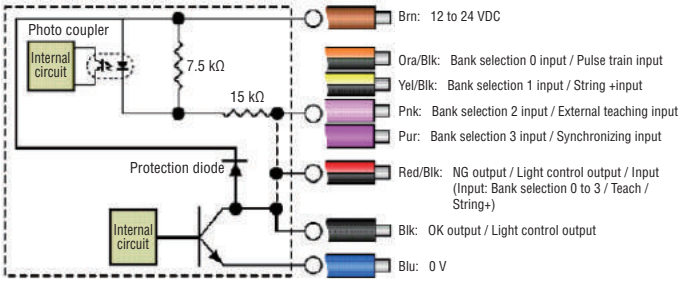
Type		Standard	Middle range	For small characters	Long range	Wide	Standard, Vertical
Model[1]	CVS4	-N23W-R	-N24W-R	-N21W-R	-N20W-R	-N40W-R	-N23RW-R
Angle of view		20°				40°	20°
Focal distance		50+/-6 mm	65 to 85 mm	35+/-4 mm	90 to 150 mm	40 to 100 mm	50+/-6 mm
Field of view (H×V)		30×15 mm	38×19 to 48×24 mm	21×10 mm	53×25 to 79×38 mm	53×25 to 115×53 mm	15×30 mm
Character height (Each mode of "Wide")	OFF	1.1 to 12 mm	2.1 to 19 mm[2]	0.75 to 8.2 mm	2.8 to 31 mm[2]	2.8 to 43 mm[2]	1.1 to 12 mm
	ON	2.2 to 24 mm	4.2 to 38 mm	1.5 to 16 mm	5.6 to 62 mm[2]	N/A	2.2 to 24 mm
	FAST / FST2	2.2 to 12 mm	4.2 to 19 mm	1.5 to 8.2 mm	5.6 to 31 mm[2]	5.6 to 43 mm[2]	2.2 to 12 mm
Lighting	Light source	12 White LEDs					
	Brightness	Approx.70 cd		Approx.35 cd	Approx.70 cd	Approx.54 cd	Approx.70 cd
	Lifetime	Approx. 100,000 hours (In room temperature and humidity. Brightness level down by 1/2 of the initial level)					
Image sensor		330,000 pixels, CMOS monochrome image sensor					
Supply voltage		12 to 24 VDC +/-10%					
Current consumption		Max.140 mA / 24 VDC					
Resolution		512×244					244×512
Response time		20 characters of the date in 2 rows Approx. 23 to 48 ms ("Rotate" 0 to +/-10°)					
Output signal		NPN Open collector output:x2, max.100 mA, Residual voltage 1.0 V or less, OK/NG output, External light control					
Input signal		Bank selection, String addition, External teaching, Synchronism, Pulse					
Input filter time		12 ms (max): Bank selection[3], String addition, External teaching input, 48 µs (turn on, max), 450 µs (turn off): Synchronism, Pulse train input					
Operating temp./ humidity		0 to 40°C (No condensation), 35 to 85%/RH					
Strage temp./humidity		'-20 to +70°C, 25 to 95%/RH					
Vibration/Shock		10 to 55 Hz, Amplitude1.5 mm, 2 hours on XYZ each axis / 50 G (500 m/s²) 3 times on XYZ each axis					
Applicable regulation		EMC Directive (2014/30/EU), EU Battery Directive (2006/66/EC)					
Applicable standard		EN61000-6-2, EN61000-6-4					
Material		Case: ABS, LCD & LED Lens: Acrylic (LED Lens for -N21W-R & -N40W-R: PC)					
Protection class		IEC 60529: IP67					
Weight		Approx. 200 g (Including cable)					
Recognized number of characters, rows		60 characters (All rows) / 6 rows					
Recognized number of characters per a row		30 characters per row					
Recognized number of dates, times, and strings		4 in total: Each 2 for the date and the time, below 4 for the string (total 22 characters)					
User-defined dictionary		56 characters (Registered by NG Log or transferred from PC[4])					
Date and time in letters		Month: 1 chr., Date: 2 chr., Hour: 1 chr., Minute: 1 chr. Converting to the above-mentioned alphabetical and numeric characters is available. (Transferred from PC)[4]					
Built-in clock accuracy		Monthly difference: -45 sec to + 1 min 15 sec (Typical value)					
Built-in clock Backup		Primary battery: 5 years with the power OFF (Typical value) Supercapacitor: 7.8 years (Typical value with 3 days of backup time)					
Communication		RS-232C (TTL Level) 4,800 to 115,200 bps[4]					

1) For the PNP output type, the "N" after the hyphen is changed to a "P." ex.) CVS4-N23W-R → CVS4-P23W-R
There are other special models in addition to the one shown above. For details, contact Optex FA.
2) The minimum detectable character height depends on the distance.
CVS4-N24W-R: 2.1 mm (at 65 mm) to 2.7 mm (at 85 mm)
CVS4-N20W-R: 2.8 mm (at 90 mm) to 4.2 mm (at 150 mm)
CVS4-N40W-R: 2.8 mm (at 40 mm) to 5.9 mm (at 100 mm)
3) Approximately 100 ms is required from the point where the bank is switched to the point where the next image can be captured.
4) To connect this device to a PC, the optional PC I/F cable CVS-C2C (sold separately) is required. You can also download the setup software (see P.14) free of charge from the Optex FA website, "www.optex-fa.com."

4. I/O Circuit Diagram and Wiring

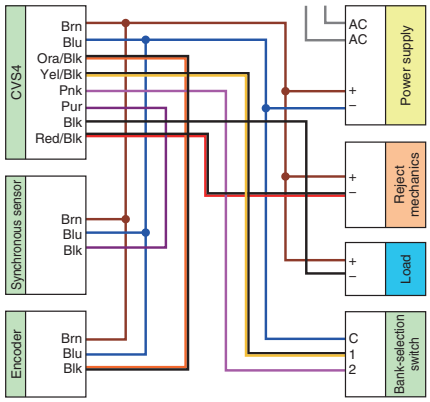
(For details on PNP output types, see the appendix.)

[I/O Circuit Diagram (NPN Type)]



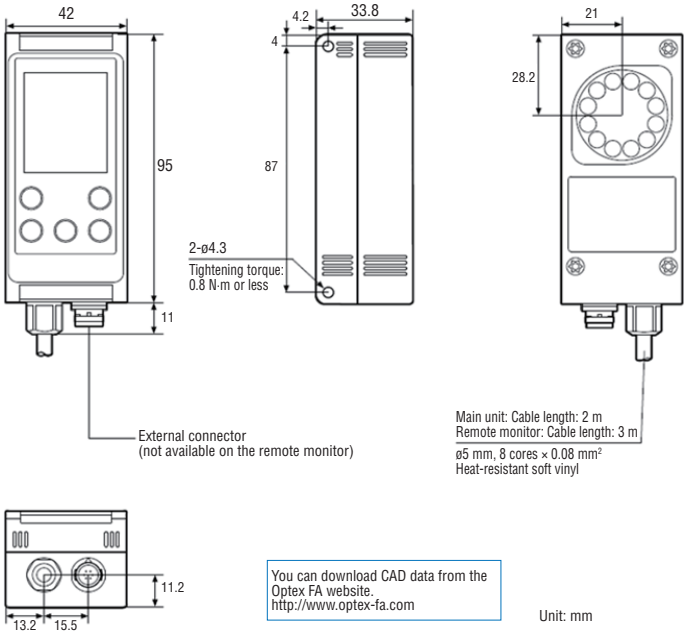
[Wiring example for NPN output]

Typical example to connect Synchronous sensor, Rotary encoder, Reject mechanics and Bank-selection switch.



* When capturing images of moving objects, timing input from a synchronous sensor is required.

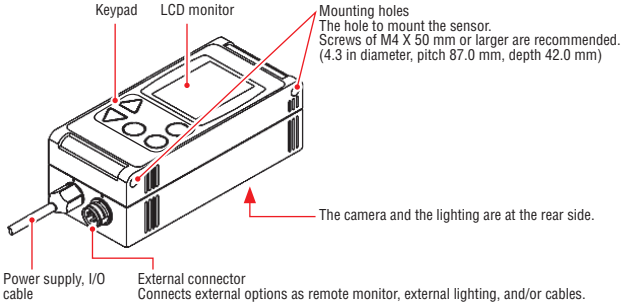
5. Dimensions



You can download CAD data from the Optex FA website.
http://www.optex-fa.com

Unit: mm

6. Part Names and Functions



7. Options and External Lighting Devices

[Options that can be connected to the CVS4]

Model	Application
Remote monitor **CVS-M1-R**	This is a monitor unit equipped with a remote control function for the CVS series. Connect this unit when viewing the judgment results at a distance from the objects. You can also perform teaching and set the parameters of this unit in the same way as the CVS4 series.
PC I/F cable **CVS-C2C**	You can use this cable to connect to a PC in order to read and save data. Download the communication software from the Optex FA website (http://www.optex-fa.com).
Video cable **CVS-CN**	This cable is equipped with a pin plug for connecting to the video input terminal of a NTSC TV or similar device in order to view the images captured with the CVS4.
PC I/F cable + video cable **CVS-C2P**	This cable is equipped with a pin plug for communicating with a PC and, at the same time, viewing the images captured with the CVS on a NTSC TV or similar device.
PC I/F cable + I/F cable for video out **CVS-C2Y**	This cable can be used to communicate with a PC and, at the same time, view the captured screens on the remote monitor CVS-M1-R. (You cannot perform operations from the CVS-M1-R. You can only view the screen.)
Extension cable for remote monitor (3 m) **CVS-C3S**	Use this to extend the dedicated cables and the cable of the remote monitor CVS-M1-R. You can use up to four extension cables (for a total length of 15 m).

[External lighting]

Model	Application
External bar lighting, white light, 50 mm wide **OPB-5015W2-B**	Use this option when the built-in lighting causes glare. The OPPD-15 or OPP-10-H (10 W) will be required (sold separately).
External bar lighting, white light, 100 mm wide **OPB-10015W2-B**	Use this option when the built-in lighting causes glare. The OPPD-15 or OPP-30-H (30 W) will be required (sold separately).
LED lighting controller **OPPD-15**	This is the controller for the OPB-5015W2-B and OPB-10015W2-B. Supply voltage of 24 VDC and 1 lighting output channel.
Lighting power supply **OPP-10-H (10 W)**	This is the 100 VAC power supply for the OPB-5015W2-B. It has 2 lighting output channels.
Lighting power supply **OPP-30-H (30 W)**	This is the 100 VAC power supply for the OPB-10015W2-B. It has 2 lighting output channels.
Bar lighting mounting bracket **CVS-OPDB-2000**	This mounting bracket is used to install the CVS and the OPB-5015W2-B vertically. (You can use two mounting brackets to install two OPB-5015W2-B lighting units.)
Bar lighting mounting bracket **CVS-OPDB-3040**	This mounting bracket is used to install the CVS and the OPB-5015W2-B or OPB-10015W2-B horizontally. (You can use two mounting brackets to install two OPB-10015W2-B lighting units.) You can make horizontal adjustments over a range of 30 mm and height adjustments over a range of 40 mm.
Bar lighting mounting bracket **CVS-OPDB-6080**	This mounting bracket is used to install the CVS and the OPB-5015W2-B or OPB-10015W2-B horizontally. (You can use two mounting brackets to install two OPB-10015W2-B lighting units.) You can make horizontal adjustments over a range of 60 mm and height adjustments over a range of 80 mm.

We can prepare the optimum lighting units to match your applications and objects. Contact Optex FA for details.

8. Bank Selection

[What is bank selection?]

You can configure up to 16 settings for reading characters on the CVS4 and then use this function to select the settings by applying an external signal.
For example, consider the case in which the product to be manufactured today has an expiration period of three days but the product manufactured tommorow has an expiration period of seven days. If you save settings for the three-day expiration period in bank 0 and settings for the seven-day expiration period in bank 1, you can perform smooth changeovers from one product to another because there is no need to reconfigure the settings on the CVS4 when the length of the expiration period changes.
You can also use CVS4 button operations to perform bank selection (see [Bank] on P.9).

[Bank numbers and Input signals]

Bank No.	Line color and input signal			
	Ora/Blk	Yel/Blk	Pnk	Pur
0	OFF	OFF	OFF	OFF
1	ON			
2	OFF	ON		
3	ON			
4	OFF	OFF	ON	
5	ON			
6	OFF	ON		
7	ON			
8	OFF	OFF	OFF	ON
9	ON			
10	OFF	ON		
11	ON			
12	OFF	OFF	ON	
13	ON			
14	OFF	ON		
15	ON			

For NPN output
ON: Connect to Blue line (0 V)
OFF: Open, or connect to Brown line (+V)

For PNP output
ON: Connect to Brown line (+V)
OFF: Open, or connect to Blue line (0V)

[Selecting the bank input line function with the parameter settings]

You can also use the four bank selection input lines (0 to 3) for other applications such as the trigger input and teaching input. To use these for a purpose other than bank selection input, set the [Bank] (P.9), [Synchron] (P.6), [String +] (P.10), and [SyncPuls] (P.10) parameters according to the following table.

Parameter (in "Parameter")				Function of Bank input line				Selectable range
Bank	Synchron	String +	SyncPuls	Ora/Blk	Yel/Blk	Pnk	Pur	
BKIN	CONT	OFF	Besides ON	Bank selection 0	Bank slctn 1	Bank slctn 2 Note)	Bank slctn 3	0 to 15
			ON					
		ON, SCLR	Besides ON		String +			0, 1, 4, 5, 8, 9, 12, 13
			ON					
	UP, HIGH, DOWN, LOW	OFF	Besides ON		Bank slctn 1		Synchronous input	0 to 7
			ON	Puls train				0, 2, 4, 6
		ON, SCLR	Besides ON	Bank slctn 0	String +			0, 1, 4, 5
			ON	Puls train				0, 4
TCH	CONT	OFF	Besides ON	Bank selection 0	Bank slctn 1	External teaching Note)	Bank slctn 3	0 to 3, 8 to 11
			ON					
		ON, SCLR	Besides ON		String +			0, 1, 8, 9
			ON					
	UP, HIGH, DOWN, LOW	OFF	Besides ON		Bank slctn 1		Synchronous input	0 to 3
			ON	Puls train				0, 2
		ON, SCLR	Besides ON	Bank slctn 0	String +			0, 1
			ON	Puls train				0
0 to 15, COMM	CONT	OFF	Besides ON	Invalid	Invalid		Invalid	Not selectable by External signal (Select by Keypad of CVS4) COMM: Sets with RS-232C.
			ON					
		ON, SCLR	Besides ON		String +			
			ON					
	UP, HIGH, DOWN, LOW	OFF	Besides ON		Invalid		Synchronous input	
			ON	Puls train				
		ON, SCLR	Besides ON	Invalid	String +			
			ON	Puls train				

Note) If you set [String +] to "SET0," the pink line will become the function for overwriting the numeric values in the character string with "0." This will make it impossible to select bank numbers 4 to 7 and 12 to 15, which require the pink line.
* It takes approximately 30 ms from the application of the bank selection signal to the actual selection of the bank, but approximately 100 ms is required from this point to the point where the next image can be captured.

If you use a bank selection line for a different function such as the trigger input, the number of bank channels that you can select with external signals will become smaller. If you want to use bank selection lines 0 to 3 for different functions and fully select between all 16 banks, you can use the alternative inputs shown below.

○ When you are using only one of the four bank selection lines from 0 to 3 for a different function, you can use the red/black NG output line as the bank input line with [NG-I/O] (P.10).

[NG-I/O] setting		NG output line function
Select bank 0	→	The NG line (red/black) can be used in place of bank selection line 0 (orange/black).
Select bank 1	→	The NG line (red/black) can be used in place of bank selection line 1 (yellow/black).
Select bank 2	→	The NG line (red/black) can be used in place of bank selection line 2 (pink).
Select bank 3	→	The NG line (red/black) can be used in place of bank selection line 3 (purple).

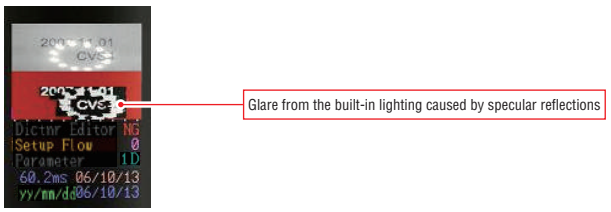
Reference) You can also use the NG output line (red/black) as the [Str+] or [Tch] line with [NG-I/O] (P.10). Also, if you want to add inputs by using the NG output and not using the OK output, you can set the OK line (black) to NG output by setting [Out Sel] (P.10) to "Rev."

You can support 17 or more types of printed details by communicating with the PC to read/write settings. In this situation, purchase the optional PC I/F cable CVS-C2C (sold separately) and download the setup software (free of charge) from the Optex FA website.
(http://www.optex-fa.com)

9. Installation and Related Precautions Important

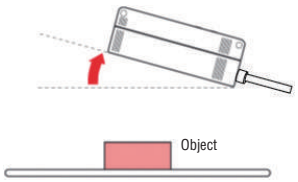
[Installation angle when using the built-in lighting]

If you install the CVS4 so that it is parallel with the objects, glare will occur due to the specular reflections of the light from the built-in lighting, which will make it difficult to capture images with good conditions.

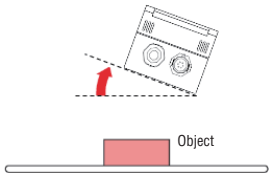


To prevent glare caused by specular reflections, install the device at an angle as shown in the following figures. The angle varies depending on how lustrous the objects are. For basic objects, use an angle of approximately 20°. For highly lustrous objects, use an angle of 35°.
* You can also install the device at an angle in the opposite direction (in the following figures, the right side would be higher).

For Horizontal models
(CVS4-N23W-R, -N24W-R, -N21W-R, -N20W-R, -N40W-R, etc.)



For vertical models
(CVS4-N23RW-R and models which the end of model name is "RW-R")



[Set the installation angle with [Trapezid]]

If you install the device at an angle, characters are deformed into a trapezoid shape when images are captured, so set the installation angle with [Trapezid] on P.6.

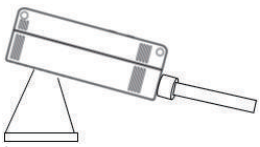
Characters are deformed into a trapezoid shape.

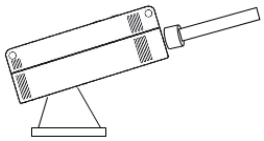
Adjust the parameter so that the characters on the left and right sides become perpendicular.

The character deformation is corrected.

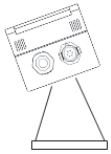
* Adjust [Trapezid] to the positive (+) side when the device is tilted as shown in the figure below on the left and to the negative (-) side when the device is tilted as shown in the figure below on the right.

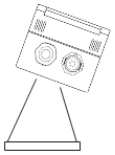
For Horizontal models
(CVS4-N23W-R, -N24W-R, -N21W-R, -N20W-R, -N40W-R, etc.)


Set 0 to +45


Set 0 to -45

For vertical models
(CVS4-N23RW-R and models which the end of model name is "RW-R")


Set 0 to +45


Set 0 to -45

* If glare occurs no matter how you adjust the installation angle, an external lighting device is required. Contact Optex FA, and we will provide you with a proposal for the optimum lighting device to match your application.
* If other lighting (such as fluorescent lights) causes glare, implement measures such as installing shading plates.

[Character size and the distance to the characters]

1 Ensure that the characters are displayed in their entirety in the field of view within the range of the sensor's operating distance. (Except when using the continuous trigger image capture function.)

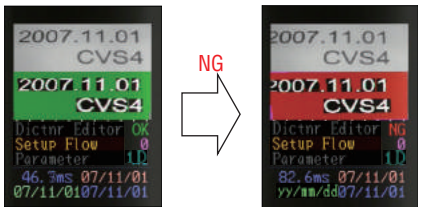
Model	Focal distance	Field of view (H×V)
CVS4-N21W-R	35+/-4 mm	21×10 mm
CVS4-N23W-R / -N23RW-R	50+/-6 mm	30×15 mm / 15×30 mm
CVS4-N24W-R	65 to 85 mm	38×19 mm at 65 mm, 48×24 mm at 85 mm
CVS4-N20W-R	90 to 150 mm	53×25 mm at 90 mm, 79×38 mm at 150 mm
CVS4-N40W-R	40 to 100 mm	53×25 mm at 40 mm, 115×53 mm at 100 mm

2 Within the range of the operating distance, the smaller the distance between the characters and the sensor, the smaller the characters that can be read. However, note that when the field of view is filled with the characters, they may leave the field of view in the event of changes to the object speed and minor object position offsets.

Distance in which position offsets are considered (space available on the top, bottom, left, and right)

There is space on the top, bottom, left, and right of the characters, so minor position offsets occurring will not cause any problems.

Too close (no space on the top, bottom, left, and right)



The screen is full of the characters, so even minor position offsets cause the characters to leave the field of view, which results in NG judgments.

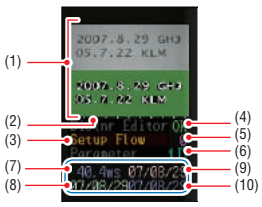
When characters leave the field of view due to object speed changes
(see "Speed change correction function" on P.12)
In addition to a synchronous sensor, prepare a rotary encoder. By applying the encoder's pulse signals to the CVS4, you can monitor the speed and correct position offsets.
(Use a rotary encoder that is capable of a pulse width of 500 µs or more.)

When characters leave the field of view due to trigger timing variations
(see "Continuous image capture function" on P.12)
Set [Wide] (P.6) to "FST2" (continuous image capture). Two images are captured per trigger signal. Even if NG is the result from the first image capture, if OK is the result from the second image capture, OK is output.
* When you specify "FST2," note that the required height of one character is twice that when "CONT" is specified. (See the character height in the specifications on P.2.)
* The interval between the first and second image capture is approximately 13.3 ms.

10. Details of the LCD and Operation

[Top menu screen]

Top menu



(1) Captured screen: Press the VIEW button to switch between screens (explained later). When the partitioned screen shown on the left or the extraction screen is displayed, the screen is green when the judgment is OK, red when the judgment is NG, and yellow during teaching. Also, momentary OK/NG judgments are displayed for 500 ms.

(2) Scale (white dots) **with gradations placed at approximately 50-pixel intervals:** Use these as guidelines when adjusting the character width and other items.

(3) Menu display: The currently selected item is displayed in yellow.

(4) Judgment result:
OK: The date or time is within the range of the upper and lower limits or the character string is a match.
NG: The date or time is outside the range of the upper and lower limits or the character string is not a match.
ER: A calendar timer backup error has occurred (reset the seconds in the calendar timer on the top menu to clear this error).

(5) Current bank number (0 to 15)

(6) Reading result display method: The blue frame in the bottom of the screen in the above image. For the selection method, see P.4.
1D: The first date and processing time are displayed.
2D: The second date and processing time are displayed.
1T: The first time and processing time are displayed.
2T: The second time and processing time are displayed.
CH: The number of read characters and the characters are displayed.
SZ: The number of read characters and the character width are displayed.
* With the [1D], [2D], [1T], and [2T] displays, if the corresponding items are not set, the processing time and the read characters are displayed.

(7) Processing time (This is the time from the trigger input to the judgment output. This is not displayed for the [CH] or [SZ] display.)

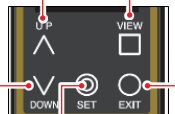
(8) Recognized date (for the [1D] and [2D] displays)

(9) Date/time upper limit (for the [1D], [2D], [1T], and [2T] displays)

[Name and function of keypad]

UP key
Use to select a menu or setting items as well as to increase the setting value.

VIEW key
Use to select a screen display mode. In switching the string to be monitored, press this key with Up/Down key together.



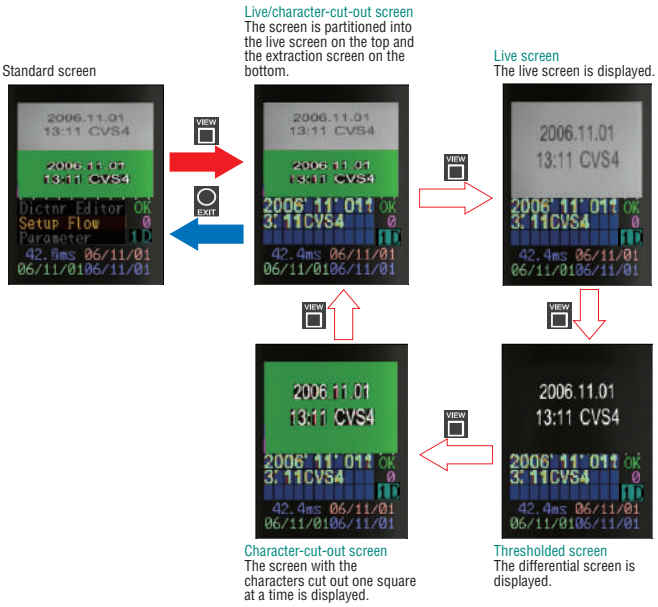
DOWN key
Use to select a menu or a setting item as well as to decrease the setting value.

EXIT key
Use to switch between the top menu and the teaching menu, cancel the change of setting value, or to return to the menu.

SET key
Use to perform the selected menu or to write the setting value.

[Procedure for displaying and selecting the captured screen]

Each time you press VIEW, the (top half of the) captured screen is switched. Pressing this button also changes the bottom half of the screen to the monitor screen.



If you want to configure settings and perform teaching of the captured screen from, for example, the thresholded screen, press EXIT on the thresholded screen to enable these operations while the thresholded screen is still displayed (you can return to the normal screen with the thresholded screen displayed).

When a character string is displayed at the bottom of the screen, you can switch between different displays of the reading result each time you press SET.

[Procedure for displaying and selecting the reading result screen]

The CVS4 can read up to two dates, up to two times, and up to 22 characters other than the dates and times. However, only one of these can be displayed at the bottom of the screen. The item that is currently displayed is indicated with the light blue characters on the right side of the bottom half of the screen. To switch the display to a different date, time, or other characters, press VIEW to show the monitor display, and then use UP or DOWN to switch the display at the bottom of the screen.

* If the date or time has not been set, the character string is displayed, as shown here. The color of the characters indicates the match rate with the dictionary. If a character's offset from the dictionary exceeds the value set with [CharMrgn] (P.11), the character is displayed as a question mark ("?").

	← High match rate								Low match rate →
	Green	Light green	Cream	Yellow	Yellowish-orange	Orange	Red	Brown	Magenta
Calculated [CharMrgn] value	0	4	8	12	16	20	24	28	32

You can keep the current reading result display and return to the top menu. For example, on the [1T] display, press EXIT to return to the top menu with the [1T] display still shown.
* The display of the bottom part of the screen for anything other than the top menu is switched so that it is displayed according to the details of the parameters.

If the first candidate and the second candidate for a read character are different characters, the corresponding character ("6" in the following figure) is highlighted when the character string is displayed. Even when the match rate is high (the character is displayed in green), the highlighted character may be recognized incorrectly as a different character, so adjust [Bold] (P.9) so that this character is not highlighted. If the character is still highlighted even after you adjust [Bold], you can obtain stable reading by registering the character in the expansion dictionary (P.13).

11. Top Menu

Top menu

Setup Flow
Parameter
Date/Time
ExpertParamtr
View NG Log
Calendar
Auto Teach
SemiautoTeach
Date Teach
String Editor
Dictnr Editor

[Setup Flow] For details, see the next section, "12. Using Setup to Configure Settings and Perform Teaching."
The basic parameters that the CVS4 uses to read characters are included in this menu.
You can complete the basic settings by setting the parameters in order from the top and performing teaching within the [Setup Flow] menu.

[Parameter] For details, see P.9.
Use this menu to configure the settings related to I/O such as the trigger input, RS-232C communication settings, bank selection, and timer. You can also access the [Initializ] function from this menu (to return all the settings to their factory default values).

[Date/Time] For details, see P.10.
Use this menu to change the format and order of the dates, times, and other characters that you have set or adjusted with the [Setup Flow] menu.

[ExpertParamtr] For details, see P.11.
Use this menu to perform advanced adjustments—such as the tolerance for how strictly to judge characters, the teaching input mode, and the masking settings—outside the range of the basic parameters of the [Setup Flow] menu.

[View NG Log]
Use this menu when you want to investigate the cause of an NG judgment. You can use this menu to do things such as display screens when the CVS4 changed the judgment from OK to NG. Up to 95 screens can be saved to the built-in memory of the CVS4. When the 96th screen is saved, the oldest piece of data is overwritten.

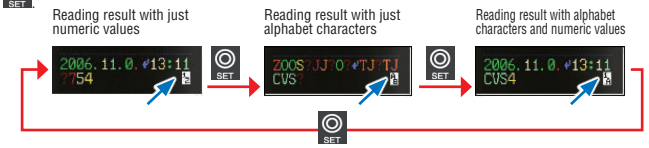
* The NG data can be extracted to a PC. (P.13)
* When you use this function, set [Save NG] (P.10) to a value other than "OFF."

Screen number: The latest NG screen is number 1. You can use UP to switch to the oldest and DOWN to switch to the newest NG screen.

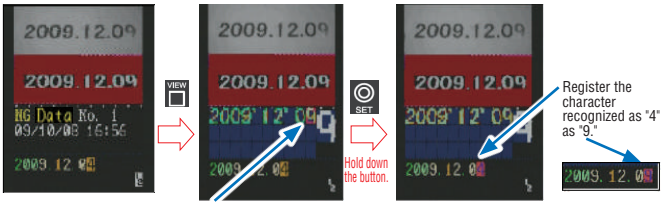
Date and time that the NG screen occurred.

Reading result: In this example, you can see that part of the "1" in the right-most position of the first row was missing from the printed data and was read as a dot (".", which caused the judgment to be NG.

On the [View NG Log] screen, you can switch between different displays of the reading result each time you press SET.



You can register NG characters to the expansion dictionary from the [View NG Log] screen.
This section will use the example of the "9" in "2009.12.09" being recognized incorrectly as "4" to explain this process ("4" will be registered as "9").



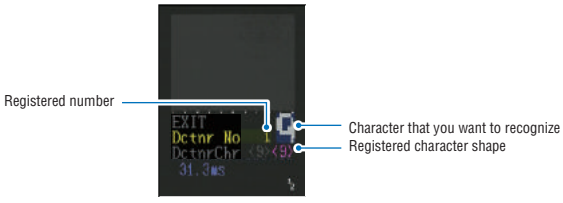
Select the NG image that has the character you want to register, and then press VIEW.

Use UP and DOWN to move the red frame to the "4" that you want to register, and then hold down SET.
(A zoomed-in display of the character selected with the red frame is shown on the right side.)

Use UP and DOWN to select the character to recognize, and then press SET to register this character to the [ExpDctnr] (P.11) number. (After registering the character, [ExpDctnr] will be incremented.)

[Calendar]
Set the current date and time, which will be used as the references when making date and time judgments. Leap years are also supported, so be sure to set the values according to the western calendar when reading Japanese era years.
For details on **[Auto Teach]**, see P.6.
For details on **[SemiautoTeach]**, see P.8.
For details on **[Date Teach]**, see P.9.
For details on **[String Editor]**, see P.8.
If you edit strings and perform teaching frequently, you can do so from the top menu without having to enter the [Setup Flow] menu.

[Dictnr Editor]
You can use a PC or [View NG Log] to edit and delete the characters that have been registered to the expansion dictionary.
* If [ExpDctnr] (P.11) is set to "0," this item is displayed in gray and cannot be selected.



1. Dctnr No — Setting range: 1 to the value set with [ExpDctnr]
   Default setting: 1 — Select the number of the extended character that you want to change or delete.
   Common to all banks
2. DctnrChr — Options: -./ 0 to 9 : ; < = > ? @ A to Z [/] ~ _ ` a to z
   Default setting: ? — Change the character that you want to recognize as the extended character selected with [Dctnr No].
   Common to all banks
3. DctnrChr — Execute this function to delete the extended character selected with [Dctnr No]. ([ExpDctnr] (P.11) is reduced by 1, and all the characters whose numbers come after the deleted one are sorted.)
4. Exit — Exits the [Dictnr Editor] menu and returns to the top menu.

12. Using Setup to Configure Settings and Perform Teaching

The settings and teaching of the CVS4 are organized in order from the top down with the items in the [Setup Flow] menu. Performing the operations in order prevents any settings from being forgotten or overlooked.

[Parameter tree]
Top menu

Setup Flow
* Before starting setup, switch to the bank number to set.

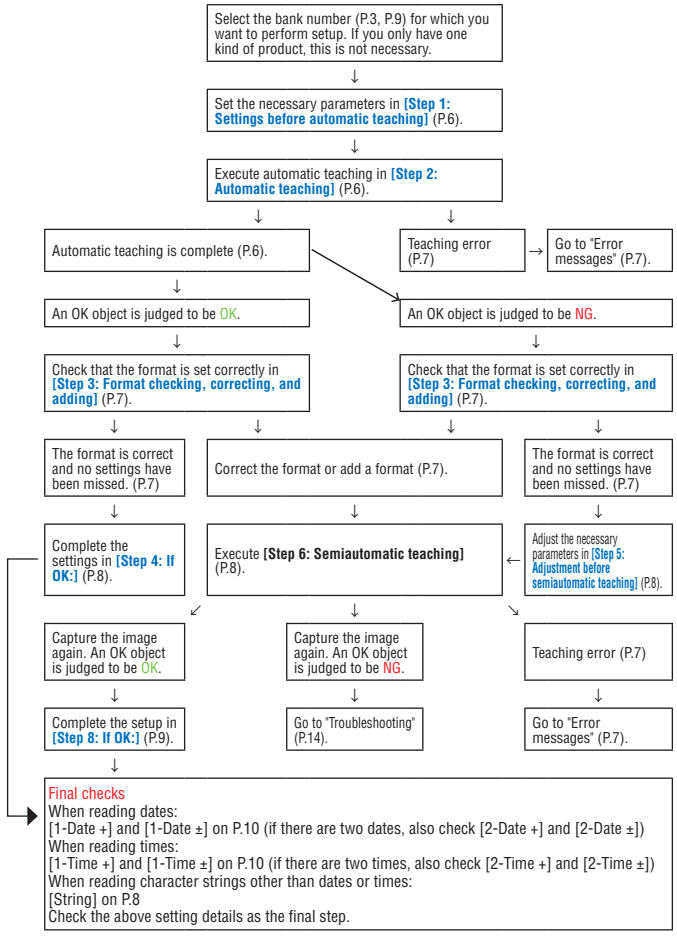
How to select parameters
→ Move from the top menu to Setup Flow. (Enter/execute) — SET
← Move from Setup Flow to the top menu. (Back) — EXIT
↑ ↓ Move up and down. (Loops through the selections) — UP DOWN

	Setup Flow	Overview	Automatic settings according to teaching mode
	Language	Switch the language of the LCD between English and Japanese.	None (manual)
	Orienttn	Select the character orientation between normal, vertically inverted, and mirrored.	None (manual)
	Wide	Change the field-of-view and mode.	None (manual)
	Light	Switch the built-in lighting on/off.	None (manual)
	Shading	Correct for uneven brightness on the left and right of the screen.	None (manual)
	Surface	Select whether the surface is white or black.	None (manual)
Important	Trapezid	Enter the installation angle of the CVS4 in relation to the object.	None (manual)
Important	ShtrLimt	Enter the upper limit for the shutter speed.	None (manual)
Important	Synchron	Select the trigger mode.	None (manual)
	DateFrmt	Select the format from YMD, MDY, and DMY.	None (manual)
Important	Auto Tch	Execute automatic teaching.	
Important	Format 1 / Format 2 / Format 3 / Format 4	Check, correct, and add formats (you can specify up to four) of the characters to capture. The format can be a date, time, or a character string such as a serial number.	Automatic and semiautomatic teaching*1 (This only applies to "YMD" and "YM" formats. Other formats are set manually.)
	If OK:	The settings are complete if an OK product results in an OK judgment and an NG product results in an NG judgment.	
	LightPwr	Select the brightness of the built-in lighting.	Automatic teaching
	Shutter	Enter the shutter speed.	Automatic teaching
Important	Luster	Adjust for the influence of the object luster.	Automatic teaching
Important	Threshld	Adjust the contrast between the surface and the characters.	Automatic teaching
	DotCheck	Turn this off if there are no dots within the characters.	Automatic teaching
	↓ Check	Make the device recognize line feed characters (they are handled as dots).	None (manual)
Important	Semiauto	Execute semiautomatic teaching.	
Important	String	Check and correct character strings such as serial numbers.	(Semiautomatic teaching)*2
	If OK:	The settings are complete if an OK product results in an OK judgment and an NG product results in an NG judgment.	
Important	Bold	Adjust the characters to their optimum width.	Automatic and semiautomatic teaching
	Rotate	Adjust the rotation angle of the characters.	Automatic and semiautomatic teaching*3
	SlantOfs	Adjust the [Slant] central angle.	Automatic and semiautomatic teaching*3
Important	Slant	Adjust the slant of the characters.	Automatic and semiautomatic teaching*3
Important	CharWdth	Adjust the width of the characters that you want to detect.	Automatic and semiautomatic teaching*3
	CharNarw	Make adjustments so that narrow "1" and "." characters are detected.	Automatic and semiautomatic teaching*3
	CharHght	Adjust the character height.	Automatic and semiautomatic teaching*3
	Date Tch	Only teach the sensor the contents of characters that should be recognized as OK.	
	EXIT	The settings are complete if an OK product results in an OK judgment and an NG product results in an NG judgment.	

*1 During semiautomatic teaching, settings that have already been configured will be given priority.
*2 This is only set automatically when "STRG" is selected for one of the formats from 1 to 4.
*3 You can also use [FixRtSlt] (P.11) to configure this setting so it is not set automatically.

Yellow — Common setting to all banks
Purple — Individual setting on each bank
Green — Execute parameter

[Setup flowchart]



[Things to check once more before starting setup]

1. Have the I/O lines such as the power supply, trigger input, and OK/NG output been wired (see P.2)?
2. Has the sensor been installed at an angle of 20° to the object (excluding the case where you are using external lighting)?
   → Install the CVS4 at an angle so that no glare is caused by the built-in lighting (see P.3).
3. Has the sensor been installed at the proper operating distance from the object?
   → Within the range of the operating distance, the closer the sensor is to the object, the better the reading accuracy. However, the characters may leave the field of view in the event of minor position offsets. Install the sensor as close to the object as possible while still ensuring that the characters remain within the field of view (see P.4).
4. Is the distance from the object to the sensor constant, and do the objects pass by a constant location?
   → Capture images in a location that is not subject to rattling and vibrations. Alternatively, use tools such as guides to minimize the effect of rattling and vibrations.

If the four points listed above are OK, start configuring the settings using [Setup Flow].

[Parameter change procedure] This section uses [Orienttn] as an example to explain the operation method.

1 Turn on the sensor, and then display [Setup Flow].

2 Press SET with [Setup Flow] highlighted to display [Language].

3 Press DOWN to display [Orienttn].

4 Press SET to display "NORM" in black characters on a red background.

5 Press UP to select the correct character orientation from "NORM," "REVS," "MIRR," and "RVMR."

NORM (normal)
A 05. 4. 23
B 05. 4. 27

REVS (vertically inverted)
B 05. 4. 27
A 05. 4. 23

MIRR (mirrored)
A 05. 4. 23
B 05. 4. 27

RVMR (vertically inverted and mirrored)
B 05. 4. 27
A 05. 4. 23

6 ex.) When the characters are vertically inverted

Select "REVS" and press SET to return the reversed display to normal and complete the setting of [Orienttn].

[Step 1: Settings before automatic teaching]

Manually set and enter the 10 parameters from [Language] to [DateFrmt]. (These parameters are not set automatically even if you execute automatic teaching or semiautomatic teaching.)
Refer to the operations explained under [Parameter change procedure] above, and then set the parameters correctly and in order starting at the top.

1. **Language**
   Default setting: ニホン
   Common to all banks
   Options: ENGL, ニホン
   Select whether to use English or Japanese as the language displayed by the CVS4.
   ニホン: Japanese will be displayed.
   ENGL: This stands for English. English will be displayed.

2. **Orienttn**
   Default setting: NORM
   Can be configured for each bank
   Options: NORM, REVS, MIRR, RVMR
   Select the orientation of the characters to capture. If the characters are oriented normally, there is no need to set this parameter. However, if the characters are vertically inverted or mirrored, select the correct orientation.

NORM (normal)	REVS (vertically inverted)	MIRR (mirrored)	RVMR (vertically inverted and mirrored)
A 05. 4. 23 B 05. 4. 27	B 05. 4. 27 A 05. 4. 23	A 05. 4. 23 B 05. 4. 27	B 05. 4. 27 A 05. 4. 23

3. **Wide**
   Default setting: CONT
   Common to all banks
   Options: CONT, ON, FAST, FST2
   Select the image capture mode. "CONT" provides the image capturing with the best accuracy, so normally select this option.
   CONT:
   All the pixels will be used to capture an image with good accuracy.
   ON:
   The field of view will be doubled in the vertical (height) direction. Only select "ON" when there are many rows and all the characters cannot fit in the field of view.
   * On the wide-angle type CVS4-N40W-R, do not set this parameter to "ON."
   FAST:
   The field of view is the same as with the "CONT" option, but the perpendicular resolution in the vertical (height) direction is reduced to half, so the response is faster. Select "FAST" when you want to improve the response, such as when objects move at high speed and images are captured with characters at an angle.
   FST2:
   With the "FAST" option, two consecutive images are captured per trigger input. If the judgment is OK for even one of these two images, the overall judgment is OK. Only select "FST2" when the characters leave the field of view due to minor position offsets.
   Reference: The interval between the first and second image capture is approximately 13.3 ms.
   * Caution When you select "ON," "FAST," or "FST2," the character height required for reading is twice that when "CONT" is selected. Exercise caution regarding this point. (See the character height in the specifications on P.2.)

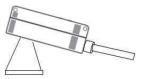
4. **Light**
   Default setting: ON
   Can be configured for each bank
   Options: ON, OFF
   Select whether to turn the built-in lighting on or off. If you mainly attach external lighting when capturing images, set this to "OFF."
   ON: The built-in lighting turns on.
   OFF: The built-in lighting turns off.

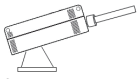
5. **Shading**
   Default setting: 0
   Can be configured for each bank
   Setting range: 0 to 4
   Correct for decreased brightness on the left and right edges of the screen. Use this with models that have wide fields of view such as the long-range type CVS4-N20W-R and the wide-angle type CVS4-N40W-R. With models that have wide fields of view, the brightness of the built-in lighting can decrease on the left and right sides of the screen, which can make it difficult to cut out characters from the background. You can correct for this situation by increasing the setting value.
   If you are using external lighting and are turning off the built-in lighting when you capture images, there is no need to set this parameter, so leave it at the default setting of 0.

6. **Surface**
   Default setting: WHIT
   Can be configured for each bank
   Options: WHIT, BLAK
   Select the color of the surface on which the characters are printed. Select "WHIT" if the surface color is white or a color that is lighter than the characters. Select "BLAK" if the surface color is black or a color that is darker than the characters.
   ex.) When "WHIT" is selected: ABC 2006.11
   ex.) When "BLAK" is selected: ABC 2006.11

Important

7. **Trapezid**
   Default setting: 0
   Common to all banks
   Setting range: -45 to +45
   Set the installation angle of the CVS4 in relation to the object. This corrects the way in which characters appear in a trapezoid shape when you install the CVS4 at an angle in order to prevent specular reflections. The unit is degrees.
   To determine whether to set this parameter to a positive or negative value, see the following figures.


Set 0 to +45


Set 0 to -45

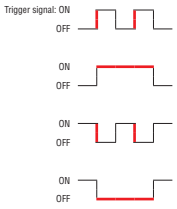
* For details on the directions that the vertical models can be tilted in, see P.3.

Important

8. **ShtrLimt**
   Default setting: 132
   Can be configured for each bank
   Setting range: 0 to 132
   Set the upper limit of the shutter speed (P.8) that is set automatically during automatic teaching.
   Use the following calculation to determine the upper limit according to the width of the lines of the characters to be captured.
   Setting value = 10 × width of the lines to detect (mm) ÷ object movement speed (m/s)
   * For inkjet printers, calculate from the diameter of one dot.
   * If the setting value will be 5 or lower, add an external lighting device to increase the brightness.

Important

9. **Synchron**
   Default setting: CONT
   Common to all banks
   Options: CONT, UP, HIGH, DOWN, LOW
   Normally select "UP" (this is the recommended option).
   Select whether the trigger input is used and select the operation mode. If you select an option other than "CONT," the bank selection 3 input line (purple) will be switched to the trigger input line.
   Obviously, the CVS4 outputs OK when the images of OK characters are captured. However, there are two cases in which NG is output: the object is not within the field of view and the object is within the field of view but the character details are incorrect. Therefore, we recommend that you apply the trigger input directly to the CVS4.
   Also, when you are using the built-in lighting to capture images, the built-in lighting automatically turns on and off in synchronization with the trigger input signal, which makes it possible to extend the service life of the lighting.
   CONT:
   Images will be captured continuously without using the trigger input.
   UP (recommended):
   Rising edge. One image will be captured when the trigger input signal switches from OFF to ON.
   HIGH:
   Images will be captured continuously while the trigger input signal is ON.
   DOWN:
   Falling edge. One image will be captured when the trigger input signal switches from ON to OFF.
   LOW:
   Images will be captured continuously while the trigger input signal is OFF.



10. **DateFrmt**
    Default setting: YMD
    Common to all banks
    Options: YMD, MDY, DMY
    Select the order of the information in the dates: year, month, day; month, day, year; or day, month, year.
    You can select any of these options if you are only reading times and character strings.

After you have set the 10 parameters listed above, proceed to automatic teaching, which is explained in the following section, Step 2.

Important

[Step 2: Automatic teaching]

After setting and entering the 10 parameters from [Language] to [DateFrmt], execute automatic teaching. The teaching method varies depending on the [Synchron] setting (for example, whether this is set to "CONT" or "UP"), so perform automatic teaching according to the selected option.

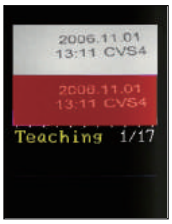
• Automatic teaching procedure when "UP" (or "DOWN") is selected for [Synchron]

1 Refer to the parameter tree on P.5 and display [Auto Tch].

2 Press SET to display Execute? ▲Yes ▼No at the bottom of the screen. Press UP to select "Yes."

3 Pass an object past the sensor.
* If you have selected "UP" (or "DOWN") for [Synchron], it is necessary to capture four images in order to configure the automatically set parameters (see "Parameter tree" on P.5) to the optimum values, so pass four objects past the sensor.
* If the movement speed of the fourth object to be passed by the sensor has not reached the maximum speed, wait until the maximum speed is reached and start again from step "1."

4 Automatic teaching starts.

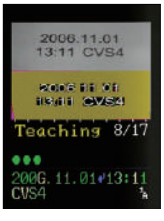


First object

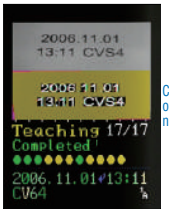
Second object

Third object

Fourth object

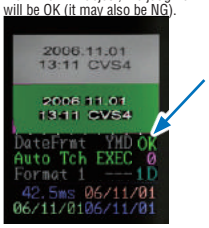


Automatic teaching is finished after 3 to 4 seconds.



Continued on the next page.

From the fifth object, the judgment will be OK (it may also be NG).



Note) Formats 1 to 4 are only set automatically (in the table on the page on the right) during automatic teaching for the three date formats shown below.

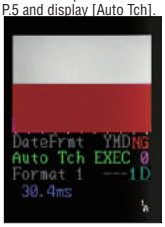
ex.) 2006.11.01 Date specified with the year (using four digits in the western calendar), the month, and the day
2006.11 Date specified with the year (using four digits in the western calendar) and the month
06.11.11 Date specified with the year (using two digits in the western calendar), the month, and the day

Dates other than those shown above, times, and character strings such as lot numbers are not set to formats 1 to 4 automatically, so the dates and character strings are not read at this point in time. To read times and character strings, manually set the format in [Step 3: Format checking, correcting, and adding], which is explained later.

This completes the automatic teaching. Regardless of whether the judgment is OK or NG, proceed to Step 3, which is explained later.
* If an error message is displayed, proceed to "Error messages" at the bottom of this page.

• Automatic teaching procedure when "CONT" (alternatively, "HIGH" or "LOW") is selected for [Synchron]

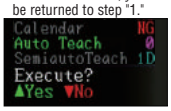
1 Refer to the parameter tree on P.5 and display [Auto Tch].



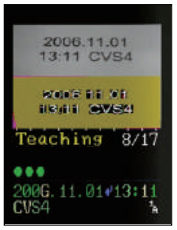
2 Insert an object into the field of view, and then stop the object (you cannot perform automatic teaching with objects passing by the sensor).

3 Press SET to display

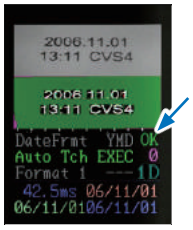
at the bottom of the screen. Press UP to select "Yes."
* If you do not select "Yes" within 20 seconds, you will be returned to step "1."



4 Automatic teaching starts and is finished after 3 to 4 seconds.



5 The judgment will be OK or NG.

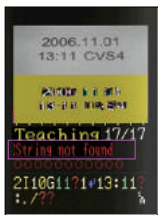


This completes the automatic teaching. Regardless of whether the judgment is OK or NG, proceed to Step 3, which is explained later.
(If an error message is displayed, proceed to the next section.)
* If you want to perform teaching with the object stopped and then capture images of moving objects, see "②Wrong recognition in high speed of object" (P.16) and perform adjustments.

• Error messages

If the teaching (automatic teaching, semiautomatic teaching, or date and character string teaching) operation fails, an error message will be displayed. The countermeasures vary depending on the type of error message, so proceed with the adjustments according to the information shown below.

1. String not found



[Cause]
Not even one character that can be read was detected due to the brightness being insufficient for image capturing or due to the contrast between the characters and the surface being insufficient.
[Countermeasures]
Adjust [ShtrLimt] and [Surface] on P.6 and [Shutter] and [Threshld] on P.8 so that the characters are displayed correctly, and then execute [Semiauto] on P.8. Even after making these adjustments, if the same error message is displayed after teaching, the object movement speed is too fast. If the shutter speed is set too short, the brightness may be insufficient for capturing images, so it may not be possible to detect characters. In this situation, add an external lighting device to increase the brightness or decrease the object movement speed.
[Automatic setting of parameters]
All the parameters return to their original values without being set automatically.

2. Format not found

[Cause]
During automatic teaching, the automatically set format could not be found. During semiautomatic teaching or date and character string teaching, the manually set format could not be found.
[Countermeasures]
Correctly set formats 1 to 4 as shown in [Step 3: Format checking, correcting, and adding], which is explained later, and then execute [Semiauto] on P.8.
[Automatic setting of parameters]
In the case of the "Format not found" error, the parameters set in automatic teaching or semiautomatic teaching (see "[Parameter tree]" on P.5) will be set automatically even if the teaching operation fails.

3. Date overflow/Date underflow

[Cause]
If [TchRange] (P.11) is "---," the read date was 999 days or more before the current day or was 5000 days or more after the current day.
For any values other than "---," the data was older than the previous day or exceeded the setting value.
[Countermeasures]
(1) Review the [TchRange] parameter (P.11).
(2) Set [DateFrmt] on P.6 and formats 1 to 4, which are explained later, and then execute [Semiauto] on P.8.
If you are reading Japanese era years instead of years in the western calendar, set [YearOfst] on P.11, and then execute [Semiauto] on P.8.
(3) Set a character string in format 1 as shown in [Step 3: Format checking, correcting, and adding], which is explained later. You cannot use the calendar function when reading dates and character strings, so execute date and character string teaching each time that the printed details change.
[Automatic setting of parameters]
In the case of the "Date overflow/Date underflow" error, the parameters set in automatic teaching or semiautomatic teaching (see "[Parameter tree]" on P.5) will be set automatically even if the teaching operation fails.

Important

[Step 3: Format checking, correcting, and adding]

Formats are used to set what type of characters are read by the CVS4: dates, times, or character strings such as lot numbers. Selecting a date or time format enables the calendar function, so there is no need to reconfigure the settings even when the date or time is updated. You can specify up to two dates and times (respectively) and up to four character strings.
The only formats that are set automatically by automatic teaching are those indicated with a circle in the following table, so manually select format 1 to 4 and enter the format when reading times or character strings.

The image on the left is an example of the screen after automatic teaching has been performed. The [4YMD] format, which has been set automatically by automatic teaching, has been correctly set in format 1, but formats 2 and 3 display "---" when they are viewed. Nothing has been set for these formats.
Manually set those formats that are marked with a "×" under "Automatic setting by way of automatic teaching" in the following table. (In this example, manually set format 2 to [H:M] with "13:11" and format 3 to [STRG] with "CVS4.")

Example of characters to read	Explanation	Format	Automatic setting by way of automatic teaching
2006.11.01	Date specified with the year (using four digits in the western calendar), the month, and the day	4YMD	○
2006.11	Date specified with the year (using four digits in the western calendar) and the month*3	4YM	○
06.11.01	Date specified with the year (using two digits in the western calendar), the month, and the day (Japanese eras can also be used)	2YMD	○
17:30	Hour and minutes	H:M	×
06.11	Date specified with the year (using two digits in the western calendar) and the month (Japanese eras can also be used)*3	2YM	×
17	Hour (17:00 in the example on the left)*4	HOUR	×
AA00321	Character string other than a date or time*5	STRG	×
*6	A month and day encrypted as alphabet characters and numeric values*1	A-MD	×
*6	A month encrypted as alphabet characters and numeric values*1, 3	A-M	×
*6	Hours and minutes encrypted as alphabet characters and numeric values	A-HM	×
*6	Hours encrypted as alphabet characters and numeric values*4	A-H	×
*6	A day encrypted as alphabet characters and numeric values*1, 2	A-D	×
11.01	A month and day*1	MD	×
2006NOV01	Date specified with the year (using four digits in the western calendar), the month (written out), and the day	4YED	○
2006NOV	Date specified with the year (using four digits in the western calendar) and the month (written out)*3	4YE	○
06NOV01	Date specified with the year (using two digits in the western calendar), the month (written out), and the day	2YED	○
06NOV	Date specified with the year (using two digits in the western calendar) and the month (written out)*3	2YE	○
6	Year specified with one digit (2006 in the example on the left)*2, 3	PY	×
*7	String Specified by Alphabetical Date	SSAD	×
1730	Hour and minutes with no colon (17:30 in the example on the left)	4-HM	×
	Do not set*8	—	×

*1 For date formats that do not have the year (for example, [MD]), the year read from a previous format will be substituted in if available. If this previously read year is not available, the current year will be substituted in. If the judgment result is NG, the following year will be substituted in, and then the judgment will be performed again. If today is 2005.12.31 and [1-Date +] (P.10) is set to "1," 2006.1.1 is the upper/lower limit date. If the read date is 2005.1.1, the current year is judged to be NG, but if the following year is substituted in, the date becomes 2006.1.1, which is OK.
*2 For date formats that do not have the month (for example, [A-D]), the month read from a previous format will be substituted in if available. If this previously read month is not available, the current month will be substituted in.
*3 For date formats that do not have the day (for example, [4YM]), the current day will be substituted in. If the judgment result is NG, the 30th will be substituted in if the current day is from the 1st to the 15th and the 1st will be substituted in if the current day is from the 16th to the 31st, and then the judgment will be performed again. (If the read month is February, the 28th will be substituted in instead of the 30th.) If today is 2005.10.31 and [1-Date +] (P.10) is set to "1," 2005.11.1 is the upper/lower limit date. If the read date is 2005.11.31, the current day is judged to be NG, but because today is the 31st, the 1st is substituted in, which makes the current date 2005.11.1, which is OK. (Set the value of [1-Date ±] on P.10 to "3" or higher.)
*4 For the read time, the read "hours" are used and the minutes are set to "00." In exchange, the minutes of the upper/lower limit time are judged to be "00." (However, this is not applied to the upper/lower limit time on the screen.)
*5 You can set up to 22 characters. If you are specifying character strings in multiple locations, use [String] (P.8) to enter the underscore character ("_") as the character string delimiter.
*6 Use this when reading months, days, hours, and minutes encrypted as alphabet characters and numeric values.
Printing example: 2006.11A1 (The year and month are printed normally. Only the day is encrypted.)
If the encrypting is such that A1: 1st, A2: 2nd, A3: 3rd, ... A0: 10th, B1: 11th, B2: 12th, enter the formats as shown below.
Format 1: 4YM
Format 2: A-D
The encrypted character settings are edited from a PC, so purchase the PC I/F cable CVS-C2C (sold separately). You can also download the setup software (P.13) free of charge from the Optex FA website. (http://www.optex-fa.com)
*7 Use [String] (P.8) to specify a command and read the interpreted result as the date. Detailed materials are available, so contact Optex FA if you are interested in them.
*8 Enter "---" in format 1 to enable the character count judgment function (P.12).

• Setting examples when using multiple formats

Reading expiration periods, manufacturing times, and lot numbers

2006.11.01
13:11 CVS4

Format 1: 4YMD
Format 2: H:M
Format 3: STRG
* Use [String] to set the character string to "CVS4."

Reading manufacturing days and expiration periods

06.11.01
2006.11.11

Format 1: 2YMD
Format 2: 4YMD

Reading manufacturing plant identification marks, expiration periods, and lot numbers

YA1
06.11.01 / 0643B

Format 1: STRG
Format 2: 2YMD
Format 3: STRG
* Set two [STRG] formats, and then use [String] to set "YA1_/0643B."
Rows 1 and 2 are delimited by the [2YMD] format, so set the underscore character ("_") between the first and second [STRG] formats.
* To specify the line feed position, enter "↵" as shown below.
YA1↵_/0643B

* For details on [String], see P.8.

• Operation/setup procedure

Refer to the operations explained under [Parameter change procedure] on P.5, and then perform the operations/setup.

After you finish checking, correcting, and adding formats, proceed to Step 4, the next section.

[Step 4: If OK:]

If the read characters are a date such as "2006.11" or "06.11.01," capturing images of correct printed characters results in an OK judgment, and capturing images of NG printed characters results in an NG judgment, the setup is complete.

Press EXIT or press SET on the [If OK:] item to return to the top menu.

* If you executed automatic teaching and the judgment was OK but you corrected formats 1 to 4 or added a format, proceed to [Step 6: Semiautomatic teaching], which is explained later.
* If you executed automatic teaching and the judgment was NG, proceed to Step 5, which is shown below.
* If you need to set the one-shot timer or if you need to configure I/O settings such as when you want to configure the settings so that NG screens are saved, proceed to "13. Parameter" on P.9.

[Step 5: Adjustment before semiautomatic teaching]

If you have performed [Step 2: Automatic teaching] on P.6 but capturing images of correct printed characters does not result in an OK judgment, set and adjust the following six parameters, and then perform semiautomatic teaching (which is explained later).
Also, set the parameters in order from the top, from [LightPwr] to [DotCheck].

1. **LightPwr**
   Default setting: 50%
   Can be configured for each bank
   Setting range: 6 to 100%
   When [ShtrLimt] (P.6) is set according to the formula, this parameter is automatically set to 50% when the brightness is sufficient during automatic teaching and to 100% when the brightness is insufficient during automatic teaching. If you want to fine-tune this parameter, manually adjust the value.
   6 to 94%: The lighting remains on continuously when "CONT" is selected for [Synchron].
   100%: The brightness of the built-in lighting is set to its maximum. The lighting blinks even when the trigger input is not in use, so do not look directly at the lighting during operation of the device.

2. **Shutter**
   Default setting: 15
   Can be configured for each bank
   Setting range: 0 to 132 (unit: 0.1 ms)
   Set the shutter speed. If the value obtained from the [ShtrLimt] (P.6) formula has been entered correctly, there is normally no need to change this setting.
   Note that when capturing images of moving objects, specifying a value that is greater than or equal to the value obtained from the formula will cause blurring in the captured image, which will make it impossible to perform correct reading.

Important

3. **Luster**
   Default setting: 16
   Can be configured for each bank
   Setting range: 0 to 63
   Increase the screen's brightness to reduce the influence of luster. Set a large numeric value to heavily correct for the influence of luster. If you install the sensor according to [Installation angle when using the built-in lighting] on P.3, there is normally no need to change this setting. Set this value if you cannot install the sensor at an angle due to installation limitations and you cannot avoid glare from occurring.
   * After you adjust this setting manually, be sure to also adjust [Threshld].
   * Adjusting [Luster] to correct for glare and finding that you cannot see the characters in the corrected locations indicates the limit of the [Luster] parameter. Use an external lighting device and turn off the built-in lighting when you capture images.

Important

4. **Threshld**
   Default setting: 35
   Can be configured for each bank
   Setting range: 0 to 255
   Set the differential threshold between the characters and the surface. With a small setting value, minor changes will be detected as characters, but this leads to many cases in which stains and luster are erroneously detected.

The setting value is too low, so unnecessary locations are also cut out.	The setting value is suitable. The surface is not cut out. The character width is also suitable.	The setting value is too high, so the characters become thin and blurry.
		

5. **DotCheck**
   Default setting: ON
   Can be configured for each bank
   Options: ON, OFF
   Checks for the presence of dots between the parts of dates.
   ON: The result will be NG if there are no dots between the parts of dates. ("2006 11.01" will result in an NG judgment.)
   OFF: The judgment will be OK so long as the printed characters can be read as a date regardless of whether there are dots between the parts of the date or not.

6. **↲Check**
   Default setting: OFF
   Can be configured for each bank
   Options: ON, OFF
   Set whether to recognize line feed characters. If you select "ON," vertically printed characters (in which line feed characters are within the year, month and date) can also be recognized, but line feed characters will be handled as dots, so if you set [DotCheck] (explained above) to "ON," line feed characters will also be recognized as dots. Set [↲Check] to "ON" and [ChrSpace] (P.11) to "×1.5" to enable the space recognition function. This makes it possible to perform reading correctly when printed characters continue to the right of a one-digit month or day character. (See P.12.)

[Parameter change procedure] This section uses [Threshld] as an example to explain the operation method.
* If you have selected "UP" or "DOWN" for [Synchron] (P.6), either configure the settings while passing objects by the sensor or change [Synchron] to "CONT," insert the object into the field of view, and then make adjustments. (When setting parameters other than [Threshld], you do not have to change [Synchron].)

1 Refer to the parameter tree on P.5 and display [Threshld].

2 Press SET to display the setting value "19" in black characters on a red background.

3 Press UP to increase the setting value. (Hold down the button to change the value quickly.)

4 Set the characters to the appropriate width so that unnecessary parts of the surface are no longer cut out.

5 Press UP to return the display of the numeric value to normal and complete the setting procedure.

* Press DOWN to decrease the numeric value.

[Threshld] setting guidelines
1. Increase the setting value until unnecessary parts of the surface are not cut out.
2. Decrease the setting value until characters are not thin and there are no missing parts of characters.

The target value is one that is midway between the values found by following these two instructions.

After you finish the adjustments before semiautomatic teaching, proceed to Step 6, the next section.

Important

[Step 6: Semiautomatic teaching]

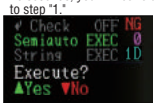
If you have followed the instructions under [Step 3: Format checking, correcting, and adding] on P.7 to enter a format that is not set automatically even when you perform automatic teaching, you can search for the entered format and add characters to read by performing semiautomatic teaching. You can also perform teaching according to the settings of the five parameters that you adjusted in [Step 5: Adjustment before semiautomatic teaching] described above.

• Semiautomatic teaching procedure

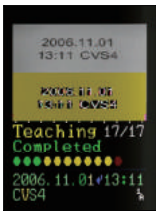
(This is a continuation of [Step 3: Format checking, correcting, and adding] on P.7. Format 1 was set to [H:M] and format 2 was set to [STRG], so the judgment was NG.)

1 Refer to the parameter tree on P.5 and display [Semiauto].

2 Press SET to display  at the bottom of the screen. Press UP to select "Yes."
* If you do not select "Yes" within 20 seconds, you will be returned to step "1."



3 Semiautomatic teaching starts and is finished after 3 to 4 seconds.



When [Synchron] is set to "UP" or "DOWN"

4-1-1 The screen stops without performing an OK or NG judgment, and the semiautomatic teaching is complete.

4-1-2 When the image is captured of the next object, it is judged to be OK.

* If the image capture conditions are poor, the judgment may be NG.

When [Synchron] is set to "CONT," "HIGH," or "LOW"

4-2 The judgment is OK, and the semiautomatic teaching is complete.

* If the image capture conditions are poor, the judgment may be NG.

This completes the semiautomatic teaching. Regardless of whether the judgment is OK or NG, proceed to Step 7, the next section.
(If an error message is displayed, return to P.7.)

Important

[Step 7: String editing]

Check whether character strings (things other than dates and times, for example, lot numbers and manufacturing plant identification marks) have been set accurately with semiautomatic teaching and make corrections if the settings are incorrect. Also, a wildcard function in which any character is OK at the position where you enter "?" is available.
* If there are no character strings in the text that you are capturing (when you are only capturing images of dates or times), proceed to Step 8.

The string editing function is frequently used, so this item is available in both the [Setup Flow] menu and the top menu. The settings are the same whether you configure them from [String Editor] in the top menu or from [String] in the [Setup Flow] menu.

• Procedure for checking and correcting with the string editor

1 Refer to "Parameter Tree and Basic Operation" on P.1 and display [String].

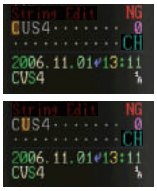
*In the printing example shown in the above screen, "2006.11.01" is the date and "13:11" is the time, so check and correct the character string "CVS4."

2 Press SET to switch the bottom part of the screen to the [String] screen. The character string set with semiautomatic teaching is displayed.
Check that the character string has been set correctly as "CVS4."

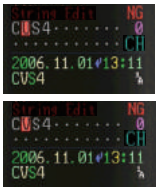
* Enter "?" to make any character OK at that position.
* You can clear the entire character string that has been set by entering "•" for the first character.

3-1 If the set character string is correct, press EXIT to complete the string editing.

3-2 If the set character string is incorrect, correct it.
ex.)To correct "CUS4" to "CVS4," press DOWN to move the orange cursor, which was positioned on the "C" in the left-most position, one position to the right to highlight the "U."



4 Press SET to display "U" in black on a red background.
Then, press UP (or DOWN) to correct this character to "V."



5 Press SET to change the color of the "V," which was displayed in black on a red background, to orange and complete the correction.
When you are finished, press EXIT to return to the screen in step "1."

When comparing character strings, numeric values are compared against the numeric value dictionary and alphabet characters are compared against the alphabet character dictionary.
Also, if a character string has already been registered during teaching, the numeric value locations in this set character string are compared against the numeric value dictionary and the alphabet character locations are compared against the alphabet character dictionary. "?" characters and lowercase alphabet characters are left as-is, and the following character is registered.

After you finish checking and correcting the string editor, proceed to Step 8, the next section.

[Step 8: If OK:]
If capturing images of correct printed characters results in an OK judgment and capturing images of NG printed characters results in an NG judgment, the settings and teaching are complete.

Press EXIT or press SET on the [If OK:] item to return to the top menu.

* If capturing images of correct printed characters results in an NG judgment or if capturing images of NG printed characters results in an OK judgment, proceed to Step 9, the next section.
* If you need to set the one-shot timer or if you need to configure I/O settings such as when you want to configure the settings so that NG screens are saved, proceed to "13. Parameter," which is explained later.

[Step 9: Adjustment after semiautomatic teaching]
If you have configured the settings up to [Step 7: String editing] on P.8 and capturing images of correct printed characters does not result in an OK judgment, perform further adjustment of the following seven parameters.

- **Operation/setup procedure** (Refer to the operations explained under [Parameter change procedure] on P.6, and then perform the operations/setup.)

Important

1. **Bold**
   Default setting: 0
   Can be configured for each bank
   Setting range: -2 to +8
   Make the captured characters bolder or narrower. Use this parameter to make adjustments when making narrow characters, such as dot characters and those made with a laser marker, bold and when making bold characters narrow in order to make the characteristics of the characters clear.

2. **Rotate**
   Default setting: 1
   Can be configured for each bank
   Setting range: 0 to 20
   Set the maximum angle of rotation correction. Perform rotations of +/-0.94° per setting value in order to find the correct character orientation. (The maximum is +/-19°.)
   Set a large value when the characters are rotated more than the case in which four images are captured during automatic teaching. However, note that setting a large value will increase the processing time.

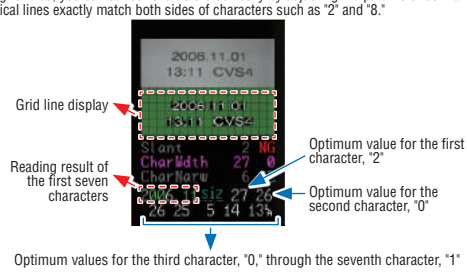
3. **SlantOfs**
   Default setting: 1
   Can be configured for each bank
   Setting range: -26 to +26
   Set the slant central angle when images of slanted characters are captured (unit: degrees). The [Slant] (P.9) angle width will be searched for with this angle as the center.

Important

4. **Slant**
   Default setting: 0
   Can be configured for each bank
   Setting range: 0 to 20
   Specify the slant search angle when images of slanted characters are captured.
   Perform slanting of +/-0.85° per setting value with the [SlantOfs] (P.9) angle as the center in order to find the correct character orientation.
   Set a large value when the object movement speed is faster than the case in which four images are captured during automatic teaching and the characters are slanted. However, note that setting a large value will increase the processing time.

Important

5. **CharWdth**
   Default setting: 40
   Can be configured for each bank
   Setting range: 0 to 200
   Set the width of the characters to cut out (unit: pixels). Adjust this parameter so that individual characters are cut out correctly when two characters are connected together and cut out as one character and when one character is separated and cut out as two characters. When you set [CharWdth], the reading results of the first seven characters and numeric values of the widths of these seven characters are displayed at the bottom of the screen, as shown in the following figure. Adjust the parameter so that the character width becomes the width of a typical character such as "2" or "8," not the width of characters such as "1," "." or other similar narrow characters. Also, when the character-cut-out screen is shown for the captured screen, grid lines are displayed. When making adjustments with the grid lines, you can cut out characters correctly by adjusting the parameter so that the vertical lines exactly match both sides of characters such as "2" and "8."



6. **CharNarw**
   Default setting: 5
   Can be configured for each bank
   Setting range: 0 to 100
   Specify the width of the narrowest character to cut out (unit: pixels). Characters whose widths are less than this setting value will not be cut out.
   When fine noise occurs on the captured screen and is read as dots, set a large value so that this noise is not read.
   * The same as the [CharWdth] parameter, grid lines are displayed on the character-cut-out screen and the character widths are displayed at the bottom of the screen, so set this parameter while viewing the grid lines and the numeric values.

7. **CharHght**
   Default setting: 50
   Can be configured for each bank
   Setting range: 0 to 200
   Set the height of the characters to cut out (unit: pixels). Use this parameter to correctly read dots (".") and other such characters that have small heights. When you set [CharHght], grid lines are displayed on the character-cut-out screen, so you can cut out characters correctly by adjusting the value so that the horizontal lines exactly match the top and bottom of characters having typical heights such as "2" or "8," not dots (".") or other such characters that have small heights.

8. **Date Tch**
   This is explained in a later section.

9. **EXIT**
   If capturing images of correct printed characters results in an OK judgment and capturing images of NG printed characters results in an NG judgment, the setup is complete. Press SET to return to the top menu.

* If you need to set the one-shot timer or if you need to configure I/O settings such as when you want to configure the settings so that NG screens are saved, proceed to "13. Parameter," which is explained later.

Useful function
Date Tch
[Date Tch] is a function that only teaches the sensor the contents of printed characters that are judged as OK. With automatic teaching and semiautomatic teaching, there are parameters that are reset when teaching is performed (see the parameter tree on P.5). However, the [Date Tch] function can be used to perform teaching without resetting parameters that have been set to their optimum values (note that only string editing is reset). You can support multiple-product lines by executing the [Date Tch] function each time that you perform a product changeover.

ex.1) Changing only the printed details of the date
2006.11.01 → 2006.11.16
ex.2) Changing the part number (character string)
A04321 → B09

* You cannot use [Date Tch] when you need to change parameters. In situations such as those shown below, use the bank selection.

ex.3) 2006.11.01 → 06.11.01 (Format must be changed from [4YMD] to [2YMD])
ex.4) 2006.11.01 → 2006.11.01 (There is an extreme change in the character size. The case in which there is an extreme change in the distance to the printed characters is the same.)

- **Date Tch (Date and character string teaching procedure)**

Refer to the operations explained under [Semiautomatic teaching procedure] on P.8, and then perform the operations/setup.
If an error message is displayed, return to P.7.

13. Parameter

Configure the I/O settings, such as setting the one-shot timer and setting whether to save NG screens. You can also initialize all the settings (return them to their factory default values) from this menu.

- **Operation/setup procedure**

Refer to the operations explained under [Parameter change procedure] on P.6, and then perform the operations/setup.

Top menu → Parameter (SET) / (EXIT)

* Only when setting [SyncDely], switch to the bank number to set in advance.

How to select parameters

→ Move from the top menu to Parameter. (Enter/execute)	SET
← Move from Parameter to the top menu. (Back)	EXIT
↑ ↓ Move up and down. (Loops through the selections)	UP / DOWN

Parameter	Overview	Automatic settings according to teaching mode
Bank	Set the bank selection method.	None (manual)
BankCopy	Copy the setting details to a different bank number.	None (manual)
Communic	Select the communication function and baud rate.	None (manual)
Initialz	Set all the settings to their factory default values.	
LightOut	Controlling the external lighting.	None (manual)
NG Delay	Output if many times consecutive NG judgments must occur.	None (manual)
OffDelay	Set the off-delay time in units of 1 ms.	None (manual)
On Delay	Set the on-delay time in units of 1 ms.	None (manual)
One-shot	Set this to "ON" to turn the sensor on for the length of time specified by the off-delay time.	None (manual)
OutSynDl	Set this parameter when the detection point is far from the rejection point.	None (manual)
Save NG	Set the storage method for NG images.	None (manual)
String +	Set the input for string addition.	None (manual)
SyncDely	Delay the time from the trigger timing to the capturing of the image.	None (manual)
SyncFilt	Eliminate short noise from the trigger signal.	None (manual)
SyncPuls	Set the synchronous pulse.	None (manual)
Synchron	Select the trigger mode.	None (manual)
NG-I/O	Select how to use the NG line.	None (manual)
Out Sel	Select the OK and NG output lines.	None (manual)
EXIT	Return to the top menu.	

Yellow	Common setting to all banks
Purple	Individual setting on each bank
Green	Execute parameter

1. **Bank**
   Default setting: BKIN
   Common to all banks
   Options: COMM, BKIN, TCH, 0 to 15
   Set the bank number selection method. (See "8. Bank Selection" on P.3.)
   0 to 15:
   The bank number is selected. You cannot use an external signal to select the bank.
   TCH:
   The bank selection 2 input line (pink) is switched to use as an external teaching input line. The bank selection 0, 1, and 3 input lines are used to select the bank.
   BKIN:
   The bank selection 0 to 3 input lines are used to select the bank.
   COMM:
   RS-232C communication is used to select the bank. When the power is turned off, the bank number set with communication returns to bank 0.
   * If you select an option other than "BKIN," the bank selection 2 input line (pink) will be switched to teaching input.

2. **BankCopy**
   Default setting: 0
   Common to all banks
   Setting range: 0 to 15
   Copy all the settings of the current bank number to another bank.
   Switch to the copy source bank, and then set the copy destination bank number with this parameter to copy the settings. The setting value returns to "0" when the power is turned off.

3. **Communic**
   Default setting: 57k6
   Common to all banks
   Options: OFF, 4.8k, 9.6k, 19k2, 38k4, 57k6, 115k
   Set the RS-232C communication function. The CVS-C2C (sold separately; P.2) is required.
   OFF:
   The communication function will not be used. Set this parameter when you are using a CVS-LW1 external lighting device (Discontinued device).
   4.8k to 115k:
   The communication function will be used. The baud rate is set in order to 4800, 9600, 19200, 38400, 57600, and then 115200 bps. The data length is 8 bits, no parity is used, and the number of stop bits is 1.

4. **Initialz**
   Default setting: ----
   Options: ----, EXEC
   If you set this parameter to "EXEC," and then write the parameter, all the settings will be returned to their (factory) default values.

5. **LightOut**
   Default setting: --
   Common to all banks
   Options: --, NG, OK, NG-P, OK-P
   Set this parameter when you connect the OK output line (black) and NG output line (red/black) to an external lighting device in order to control it (turning the lighting device on and off).
   --:
   The red/black line will be used for NG output and the black line will be used for OK output.
   NG:
   The NG output line (red/black) will be turned off in synchronization with image capturing. Use this option when you are controlling an external lighting device (turning the lighting device on and off). The OK output line (black) will turn on normally when an OK judgment occurs.
   OK:
   The OK output line (black) will be turned off in synchronization with image capturing. The NG output line (red/black) will turn on normally when an NG judgment occurs.
   NG-P:
   The NG output line (red/black) will be turned on in synchronization with image capturing.
   OK-P:
   The OK output line (black) will be turned on in synchronization with image capturing.

6. **NG Delay**
   Default setting: 0
   Common to all banks
   Setting range: 0 to 255
   NG output only turns on when the number of consecutive NG judgments exceeds the specified value.
   However, NG output will be generated immediately if none of the printed characters set to formats 1 to 4 (P.7) on the captured screen are present. Even if NG output is not generated, it will be shown on the screen that the judgment was NG, and the NG screen will be saved. (When [Save NG] is set to "CHNG", "ALL", "OK-A" on P.10.) Set this parameter when detecting defects in which consecutive NG judgments occur such as when a stamp is out of ink or when the printer's date setting is incorrect. (Unit: Number of times)

7. **OffDelay**
   Default setting: 0
   Common to all banks
   Setting range: 0 to 5000
   This parameter delays the turning off of the OK/NG output. If the off condition is met continuously by the judgment result for the set time (in units of milliseconds) or longer, the output is turned off (the OK and NG output timers operate independently from each other). Also, if [One-shot] (explained below) is set to "ON," this parameter is the one-shot output time.

8. **On Delay**
   Default setting: 0
   Common to all banks
   Setting range: 0 to 5000
   This parameter delays the turning on of the OK/NG output. If the on condition is met continuously by the judgment result for the set time (in units of milliseconds) or longer, the output is turned on.

9. **One-shot**
   Default setting: OFF
   Common to all banks
   Options: OFF, ON
   Set this parameter to "ON" to turn on the output just for the length of time set with [OffDelay] (explained above) when the output turns on. If the [OffDelay] time is "0," the output will remain on continuously. To turn off the output, switch the bank.
   This parameter is enabled when [Synchron] is set to a value other than "CONT."

10. **OutSynDl**
Default setting: 0
Common to all banks

Setting range: 0 to 15 (Unit: Number of times)
This parameter delays the timing with which the OK/NG output is turned on by the specified number of image captures.
This parameter is enabled when [One-shot] (P.9) is set to "ON" and [Synchron] (P.6) is set to "UP" or "DOWN." Set this parameter when the ejection process is after the rejection point and the NG output is used as-is for the rejection signal.

11. **Save NG**
Default setting: OFF
Common to all banks

Options: OFF, CHNG, ALL, OK-A
This function saves up to 95 captured screens to the built-in memory. When the 96th screen is saved, the oldest piece of data is overwritten.
The details and date/time of occurrence of the raw and character-cut-out screens and the read character string are saved. If the power is turned off during the saving operation, the corresponding screen will not be saved.
Use [View NG Log] (P.5) on the top menu to investigate the cause of the NG judgment and to register NG characters in the expansion dictionary.
OFF:
Screens will not be saved.
CHNG:
When the judgment switches from OK to NG, the screen will be saved.
ALL:
All NG screens will be saved.
OK-A:
All screens will be saved, including OK screens.

12. **String +**
Default setting: OFF
Common to all banks

Options: OFF, ON, SET0, SCLR
Set whether to use the bank selection 1 input line (yellow/black) as the character string addition input or as the character string clear input and the bank selection 2 input line (pink) as the set character string to 0 input.
Set this parameter to increment or clear the characters set with character string editing (P.8) and to reset to 0 (zero) only the numeric values in this character string.
This function is useful when incrementing serial numbers and lot numbers.
OFF:
This function will not be used.
ON:
The bank selection 1 input line (yellow/black) is switched to the character string addition input, and the character string set with character string editing (P.8) is incremented.
The right-most digit is changed to the next character on the rising edge of each input.
Numeric values that are "9" are set to "0" and carrying is performed on the next digit.
Alphabet characters that are "Z" are set to "A" and carrying is performed on the next character.
The character string returns to its original value when the power is reset or the bank is switched.
ex.) Characters set with character string editing: AB0123
On the rising edge of the yellow/black wire, this becomes AB0124, AB0125, ... AB0129, AB0130, AB0131, etc.
When the power is reset or the bank is switched, the character string is incremented again from AB0123, the value that was initially set with character string editing.
SET0:
Set whether to use the bank selection 2 input line (pink) as the set character string to 0 input. On the rising edge of the signal, the numeric values in the character string set with character string editing (P.8) are reset to "0." Character strings set to 0 in this manner are written to memory, so the settings are retained even if you turn the power off.
SCLR:
The bank selection 1 input line (yellow/black) is switched to the character string clear input, and the character string set with character string editing (P.8) is cleared on the rising edge of this signal. Cleared character strings are written to memory, so the settings are retained even if you turn the power off.

13. **SyncDely**
Default setting: 0
Can be configured for each bank

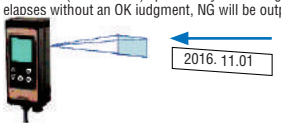
Setting range: 0 to 8000
Delay the start of image capturing by calculating, on the basis of the trigger input period (maximum: 4.19 seconds), the time that must elapse from the reception of the trigger input to the start of the actual capturing of the image. Even if the object speed changes, the image capture position is constant, so change this parameter according to the acceleration and deceleration of the objects.
The maximum delay time is 0.52 seconds.
Setting value = 8192 × delay time ÷ trigger input period
Unit
The trigger delay time is the number of pulses when [SyncPuls] (explained below) is set to "ON," the setting value × 64 µs when [SyncPuls] is set to "TIME," and the setting value × 256 µs when [SyncPuls] is set to "TIM4."

14. **SyncFilt**
Default setting: 40us
Common to all banks

Options: 40us, 100u, 400u, 1.0m, 2.5m, 5.0m, 10ms to 50ms (at 5 ms intervals)
Set the trigger input filter time. You can set the time to a value from 40 µs to 50 ms.
Set a large value when there is noise in the trigger signal, causing images to be captured by mistake.
Note that a delay equivalent to the set time occurs between the reception of the trigger input and the start of image capturing.

15. **SyncPuls**
Default setting: TIM4
Common to all banks

Options: OFF, ON, TIME, TIM4, REPT
Set this parameter when you are using a rotary encoder to correct position offsets caused by changes in object movement speed, when you are delaying the start of image capturing after the trigger input is received by using [SyncDely] (explained above), and when the characters to read are larger than the field of view and you are performing judgment by capturing multiple images.
OFF:
The delay time will be found by adding the trigger input period and the setting value of [SyncDely] (explained above).
ON:
Select "ON" when you are applying rotary encoder pulses to correct position offsets caused by changes in object movement speed.
After the rising edge of the trigger input (when [Synchron] on P.6 is set to "UP"), the image is captured when the number of rising edges of the bank selection 0 input line (orange/black) reaches the setting value of [SyncDely] (explained above).
TIME:
The trigger input delay time will be the setting value of [SyncDely] (explained above) × 64 µs.
TIM4:
The delay time is the same as the "TIME" option, but 256 µs is the unit.
REPT:
For one trigger input, images are captured consecutively until the judgment is OK.
If the time (unit: 0.1 ms) specified by the setting value of [SyncDely] (explained above) elapses without an OK iudgment, NG will be output.



The "REPT" option is useful when the length of all the characters is longer than the width of the field of view!
*Set [Re-Scan] (P.11) to "SEQN."

The image capture interval is the processing time, so set [Wide], [Rotate], [Slant], and [Re-Slant] so that the processing time is as short as possible.

16. **Synchron**
The [Synchron] parameter on the [Setup Flow] menu can also be set here. For details, see P.6.

17. **NG-I/O**
Default setting: Out
Common to all banks

Options: Out, Bnk0, Bnk1, Bnk2, Bnk3, Str+, Tch
Select the function of the NG line (red/black). Set this parameter when you are using the NG line (red/black) to perform the functions of the four bank selection input lines (0 to 3).
Out:
The NG line (red/black) will be used for NG output.
Bnk0:
The NG line (red/black) will be used as the bank selection 0 input line.
When you are using the bank selection 0 input line (orange/black) for the input of [SyncPuls] (explained above), you can use the NG line (red/black) as the bank selection 0 input.
Bnk1:
The NG line (red/black) will be used as the bank selection 1 input line.
When you are using the bank selection 1 input line (yellow/black) for [String+] (explained above), you can use the NG line (red/black) as the bank selection 1 input.
Bnk2:
The NG line (red/black) will be used as the bank selection 2 input line.
When you are using the bank selection 2 input line (pink) for the teaching input (see [Bank] on P.9) or for the "SET0" option of [String+] (explained above), you can use the NG line (red/black) as the bank selection 2 input.
Bnk3:
The NG line (red/black) will be used as the bank selection 3 input line.
When you are using the bank selection 3 input line (purple) for [Synchron] (P.6), you can use the NG line (red/black) as the bank selection 3 input.
Str+:
The NG line (red/black) will be used as the [String+] line.
Tch:
The NG line (red/black) will be used as the teaching input line (see [Bank] on P.9).

18. **Out Sel**
Default setting: Norm
Common to all banks

Options: Norm, Rev
Norm:
OK signals will be output on the OK line (black), and NG signals will be output on the NG line (red/black).
Rev:
OK signals will be output on the NG line (red/black), and NG signals will be output on the OK line (black).

19. **EXIT**
Exits the [Parameter] menu.
Press SET to return to the top menu.

14. Date/Time

Use this menu to configure the settings related to the date and time.

• Operation/setup procedure

Refer to the operations explained under [Parameter change procedure] on P.6, and then perform the operations/setup.

Top menu → Date/Time

Date/Time

* When setting a [Date/Time] parameter, switch to the bank number.

How to select parameters

→ Move from the top menu to Date/Time. (Enter/execute)	SET
← Move from Date/Time to the top menu. (Back)	EXIT
↑ ↓ Move up and down. (Loops through the selections)	UP / DOWN

Date/Time	Overview	Automatic settings according to teaching mode
1-Date +	This is the difference in the number of days between today's date and the date of the OK product.	Automatic and semiautomatic teaching (These are only available when the characters being captured are dates or times. These parameters cannot be set in the case of character strings such as serial numbers. Also, when using the character count judgment function (P.12), these parameters are set manually.)
1-Date ±	Set the number of days before and after an OK date for judgment to still be OK.	
2-Date +	This is the difference in the number of days between today's date and the date of the OK product.	
2-Date ±	Set the number of days before and after an OK date for judgment to still be OK.	
1-Time +	This is the difference in the number of minutes between the current time and the time of the OK product.	
1-Time ±	Set the number of minutes before and after an OK time for judgment to still be OK.	
2-Time +	This is the difference in the number of minutes between the current time and the time of the OK product.	
2-Time ±	Set the number of minutes before and after an OK time for judgment to still be OK.	
Format 1 Format 2 Format 3 Format 4	Check and correct formats (you can specify up to four) of the characters to capture. The format can be a date, time, or a character string such as a serial number.	Automatic and semiautomatic teaching*1 (This only applies to "YMD" and "YM" formats. Other formats are set manually.)
No.ofCHR	Set this parameter when you want to judge the number of characters.	None (manual)
No.ofTOL	Set how many characters more or less than the target amount will be OK.	None (manual)
Max Strg	Set this parameter when you select the "STRG" format.	None (manual)
MonthChr	When capturing images of written-out month names, enter the number of characters to use for these month names.	None (manual)
StrgLine	Set this parameter when you select the "STRG" format.	None (manual)
YearOfst	When years are expressed as Japanese eras, enter the difference between these years and years according to the western calendar.	None (manual)
EXIT	Return to the top menu.	

*1 During semiautomatic teaching, settings that have already been configured will be given priority.

Purple	Individual setting on each bank
Green	Execute parameter

1. **1-Date +**
Default setting: 0
Can be configured for each bank

Setting range: -999 to +5000 (unit: days)
This is the setting of the first date. Set the difference in the number of days. That is, set how many days after today the date to read is (or how many days before today the read date was). If the value of [1-Time +] (explained below) is set on the positive side and the current time exceeds 23:59, the date will switch to the subsequent date. If the value of [1-Time +] is set on the negative side and the current time falls below 0:00, the date will switch to the previous date. Also, if format 1 (P.7) is set to "---," the character count judgment function will operate.
Use [1-Date +] to set the number of characters that is OK and use [1-Date ±] (explained below) to set how many characters more or less than the number of characters that is OK. (For details, see "Character count judgment function" on P.12.)

2. **1-Date ±**
Default setting: 0
Can be configured for each bank

Setting range: 0 to 1000 (unit: days)
Set the number of days before or after the date set with [1-Date +] (explained above) during which the judgment will still be OK. Also, when format 1 (P.7) is set to "---," the character count judgment function will operate, so use [1-Date ±] to set how many characters more or less than the target number of characters will be OK.
(For details, see "Character count judgment function" on P.12.)

3. **2-Date +**
Default setting: 0
Can be configured for each bank

Setting range: -999 to +5000 (unit: days)
This is the setting of the second date. Set the difference in the number of days. That is, set how many days after today the date to read is (or how many days before today the read date was). If the value of [2-Time +] (P.11) is set on the positive side and the current time exceeds 23:59, the date will switch to the subsequent date. If the value of [2-Time +] is set on the negative side and the current time falls below 0:00, the date will switch to the previous date.

4. **2-Date ±**
Default setting: 0
Can be configured for each bank

Setting range: 0 to 1000 (unit: days)
Set the number of days before or after the date set with [2-Date +] (explained above) during which the judgment will still be OK.

5. **1-Time +**
Default setting: 0
Can be configured for each bank

Setting range: -999 to 1439 (unit: minutes)
This is the setting of the first time.
Set the difference in the number of minutes. That is, set how many minutes after the current time the time to read is (or how many minutes before the current time the read time was).

6. **1-Time ±**
Default setting: 30
Can be configured for each bank

Setting range: 0 to 720 (unit: minutes)
Set the number of minutes before or after the minutes set with [1-Time +] (explained above) during which the judgment will still be OK.
The tolerance is also applied to dates, and times that cover two dates will be OK for both the previous and later dates.

7. **2-Time +**
Default setting: 0
Can be configured for each bank
Setting range: -999 to 1439 (unit: minutes)
This is the setting of the second time.
Set the difference in the number of minutes. That is, set how many minutes after the current time the time to read is (or how many minutes before the current time the read time was).

8. **2-Time +**
Default setting: 30
Can be configured for each bank
Setting range: 0 to 720 (unit: minutes)
Set the number of minutes before or after the minutes set with [2-Time +] (explained above) during which the judgment will still be OK.
The tolerance is also applied to dates, and times that cover two dates will be OK for both the previous and later dates.

9. **Format 1**
10. **Format 2**
11. **Format 3**
12. **Format 4**
Formats 1 to 4 on the [Setup Flow] menu can also be set here. For details, see [Step 3: Format checking, correcting, and adding] on P.7.

13. **No.ofCHR**
Default setting: 0
Can be configured for each bank
Setting range: 0 to 31
When performing judgments on the number of characters, set the number of characters to judge.
When you set this to "0" and set [Format 1] to "---," the sensor will operate with compatibility with the old CVS4.
For details, see "Character count judgment function" on P.12.

14. **No.of TOL**
Default setting: 0
Can be configured for each bank
Setting range: 0 to 15
Set the number of characters more or less than the number of characters set with [No. ofCHR] (explained above) that will be judged as OK. This parameter is enabled when [No. ofCHR] is set to a value other than "0."

15. **Max Strg**
Default setting: 0
Can be configured for each bank
Setting range: 0 to 22
When one of the formats from 1 to 4 (P.7) is set to "STRG," set the maximum number of characters to register during semiautomatic teaching. "0" means the same as "22." Even if the number of characters is less than the setting value, the character string will not be registered if its number of rows exceeds the value set with [StrgLine] (explained below). If a single row contains both a character string and a date such as "ABC 05.3.25," set the number of characters in the leading part (in this example, the number of characters is 3).

16. **MonthChr**
Default setting: 3
Can be configured for each bank
Setting range: 3 to 9
Specify the number of characters when reading months expressed by their written-out names (when one of the formats from 1 to 4 on P.7 is set to "4YED," "4YE," "2YED," or "2YE"). If you specify 3, January will be expressed as "JAN." If you specify 7 or higher, January will be expressed as "JANUARY."

17. **StrgLine**
Default setting: 1
Can be configured for each bank
Setting range: 1 to 10
When one of the formats from 1 to 4 (P.7) is set to "STRG," set the number of rows in the character string. If there is a large space between characters, a line feed character will be inserted, so each large interval will also be counted as a row.

18. **YearOfst**
Default setting: 0
Can be configured for each bank
Setting range: 0 to 99
Set this parameter when years are expressed not in the western calendar but as Japanese eras.
The set value will be subtracted from the read year, and the result will be compared against the current date. The built-in calendar only supports the western calendar, so years expressed as Japanese eras are converted to the western calendar by way of this subtraction.

19. **EXIT**
Exits the [Date/Time] menu.
Press SET to return to the top menu.

15. Expert Parameter

These parameters—such as the character size, mask settings, dictionary settings, and retries—are used to make advanced adjustments and under special circumstances.

• Operation/setup procedure

Refer to the operations explained under [Parameter change procedure] on P.6, and then perform the operations/setup.

Top menu → SET → ExpertParamtr

* When setting a parameter displayed in purple on the [ExpertParamtr] menu, in advance, switch to the bank number to set.

How to select parameters

→ Move from the top menu to ExpertPrmtr. (Enter/execute)	SET
← Move from ExpertPrmtr to the top menu. (Back)	EXIT
↑ ↓ Move up and down. (Loops through the selections)	UP / DOWN

ExpertParamtr	Overview	Automatic settings according to teaching mode
CharMrgn	Set how strictly to judge characters.	None (manual)
ChrSpace	Set the interval between characters.	None (manual)
ExpDctnr	This is the number of characters that have been additionally registered to the dictionary.	None (manual)
ExtLgtPw	Set the brightness of the CVS-LW1 external lighting device.	None (manual)
ExtTeach	Select the teaching input mode.	None (manual)
FixRtSlt	Set the parameters that will not be rewritten by teaching.	None (manual)
TchRange	Limit the dates that are automatically added during teaching.	Use this setting to limit the dates.
IntDctnr	Set this to "OFF" when not using the built-in dictionary.	None (manual)
LCD View	Vertically invert the LCD or rotate it to the right.	None (manual)
Msk Left	Mask the left side of the screen.	None (manual)
MskRight	Mask the right side of the screen.	None (manual)
Msk Up	Mask the upper part of the screen.	None (manual)
Msk Down	Mask the lower part of the screen.	None (manual)
PrintSts	Set this parameter according to the printing status.	None (manual)
Re-Scan	Skip over unrelated characters during reading.	None (manual)
Re-Slant	When an NG judgment occurs, change the slant of the characters and perform reading again.	None (manual)
Sprt 123	Enable/disable the splitting of characters from rows 1 to 3.	None (manual)
Sprt 456	Enable/disable the splitting of characters from rows 4 to 6.	None (manual)
ZeroChck	Judge dates and times that are a single digit as NG.	None (manual)
EXIT	Return to the top menu.	

Yellow	Common setting to all banks
Purple	Individual setting on each bank
Green	Execute parameter

1. **CharMrgn**
Default setting: 30
Can be configured for each bank
Setting range: 0 to 255
Set the degree to which differences between the cut-out character and the dictionary data will be allowed.
If the differences exceed the setting value, the character will be displayed as a question mark. During teaching, perform processing with this set to $\frac{1}{2}$.

2. **ChrSpace**
Default setting: ×4.0
Can be configured for each bank
Setting range: ×1.5 to ×7.0
If the interval between characters equals the magnification set with the value of [CharWdth] (P.9), a delimiter (line feed character) will be entered.

3. **ExpDctnr**
Default setting: 0
Common to all banks
Setting range: 0 to 56
This is the number of characters that have been registered to the expansion dictionary using a PC or [View NG Log].
When characters are registered to the expansion dictionary, this parameter is automatically overwritten.

4. **ExtLgtPw**
Default setting: 100%
Can be configured for each bank
Setting range: 6% to 100%
Use this parameter to adjust the brightness of a CVS-LW1 external lighting device (discontinued device). If you are using a CVS-LW1, set [Communic] (P.9) to "OFF."
Also, if you are using a CVS-M1-R remote monitor, connect it to the CVS-LW1.
(You cannot perform RS-232C communication.)

5. **ExtTeach**
Default setting: SEMI
Common to all banks
Options:
SEMI, AUTO, DATE, NSTR, SA M, AT M, DT M, NS M
Set the teaching mode when the bank selection 2 input line (pink) is used as the teaching input. (Excluding "NSTR." See the explanation given below.)
SEMI:
The teaching mode is set to semiautomatic teaching.
AUTO:
The teaching mode is set to automatic teaching.
DATE:
The teaching mode is set to date and character string teaching.
NSTR:
Not only during external teaching but during semiautomatic teaching and date and character string teaching using button operations as well, character strings will not be stored.
For options with "M," (SA M, AT M, DT M, and NS M), the setting values are not saved after teaching.
(This parameter will return to its previous setting value when the bank is switched or when the sensor is restarted.)

6. **FixRtSlt**
Default setting: OFF
Common to all banks
Options: OFF, ON, CHAR, C+RS
You can set the parameters that will not be set automatically during semiautomatic teaching (from the following parameters on P.9: [Rotate], [SlantOfs], [Slant], [CharWdth], [ChrSpace], and [CharHght]).
* [FixRtSlt] is only enabled during semiautomatic teaching. Automatic teaching operates in the same way as if you selected "OFF."
OFF:
During teaching, [Rotate], [SlantOfs], and [Slant] will be set automatically.
ON:
The values of [Rotate], [SlantOfs], and [Slant] will not be set automatically. In situations such as when the object speed is faster than during teaching, set [Rotate], [SlantOfs], and [Slant] to the optimum values in advance.
CHAR:
The character size ([CharHght], [ChrSpace], and [CharWdth] parameters) will not be set automatically during teaching. When bold characters and narrow characters are mixed together, adjust the above settings to enable reading, and then execute teaching.
C+RS:
You can use this option to perform teaching with none of [Rotate], [SlantOfs], [Slant], [CharHght], [ChrSpace], and [CharWdth] set automatically.

7. **TchRange**
Default setting: ---
Common to all banks
Setting range: --- to 2047 (unit: days)
Apply a limit on the automatically set dates during automatic, semiautomatic, and date and character string teaching. For example, if the expiration period is three days, set this value to "3."
---:
No limit will be applied. Dates will be set automatically within the range of 999 days in the past to 5000 days in the future.
1 to 2047:
Dates in the past will be fixed to the day before the current day (- 1 day). Dates in the future will be set automatically up to the positive setting value (day).

8. **IntDctnr**
Default setting: ON
Common to all banks
Options: ON, OFF
This function regulates the use of the built-in dictionary. To perform character reading using only the registered expansion dictionary, set this parameter to "OFF."

9. **LCD View**
Default setting: NORM
Common to all banks
Options: NORM, REVS, ROTA
NORM:
The LCD contents will be displayed normally.
REVS:
The LCD contents will be vertically inverted. Use this option when the device is installed upside down. (The external monitor will not be inverted.)
ROTA:
This option returns to the correct position images of the CVS4 screen that are turned sideways when the CVS-CN (P.2) or a similar device is used to display these images on a NTSC TV or other external monitor.
(The CVS4 LCD is not rotated.)

10. **Msk Left**
11. **MskRight**
12. **Msk Up**
13. **Msk Down**
Default setting: (0, 255, 0, 243)
Can be configured for each bank
Specify the coordinates in the left, right, upper, or lower side in which the character cut out search will not be performed. If a pattern or design is present in the field of view and reading this pattern or design will lead to erroneous judgments, you can mask the pattern or design so that it is not judged. Also, by overlapping the horizontal and vertical ranges, you can mask the central part.

14. **PrintSts**
Default setting: NORM
Can be configured for each bank
Options: NORM, STMP, PRNT, STPR
Normally use "NORM."
NORM:
Use this option with normal printed characters.
STMP:
It may be beneficial to use this option when reading stamped characters.
The top and bottom rows are darkened for reading. Use this option when the horizontal lines at the bottom of "2" and at the top of "7" are faint in the printed characters.
PRNT:
Use this option when a different pattern is present on the left or right of the printed part and characters printed in two rows are cut out with the upper and lower characters joined together.
STPR:
This option performs the operations of both the [STMP] and [PRNT] options.

15. **Re-Scan**
Default setting: FULL
Common to all banks
Options: OFF, ON, FULL, SEQN
When an NG judgment occurs, the date, time, etc. is searched for again from the next character. If unnecessary characters (such as *kanji* characters) are included on the screen, you can skip over them during reading.
With the "ON," "FULL," and "SEQN" options, dots (".") that exist in the read character string will be ignored (when one of the formats from 1 to 4 on P.7 is set to "STRG").
OFF:
No characters will be skipped over.
ON:
Re-scanning will be performed from the next line feed character (this also includes locations where the space between characters is large).
FULL:
Re-scanning will be performed from the next character. Scanning will be performed even if there is no space between the characters.
However, this option has the weakness of judging characters read as "12:34" as OK when the character string "2:34" is OK.
When reading times, set this parameter to "ON."
SEQN:
Use this option with [SyncPuls] set to "REPT." Reading is performed in order starting with format 1 (P.7). If the judgment result is OK, judgment is performed with the next format during the next consecutive image capture. OK output is generated when all the set formats are OK. NG output is generated when the consecutive image capture time (set with [SyncDely] on P.10) is exceeded and the judgment is not OK.

16. **Re-Slant**
Default setting: 2.5
Common to all banks
Options: OFF, 0.9, 2.5, 4.3, 6.0, 8.5
When character strings expressed in English are judged to be NG, this function slants the characters to the left or right and performs the reading operation again. The larger the setting value, the longer the processing time will become when an NG judgment occurs. The setting value indicates the angle when reading is attempted again.

17. **Sprt 123**
18. **Sprt 456**
Default setting: ooo
Can be configured for each bank
Setting range: xxx to ooo
When neighboring characters are joined together and are read as a single character, you can use [CharWdth] (P.9) to set the character width to the optimum value in order to read this single character separated into 2 to 4 characters. You can use these parameters to set on which rows this separation function is enabled.
Set a digit to "o" to enable the separation function on the corresponding line (digits from the left correspond to rows from the start).
For rows that contain a mixture of characters having different widths, if you want to recognize each character separately, set the corresponding line to "x."
ex.) If [Sprt 123] is "oxx," the separation function will only be enabled on the first row.
If [Sprt 456] is "xoo," the separation function will only be disabled on the fourth row.

19. ZeroChck
Default setting: ---
Can be configured for each bank

Setting range: --- to 123, ×0
This function judges month, day, hour, and minute numeric values as NG if they are a single digit. Years are always NG unless they are two or four digits. (Excluding the case when the format on P.7 is set to "PY.")
---: All values are OK so long as they are one or two digits. (Both "05" and "5" are OK.)
1--: Only the first numeric value is checked to ensure that it is two digits.
When the format is set to "H:M," the hour value being one digit will result in an NG judgment.
-2-: Only the second numeric value is checked to ensure that it is two digits.
When the format is set to "2YMD," the month value being one digit will result in an NG judgment.
12-: The first and second numeric values are checked to ensure that they are two digits.
123: The three numeric values are checked to ensure that they are two digits.
×0: If the month, day, hour, or minute numeric value is one digit, the judgment will be NG if the value is "0."
("2006.11.1" will be OK, but "2006.11.01" will be NG.)

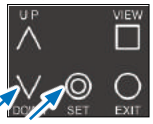
20. EXIT
Exit the [ExpertParamtr] menu.
Press SET to return to the top menu.

16. Preventing Teaching and Setting Changes

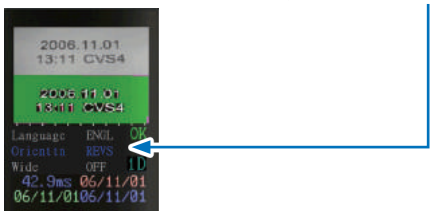
You can lock the sensor so that none of the settings can be changed, teaching cannot be executed, character strings cannot be edited, and the calendar timer cannot be corrected (the date and time cannot be synchronized).
This makes it possible to prevent erroneous changes to the settings and operation of the sensor by users who are unfamiliar with its operations.
* Even when the sensor is locked, you can still view the setting values of all the parameters.

[How to lock the sensor]

On the top menu, hold down SET and DOWN at the same time for 3 seconds or more.

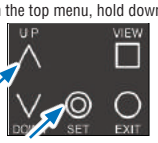


When the sensor is locked, the teaching and parameter characters are displayed in blue to indicate this.



[How to unlock the sensor]

On the top menu, hold down SET and UP at the same time for 3 seconds or more.



* You can unlock only [1-Date +] and [2-Date +] by entering the [Date/Time] menu and then holding down SET and UP at the same time for 3 seconds or more. In addition, this also unlocks [Date Teach] (P.9) on the top menu, which enables date and character string teaching. ([Date Tch] on the [Setup Flow] menu remains locked.)

17. Functions for Performing Operations by Combining Multiple Parameter Settings

The CVS4 has multiple functions for performing operations with a combination of the settings of multiple parameters. Details on the parameters are also given in their explanations, but the pages where the explanations of these parameters to combine are separate from each other, so typical functions are explained in this section.

[One-shot timer]

● If [Synchron] is set to "UP" or "DOWN," when the trigger signal is applied, the image can only be captured once. However, the OK or NG output is maintained until the image of the next character is captured. To cut off the output after each image is captured, use the one-shot timer.

Settings

Details	Parameter name	Parameter setting
P.9	OffDelay	The time of the one-shot timer (unit: ms)
P.9	One-shot	ON

[Speed change correction function] Recommended

● For devices such as high-speed pillow packaging machines, if the packaging speed is slow when the machine starts operation and the maximum speed is reached some tens of seconds later, variations in the image capture position (the timing) occur due to the changes in the speed. By applying the pulse output of a rotary encoder to the CVS4 input, you can monitor the speed and reduce variations in the image capture position.

Settings

Details	Parameter name	Parameter setting
P.10	SyncPuls	ON
P.10	SyncDely	Number of rotary encoder pulses from the point when the synchronous sensor is off to the point where it turns on.

Note) Use a rotary encoder that is capable of a pulse width of 500 µs or more.

[Character count judgment function]

● If there are many NG judgments due to the image capture conditions being poor and characters being read incorrectly, you can perform OK/NG judgments not according to reading but according to the number of characters. Various settings are possible for character count judgments, so select the settings that match your application from setting examples 1 to 4 shown below.

Setting example 1: So long as there is at least one character printed in the first and second rows, the judgment will be OK, but if the printed characters only exist in one of these rows, the judgment will be NG.

Example of printed characters: ABCD / 06.11.01 / E
Printed characters in the first row / Printed characters in the second row
If both the first and second rows have at least one character, the judgment will be OK.

Settings

Details	Parameter name	Parameter setting
P.7	Format 1	STRG
P.7	Format 2	STRG
P.8	String Editor	?↲ ?↲
P.11	Re-Scan	FULL

○ For the rows on which you want to perform character count judgment, set the format to "STRG." Because two rows are used in this example of printed characters, set [Format 1] and [Format 2] to "STRG." (If characters are only printed in one row, set only [Format 1] to "STRG." If characters are printed in three rows, set [Format 1] to [Format 3] to "STRG.")
○ A wildcard function in which any character is OK at the position where you enter "?" in the character string editor is available.
○ In this example, the wildcard function is used to judge the number of characters, so enter a number of "?" characters that matches the minimum number of characters that will result in an OK judgment.
○ Enter "↲" during character string editing to have the sensor recognize a line feed character at that position. Also, judgment is performed after delimiting the formats, so enter an underscore ("_") after the line feed character.
○ You can change the number of characters that you want to judge as OK in the first and second rows by changing the number of question marks in the character string editor.
Setting the judgment so that two or more printed characters in both the first and second rows will be OK
String editor input: ??↲_??↲
Setting the judgment so that three or more printed characters in the first row and four or more printed characters in the second row will be OK
String editor input: ???↲_????↲
○ If you set [Re-Scan] to "FULL," reading will skip one character at a time to the position where each format is OK.

Setting example 2: The judgment will only be OK if the number of characters in the first row and the number of characters in the second row are both exactly the set number of characters.

Example of printed characters: ABCD / 06.11.01 / E
Printed characters in the first row / Printed characters in the second row
The judgment will only be OK when the first row has 4 characters and the second row has 10 characters.

Settings

Details	Parameter name	Parameter setting
P.7	Format 1	STRG
P.8	String Editor	????↲??????????
P.11	Re-Scan	OFF

○ A wildcard function in which any character is OK at the position where you enter "?" in the character string editor is available. In this example, the wildcard function is used to judge the number of characters, so enter a number of "?" characters that matches the number of characters that will result in an OK judgment.
○ Enter "↲" during character string editing at the location where you want the sensor to recognize a line feed character (in the above example, the location is the end of the first row).
○ You can change the number of characters that you want to judge as OK on the first and second rows by changing the number of question marks in the character string editor.
Setting the judgment so that one printed character in the first row and three printed characters in the second row will be OK
String editor input: ?↲???
Setting the judgment so that three or more printed characters in the first row and six printed characters in the second row will be OK
String editor input: ???↲??????
○ If you set [Re-Scan] to "OFF," the characters will be read in order from the beginning without any characters being skipped.

Setting example 3: Perform judgment by reading the date part, "06.11.01," surrounded by the green frame. Judgment is performed on the entire part by way of the number of characters. The judgment will be OK if the number of characters is within +/-2 characters of the target amount.

Example of printed characters: ABCD / 06.11.01 / E
Printed characters in the first row / Printed characters in the second row
- Total number of printed characters = 14
- Number of characters to judge as OK = 12 to 16
- The sensor judges the date (green frame) part not only for the presence of printed characters but also for errors.

Settings

Details	Parameter name	Parameter setting
P.7	Format 1	2YMD
P.11	No.ofCHR	14 (total number of characters)
P.11	No.ofTOL	2 (number of characters to add to/subtract from [No.ofCHR] to give the range of acceptable character counts)
P.11	Re-Scan	FULL

Judgment is performed by reading the date part, "06.11.01," surrounded by the green frame, so set [Format 1] to "2YMD." The total number of characters is 14, so set [No.ofCHR] to "14." The range of acceptable character counts is +/-2 characters, so set [No.ofTOL] to "2." "06.11.01" is between the character strings "ABCD" and "/ E," so set [Re-Scan] to "FULL."

Note 1. When [No.ofTOL] is set to "0," ensure that the printed details are such so that the overall number of characters does not change. (Printing the month and day with one or two digits will result in an NG judgment.)
Note 2. With these settings, the second character string, "/ E," can be in either the second row or the third row for the judgment to be OK. To specify the row positions, use setting example 1. However, the judgment of the date section will also be performed according to the number of characters, so reading will no longer be possible.

Setting example 4: Judgment is performed on the date section and the character string section according to the number of characters. The judgment will be OK if the number of characters is within +/-2 characters of the target amount.

Example of printed characters: ABCD / 06.11.01 / E
Printed characters in the first row / Printed characters in the second row
Judgment is performed according to the total number of characters in the first and second rows.

Settings

Details	Parameter name	Parameter setting
P.7	Format 1	STRG
P.8	String Editor	? or _ (underscore)
P.11	No.ofCHR	14 (total number of characters)
P.11	No.ofTOL	2 (number of characters to add to/subtract from [No.ofCHR] to give the range of acceptable character counts)

The number of characters is 14, so set [No.ofCHR] to "14." The range of acceptable character counts is +/-2 characters, so set [No.ofTOL] to "2." With these settings, the total number of printed characters being within the range of 14 +/- 2 will result in an OK judgment.

Reference: When [No.ofCHR] is set to "0," the character count judgment can be performed even with the following settings.
* These settings provide parameter compatibility with the old CVS4, so the operations are exactly the same as in setting example 4.

Settings

Details	Parameter name	Parameter setting
P.7	Format 1	---
P.10	1-Date +	14 (total number of characters)
P.10	1-Date ±	2 (number of characters to add to/subtract from [1-Date +] to give the range of acceptable character counts)

The number of characters is 14, so set [1-Date +] to "14." The range of acceptable character counts is +/-2 characters, so set [1-Date ±] to "2." With these settings, the number of characters being within the range of 14 +/- 2 will result in an OK judgment.

[Space recognition function]

● When months and days are printed with one digit, a character existing to the right of the month or day (even if there is a space separating the characters) may lead to the month or day being read and erroneously recognized with two digits.
The space recognition function recognizes spaces as line feed characters to ensure reading is performed correctly.

ex.1) Actual printed characters: 09.12.1 BC
Reading result: 09.12.18 C
Cause: "B" is incorrectly recognized as "8," which leads to the character string being read as "09.12.18 C."

ex.2) Actual printed characters: 2009.1 ZW
Reading result: 2009.12 W
Cause: "Z" is incorrectly recognized as "2," which leads to the character string being read as "2009.12 W."

Settings

Details	Parameter name	Parameter setting
P.8	↲Check	ON
P.11	ChrSpace	x1.5

By setting [↲Check] to "ON" and [ChrSpace] to "×1.5," if there is a space that is half the width of a character, the sensor can insert a line feed character to recognize this space between the characters in order to perform correct reading.

Note 1. If [DotCheck] (P.8) is set to "ON," line feed characters are recognized as dots.
Note 2. If months and days are always printed using two characters (2009.1 → 2009.01, 09.12.8 → 09.12.08), the character to the right will not be read as part of the month or day, so there is no need to set the space recognition function.

[2-time image capture function]

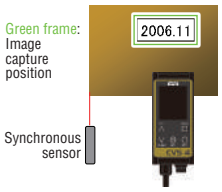
● Set this function when all the characters are not contained within the field of view due to the occurrence of minor position offsets caused by the objects not always passing the sensor at the same location or variations in the signal from the synchronous sensor.
This function captures two images per trigger signal. So long as one of the images results in an OK judgment, the overall judgment is OK.

Settings

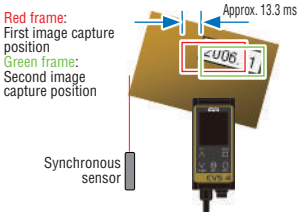
Details	Parameter name	Parameter setting
P.6	Wide	FST2
P.6	Synchron	UP, DOWN

Note 1. The interval between the first and second image capture is approximately 13.3 ms.
Note 2. When you specify "FST2," twice the character height is required. (See the character height in the specifications on P.2.)

When an object passes the sensor normally, all the characters are contained within the field of view, so the judgment can be performed just by capturing one image.



If the position where the objects pass the sensor or the orientation of the objects is not constant, it is not possible for all the characters to fit within the field of view unless images are captured twice.



[Output shift function]

● When the rejection process is after the detection point and objects reach the rejection mechanism after the number of image captures set with the parameters, the NG output can be used as-is for the rejection signal.

Settings

Details	Parameter name	Parameter setting
P.10	OutSynDl	The number of image captures from the point an object's image is captured to the point the object reaches the rejection mechanism
P.6	Synchron	UP, DOWN
P.9	One-shot	ON
P.9	OffDelay	Enter the length of time to perform one-shot output (1 to 5000) in units of milliseconds.

Note. You cannot use this function when the interval between objects is not constant.

[Continuous trigger image capture function]

● When the length of all the characters is longer than the width of the field of view, this function captures continuous images until the judgment is OK within the set time for one trigger input.

Settings

Details	Parameter name	Parameter setting
P.6	Synchron	UP, DOWN
P.10	SyncPuls	REPT
P.10	SyncDely	Time during which to perform repeated image captures (0 to 800.0 ms)
P.11	Re-Scan	SEQN

Note 1. The image capture interval is the processing time, so set [Wide] (P.6), [Rotate] (P.9), [Slant] (P.9), and [Re-Slant] (P.11) so that the processing time is as short as possible.
Note 2. If there are multiple formats, set them in the order that they enter the screen.

Reference: Image capture position variations due to response time and object speed

		Response time			
		20 ms	30 ms	40 ms	50 ms
Object speed	10 m/min.	+/-1.7mm	+/-2.5mm	+/-3.3mm	+/-4.2 mm
	20 m/min.	+/-3.3 mm	+/-5.0 mm	+/-6.7 mm	+/-8.3 mm
	30 m/min.	+/-5.0 mm	+/-7.5 mm	+/-10.0 mm	+/-12.5 mm
	40 m/min.	+/-6.7 mm	+/-10.0 mm	+/-13.3 mm	+/-16.7 mm

[Trigger delay function]

● The CVS4 is installed so that it captures images at the instant that the synchronous sensor detects the object. However, when the CVS4 and the synchronous sensor are installed at a distance, the image capture timing can be delayed to minimize the fine tuning of the installation distance between the devices.

Settings

Details	Parameter name	Parameter setting
P.6	Synchron	UP, DOWN
P.10	SyncDely	0 to 8000 (unit: 0.1 ms)
P.10	SyncPuls	TIME (64 µs), TIM4 (256 µs)

Delay time calculation
"TIME" Delay time = 64 µs × the [SyncDely] setting value
"TIM4" Delay time = 256 µs × the [SyncDely] setting value

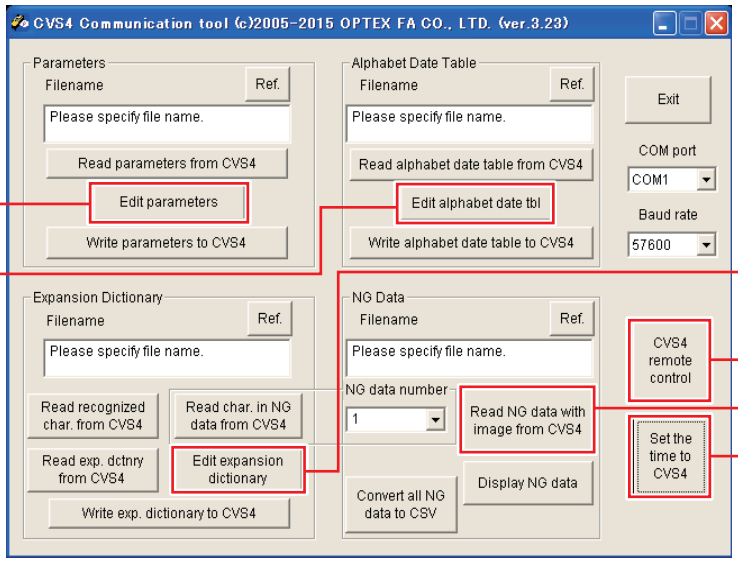
Note 1. Note that changing the speed of the object causes the image capture position to be offset.
Note 2. If the devices are installed too close together, reinstall them at more of a distance from each other.

18. Connecting to a PC and Using the Communication Function

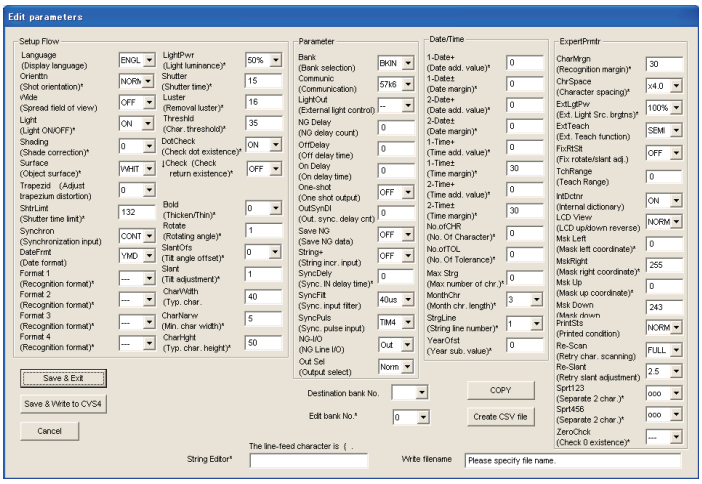
If you use the optional PC I/F cable "CVS-C2C" to connect to a PC, you can output the read characters in ASCII code.
Also, if you download the setup software (free of charge) from the Optex FA website, "www.optex-fa.com," you can use a variety of functions that are only available with communication.

* The operations have been confirmed to work on Microsoft Windows® XP, 2000, and 98.
* Communication is performed over RS-232C.

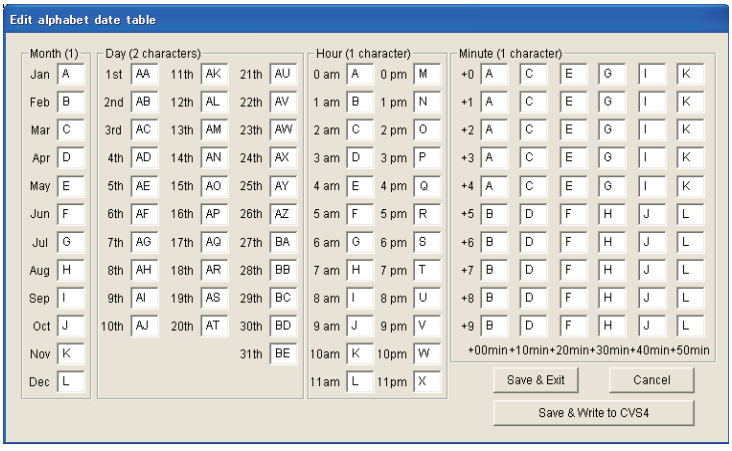
[Main menu]
Click the buttons to display screens for editing the setting values and viewing the NG data.



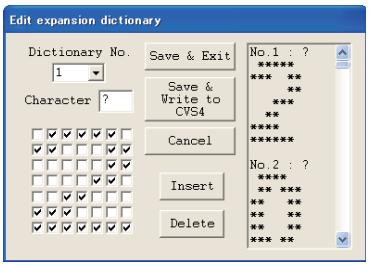
[Edit Parameters]
You can read, edit, and write all the setting values. When there are 17 or more types of models (greater than or equal to the number of banks), you can write to the CVS4 settings that match the objects without having to perform teaching each time that you perform a product changeover.
You can also transfer edited setting values to another CVS4.



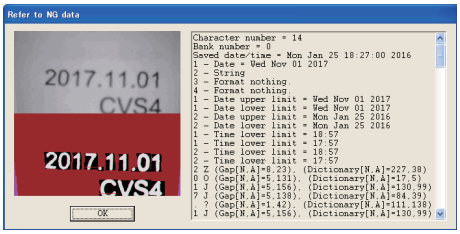
[Edit alphabet date table]
This function reads dates and times encrypted as alphabet characters and numeric values and converts them to actual dates and times for reading. (See *6 on P.7.)



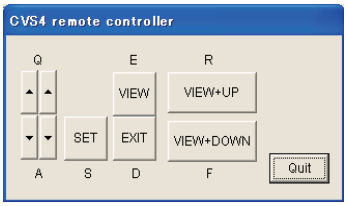
[Edit expansion dictionary]
When the CVS4 reads a character as "?" or recognizes a character erroneously (for example, reading "H" as "M"), you can eliminate this erroneous recognition by registering the correct character ("H") in the dictionary.



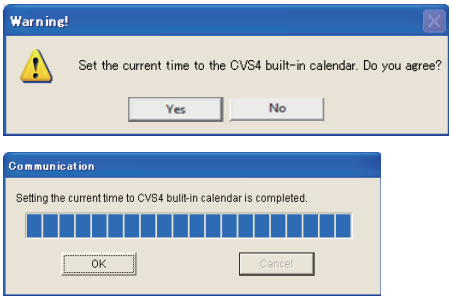
[Refer to NG Data]
Read the images from NG judgments and the data of the corresponding internal information that are stored on the CVS4. This is useful when making adjustments because you can check the causes of NG judgments. You can also save this NG data on a PC.



[CVS4 remote controller]
CVS4 button operations can be performed by way of communication, which makes it possible to operate the CVS4 remotely.
(You cannot display the CVS4's LCD screen on a PC.)



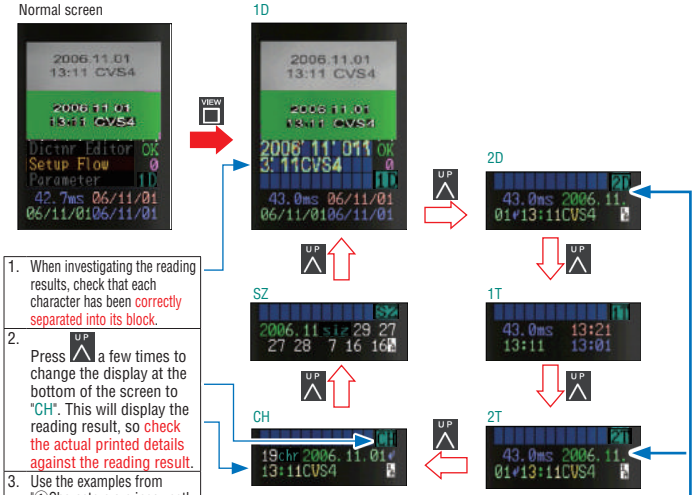
[Set the time to CVS4]
When the time of the calendar function is incorrect, you can synchronize it to the PC's time.



19. Troubleshooting

This section explains adjustment methods for the cases in which NG judgments occur due to poor character reading even though you have performed teaching and in which OK judgments do not occur even when images are captured of objects with OK printed characters.

To determine the cause of the NG judgment, it is useful to press VIEW to switch to the monitor display.



1. When investigating the reading results, check that each character has been correctly separated into its block.
2. Press UP a few times to change the display at the bottom of the screen to "CH". This will display the reading result, so check the actual printed details against the reading result.
3. Use the examples from "①Characters are incorrectly compared with dictionary or wrongly read" to "⑦String is not recognized as the specified date or time" as references while you make adjustments.

Press DOWN to switch the display in the reverse order.

* If the date or time has not been set, the character string is displayed, as shown here. The color of the characters indicates the match rate with the dictionary. If a character's offset from the dictionary exceeds the value set with [CharMrgn] (P.11), the character is displayed as a question mark ("?").

	← High match rate							Low match rate →	
	Green	Light green	Cream	Yellow	Yellowish-orange	Orange	Red	Brown	Dark brown
Calculated [CharMrgn] value	0	4	8	12	16	20	24	28	32

If the characters displayed as a character string are brown or dark brown, the match rate is low, so use the optional PC I/F cable CVS-C2C to connect to a PC and register the characters in the expansion dictionary. This will increase the match rate.
You can download the expansion dictionary registration software (P.13) free of charge from the Optex FA website.
http://www.optex-fa.com

You can keep the current reading result display and return to the top menu. For example, on the [1T] display, press EXIT to return to the top menu with the [1T] display still shown.
* The display of the bottom part of the screen for anything other than the top menu is switched so that it is displayed according to the details of the parameters.

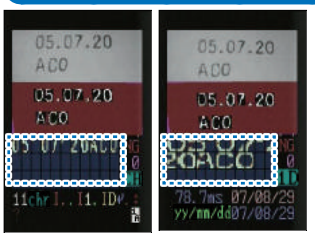
If the first candidate and the second candidate for a read character are different characters, the corresponding character ("6" in the following figure) is highlighted when the character string is displayed. Even when the match rate is high (the character is displayed in green), the highlighted character may be recognized incorrectly as a different character, so adjust [Bold] (P.9) so that this character is not highlighted.
If the character is still highlighted even after you adjust [Bold], you can obtain stable reading by using the communication function to register the character in the expansion dictionary (P.13).

You can also use [View NG Log] on the top menu to investigate the cause of the NG judgment.
The screen captured when the CVS4 changed the judgment from OK to NG, the date and time when this occurred, and the reading result can be displayed as NG data. Also, up to 95 sets of NG data are automatically saved to the built-in memory. (When the 96th set is saved, the oldest piece of data is overwritten.)

* The NG data can be extracted to a PC. (P.13)
* When you use this function, set [Save NG] (P.10) to a value other than "OFF."

Screen number: The latest NG screen is number 1. You can use UP to switch to the oldest and DOWN to switch to the newest NG screen.
Date and time that the NG screen occurred.
Reading result: In this example, you can see that part of the "1" in the right-most position of the first row was missing from the printed data and was read as a dot (".", which caused the judgment to be NG.

①Characters are incorrectly compared with dictionary or wrongly read



ex.1) When the character becomes narrow due to block separation or the one character is separated into two to four.

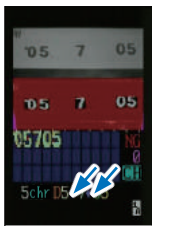
Solution
(1-1) If [CharWdth] (P.9) value is too large, characters become narrow. If this value is too small, characters are separated into two to four segments.
This parameter is set automatically to the optimum character width (90% of the width of typical characters) with automatic teaching (P.6) or semiautomatic teaching (P.8), but if extremely wide characters, such as *kanji* characters, enter the field of view, this parameter may not be set correctly. In this situation, manually adjust the parameter.

ex.2) Block separation is successful but the characters are too small to be recognized stably.

Solution
(1-2) Set the characters so that they are displayed as wide as possible. Increase the setting value of [Re-Slant] (P.11) to improve. Adjust the [Bold] (P.9) value so that the character obtains the adequate width.
Set [Slant], [SlantOfs] and [Rotate] (P.9) to 0 when the object rotation or the character slant is hardly found.
Set to "CONT" if [Wide] (P.6)is set to "ON", "FAST" or "FST2".

ex.3) Patterns exist around the characters and the characters are not cut-out.

Solution
(1-3) Exclude the pattern being displayed or apply masking by adjusting [Msk Left], [MskRight], [Msk Up], and [Msk Down]. (P.11)
(1-4) You can reduce the effect of patterns on the left and right sides of the screen by setting [PrintSts] (P.11) to "PRNT."

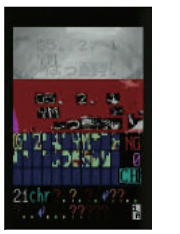


ex.4) Line feed mark exists between date of time.

Solution
(1-5) The line feed mark is inserted in a wide interval between characters.
Increase [ChrSpace] (P.11) value to exclude the line feed mark inserted.

ex.5) Block separation is successful but the recognized characters are not correct.

Solution
(1-6) *Kanji* characters are not recognized correctly. Register expansion dictionary before teach-in to recognize special font and characters. Increase [CharMrgn] (P.11) to recognize most similar character in built-in dictionary instead of "?".

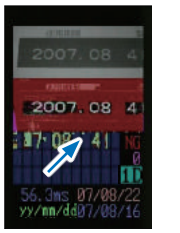


ex.6) Images are unstable due to the lustrous characters or backgrounds.

Solution
(1-7) Increase [Luster] (P.8) value and saturate the screen with the light to cancel the lustrous part. Adjust [Threshld] (P.8) value to allow the characters pop-up. If the problem still persists, adjust the CVS4 setting angle or use the external light to avoid the direct reflected light.

ex.7) Images are blurred.

Solution
(1-8) When not focused correctly, the feature of character becomes blurred. Adjust the distance between CVS4 and the object to focus.
(1-9) When the object moving speed is fast, please refer solution (2-3).

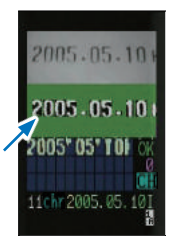


ex.8) Fine noises on the screen are recognized as dots.

Solution
(1-10) Increase the value in [CharNarw] (P.9) to ignore the characters with narrower width than this setting values.
(1-11) Increase [Threshld] (P.8) value to avoid fine noises displayed on the screen.

ex.9) Character cut-out is not successful due to the shooting of the cylinder-shape object shot at an angle.

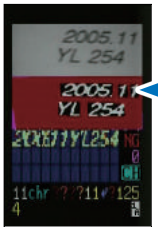
Solution
(1-12) Shoot from the front side. To avoid reflection of the built-in light, set [Light] (P.6) to "OFF" and use the external light.



ex.10) Horizontal line of "2" or "7" gets thinner and be misrecognized. But increasing Bold effects misrecognition between "6" and "8".

Solution
(1-13) You can apply emphasis to the horizontal lines of the characters. To do so, set [PrintSts] (P.11) to "STMP".
On the other hand, if you want to exert this poor influence, set [PrintSts] to "NORM".

②Wrong recognition in high speed of object

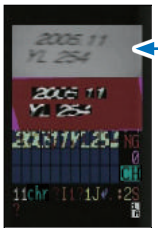


The slant correction is insufficient as the object moves in higher speed than in teaching.

Solution

(2-1) [Set FixRtSlt] (P.9) to "ON" in advance and increase [Slant] (P.9) value by the value of required slant correction. Doing this avoids rewriting of [Slant] and [SlantOfs] (P.9) value in teaching.

(2-2) If you set [Wide] (P.6) to "FAST", the rolling shutter interference (see the note at the bottom of this page) will be halved, which will also halve the slanting of the characters.



High speed of the object blurs the shot images.

Solution

(2-3) Refer to the page for to set [ShtrLimt] (P.6) value before performing teaching. Add the external light if the screen is not enough light in teaching (the case [Shutter] (P.8) value becomes 5 or less).

Changing the speed of the object shifts the shooting position and the characters run out of the screen.

Solution

(2-4) To absorb the dispersion of the object position, set [Wide] (P.6) to "FST2", or set [SyncPuls] (P.10) to "REPT". And decrease the setting value of [Rotate] (P.9) and [Slant] (P.9) and set [Re-Slant] (P.11) to "OFF", to reduce processing time.

When the object moves in high speed, the character height changes to disable cutting them out.

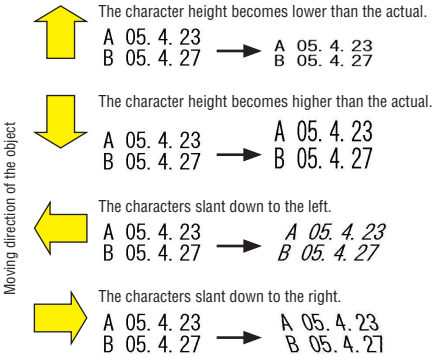
Solution

(2-5) Perform teaching in the condition that the object moves in high speed. Or decrease [CharHght] (P.9) value to cut out. (In this picture, the object moving at 0.7 m/s is shot.)

Rolling shutter interference

Horizontal models:
CVS4-N23W-R, -N21W-R,
-N24W-R, -N20W-R, -N40W-R

Vertical models:
CVS4-N23RW-R, etc.



Reference: Image capture position variations due to response time and object speed

		Response time			
		20 ms	30 ms	40 ms	50 ms
Speedness of objects	10 m/min.	+/-1.7 mm	+/-2.5 mm	+/-3.3 mm	+/-4.2 mm
	20 m/min.	+/-3.3 mm	+/-5.0 mm	+/-6.7 mm	+/-8.3 mm
	30 m/min.	+/-5.0 mm	+/-7.5 mm	+/-10.0 mm	+/-12.5 mm
	40 m/min.	+/-6.7 mm	+/-10.0 mm	+/-13.3 mm	+/-16.7 mm

Reference: Maximum line speed guidelines for printed character types and formats

Type	Standard	Middle range	For small characters	Long range	Wide	With additional external lighting*
Model CVS4	-N23W-R	-N24W-R	-N21W-R	-N20W-R	-N40W-R	
Thermal printer	30 m/min.	15 m/min.	60 m/min.	10 m/min.	43 m/min.	150 m/min.
Inkjet printer	18 m/min.	9 m/min.	36 m/min.	6 m/min.	26 m/min.	90 m/min.
Bold stamped characters	18 m/min.	9 m/min.	36 m/min.	6 m/min.	26 m/min.	90 m/min.
Engraved characters	6 m/min.	3 m/min.	12 m/min.	2 m/min.	—	30 m/min.

* The values depend on the type of external lighting, but these values are the maximum speeds with highly bright lighting and while also using the built-in lighting.
Also, the field of view is highly limited with these line speeds.
* The vertical models (which have the character string "RW-R" at the end of their model names) are the same as the horizontal models (which have the character string "W-R" at the end of their model names).
Note. The maximum line speed varies depending on the image capture conditions. The values given here should only be used as references.

③Character is linked with the next character

Two character "0" and "5" are in one block.

The situation that the character is linked with the next character occurs in unsuccessful cut-out of the interval between characters. This may occur in the case of shooting bold characters.

Solution

(3-1) Decrease the setting value [Bold] (P.9).
Decrease the bold level and widen the interval between characters. Adjust the lightness of characters by decreasing [Threshld] (P.8) value.

(3-2) Decrease the setting value [CharWdth] (P.9).
The separation function for up to 2, 3 and 4 characters operates against the characters with double to quadruple width of [CharWdth] setting value. The interval between white dots under the shooting screen is approx. 50 pixels. Adjust the setting value referring to the character size.

(3-3) Adjust the value of the setting value [Trapezid] (P.6).
The screen changes to a trapezoid shape when CVS4 is set to the object. When changed, the characters slant at the both edges on the screen. Adjust the setting value to correct this situation. Set the setting value to the mounting angle of CVS4.

④Judged as NG at the point at the date change

This trouble occurs when the difference exists between the printer for the date and the CVS 4 calendar.

Solution

(4-1) Increase [1-Time±] (P.10) value. Set the duration of specified time (minutes) as the upper and lower limit of the date before the date change. Also set the current date and the previous date as the upper and lower limit on the current date, the next date and the after the date change. Set with [2-Time±] (P.10) for the second date (2-Date).

(4-2) Increase [1-Date±] (P.10) value. In the format of "Y/M", the difference of months occurs at the month change with the different days. Normally, setting to 3 avoids any trouble in any month.

⑤Misrecognizes date when date is 1-digit

Recognizes date characters that be linked the original 1-digit date and the next character.

Solution

(5-1) Print the next characters apart from date character, and decrease the setting value of [ChrSpace] (P.11) to insert line-feed character.
(Ex. "2005.11. 1 SA")

(5-2) Be sure to print 2-digit date.
(Ex. "2005.11.01 SA")

(5-3) Register the next character to the expansion dictionary as character ".".

(5-4) Decrease the setting value of [CharMrgn] (P.11) to recognize the next character as "?". (Be careful not to change "." date characters that you want to recognize.)

(5-5) Use [↲Check] (P.8) to recognize spaces as line feed characters.
(For details, see "Space recognition function" on P.12.)

⑥NG judgment when verifying multiple lines string

Specify correct character string in [String Editor], but the judgment is still NG.

Solution

(6-1) Set the parameter of [StrgLine] (P.11) to necessary lines (This example is 2).

(6-2) Set the parameters of [Format] (P.7) to "STRG" the number of times of necessary lines, and specify "↲" character in [String Editor] (P.8) as the separator. (This example requires [Format 1] to "2YMD", [Format 2] to "STRG", [Format 3] to "STRG", and [String Editor] to "S↲A5".)
By setting the parameters in this way, you can skip over any unnecessary characters that exist at the start of each row. (Set [Re-Scan] on P.11 to "FULL".)

⑦String is not recognized as the specified date or time

The date of 2nd line on "1D".

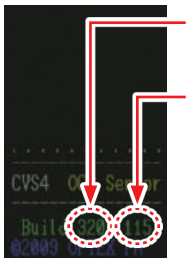
The date and time may not be correctly displayed even though the strings show the correct date and time order.
This problem occurs when [Re-Scan] (P.11) is set to "FULL" or "ON".
The string within the upper and lower limit of date and time is searched from the top. Therefore, if no string of OK judgment exists, the date and time recognized in the last part of string are displayed.

Solution

(7-1) Select "OFF" for [Re-Scan] setting or correctly set the upper and the lower setting of date and time in [Date/Time] (P.10).

20. Version Information

On the initial screen immediately after turning the power on or on the top menu, hold down UP and VIEW at the same time for 3 seconds or more.



This instruction manual corresponds to the software version 3.20 or greater (Screen display at startup is 320 or greater).

Indicates hardware version.

Press EXIT to return to the top menu.

FAX Inquiry Sheet (Copy this sheet to a piece of A4 paper before filling it in.)

If OK objects and NG objects are not judged correctly even after you perform teaching and configure the settings as explained in this instruction manual, fill out the required sections shown below, and then contact us by FAX.

Date: _____

OPTEX FA CO., LTD.
Headquarters

▶ **FAX** ☐Headquarters: +81-75-325-2921

Company			
Department		Address	
Name			
TEL		FAX	
e-mail	@		
Industry			
Manufactured products			

● Inquiry details (Draw a check mark for the appropriate items.)
☐ Almost all OK objects are judged to be NG. ☐ OK objects are sometimes judged to be NG.
☐ Objects are judged to be OK when they are stopping, but judged to be NG when moving.
☐ Others ( )

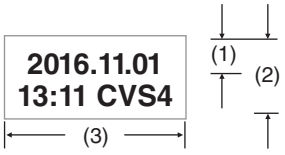
● What model are you using? What is the operating distance from this model to the object?

Model: CVS4-_____ Operating distance: _____mm

● What kind of printer are you using? (Draw a check mark for the appropriate items.)
☐ Thermal printer ☐ Inkjet printer ☐ Hot printer ☐ Laser marker
☐ Stamps ☐ Other ( )

● Printed characters (Basically, the following information is required.)

Example)



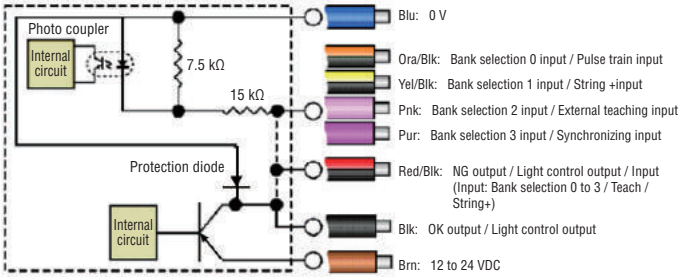
(1) What is the height of the detected characters?
_____mm
(2) What is the total height of the printed characters?
_____mm
(3) What is the total width of the printed characters?
_____mm
(4) How many rows? _____row(s)
(5) What is the surface? ☐White
☐Black
☐Patterned
☐Other ( )

● What type of surface are characters printed on? (Draw a check mark for the appropriate items.)
☐ Package film ☐ Labels ☐ Package boxes ☐ Cardboard boxes ☐ Other ( )

● What is the line speed in m/minute? (In terms of takt time, please calculate the line speed from the interval between objects.)
_____m/min.

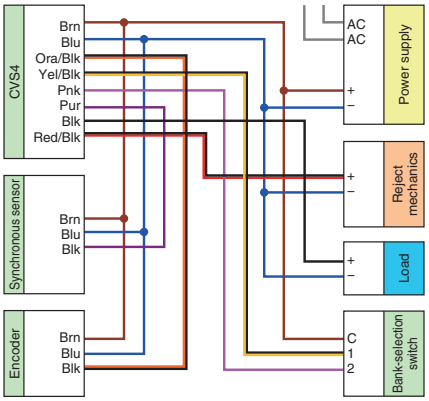
Appendix

[I/O Circuit Diagram (PNP Type)]



[Wiring example for PNP output]

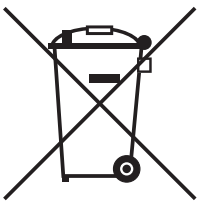
Typical example to connect Synchronous sensor, Rotary encoder, Reject mechanics and Bank-selection switch.



* When capturing images of moving objects, timing input from a synchronous sensor is required.

Symbol mark explanation

- The symbol mark on the right indicates that this product has an embedded battery.
- When the final user disposes of this product, it is forbidden for this product to be disposed of as general, non-separated waste.
- Failure to properly collect and dispose of this product's used battery may pose health and environmental hazards.
- This product must be disposed of by a collection/recycling facility certified by the local country or area so as to properly dispose of the used battery in accordance with the related laws and regulations.
- To protect the environment, we ask for your cooperation in this matter.



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