Panasonic

MACHINE VISION SYSTEM

IMAGECHECKER®

PV230

User's Manual

WME-PV230-OP-04

2021.04 | panasonic.net/id/pidsx/global

Introduction

Thank you for purchasing Panasonic Industrial Devices SUNX's IMAGECHECKER PV230.
Please read this Instruction Manual carefully and thoroughly for the correct, optimum and safe use of this product.

All our products are strictly inspected before shipped. However, before using this product, check for problems that occurred during transport and then perform operation check. If the product is found to be damaged or does not operate as specified, we are sorry to trouble you, but please contact the shop where you purchased the product or our nearest local office to you.

Precautions When Using Network Function

There is the risk of suffering following damage when a system using this product is used via a global network.

(1) Information leakage through this unit
(2) Illegal operations by a malicious third party
(3) Obstructing or stopping by a malicious third party

Sufficient network security measures should be taken including the following measures at your own risk to prevent such damages.

- Use the system via a network whose safety is secured by a firewall, etc.
- For a system using a computer, perform the check for virus and malicious program infections, and eliminate them.
- Set a user name and password, and restrict users who can log in the computer to protect the system from unauthorized attack.
- There is a possibility that information such as image data, authentication information (user name, password), alarm mail information, FTP server information and DDNS server information is leaked. Take measures such as restricting access by user authentication.
- Change the password of NAS (FTP server) periodically.
- Do not install the system in a place where cables, etc. can be easily damaged or altered.
- It is recommended to use the system via VPN (Virtual Private Network) or under the environment in which a dedicated line network is built to enhance security furthermore.

Manual Configuration

The following manuals have been prepared for this product. Go through these manuals according to the objectives and use them fully. Keep the manuals at hand after reading over so that you can see them whenever necessary.

☑ IMAGECHECKER PV230 Manual Operation Edition (This description)

Describes items necessary for operating the PV230. If you need the booklet, please contact our personnel in charge of sales.

- OCR Checker
- Code Reader Checker
- Communication Commands
- Preset menu

For the hardware information and the functions other than OCR Checker and Code Reader Checker, please refer to the PV200 Manual.

☐IMAGECHECKER PV200 Manual Operation Edition

Describes items necessary for operating the PV200. Use this manual for preprocessing functions and procedure for setting inspection conditions of various checkers. If you need the booklet, please contact our personnel in charge of sales.

- Procedure for setting inspection conditions with various checkers used (except for Optical Character Reader (OCR) checker and code reader checker)
- Operation and procedure for setting RUN Menu
- Environment Setting
- Tool Setting (Configuration change)
- Debugging of main unit (Inspection re-examination function)
- Select Menu
- Communication Settings
- Tool software for PC
- Specification and Part No. List

Symbol Indications

▶ Note	Describes the details of its part or useful things.
▶ Caution	Describes things that need to be paid special attention when operating the product.
▼Refer to▼	Indicates the reference including the details related to its part.

Table of Contents

List of menus

Code Reader Checker

- Area Setting
  - Comment
  - Select Camera
  - Select Color Image
  - Position Adjustment
  - Area Setting
- Segmentation Condition
  - Image Filter
    - Grayscale Preprocess — No / A – P (16 types)
    - Threshold method
      - Fixed
        - Segment Color — White / Black
        - Slice Level — A – P (16 types)
      - Dynamic
        - Average Size — 1 to 255
        - Offset — 0 to 255
        - Background (Dynamic) — Light / Dark
      - Auto — Background (Auto) — Light / Dark
    - Segment Preprocess — No/Dilation/Erosion/Dotted Char. — Filter X / Filter Y
    - Slant Angle — -45.00 to +45.00 degrees
  - Segmentation Condition
    - Max. Area, Min. Area
    - Max. Width, Min. Width
    - Max. Height, Min. Height
    - Segment Direction — Left->Right / Right->Left / Top->Bottom / Bottom->Top
    - Boundary — Yes / No
    - Partition — No / Yes — Character Width (1 to 100)
- Inspection Condition
  - Recognized Reversed Character — No / Yes
  - Output Judged Characters — Yes / No
  - Number of Lines — Two or more / One
  - Recognition rate method — No / Correlation Value / Subtraction / Max. / Min. / Average
    - Method — Details Mode / Rough+Details Mode / Rough
    - Filter — No / 2x2 / 3x3 / 4x4 / 5x5 Erosion->Dilation
    - Subtraction Threshold — 0 to 255
    - Recognition rate judgement — No / Individual dictionary / All dictionaries
- Judgement Limits 1
  - Judgement type
    - Character String
      - Judgement characters
      - No. of Characters Judgement — No / Yes — No. of Characters (1 to 80)

- Calendar — Calendar Condition
  - Calendar Format — Year/Month/Day, Day/Month/Year, Year/Month, Month/Year, Month/Day, Day/Month, Year, Month, Day
  - Delimiter — “.” / “/” / “-” / None
  - Digits of Month and Day — 2-digit / Variable
  - Digits of Year (When "Year" is included in format) — 4-digit / 2-digit
  - Offset — Designated Date / Range
  - OK (Year, Month, Day, Hour)
- Judgement Character Size — No / per Judge. Char. / per Dic. Label — Character Size (Area, Width, Height)

Judgement Limits 2
- Period Identification — No / Yes
  - Max. Width — 2 to 2000
  - Max. Height — 2 to 2000
  - Recognition Rate Result — Variable / Always 100
- Individual Judgement — No / per Judge. Char. / per Dic. Label
  - Minimum recognition rate — 0 to 100

Dictionary
- Dictionary No.
  - Registration
    - Segment (Execute)
    - Character Assignment
    - Register (Execute)
  - Recognition Speed — Normal / High Speed
  - Learning Type — Normal / Rough(High-speed) / Fine(Low-speed)
  - Edit
  - Learning (Start)

OCR Checker

Area Setting
- Comment
- Camera
- Select Color Image
- Position Adjustment
- Area Setting

Inspection Condition
- Grayscale Preprocess — No / A - P (16 types)
- Code Type (27 types)
- Code Model Parameter — *Settings differ depending on the selected code type.*
- Background — Light / Dark / Auto — (Not selectable for 2D code when "Code Model Parameter" is "Enhanced")
- Recognize Reversed Code — No / Up-Down / Left-Right — (Not selectable for 2D code)
- Quality Check — Invalid / Valid — (Not selectable for bar code)
- Error Output

Menu options of Code Model Parameter

For Bar Code

- Code Model Parameter — Manual
  - Element Height Min. — -1, 8 to 200
  - Code Orientation — -90.0 to 90.0
  - Code Orientation Tol. — 0.0 to 90.0
  - Edge Threshold — 0.01 to 1.00
  - Angle Range — 2 to 20
  - Composite Code — None / CC-A/B (Selectable only for GS1 DataBar)

For Data Matrix

- Code Model Parameter — Standard / Enhanced / Manual
  - (Following items can be set when selecting "Manual".)
  - Training
  - Base Data on — Current Val. / Default Val.
    - Mirrored — No / Yes / Auto
    - Contrast Min. — 1 to 100
    - Strict Model — No / Yes
    - Module Columns Min. — 10 to 144
    - Module Columns Max. — 10 to 144
    - Module Rows Min. — 8 to 144
    - Module Rows Max. — 8 to 144
    - Gap Size Min. — No / Small / Big
    - Gap Size Max. — No / Small / Big
    - Module Grid — Fixed / Variable / Auto
    - Slant Max. — 0.0 to 30.0

For QR code

- Code Model Parameter — Standard / Enhanced / Manual
  - (Following items can be set when selecting "Manual".)
  - Training
  - Base Data on — Current Val. / Default Val.
    - Mirrored — No / Yes / Auto
    - Contrast Min. — 1 to 100
    - QR Model Type — Auto / 1 / 2
    - Version Min. — 1 to 40
    - Version Max. — 1 to 40
    - Gap Size Min. — No / Small / Big
    - Gap Size Max. — No / Small / Big
    - Visible Pos. Patterns Min. — 2 to 3

Chapter 1

Preset Menu

1.1 Preset Menu

What is Preset Menu?

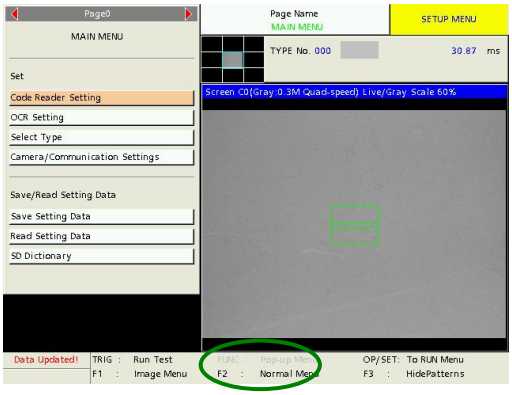
Preset Menu is the menu that the functions related to "Optical Character Recognition" and "Code Reader" are pre-registered in Select Menu provided with PV230, and it is generated when Type No.0 is newly created.

For the details of "Select Menu", refer to "Chapter 9 Select Menu" in the PV200 User's Manual.

Normal Menu

F2 Key

Select Menu



▶ Note

Pressing the F2 key switches between Normal Menu and Select Menu. However, you cannot switch the menu when the F2 key is not displayed in the key guide such as in the hierarchy under the submenu in Normal menu.

Specifying Menu Display in SETUP Menu

In the setting below, you can select which menu is displayed when switching from RUN menu to SETUP menu.

In PV230, the functions related to "Optical Character Recognition" and "Code Reader" are pre-registered in the Select Menu.

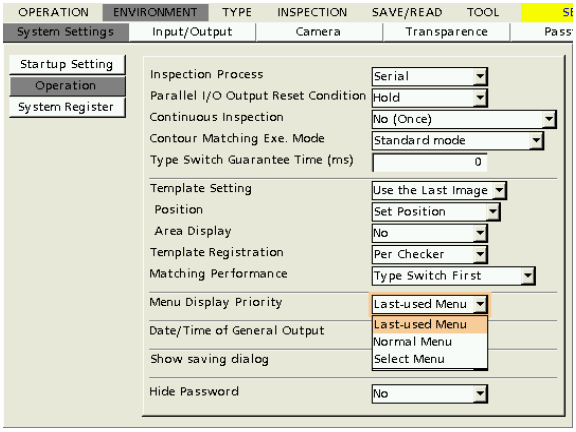
For the details of "Select Menu", refer to "Chapter 9 Select Menu" in the PV200 User's Manual.

1. **Select "ENVIRONMENT" > "System Settings".**

2. **Select "Operation" > "Menu Display Priority".**

3. **Menu Display Priority**

Select from Last-used Menu, Normal Menu, and Select Menu.
By selecting "Last-used Menu", the last-used menu format is memorized and the same format is used for displaying menu next time.



1.2 Descriptions of Preset Menu

Page 0: Main Menu

Preset Menu [Main Menu]

Set

[Code Reader Setting]

Jump to "Code Reader Setting" page 2.

[OCR Setting]

Jump to "OCR Setting" page 3.

[Select Type]

Jump to "Select Type" menu.

[Camera/Communication Settings]

Jump to "Camera/Communication Settings" page 1.

Save/Read Setting Data

Save Setting Data

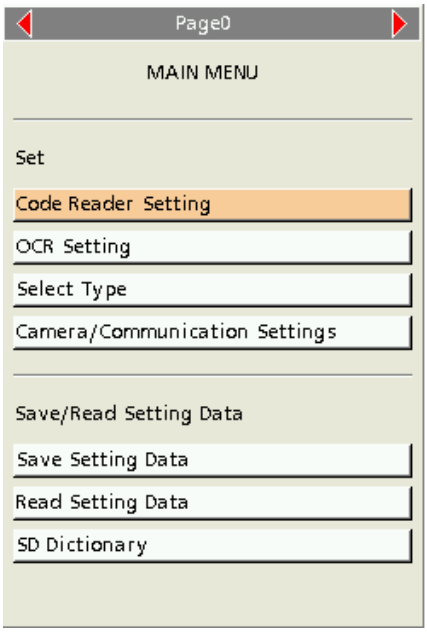
Jump to "Save Setting Data" menu.

[Read Setting Data]

Jump to "Save Setting Data" menu.

[SD Dictionary]

Jump to "SD Dictionary" menu.



Page 1: Camera/Communication Settings

Preset Menu [Camera/Communication Settings]

[Main menu]

Jump to "Main Menu" page 0.

Camera

[Camera Setting]

Jump to "Camera Setting" menu.

[Capture Setting]

Jump to "Capture Setting" menu.

Communication Setting

[General Output]

Jump to "General Output" menu.

[Serial]

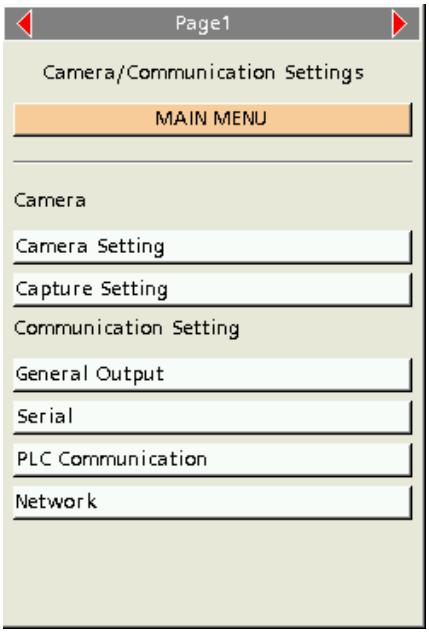
Jump to "Serial" menu.

[PLC Communication]

Jump to "PLC Communication" menu.

[Network]

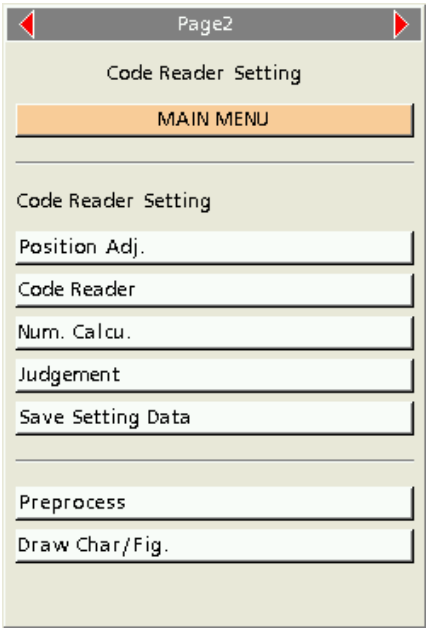
Jump to "Network" menu.



Page 2: Code Reader Setting

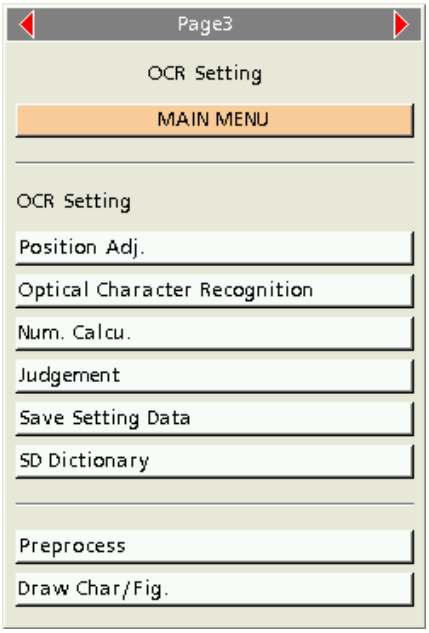
Preset Menu [Code Reader Setting]
[Main menu]
Jump to "Main Menu" page 0.
Code Reader Setting
[Position Adjustment]
Jump to "Position Adjustment" menu.
[Code Reader]
Jump to "Code Reader" menu.
[Numerical Calculation]
Jump to "Numerical Calculation" menu.
[Judgement]
Jump to "Judgement" menu.
[Save Setting Data]
Jump to "Save Setting Data" menu.

[Preprocess]
Jump to "Preprocess" menu.
[Draw Character/Figure]
Jump to "Draw Character/Figure" menu.



Page 3: OCR Setting

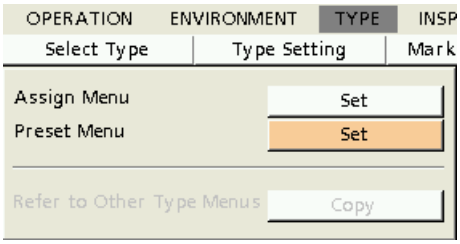
Preset Menu [OCR Setting]
[Main menu]
Jump to "Main Menu" page 0.
OCR Setting
[Position Adjustment]
Jump to "Position Adjustment" menu.
[Optical Character Recognition]
Jump to "Optical Character Recognition" menu.
[Numerical Calculation]
Jump to "Numerical Calculation" menu.
[Judgement]
Jump to "Judgement" menu.
[Save Setting Data]
Jump to "Save Setting Data" menu.
[SD Dictionary]
Jump to "SD Dictionary" menu.
[Preprocess]
Jump to "Preprocess" menu.
[Draw Character/Figure]
Jump to "Draw Character/Figure" menu.



1.3 Editing Preset Menu

Besides Optical Character Recognition and Code Reader, other checker functions can be registered in Preset Menu.

To restore initial state of Preset Menu

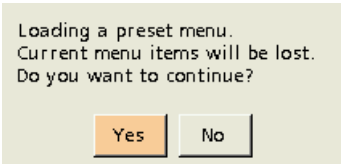


1. **Select "TYPE" > "Select Menu".**

2. **Select "Set" in "Preset Menu".**

3. **Select "Yes" in the confirmation window.**

Select "Yes" to set Preset Menu to the initial setting.



▶ Note

If the current Select Menu is not set yet, the confirmation message will not be displayed.

1.4 Using Preset Menu with Other Type Numbers or After Switching Language

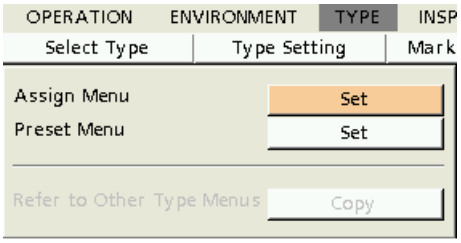
Preset Menu is automatically generated only for Type No.0.
When using Preset Menu with other Type numbers or using it after switching language, the following setting is required.

Editing Preset Menu

1. Select "TYPE" > "Select Menu".

2. Select "Set" in "Assign Menu".

The setting window is displayed.

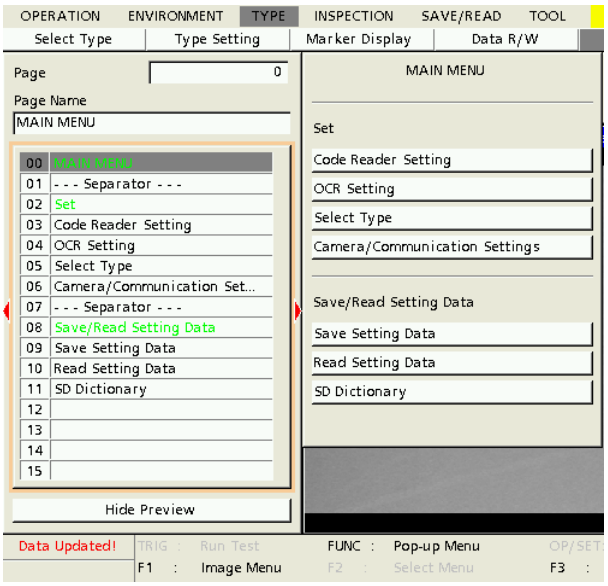


3. Select a page number.

4. Select an item number.

5. Select a function.

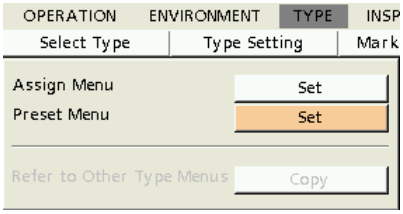
Select from Set Button, Set Text, Set Page Jump and Set Separator.
For the details of setting method, refer to "9.1.3 Setting Select Menu" in the PV200 User's Manual.



Reading New Preset Menu

1. Select "TYPE" > "Select Menu".

2. Select "Set" in "Preset Menu".

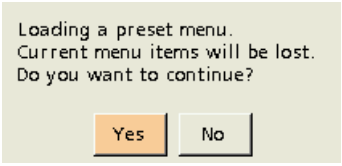


3. Select "Yes" in the confirmation window.

Select "Yes" to set Preset Menu to the initial setting.

Note

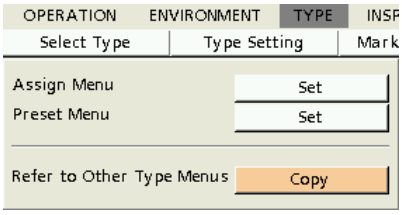
If the current Select Menu is not set yet, the confirmation message will not be displayed.



Referring to Preset Menus Created for Other Types

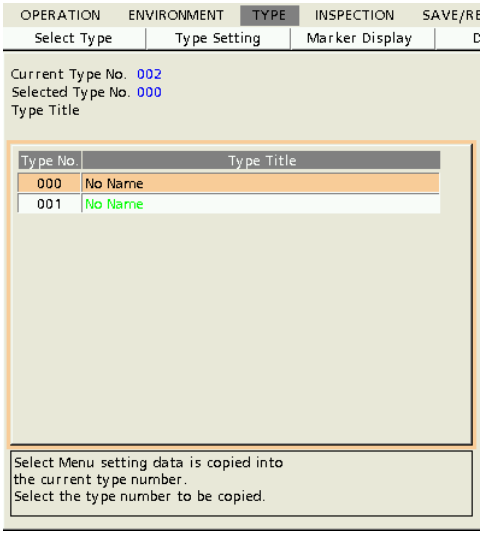
1. Select "TYPE" > "Select Menu".

2. Select "Copy" in "Refer to Other Type Menus".



3. Select the type number to be copied.

The preset menu created in the copied type number is copied.



Chapter 2

OCR Checker

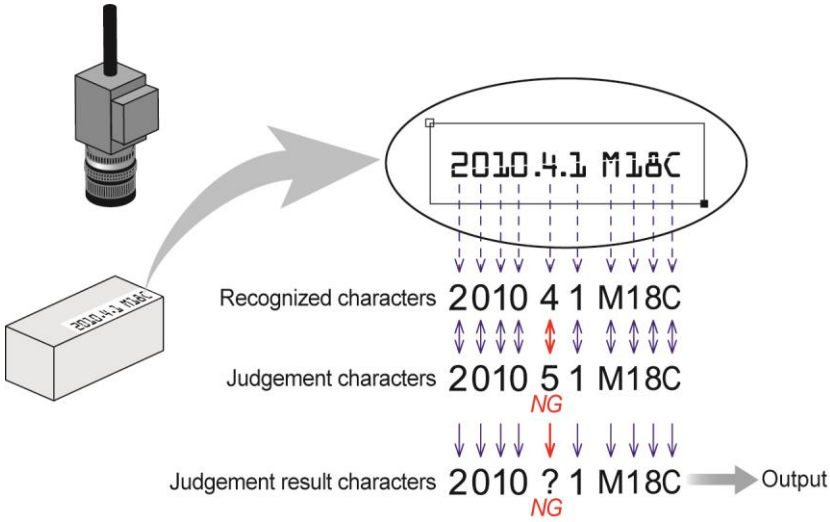
2.1 Character Recognition

General Information on Character Recognition

To recognize alphanumeric characters or symbols.

Characters such as a date or lot number are captured and search the most similar image in the image patterns of characters already registered.

Passing status can be judged by comparing to the date and time based on the specified strings or built-in calendar as well as outputting recognized strings to an external device.



Flow of Setup

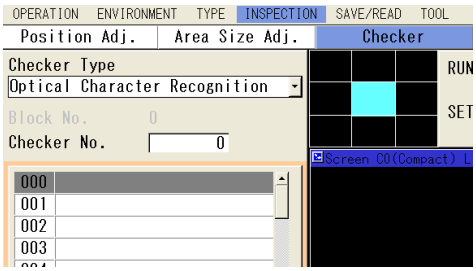
1.	**Setting items relating to Inspection area.**	Specify a range to recognize characters.
2.	**Setting Segmentation condition for characters.**	Set the condition to enable segmentation by one character.
3.	**Creating Dictionary.**	Register the character images to be criteria for Character Recognition checker.
4.	**Setting Inspection condition.**	Specify the settings for recognizing reversed characters and for outputting recognized characters.
5.	**Setting Judgement condition for recognized characters.**	
6.	**Executing Test.**	Check whether the recognized result is the one you desired.

2.2 Setting Items relating to Inspection Area

Items set in "Area Setting" menu are described below.

For Character Recognition, the inspection area size cannot be adjusted using Area Size Adjustment and a Mask Area cannot be set.

Specifying Checker No.



1. **Select “Character Recognition” in "Checker Type".**
2. **Select the checker No. list and specify a checker number to set.**
3. **Press the ENTER key to determine the checker No.**

   “Character Recognition” window is displayed.

About the No. of settable Character recognition checkers

The maximum number of character recognition checkers available for a type is 100. The settable number does not change even when the number of blocks has been added.

For example, when the number of blocks has been set to "2", available character recognition checkers are 100.

As there is no restriction on the character recognition checker No. to be created, character recognition checkers can be created in any numbers between No.0 and No.199 when the number of blocks is 2.

Selecting a Camera

Select a camera image to set a character recognition checker.

1. **Select a camera No. in “Camera”.**

   The image of the selected camera is displayed.

▶ Note

Select "Switch Disp." shown by pressing the F1 key to change the displayed image type (Live/Memory and Gray/Binary) or size.

Selecting Usage of Color Image in Inspection

Set this when using a color camera.
Select "Converted Gray Img." or "Extracted Color Img.".
Refer to Chapter 4.6 in the PV200 User's Manual for the details of setting procedure.

Selecting Position Adjustment

Position Adjustment is helpful when position or angle of an inspection object printed with characters is unstable.

Select a Position Adjustment checker that has been already set. Refer to Chapter 4.8 in the PV200 User’s Manual for details of position adjustment.

1. **Select "Position Adjustment".**

   The list of position adjustment is displayed.

▶ Note

If a position adjustment checker is not created, “Position Adj.” cannot be selected.

2. **Select a Position Adjustment No. from the list.**

Setting Inspection Area

Specify a range to capture recognized characters.

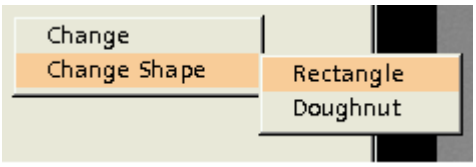
If no dictionary is created, set the area for the characters to be registered in dictionary. If dictionary has been created, set the area in the position where the characters to be read exist.

1. Select "Area Setting".

"Area Setting" window is displayed.

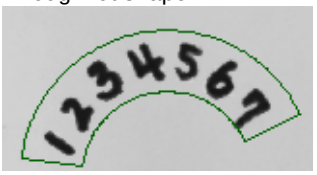
2. Select a shape.

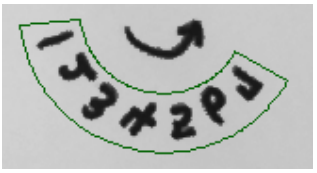
Select "Rectangle" or "Doughnut" according to the shape of recognized character string.



■Rectangle shape

■Doughnut shape





To reverse the area, press the FUNC key and select "Counterclockwise".

The direction to cut out characters is set to either "Clockwise" or "Counterclockwise" in "Segment Direction" under "Segment Condition".

▶ Note

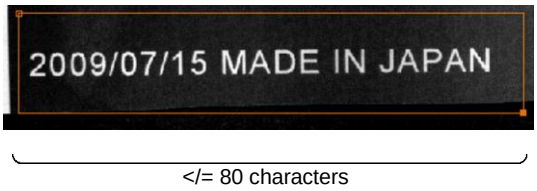
When using "Doughnut", the inspection results of PV230 and PVWIN230 differ. So always adjust the inspection settings with PV230.

3. Draw an Area.

Set an area to enclose characters.
Enter the coordinates of the area in order of a start point and end point. Entering the end point returns to Character recognition SETUP MENU.

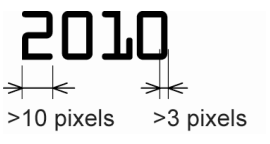
▶ Note

A maximum of 80 characters can be recognized in 1 area.



Notice on Character Size

Adjust the lens and working distance for an appropriate view range to make the character width larger than 10 pixels and the thickness larger than 3 pixels to perform stable character recognition.



2.3 Setting Segmentation Condition for Characters

Set items in "Segmentation Condition" menu. Detecting character positions and sizes character by character is called "Segment" characters. PV230 creates binarized images once for cutting out characters from the background. Set the conditions for binarization and segmented characters size, etc.

Two "Conditions to segment characters" are available, which are "Image Filter" which adjusts characters to be images that can be easily captured and "Segmentation Condition" which sets other conditions than images.

Setting Procedure

A Image Filter

Grayscale Preprocess

This is a pre-processing filter for captured images. This is shared with other checkers.

Selection and Adjustment of Threshold method

Select and set a method to detect the pixels which make up characters. Select one from three types of threshold methods; Fixed, Auto, Dynamic.

Segment pre-process filter (Dilation / Erosion)

Set Dilation / Erosion filter for detected pixels. Use this function when a character is thin, character gap is narrow, or a dotted character is used.

Slant Angle setting

Adjust the angle when the cut out characters are slanted.
It can be set between -45.00 and +45.00 degrees.

Note

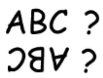
Slant Angle setting is available only for Rectangle shape.

B Segmentation Condition

Limitation of Character size (Area / Width / Height)

It is helpful in eliminating objects larger or smaller than characters.

Segment Direction



Set the direction of characters.

Boundary

Objects at the top of the frame of Inspection area are eliminated from the objects for segmentation.

Partition

It is helpful in segmenting closely adjacent characters that cannot be separated by Segment Pre-process Filter.

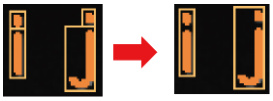
Point to be checked for character segmentation before registration in dictionary

Confirm if the character is surrounded with a square. At this time, the square should be placed as close to the character as possible. The common cases of character segmentation are as follows.

- Characters are not segmented.
Adjust the settings of binarization and segment pre-process filter in the "Image Filter" menu.

- **A stain or a burr is also in the box.**
Adjust the setting of binarization to prevent stains or burrs from being in boxes. If a character with an unnecessary object is registered in the dictionary, it is recognized as the correct sample. So, capture a clean object as much as possible for the registration in the dictionary.

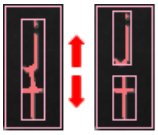
- "i" or "j" is divided into multiple boxes.
Adjust using "Segment pre-process filter". Make multiple boxes into a single box by increasing filter Y with "Dilation".



- Although characters are surrounded with boxes, there are some holes.
When characters are completely surrounded, it does not matter if there are spotty parts in red areas. The red areas are for identifying the sizes of characters. Those grayscale images surrounded with boxes are used for the dictionary and used as objects for inspections.

- Adjacent characters are in the same box.
This case is no problem. Select "Yes" for "Partition" under "Segment Condition", and set a size approx. 1.5 times larger than the character width in "Character Width". Refer to page 29 for details

- If a character joins another character or an object by "Segmentation", those characters cannot be segmented.
Change the printed position of the characters. In the left-hand figure, "j" and "t" cannot be segmented as they are too close.



Confirming Segmented Characters

About <F2> and <F3> Keys

Pressing the F3 key while various items for Segmentation condition are set displays the result of "Segment pre-process filter", and pressing the F2 key displays the final result of segmentation.Use the F2 or F3 key for checking the segmentation results and for adjusting each segmentation condition.

Note

- The filter process and segmentation is performed on the last captured image (memory image).
- If an unexpected result is displayed when confirming the segmentation result with the F2 or F3 key, the image may not have been captured. In such case, run the test (press the TRIG button) to capture the image, and press the F2 key or F3 key again.

F3: Filter process

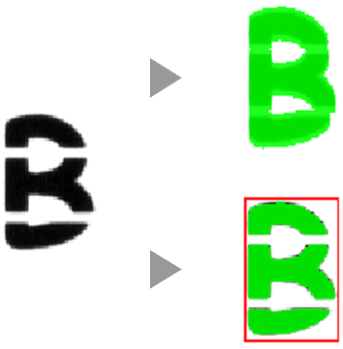
Use it to check the dilated or eroded states after the segment filter process.

As a result of the segment filter process, the extract pixels are displayed in green.

F2: Segment

The final result of segmentation (the result of all the processes set in "Segmentation Condition") is displayed. The pixels which make up characters are displayed in green, and the circumscribing rectangle for each character is displayed in red.

The area of each character in green, and the widths and sizes of the red borders are displayed in the list of segmentation results.

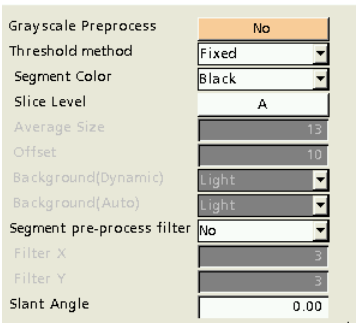


2.3.1 Image Filter

Grayscale Preprocess

Select a maximum of 10 types from the following 21 filters for a captured gray image. The combination is called a preprocess group, and a maximum of 16 preprocess groups (A to P) for 1 type and 1 camera can be stored.

This preprocess function is the data common to all checkers.



1. **Press setting button under "Segmentation Condition" > "Image Filter" of the OCR Checker.**

2. **Select one from preprocessing group A to P in "Grayscale Preprocess".**

3. **Select “Filter Type” and specify the desired filter from 21 types.**

Selectable preprocessings are as follows.
Dilation / Erosion / Erosion -> Dilation / Dilation -> Erosion / Auto Correct. / Gray Cut / Area Averaging / Correction Setting / Median / Smoothing / Sobel / Prewitt / Laplacian / Edge Extract. X / Edge Extract. Y / Sharpen / Tophat / Dynamic / Frequency Extract. / Rotation / Reflect

Note

Refer to Chapter 4.6.5 in the PV200 User's Manual for the details of preprocess filters and setting procedure.

Threshold method

Select one from the following three threshold methods according to the status of images, and set required items. Adjust checking segmentation results, together with "Segment pre-process filter" mentioned in the next page.

Threshold method	Usage
Fixed	When the brightness of image is always constant, and the brightness over the image is even.
Auto	When the brightness of whole image varies every time the inspection is executed although unevenness of brightness is less.
Dynamic	When the brightness of the image in the inspection area is uneven.

Fixed

A method to binarize based on any specified value.

Use it when there is no uneveness of brightness in the inspection area and the brightness of whole image does not vary every time the inspection is executed.

1. **Select “Fixed" in "Threshold method".**

2. **Set the color of characters in "Segment Color".**

If the characters are brighter than the background, select “White”. If the object image is darker than the background, select “Black”.

3. Select from slice level A to P in "Slice Level".

Set the minimum and maximum limits so that the target characters for "Segment preprocess filter" can be extracted checking the segmentation results.
Refer to Chapter 4.6.2 in the PV200 User's Manual for the details of setting procedure.

Auto

A method to automatically binarize based on the brightness in the inspection area.
Use it when unevenness of brightness is less in the inspection area and the brightness of whole image varies every time the inspection is executed.

1. Select "Auto" in "Threshold method".

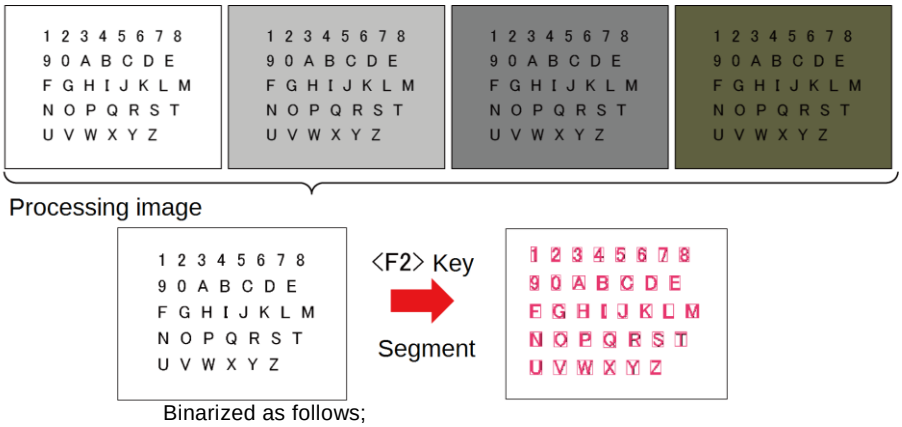
2. Select "Light" or "Dark" in "Background (Automatic)".

Specify whether the background is lighter or darker than characters.
In case of the right figure, when the upper white characters are inspected, select "Dark" because the background is darker than the characters.
When the lower black characters are inspected, select "Light" because the background is lighter than the characters.

3. Execute Segment with the F2 key, and check the displayed segmentation result.

When the target characters cannot be cut out, also use "Segment pre-process filter" mentioned in the next page for the adjustment.

Reliable segmentation can be performed when there is a possibility that the brightness of a whole image will change.

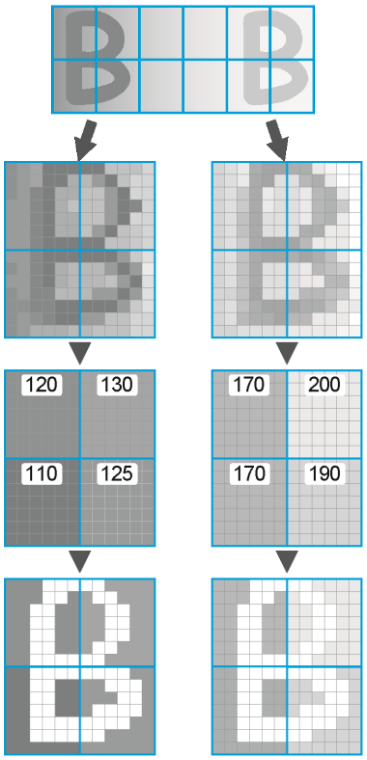


Binarized as follows;
Dark parts are characters -> Black
Light parts are backgrounds -> White

Dynamic

It is helpful when the brightness of the background in the area is uneven. For example, use it when the brightness of the left side and the right side of the area is different like the example on the right.

Example)



Behavior of Dynamic Thresholding

1. **Divide the inspection area by the specified size, and calculate the average of the brightness in each divided area.**

   In the right figure, the area where a letter "B" is located is segmented into 4.

2. **Extract pixels over "Average + Offset value" (when the background is dark and characters are light) or pixels below "Average - Offset value" (when the background is light and characters are dark) as the pixels which comprise characters in each area.**

   In case of the dark figure on the left, if the offset value has been set to "15", the threshold of each area is calculated as follows because the character is darker than the background.
   - Threshold of lower left area: 110 - 15 = 95
   - Threshold of upper left area: 120 - 15 = 105
   - Threshold of upper right area: 130 - 15 = 115
   - Threshold of lower left area: 125 - 15 = 110

3. **Execute “2" in all the divided areas.**

Calculating the average of the brightness in each inspection area that has been divided makes extracting only the target characters easier even when the thresholds for the brightness of the extracted pixels differ in each area and the brightness is uneven.

Setting Procedure

1. **Select “Dynamic" in "Threshold method".**

2. **Select "Light" or "Dark" compared to characters in "Background (Dynamic)".**

If the background is brighter than the characters, select “Light”. If it is darker than the characters, select “Dark”.

In the right example, select "Dark" for cutting out the upper white characters, and select "Light" for cutting out the lower black characters.

3. **Select a size to average brightness in "Average Size".**

Set a value which is about the same or twice as much as the size of a segmented character. However, the appropriate value will vary according to conditions. Decide the value checking the segmentation result.

4. **Set "Offset" value.**

When the contrast between the characters and background is high (black characters in white background, or white characters in black ground), set a high value, approx. 30 to 50 for the offset value. When the contrast is low, set the offset value to around 10.

5. **Execute Segment with the F2 key, and readjust "Average Size" and "Offset" checking the displayed segmentation results.**

When the target characters cannot be cut out, also use "Segment pre-process filter" mentioned in the next page for the adjustment.

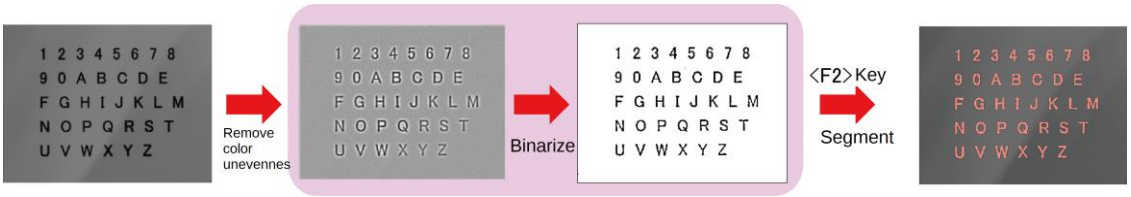
▶ Note

If an unexpected result is displayed when confirming the segmentation result with the F2 or F3 key, the image may not have been captured.

In such case, run the test (press the TRIG button) to capture the image, and press the F2 key or F3 key again.

With dynamic thresholding, reliable segmentation can be performed because the object is binarized after the reduction of color unevenness.

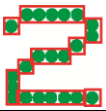
Image



Segment pre-process filter

It is used when characters cannot be stably cut out in such cases that characters are thin, a character gap is narrow, or the inspection target is dotted characters. Dilating or eroding the extracted pixels enables 2 separate characters to be 1 character, or enables 2 characters closely attached to be divided.

The size for dilation or erosion can be specified for X and Y directions respectively.

Filter	Description	When executing segmentation with original image	Original Image	When executing segmentation after filtering process
No (Default)	Does not execute Filtering process.			
Dilation	Used to cut out thin characters, broken characters due to uneven print density or dotted characters.			
Erosion	Used when characters cannot be cut out character by character as the character gap is narrow.			
Dotted Char.	Used to cut out dotted characters when they cannot cut out properly with Dilation filter.			

1. **Select "Segment pre-process filter".**

Select from No / Dilation / Erosion / Dotted Char.

2. **Set "Filter X" and "Filter Y" values.**

In the above example of "Dilation" that "1" is horizontally parted, set "Filter Y" to a value larger than the parted position to perform Dilation in Y direction. As an optimum value varies according to various conditions, adjust the value checking the result of "F3: Filtering Process".

3. **Execute Filtering process with the F3 key, and readjust the "Filter X" and "Filter Y" values checking the displayed results.**

Slant Angle

Set when characters are slanted.

Adjust the slant between -45.00 and +45.00 degrees referring to the image.

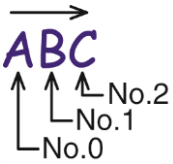
2.3.2 Segmentation Condition

Select "Segmentation Condition" from Segmentation condition setting window.

Segment Direction

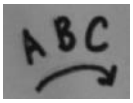
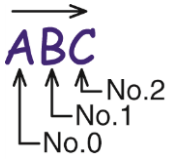
- Area Setting: Rectangle

Select a segment direction according to the direction of characters, in order to cut out characters always in the correct orientation.

Segment Direction	Direction of characters	Cut out result
Left -> Right (Default)		
Right -> Left		
Top -> Bottom		
Bottom -> Top		

- Area Setting: Doughnut

Select a segment direction according to the direction of characters, in order to cut out characters always in the correct orientation.

Segment Direction	Direction of characters	Cut out result
Clockwise (Default)		
Counterclockwise		

Boundary

Set whether or not the object on the line of inspection area will be cut out. Objects with the same brightness and size as characters existing in the inspection area can be excluded from the target for segmentation.

Yes (Default)	Objects on the line of inspection area will be cut out.
No	Objects on the line of inspection area will not be cut out.

Partition

This is a function to divide adjacent characters by specifying a character width when those characters are too close to be cut out one by one.

Using "Segment pre-process filter" in the image filters enables to set the erosion filter to divide the closely-attached characters. It is helpful to cut out the characters such as thin characters and dotted characters when the erosion filter cannot be used.

▶ Note

As this process is performed based on the fixed character width specified, the function cannot be used when the character widths vary according to each character.

1. Select “Yes” in "Partition".

Although it has been set to "Yes", the partition cannot be executed if the width of the segmented character is not more than 1.5 times of the specified value in the next "Character Width". When there is no characters with a size more than 1.5 times of character width, this process cannot be executed.

2. Set the width of the target characters in "Character Width".

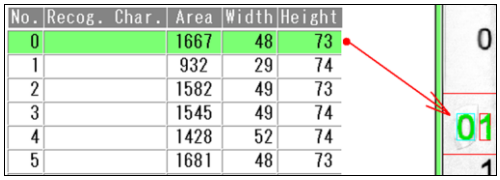
Characters are divided at optimum positions to be found around the specified character width.

Segmented Character Size

Set limits on the size of the characters to be cut out. It is helpful in eliminating foreign objects or cutting out only the characters with sizes in a certain range.

The list showing the area, width and height of each character is displayed. Set the maximum and minimum values according to the list.

Selecting a number in the list displays the character box of the data in light blue.



No.	Recog. Char.	Area	Width	Height
0		1667	48	73
1		932	29	74
2		1582	49	73
3		1545	49	74
4		1428	52	74
5		1681	48	73

1. Set "Max. Area" and "Min. Area".

The "Area" mentioned here is the number of the green pixels to be displayed on the window when executing Segment with the F2 key.

2. Set "Max. Width", "Min. Width", "Max. Height" and "Min. Height".

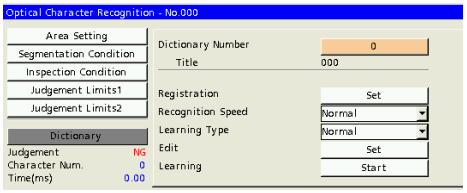
The "Width" and "Height" mentioned here is the width and height of the red border surrounding each character to be displayed on the window when executing Segment with the F2 key.

2.4 Creating Dictionary

About Dictionary

Register character images to be the standard for Character Recognition. This registration destination is called "Dictionary". One PV230 has 5 dictionaries. Different dictionary numbers are used according to the font or shape of characters to be read.

In the default setting of PV230, no character data is registered in the dictionary at all. The dictionary needs to be created to identify a segmented image as a character registered in the dictionary.



For creating the dictionary, specify a number from among five dictionaries in "Dictionary Number" to register characters. After the creation, for conducting an inspection, specify in each checker which image pattern of a dictionary is used for comparing to a character segmented from an inspection image.

Dictionary provides 74 labels as follows;

Number: 0 to 9,

Alphabet: A to Z, a to z,

Symbol: 12 types

Character images are assigned in each label, and characters and images are related.

The character image registered for each label is called "Character Pattern", and up to 3 kinds of character patterns can be registered.

The character cut out is compared to the images registered for each label, and the label of the closest image is output as the recognition character.

The right figure shows the state when opening "Dictionary" > "Edit".

Saving and Reading Dictionary data

Although the dictionary data that can be saved in the PV230 is up to 5 (No.0-4), a maximum of 100 sets, as 5 dictionary data in 1 set, can be saved in a SD memory card. As dictionary data is stored in an exclusive folder (separate from setting data), it is possible to copy only dictionary data to multiple PV230. For saving or reading dictionary data into/from an SD memory card, select "SAVE/READ" > "SD Dictionary". Press the ENTER key on the list, and select "Read" or "Save". Refer to page 36 for details.

▶ Caution

Dictionary data are not saved with "Read Setting Data". Do not forget to save dictionary data in a SD card.

Procedure for Creating Dictionary

1. **Specify a dictionary No. and enter a title.**

▼

2. **Assign labels for each detected character and register them.**

▼

3. **Check the registered characters.**

▼

4. **Execute the learning of Dictionary.** Select a learning type and execute learning.

Note

Always execute "Learning" when Dictionary has been edited (Registered, added or deleted character patterns).

Specify a dictionary No. and enter a title.

1. **Select "Dictionary" -> "Dictionary No.".**

As the dictionary list appears, select a number from No.0 to No.4.

2. **Press the FUNC key and select “Enter Title” from the displayed menu.**

Enter a title with the software keyboard appears. You can enter up to 32 characters.

About deleting dictionary

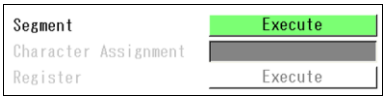
Pressing the FUNC key pointing to the dictionary number you want to delete and selecting "Delete" deletes the specified dictionary. At this time, the reference is automatically changed to Dictionary No. 0 for the character recognition that has specified the deleted dictionary number. When Dictionary No. 0 has not been registered, Dictionary No.0 is automatically created.

About copying dictionary

Point to the dictionary number to be copied and press the FUNC key and select “Copy”. Move the cursor onto the dictionary number to paste, press the FUNC key, and select “Paste”.

Segment characters and assign a label for each character.

Place an object under the camera to let characters in the inspection area.



1. Select "Register".

The setting window of character image is displayed.

2. Select "Segment: Execute", or press the F2 key to execute segmentation.

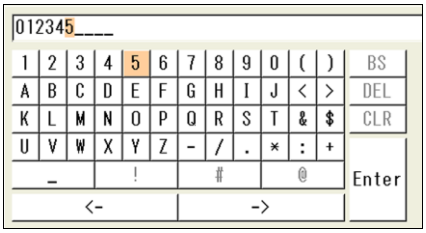
Characters are cut out.

▶ Note

The segmentation condition at this time is the same as the condition specified in "2.4.1 Image Filter" and "2.4.2 Segmentation Condition".

3. Select "Character Assignment" to assign provided labels to the segmented characters.

A window to input a label is displayed.
Specify labels in order of numbers of segmented characters.
The border for the character currently the label is being specified is displayed in blue.

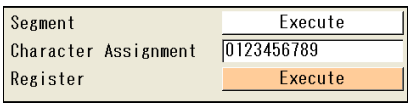


Input "_" for the label not to register a part of the segmented characters. In the right example, only characters 0 to 5 are registered, and characters 6 to 9 are not registered.
Use the "->" or "<-" button to move to the assignment of a next character or a previous character.

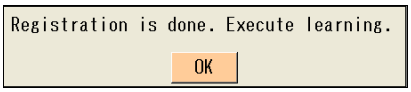
▶ Note

It is not necessary to register all of the segmented characters in this step. For details, refer to page 34 “Point of images to be used for dictionary”.Point of images to be used for dictionary.
Select “Enter” on the software keyboard at the last.

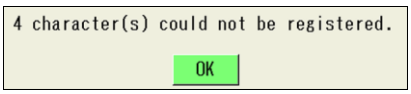
4. Select “Register: Execute".



A message showing the result of registration appears.



“Registration is done. Execute learning.”
It indicates that all the character patterns assigned to the labels have been registered properly.



"(n) character(s) could not be registered"
It indicates that the character patterns could not be registered for the specified label as 3 character patterns in the label have been already registered.
The character images with other labels have been registered.

▼Refer to▼

See the next section "Check the characters registered in (Dictionary)" for the details of checking the character patterns registered in each label.

5. Repeat *2* to *4* to register all the necessary character patterns. Press the CANCEL key at the last.

▶ Note

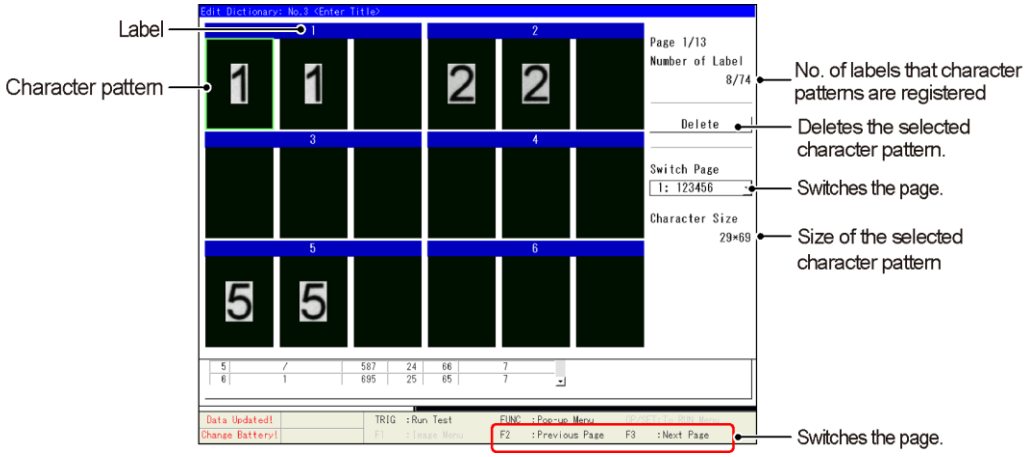
It is recommended to cut out characters with the same threshold method as the character patterns already registered when you want to add characters after the execution of learning.

Check the characters registered (in Dictionary).

Check or delete the character images registered with labels.

1. Select "Edit: Start".

The setting window of character image in Dictionary is displayed.



* About Character Size

The size displayed here may not be the same as the size of an image segmented using the "Registration" menu, because it is normalized for registration. Even if the size displayed in this menu becomes small, it does not decrease the accuracy of the dictionary or inspections as the detailed information has been registered in the dictionary.

2. Check the character patterns registered for each label.

The character patterns for 6 labels are displayed in 1 page. Switch pages by the following steps.

- Move the ENTER key from right to left or up and down.
- Press the F2 key or the F3 key.
- Select "Switch Page" on the right side of the window after selecting a character pattern.

▶ Note

About Character Size

The image size of the selected character pattern is displayed on the right side of the window. This size is the one that 4 pixels each have been added to the width and height displayed in the list of the recognition result or the list of the cut out result.

Deleting character patterns

1. Select "Delete" after selecting the character pattern you want to delete, or select "Delete" from the pop-up menu displayed with the FUNC key.

To delete all the registered character patterns, select “Delete All Label”.
Be aware the deleted patterns cannot be restored.

2. Select “Yes” following the displayed message.

The character pattern you selected is deleted.

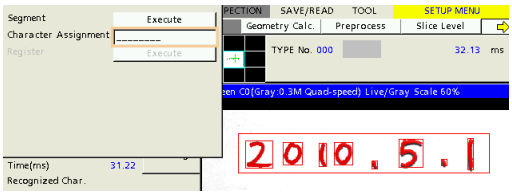
▶ Note

Point of images to be used for dictionary

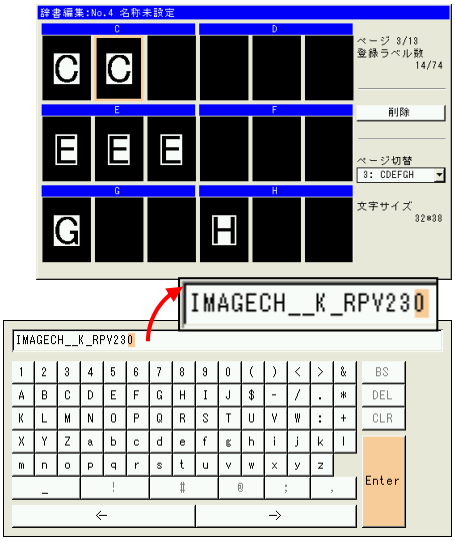
- Register a clear image as much as possible (imaged served as a model) in the dictionary.
  An illegible character causes false recognition.
- A maximum of three character patterns can be registered for each label, but it is not necessary to register all of them. One character pattern is enough.
  If there is a lot of variation in three images or they are illegible, it may reduce the accuracy of the dictionary.
  In a case where "a noise tends to be generated at this point each time", also register an image "that is with a noise in the background but the character is clear" to the character pattern besides an image without a noise. It is important that characters are not illegible.

Example where the same character is captured several times

In the right figure, characters "IMAGECHECKERPV230″ are captured. There are three "E" and two "C".



If character assignment is performed on all segmented characters in the "Character Assignment" menu under "Registration", three "E" and two "C" are registered in the dictionary as shown in the right figure.



If the size and the font of these characters are the same, only one of them is enough to be registered in the dictionary. In that case, skip the characters not to be registered and leave them as "_" as shown in the right figure.

Execute the learning of Dictionary.

Leaning is executed using the characters registered in each label and the feature quantity of the sub patterns to be generated based on those character images.

At this time, the number of sub patterns changes by changing "Leaning Type". The type and number of the used feature quantity changes by changing "Recognition Speed".

Always execute "Learning" when Dictionary has been edited (Registered, added or deleted character patterns) or when the setting of Learning type or Recognition speed has been changed.

1. Select one from "Normal", "Rough (High-speed)" and "Fine (Low-speed)" in "Learning Type".

In Learning type, select the number of sub patterns to be automatically generated based on the registered character patterns. The more sub patterns are available, the more stable Character recognition can be performed. However, the execution time of leaning becomes longer.

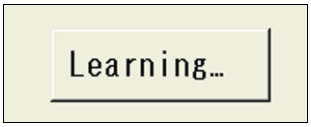
Learning Type	Sub pattern		Learning speed
Rough (High-speed)	2 types	+/-3 degree	Fast
Normal	6 types	+/-3 degree, +/-5 degree, Dilation, Erosion	↕
Fine (Low-speed)	11 types	+/-3 degree, +/-5 degree, +/-8 degree, Dilation: 2 patterns, Erosion: 2 patterns, Distortion	Slow

2. Select either "Normal", "Normal" or "High Speed" in "Recognition Speed" .

The type and number of the feature quantity to be detected during learning changes according to the recognition speed. To decrease the recognition speed, select "High Speed".
The change in the recognition speed affects recognition results. Check whether or not the recognition result is the one you require by executing a test.

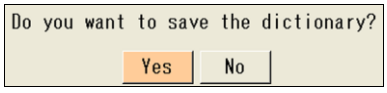
3. Select "Learning: Start", and select "Yes" from the displayed message to start learning.

A message showing the state that Learning is performed appears.
When learning has completed, the message disappears.



4. Press the CANCEL key.

A message for saving the changes and additions performed until the Cancel key has been pressed after selecting the dictionary menu appears.



[Yes]: The dictionary changed is saved in the PV230, and the menu returns to the character recognition checker menu. (*1)

[No]: Select not to save the changes.
As a confirm message appears, select "Yes". The changes including the result of learning are discarded.
The menu returns to the status before selecting the dictionary menu.

▶ Note

(*1): When pressing the Cancel key and selecting "Yes" without executing Learning, the operation returns to the procedure No. 2 and automatically executes Learning. Once Learning has completed, saving the changes automatically starts. The menu returns to the character recognition checker menu after the saving has completed.

SD Memory Card: Reading/saving Dictionary Data

Dictionary data can be saved in and read from a SD memory card.
Up to 100 sets of dictionary data can be saved in a SD memory card. Five dictionaries that can be saved in the PV230 are treated as 1 set. (However, the max. number of dictionary data can be saved varies according to dictionary data size and SD memory card capacity.)

The file name and folder of a dictionary data stored is as follows.

- Folder: ¥Panasonic-EW SUNXVision¥PV230¥OCRData
- File: OCRnn.D23 (nn = 00 to 99)

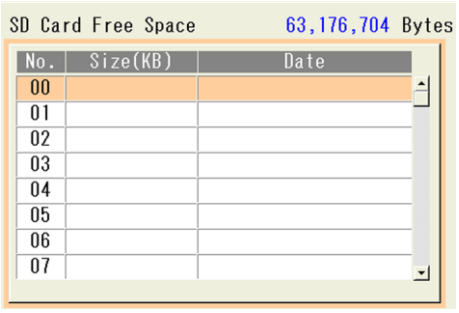
▶Caution

Dictionary data is not saved in a SD memory card even when "SD Card" has been selected for the destination to save the setting data in "Save Setting Data" menu. Note that dictionary data should be saved by the following procedure separately.

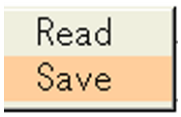
1. **Insert a SD memory card.**

2. **Select "SAVE/READ" -> "SD Dictionary" from the menu bar.**

The list of dictionary data stored in the SD memory card is displayed.

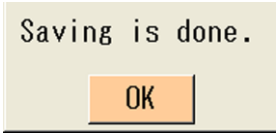


3. **Select "Save" to save the dictionary data, and select "Read" to read the data from the menu displayed by selecting a number.**



▶Caution

In the case of reading, the dictionary data in the PV230 is discarded and the dictionary data in the SD memory card is read. If the dictionary data in the PV230 is needed, select "No" when the message "Are you sure to discard the current data?" appears, and save the data in the PV230 to the SD memory card. Then, read the data.



4. **When the confirmation message appears, select "YES".**

Reading or saving is executed.
After the saving has completed successfully when saving the data, a message appears. Press the ENTER key to close.

Copying and Deleting Dictionary

Dictionary data stored in the SD memory card can be copied or deleted with the keypad.

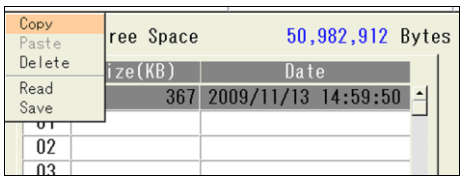
Delete

Point to the target number and press the FUNC key and select “Delete” from the displayed pop-up menu. When the dialog message for confirmation is displayed, select "YES" to continue.

Copy

Point to the number to be copied and press the FUNC key and select “Copy” from the displayed pop-up menu. Move the cursor onto the number to paste, press the FUNC key, and select “Paste”.

If data already exists in the destination, the message of overwrite confirmation appears. Select "Yes".

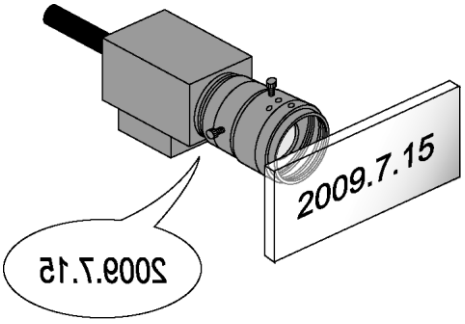


2.5 Setting Inspection Condition

Items set in "Inspection Condition" menu are described below.

Recognizing Reversed Characters

In Dictionary, register character patterns in the normal position. For Inspection, make the setting for recognizing reversed characters such as capturing printed part from the back.



Note

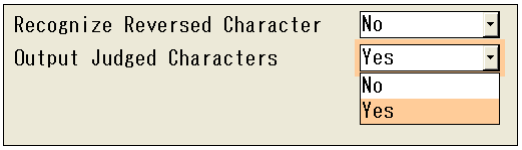
When setting to recognize reversed characters, note that the characters captured in the normal position cannot be recognized.

Example) Character pattern registered in Dictionary: 0123456789

Recognize Reversed Character	Character String 2010.5.1	Character String 2010.5.1 (reversed)
No (Default)	**Can be recognized.**	Cannot be recognized.
Yes	Cannot be recognized.	**Can be recognized.**

1. **Select "Recognize Reversed Character".**

2. **To recognize reversed characters, select [Yes].**



Outputting Recognized Characters

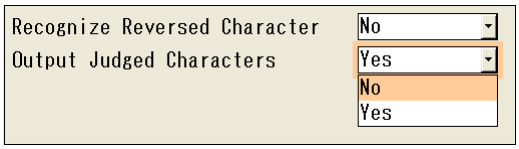
For outputting recognized characters, select the setting from "General Output" ("ENVIRONMENT" -> "Input/Output"). It can be selected for each character recognition checker whether or not recognized characters will be output. For example, when 2 character recognition checkers (No.1 and No.2) have been created, it can be selected to output the result of No.0 checker, but not to output the result of No.1 checker.

The characters to be output are "Judged Character".

1. Select "Output Judged Characters".

2. As for the character recognition checker currently being set, to output recognized characters, select “Yes”. Select “No” not to output.

Default: "Yes"



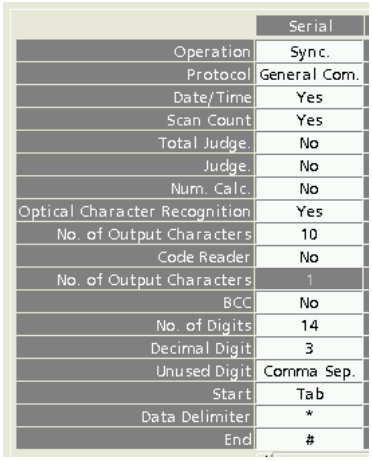
"General Output" setting

1. Select "ENVIRONMENT" -> “Input/Output” -> “General Output” from the menu bar.

2. Select "Yes" for "Output" of the port (Serial/Ethernet/SD/FTP) to which strings are output.

3. Select "General Com." or "PLC Com." in "Protocol".

4. Select "Yes" in "Optical Character Recognition".



	Serial
Operation	Sync.
Protocol	General Com.
Date/Time	Yes
Scan Count	Yes
Total Judge.	No
Judge.	No
Num. Calc.	No
Optical Character Recognition	Yes
No. of Output Characters	10
Code Reader	No
No. of Output Characters	1
BCC	No
No. of Digits	14
Decimal Digit	3
Unused Digit	Comma Sep.
Start	Tab
Data Delimiter	*
End	#

5. Specify “No. of Output Characters”.

Available numbers of characters are 1 to 80.
Specify the number of characters per character recognition checker.

▶ Note

When the number of characters recognized with each character recognition checker has exceeded "No. of Output Character", only the recognized characters of the specified number from the beginning are output.
If the character string on the right is recognized, only 5 characters "HELLO" from the beginning will be output when "No. of Output" is set to 5.

6. Select “Unused Digit” from “Fill with 0” or “Comma Sep.”.

If you select “Comma Sep.”, procedure No.7 will be valid.

7. Specify “Start”*,”Data Delimiter”*, “End”*.

*Available from PV230Ver.1.30.
*Available only for General Communication Protocol.

*These items are are valid if you setting “Unused Digit” to “Comma Sep.”

Item	Description	Default
Start	It is added to the beginning of general result output data.	None
Data Delimiter	It is added between output data as a delimiter.	,
End	It is added before the terminal CR* of general result output data. (* When BCC is added, it is added before BCC.)	None

Setting values (Start,Data Delimiter,End)	None
	,
	Space
	;
	Tab
	-
	*
	:
	@
	#
	$
	&

Output Examples

Data Type:	Character Recognition No. 0: Character Recognition No. 1:	HELLO2009 BYE2009
Output Condition:	Character Recognition: All others:	Output No

When "Output Characters" is "10" and "Unused Digit" is "Fill with Zeros".

H	**E**	**L**	**L**	**O**	**2**	**0**	**0**	**9**		**B**	**Y**	**E**	**2**	**0**	**0**	**9**			**CR**
Judged characters of Character Recognition No. 0										Judged characters of Character Recognition No. 1									

Note

Note that the spaces between judged characters of character recognition checkers are filled with blanks not zero.

When "Output Characters" is "10" and "Unused Digit" is "Comma Separated".

H	**E**	**L**	**L**	**O**	**2**	**0**	**0**	**9**	**,**	**B**	**Y**	**E**	**2**	**0**	**0**	**9**	**CR**
Judged characters of Character Recognition No. 0										Judged characters of Character Recognition No. 1							

Note

Note that the spaces between judged characters of character recognition checkers are filled with [,].

When "Output Characters" is "10","BCC" is "Yes", "Unused Digit" is "Comma Separated","Start" is"@","Data Delimiter" is "," and "End" is "#".

@	**H**	**E**	**L**	**L**	**O**	**2**	**0**	**0**	**9**	**,**	**B**	**Y**	**E**	**2**	**0**	**0**	**9**	**#**	**BCC**	**CR**
	Judged characters of Character Recognition No. 0										Judged characters of Character Recognition No. 1								2-digit block Check Code	

Note

- BCC will be output in 2 characters of ASCII.

Storing Character data in case of Outputting via PLC communication

When "Protocol" has been set to "PLC Communication", 2 characters are stored in each data register starting from the lower 8 bits of the specified data register.

Example)
Condition: No. of Output = 5

Characters to be output: HELLO

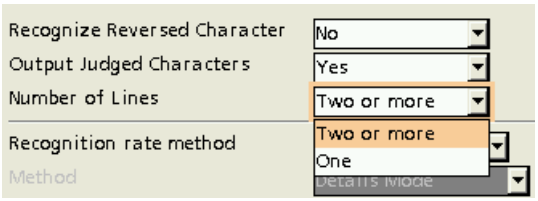
Start Register: 100

Output Result:

Register No.	Higher 8 bits	Lower 8 bits
100	E	H
101	L	L
102	(Space)	O

Setting Number of Lines

Set the number of lines of character strings to be recognized.



1. **Select "Number of Lines".**

2. **Select "One" when the recognized character string is one line, and select "Two or more" when the strings are two lines or more.**

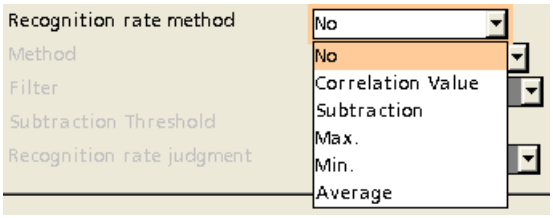
Default: "Two or more"

Note

If selecting "Two or more" when a single line string is recognized of which characters are misaligned, the order of recognized characters might be changed.

Using Character Recognition Rate

This is set for using the recognition rate of recognized characters. The recognition rate is calculated by comparing recognized characters to dictionary characters.



1. **Select a method from "No", "Correlation Value", "Subtraction", "Max.", "Min." or "Average in "Recognition rate method".**

Default: "No"

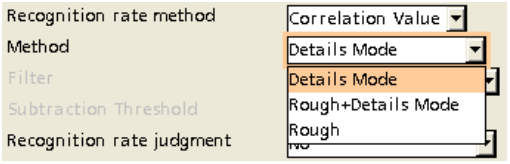
	How to calculate
No	Not calculate the recognition rate.
Correlation Value	Calculates the recognition rate from the correlation value (similarity degree) between recognized characters and dictionary data. When multiple dictionary data is registered, the maximum value of them is output.
Subtraction	Performs subtraction with dictionary data (comparing the gray values between dictionary data and detected characters and extracting pixels that shows the difference in the grayscale value of subtraction threshold), and calculates the recognition rate from the result. When multiple dictionary data is registered, the maximum value of them is output.
Max.	The maximum value calculated from the correlation value between recognized characters and dictionary data and the result of subtraction is treated as the recognition rate.
Min.	The minimum value calculated from the correlation value between recognized characters and dictionary data and the result of subtraction is treated as the recognition rate.
Average	The averaged value calculated from the correlation value between recognized characters and dictionary data and the result of subtraction is treated as the recognition rate.
	The recognition rate is the integer between 0 to 100. When a recognized character is the same as dictionary data, the recognition rate is 100.

Subtraction
With this setting, tiny defects of characters can be defected more than Correlation which detects a defect using the similarity degree of whole characters.

Dictionary image　Inspection image　Subtraction result

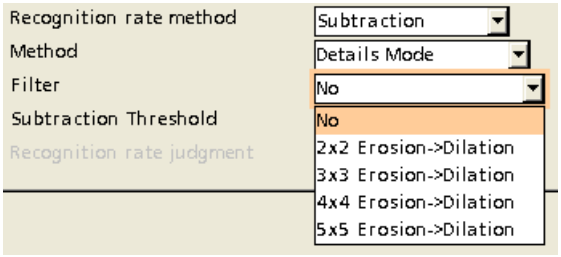
2. **Select a method from "Details Mode", "Rough+Details Mode" or "Rought". Select the comparative accuracy between recognized characters and dictionary data. In case of "Rough+Details Mode", the higher recognition rate is output after the calculations with "Detailed Mode" and "Rougth".**

Default: "Detailed Mode"



3. Select a filter from "No", "2x2 Erosion->Dilation", "3x3 Erosion->Dilation", "4x4 Erosion->Dilation" or "5x5 Erosion->Dilation".

Default: "No"
"Filter" is not available when "Recognition rate method" is "Correlation Value". In this exercise, select a filter condition for subtraction results.
Filter (Optical Character Recognition)

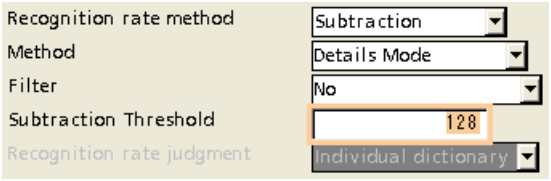


▶ Note

Minute pixels of the result of subtraction can be deleted by using the [Erosion->Dilation] filter. The larger value is set to the filter, the higher effect is achieved on the deletion.

4. Enter a threshold value of the gray range for the subtraction process in "Subtraction Threshold".]

Default: "128"
"Subtraction Threshold" is not available when "Recognition rate method" is "Correlation Value".



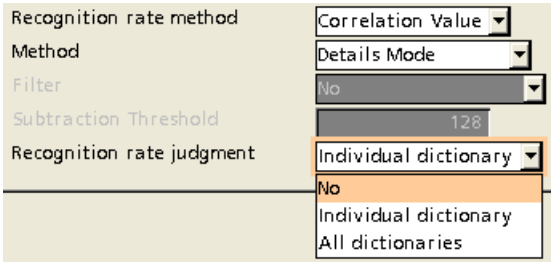
▶ Note

- The contour of characters can be extracted more easily by setting a smaller subtraction threshold. Set a value that is large enough to detect missing characters and dirt.
- When using a featureless image (i.e. no variation in luminance, and featureless shape), note that the recognition rate is 100% due to the algorithmic property of recognition rate even if there is a missing character.

  For example, if a character "-" (hyphen) created on a PC is read as an image file using "Read Image" of PV230, the recognition rate is output as 100% even if the character "-" is missing.

5. In "Recognition rate judgement", select a character recognition detection method.

Default: "No"
"Recognition rate judgement" cannot be selected if "Recognition rate method" is set to an item other than "Correlation Value".



Item	Description
No	A conventional character recognition detection method is used.
Individual dictionary	Depending on the character set in "Judgement Characters", characters with the highest recognition rate are output as the detection result after reading the individual number or alphabet dictionary data. The processing time can be reduced compared with [All Dictionaries]. Individual dictionary type ・Number ・Alphabet (Upper case) ・Alphabet (Lower case) ・Symbol
All dictionaries	Characters with the highest recognition rate are output as the detection result after reading all the characters registered in the dictionary data.

Note

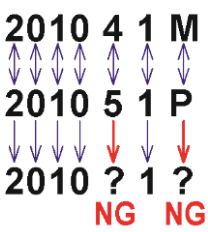
- If the character is set as "_" in "Judgement Characters" or if the characters recognized beyond the value set in "No. of Characters Judgement", judgement will be made as the same character whether set to "Individual dictionary" or "All dictionaries".
- If the character is set as ". " in "Judgement Characters", recognition rate character judgement will not be performed and the same judgement will be made as when the character judgement is set to "No".

2.6 Setting Judgement Condition

2.6.1 General Information on Judgement Condition

With Character recognition checker, passing status can be judged for each recognized character by comparing to the date and time based on the specified strings or built-in calendar. Set the criteria and conditions for passing status in Judgement Condition menu.

Judgement is performed on each recognized character, and the result is output as "Judged Character". When the judgement is OK, "Recognized Character" is output. When the judgement is NG, "?" is output.



Recognized characters

Judgement characters (or Calendar)

Judged characters

Note

Judged characters or judgement result of each character can be output to "Judgement", "Numerical Calculation" and "Data R/W".

Judgement Conditions

The following judgement conditions are available. It judges OK only when each recognized character meets all the specified judgement conditions.

Judgement Type

It sets whether to specify arbitrary characters or refer to the date of the built-in calendar for the character string to be compared with the recognized characters.

Judgement Type: in case of Character

It judges the object as Yes or No by comparing the character string specified in "Judgement Characters" with the recognized character string.

- Judgement Character:
  Specify character strings to be the acceptance criterion.
- No. of Characters Judgement:
  It judges the object based on the number of recognized characters. Only when the result of No. of characters judgement is OK, judgement characters are compared with recognized characters.

Judgement Type: in case of Calendar

It judges the object as Yes or No by comparing the date based on the built-in calendar (Year/Month/Day/Time) with the recognized character string.

- Calendar Condition:
  Specify the format selection of date and the offset value from the date of the built-in calendar.

Judgement Character Size

It judges the object based on the size (area, width, height) of recognized characters. As for the character size, select either specifying by label of dictionary or by recognized character number.

It is used for simply examining the print quality of characters after character recognition.

Period Identification

When the segmented character is smaller than the specified width and height, it is automatically recognized as a period.

Recognition Rate Judgement

Judges according to the recognition rate of recognized characters (Correlation, subtraction or Max./Min./Average). As for the minimum recognition rate, select specifying by label of dictionary, by recognized character number or specifying not to perform individual judgement.

It is used for simply examining the print quality of characters after character recognition.

Also, the changes of the shapes of characters for the registered dictionary can be controlled numerically.

2.6.2 Judgement Type - Character String

Set in "Judgement Condition 1" menu.

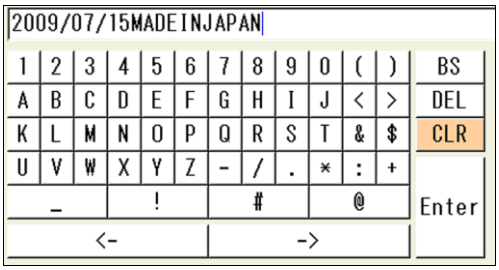
1. **Select “Character String” in "Character Type".**

Now you can set Judgement characters and No. of characters judgement.

2. **Select "Judgement Characters".**

The window to set the judgement characters is displayed.

Note
Selecting the "CLR" deletes all the character strings.



3. **Input the character string to be compared with recognized characters.**

It is also possible to specify a specific type of characters with symbols as well as characters and not to execute the comparison.

No character specification: "_" (Default)

Not judged. (*) For example, when specifying "123_", only the 4th character is not judged. When specifying "_ _ _ _", all the 4 characters are not judged. So, recognized characters are output to an external device because recognized characters are equal to judged characters. However, in this case, the " _" marks more than the number of recognized characters should be set. When the specified "_" characters are less than the number of recognized characters, the judgement is NG.

Note When "Judgement Character Size" has been set to "Per Dictionary Label", "Judgement Character Size" is performed even if judgement characters has been set to "_".

No character specification and performing only "Judgement Character Size" only: "@"

Only "Judgement Character Size" is performed. Judgement is OK when recognized characters meet the width and height specified in "Judgement Character Size". Use this symbol when you want to output the recognized characters of a specified character size to an external device.

Number specification: "#"

As for the 1st or 2nd recognized character, a number is output as a judged character regardless of the order of recognition. When an alphabet (or symbol) has been recognized for the 1st character and a number has been recognized for the 2nd character, the number is considered as a judged character. When both 2 characters are alphabets or symbols, it is judged as NG because they cannot be recognized.

Note
For characters that this symbol has been specified, "Judgement Character Size" cannot be performed.

Alphabet specification: " ! " / " ; " / " , "

As for the 1st or 2nd recognized character, the character of a specified type is output as a judged character regardless of the order of recognition.
For example, in case of the symbol ";" which specifies an uppercase character, when a number, symbol or lowercase alphabet has been recognized for the 1st character and an uppercase alphabet has been recognized for the 2nd character, the 2nd uppercase alphabet is considered as a judged character.
When both 2 characters are number and/or symbol, it is judged as NG because they cannot be recognized.

- " ! ": Alphabets (uppercase or lowercase) are considered as judgement characters.
- " ; ": Uppercase alphabets are considered as judgement characters.
- " , ": Lowercase alphabets are considered as judgement characters.
-

▶ Note

For characters that this symbol has been specified, "Judgement Character Size" cannot be performed.

▼Refer to▼
For the example of settings, refer to the next page.

▶ Note

When setting the judgement using the recognition rate, the recognition rate is judged as NG if the second recognized character is output when numbers or alphabets are specified.

4. Select “Yes”/"No" in "No. of Characters Judgement".

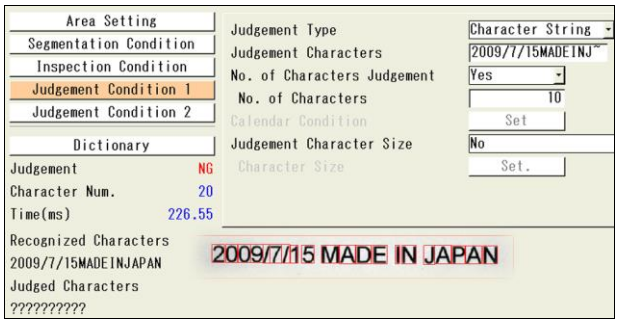
Select "Yes" to judge whether or not the number of recognized characters is the specified number of characters.

5. Specify the No. of characters in "Judgement Characters" for executing "No. of characters Judgement".

Available numbers of characters are 01 to 80.
When the number of recognized characters is a number other than the number specified here, it is judged as NG.

The judged characters at this time are output with "?" of the smaller number of characters, either No. of characters or recognized characters. Only when the No. of characters is OK, judgement characters are compared with recognized characters.

In the right example, as the recognized characters are 21 although "No. of Characters" for "No. of Characters Judgement" has been set to 10, 10 "?" marks are output as the judged characters.



Example of settings and judgement

Condition: Recognized characters

No.	(1st.) Recognized character	(2nd.) Recognized character
0	0	O
1	7	Y
2	B	8
3	5	5
4	2	Z

Result: Example of judgements with different judgement conditions

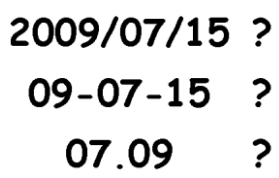
Judgement Condition		Result		Description
Judgement characters	No. of Characters Judgement: No. of Characters	Judged characters	Judgement	
07B52	Yes: 5	07B52	OK	
	Yes: 6	?????	NG	NG because "Recognized characters" = 5 characters, "No. of characters" = 6
07B5!	Yes: 5	07B5Z	OK	The 2nd recognized character "Z" is considered as the judged character because the character No.4 (5th character) in the judgement characters is specified with an alphabet.
07#52	No	07852	OK	The 2nd recognized character "8" is considered as the judged character because the character No.2 (3rd character) in the judgement characters is specified with a number.
_ _ _	No	07B??	NG	When the number of "_" specified in Judgement Characters is less than the number of recognized characters, the parts where marks are missing are NG.
_ _ _ _ _ _ _	No	07B52	OK	When the number of "_" specified in Judgement Characters is larger than the number of recognized characters, the judgement is OK.

2.6.3 Judgement Type - Calendar

It is a function to judge passing status by comparing the date of the built-in calendar with recognized characters.

The date after (or before) some days, some months or some years from the date of the built-in calendar or multiple dates until the designated date can be set as criteria as well as the calendar date as is. The dates to be used as criteria are called "Judgement Date".

Also, set the date format in this menu according to the format of the date printed on the object to be captured, such as changing the digit number of year or the order of year, month and day.



Note

The built-in calendar is kept by a backup battery. Backup battery life is approximately 10 years (at 25 °C of ambient temperature). If the battery is running out, a message saying “Change Battery!” appears in the information display area. Replace with a new one. Please refer to Chapter 1.1 in the PV200 User's Manual for information on how to replace the battery.

Calendar Function - Setting items

Calendar Format:

Select an element and order of year-month-day format from the followings.
Example: Date: July 15, 2009 Delimiter: "/"

Year-Month-Day:	**2009/07/15**
Day-Month-Year:	**15/07/2009**
Year-Month:	**2009/07**
Month-Year:	**07/2009**
Month-Day:	**07/15**
Day-Month:	**15/07**

Year:	**2009**
Month:	**07**
Day:	**15**

Delimiter:
To specify a symbol to separate Year, Month and Day. It is possible to select not to use delimiter.

Digits of Month and Day: 2-digit / Variable
Specify how to indicate 1-digit year and day without delimiter.
Example) In case of "July 1" ... 2-digit: "07/01" / Variable: "7/1"

Digits of Year: 4-digit / 2-digit
Specify the digits of year. 4-digit: "2009" / 2-digit: "09"

Offset: Designated date / Range

(Offset) Year / Month / Day / Hour:
It is a function to regard the date that the offset value has been added to the data of the built-in calendar as the judgement date.

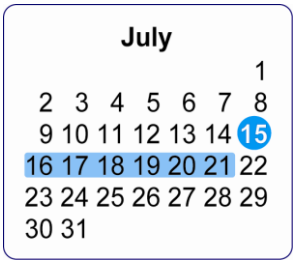
"Year":	The same day in the year of Calendar +/ Offset value (In case of "1", the same day in the next year)
"Month":	The same day in the month of Calendar +/ Offset value (In case of "1", the same day in the next month)
"Day":	The day of Calendar +/ Offset value (In case of "5", the fifth day from the next day)

When "Range" has been selected for the offset setting, multiple dates from the day to the designated day by the offset value are judged as OK.

Example)

Calendar date: 2009/7/15
Offset: Range
Offset - Day: +6

▶ **Date judged as OK**
2009/7/15 ~ 2009/7/21



Offset: About "Hour"

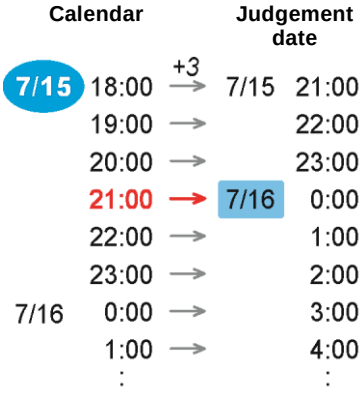
When "Offset - Hour" has been specified, the judgment date is set to the day at the time of "Current time + Offset".

Example)

When "Offset - Hour" has been set to "3", the judgement date is set to the day after "the current time + 3 hours".

The judgement date is "7/15" until 20:59 on July 15 on the calendar, as the time does not come to 24 hour even after 3 hours.

The judgement date changes to "7/16" when the current time is 21:00 on July 15, as the time come to 24:00 by adding 3 hours to 21:00.



Setting Procedure

1. Select "Calendar" in "Judgement Type".

"Calendar Condition: Set" becomes selectable.

2. Select "Calendar Condition: Set".

SETUP menu for calendar condition is displayed on the screen.
The judgement date is displayed at the bottom of SETUP MENU. This date is displayed in the format selected from "General" > "Calendar" > "Date Format". (It is not linked to the formats such as calendar format and delimiter to be selected in the subsequent procedures.) In addition, when "Range" has been set in "Offset", the farthest judgement data is displayed.

3. Select "Calendar Format".

Default: "Year/Month/Day"

4. Specify a delimiter from "," / " / " / "-" / "None" in "Delimiter".

Default: "."

5. Select either "2-digit" or "Variable" in "Digits of Month and Day".

Default: "2-digit"

6. Only when the format including "Year" has been selected in "Calendar Format", select "Digits of Year".

Default: "4-digit"

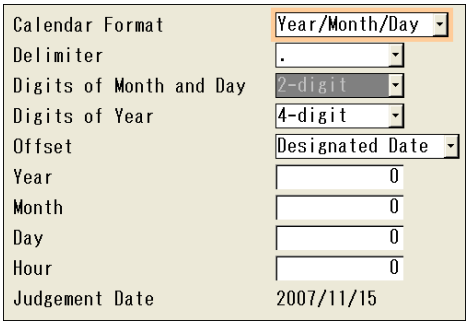
7. Select “Designated Date” or “Range” in "Offset".

Default: "Designated Date"
However, when selecting "Delimiter: None" and "Digits of Month and Day: Variable", "Offset" is fixed at "Designated Date" and "Range" is not selectable.

8. Set "Year", "Month", "Day", "Hour" as necessary.

The default is "0". The judgement date at this time is the date of the calendar.

Settable range	
Year	-99 to 99
Month	-11 to 11
Day	-30000 to 30000
Hour	-23 to 23



Note

When "Delimiter" is "None" and "Digits of Month and Day" is "Variable", and if recognized characters are like "123" which express two values, 1/23 and 12/3, judgement is performed on the both values.

The format of "Judgement Date" is displayed in accordance with the setting of "Date Format" in "TOOL" > "General" > "Calendar".

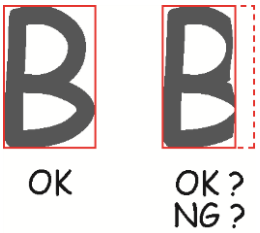
Note that this format is not that specified in the "Calendar" setting (set in the above steps 3 to 8).

That is why the displayed "Judgement Date" is "2009/07/17" which is with "/" although "Delimiter" has been set to "." in the above example.

2.6.4 Judging Character Size

It judges whether or not the size (area, width, height) of the character judged as OK by the specified character string or the calendar date is within the specified range. If the size is out of the specified range, the character is judged as NG, and "?" is output for the judged character.

This is a function to simply inspect the quality using the character size after character recognition.



Note

Note that the range of character size judgement is 0 to 65000.

Note

For recognized characters with the numbers which the following symbols have been specified in Judgement character, "Judgement Character Size" cannot be performed. The judgement is not performed, even if the maximum and minimum character sizes have been registered in the procedures described from the next page.

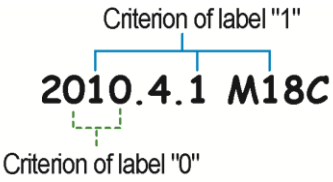
“#”, “!”, “;”, “,”

Two methods are available for setting each size, which are the method by specifying per dictionary label and the one by specifying per recognized character number.

- Per Dictionary Label:
  Specify the size per dictionary label. The criteria for the size are the same for the same character (label) regardless of the position.

  Note

  Even when "_" has been specified for Judgement Character, the judgement of character size is performed if the size has been specified for the label of the recognized character.

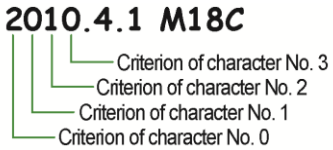


When the characters (labels) are the same, the criteria are the same.

- Per Judgement Character:
  Specify the size per recognized character number. It is used to set different criteria for the size according to the position in the character string even for the same character (label).

  Note

  When Judgement characters have been all set to "_", only Judgement Character Size is available by specifying the size per dictionary label. (The judgement cannot be executed when the size has been specified per judgement character.)
  In addition, when "_" has been specified for a part of Judgement Character, the judgement of character size is not performed for the character even if the character size has been input



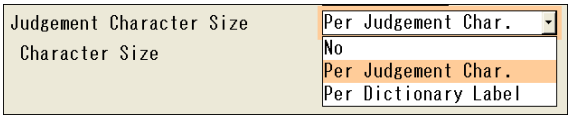
Although the characters are the same, the criteria differ according to the position.

Setting Character size per Recognized character No.

Specify the maximum and minimum values of area, width and height per recognized character number.

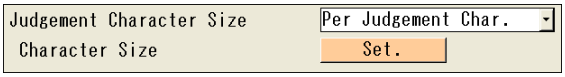
1. **Select “per Judge. Char." in "Judgement Character Size".**

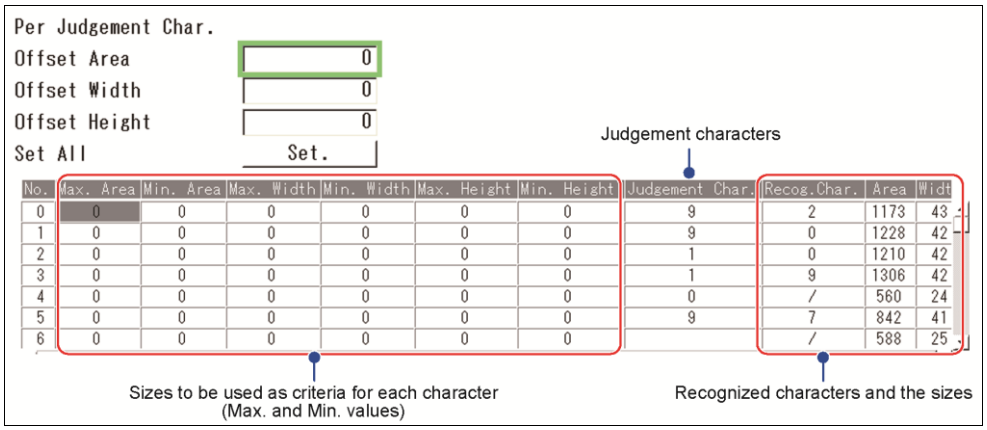
   "Character Size: Set" becomes selectable. However, when "Judgement Character" are all "_" marks, the character size cannot be specified.



2. **Select "Character Size: Set".**

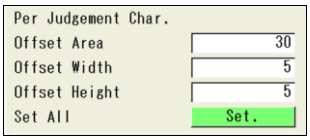
   SETUP menu for Character size is displayed on the screen.
   <TRIG>: Executing a test displays the recognized characters and the sizes in the rightmost area of the list.





3. **Input "Area Offset", "Width Offset" and "Height Offset" checking each size of recognized characters.**

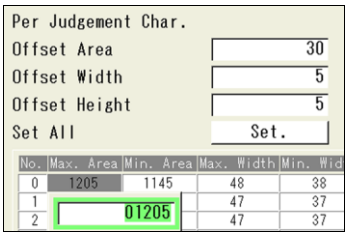
   Set necessary items only. The items entered with "0" for the maximum and minimum values both by executing "Set All" without inputting offset values represent not to execute Judgement character size.



4. **Execute "Set All: Set".**

   The value "Recognition value + Offset" is input as the maximum value, and the value "Recognition value - Offset" is input as the minimum value.

5. **For adjusting the values collectively specified, select the list, and select the items (each max. and min. values) of the recognized character No. which needs adjustment to change the values.**

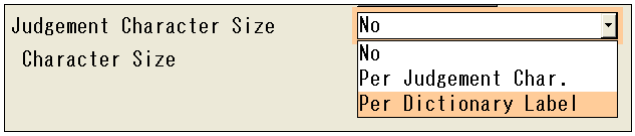


Setting Character size per Dictionary label

Specify the maximum and minimum values of area, width and height per dictionary label.

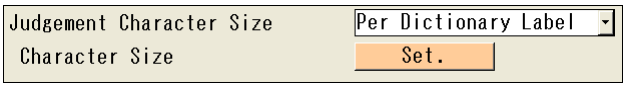
1. Select “Per Dictionary Label" in "Judgement Character Size".

"Character Size: Set" becomes selectable.



2. Select "Character Size: Set".

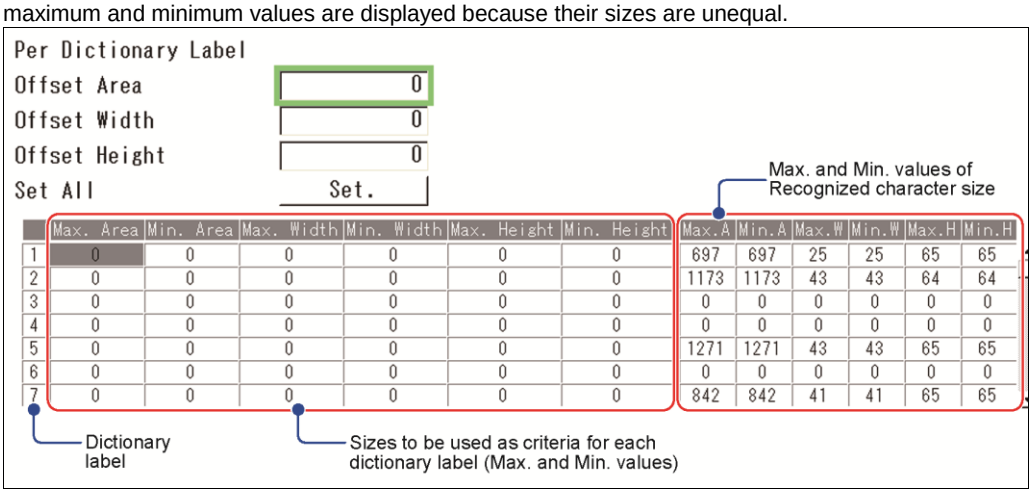
SETUP menu for Character size is displayed on the screen.



<TRIG>: Executing a test displays each maximum and minimum values (*) of area, width and height in the row of the label for the recognized character in the rightmost area of the list.

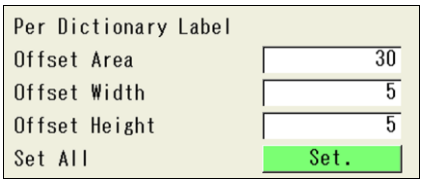
Note

*) When more than one characters with the same label have been recognized within a character string, the maximum and minimum values are displayed because their sizes are unequal.



3. Input "Area Offset", "Width Offset" and "Height Offset" checking the maximum and minimum values for each item of dictionary label.

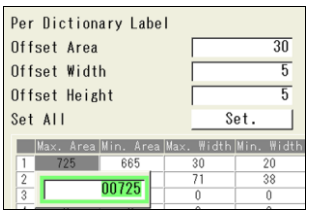
Set necessary items only. The items entered with "0" for the maximum and minimum values both by executing "Set All" without inputting offset values represent not to execute Judgement character size.



4. Execute "Set All: Set".

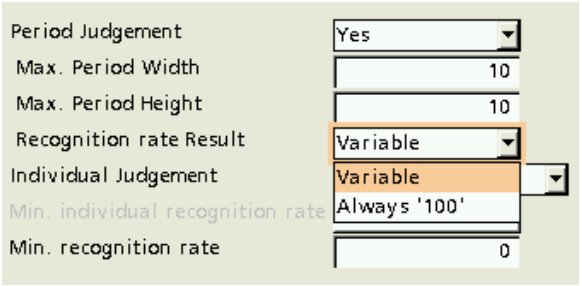
For each item, the value "Maximum + Offset" is input as the maximum value, and the value "Minimum - Offset" is input as the minimum value.

5. For adjusting the values collectively specified, select the list, and select the items (each max. and min. values) of the dictionary label which needs adjustment to change the values.



2.6.5 Period Identification

It is a function to automatically recognize the segmented character as a period without comparing with the character pattern registered in Dictionary when a period is included in the recognized characters and it is smaller than the specified width and height.



1. **Select "Judgement Limit 2".**

2. **Select “Yes” in "Period Judgement".**

Default: "No"

3. **Specify the maximum size of a character to be recognized as a period in "Max. Period Width" and "Max. Period Height".**

Default: "10" for both Width and Height

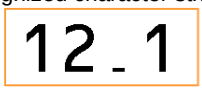
4. **Select "Variable" or "Always '100'" for "Recognition Rate Result".**

Default: "Always '100'"

Example) Character string to be recognized: 12.1

Period size: Width: Approx. 5 pixels, Height: Approx. 5 pixels

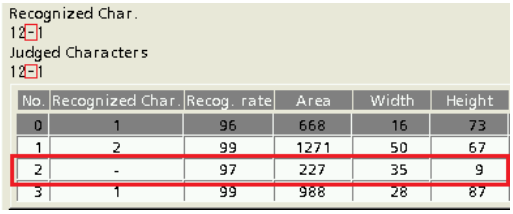
Recognized character string:



The dot is partially missing, and it looks horizontally long.It may be falsely recognized as "-".

When "Max. Period Width" and "Max. Period Height" has been set to 3, it is not judged as a period because the setting values are smaller than the period size.
When "Max. Period Width" and "Max. Period Height" has been set to 10, it is judged as a period because the period size is within the setting values.

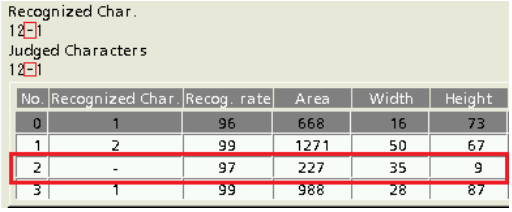
When Period Identification is No



No.	Recognized Char.	Recog. rate	Area	Width	Height
0	1	96	668	16	73
1	2	99	1271	50	67
2	-	97	227	35	9
3	1	99	988	28	87

Recognized character and judged character are both "-".

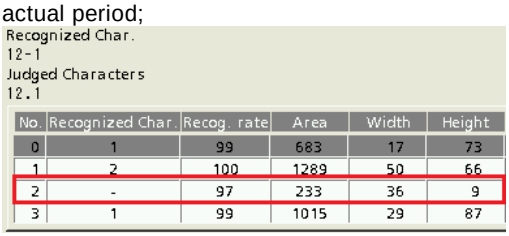
When Period Identification is Yes, Recognition Rate Result is Variable, and Max. Width, Max. Height are smaller than the actual period;



No.	Recognized Char.	Recog. rate	Area	Width	Height
0	1	96	668	16	73
1	2	99	1271	50	67
2	-	97	227	35	9
3	1	99	988	28	87

Recognized character and judged character are both "-".

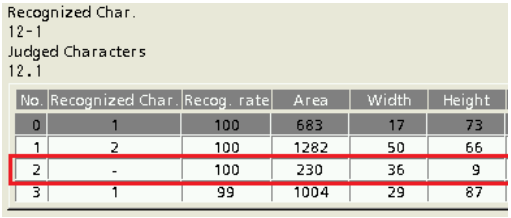
When Period Identification is Yes, Recognition Rate Result is Variable,
and Max. Width, Max. Height are larger than the actual period;


Recognized Char.
12-1
Judged Characters
12.1

No.	Recognized Char.	Recog. rate	Area	Width	Height
0	1	99	683	17	73
1	2	100	1289	50	66
2	-	97	233	36	9
3	1	99	1015	29	87

Recognized character is "-', but judged character is ".". The recognition rate is the result of "-".

When Period Identification is Yes, Recognition Rate Result is Always '100',
and Max. Width, Max. Height are larger than the actual period;


Recognized Char.
12-1
Judged Characters
12.1

No.	Recognized Char.	Recog. rate	Area	Width	Height
0	1	100	683	17	73
1	2	100	1282	50	66
2	-	100	230	36	9
3	1	99	1004	29	87

Recognized character is "-', but judged character is ".". "100" is output as recognition rate.

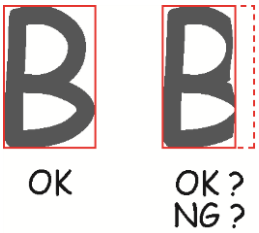
Note

- Even if any character pattern is not registered in the label of the period in Dictionary, period identification is available.
- When "Period Judgement" has been set to "Yes", segmented characters of the sizes smaller than Max. Period Width and Max. Period Height are recognized as a period. Always select "No"(Default) in "Period Judgement" for recognizing characters without periods.
- Even if a period is recognized, it is judged as NG when it is larger than the size of Period Identification, and the judged character is [?].

2.6.6 Judgement by recognition rate

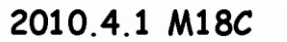
It judges whether or not the recognition rate of the character judged as OK by the specified character string or the calendar date is higher than the specified minimum value. If the rate is not higher than the specified minimum value, the character is judged as NG, and "?" is output for the judged character.

This is a function to simply inspect the quality using the recognition rate calculated with correlation or subtraction after character recognition.



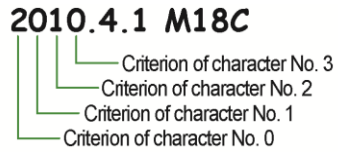
The following methods are available for setting the minimum recognition rate; Set the same minimum value for all character strings (Not perform individual judgement), set per recognized character (Per judgement character) and set per dictionary label.

- No individual judgement:
  Judges all characters of character strings using the same criterion for recognition rate.



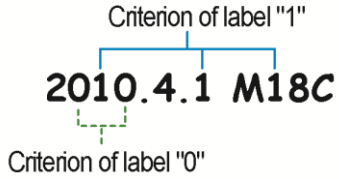
The same criterion regardless of character numbers or dictionary labels.

- Per Judgement Char.:
  Specify the minimum recognition rate per recognized character number. It is used to set different criteria for the recognition rate according to the position in the character string even for the same character (label).



Although the characters are the same, criteria differ according to recognized positions.

- Per Dictionary Label:
  Specify the minimum recognition rate per dictionary label. The criteria for the recognition rate are the same for the same character (label) regardless of the position.



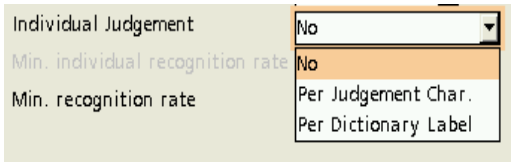
When the characters (labels) are the same, the criteria are the same.

Note

When "Recognition rate method" has been set to an item other than "No", the error code 180 is displayed if executing an inspection after reading dictionary (learning data only), and the Err signal turns on. For the details of reading dictionary data (learning data only), refer to 4.4 Reading SD Dictionary with External Device.

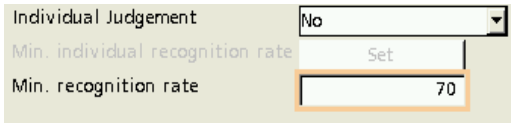
Not Performing Individual Judgement of Recognition Rate

1. Select "No" in "Individual Judgement".



2. Enter a minimum value in "Min. recognition rate".

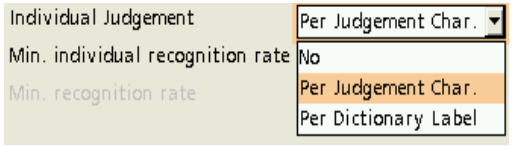
Enter a minimum value referring to the recognition rate displayed in the information list.



Setting Recognition Rate Per Judgement Character Number

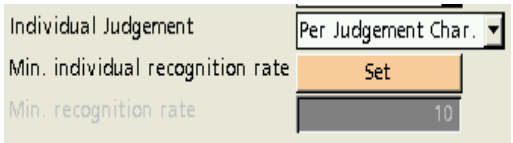
Specify the minimum recognition rate per recognized character number.

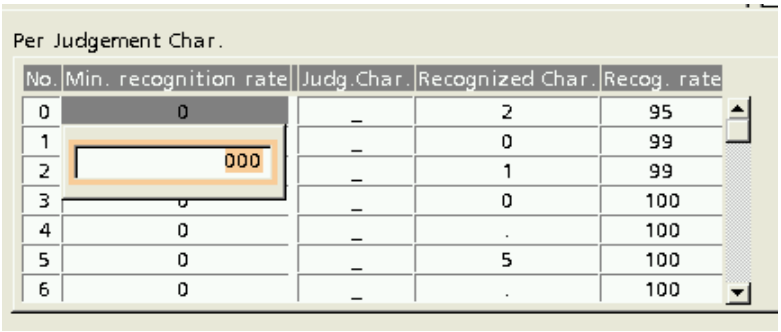
1. Select "Per Judgement Char." in "Individual Judgement".



2. Press "Set" in "Min. individual recognition rate".

The recognized characters and recognition rate is displayed for each recognition number.
Specify the minimum recognition rate per recognized character number.

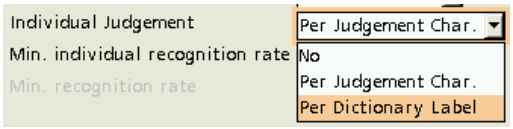




Setting Recognition Rate Per Dictionary label

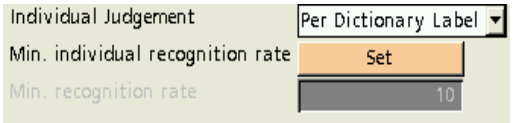
Specify the minimum recognition rate per dictionary label.

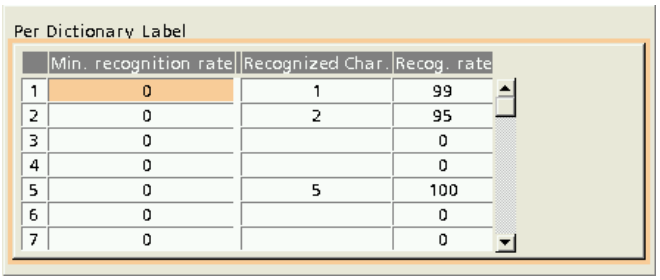
1. Select "Per Dictionary Label." in "Individual Judgement".



2. Press "Set" in "Min. individual recognition rate".

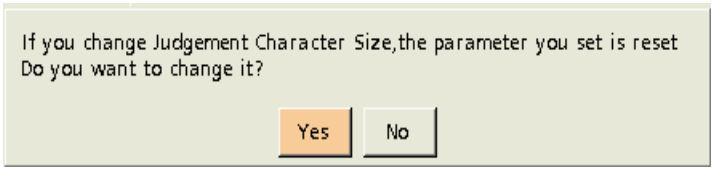
The recognition rate per dictionary label is displayed for inspected character strings. When some labels are the same in character strings, the smallest recognition rate is displayed.
Specify the minimum recognition rate per dictionary label.





Note

When changing the setting of Individual Judgment of Recognition Rate (No/Per Judgement Char./Per Dictionary Label), the specified minimum recognition rate is reset.

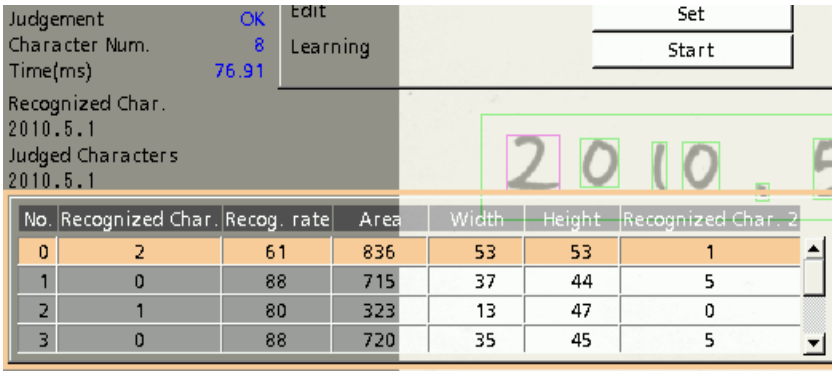


2.7 Executing Test

Press the TRIG key to execute a test. Check whether or not the desired characters could be recognized with the setting specified so far.

1. Press the TRIG key to execute a test.

The recognized characters, judged characters and the information list for the recognized characters are displayed.



No.	Recognized Char.	Recog. rate	Area	Width	Height	Recognized Char. 2
0	2	61	836	53	53	1
1	0	88	715	37	44	5
2	1	80	323	13	47	0
3	0	88	720	35	45	5

About the recognized character information list

Selecting the information list and moving the cursor onto each recognized character displays the character box on the screen window in pink when the judgement is OK, and in blue when the judgement is NG. Confirm the recognized results watching the actual character images.

Recognized character: The label of the character pattern that has been judged as the most similar character to the segmented character as a result of comparison with all the character patterns registered in Dictionary. It is also called "1st Recognized Character".

Recognition rate The recognition rate of recognized characters.

Area / Width / Height: The area, width and height of recognized character. These values are the same as the values indicated in the list on SETUP menu of Segmentation Condition.

(2nd.) Recognized character: The label of the most similar character pattern next to "(1st) Recognized Character".

▶ Note

As for the 2nd recognized character, data other than labels (Recognition rate, Area, Width, Height) cannot be displayed.

2.8 List of Output to Numerical Calculation, Judgement and Data R/W

Judgement output

Character recognition (OCR) No. 0 to 999	Judgement (JUDGE)	All the recognized characters should be the specified character strings and meet all other specified judgement conditions.
	Individual Judgement(PJUDGE) No.0 to 79	Each recognized character should be the specified character and meet other specified judgement conditions.

Numerical calculation and Data R/W

Note

When the items in "Result" of numerical calculation and data R/W has been selected and "Statistics" has been selected, the compiled statistics data vary according to items.

Statistics type	Numeric Statistics	All Statistics	OK Statistics	NG Statistics
1	Judgment Statistics If the judgement of checker is OK, calculates “All Statistics” and “OK Statistics”. If the judgement is NG, calculates “All Statistics” and “NG Statistics”. When referring the statistics of judgments(JRC/JDC) during in RUN mode, the latest result is referred.	Scan Count (Judgment Count)	OK count	NG count
2	Statistics of checker results If the judgement of checker is OK, calculates “All Statistics” and “OK Statistics”. If the judgement is NG, calculates “All Statistics” and “NG Statistics”.	Minimum	OK Judge. Min.	NG Judge. Min.
		Maximum	OK Judge. Max.	NG Judge. Max.
		Average	OK average	NG average
		Range	OK Range	NG range
		Variance	OK Variance	NG Variance

Numerical Calculation

	Result No.	Result Type	Statistics type	Details
Character recognition (OCR)No. 0 to 999	---	Judgement (JUDGE)	1	Output data OK=1, NG=0
		Inspection Time (TIME)	2	
		Detection count (COUNT)	2	Output value: 0 to 80
	0 to 79-	Area (AREA)	2	
		Width (WIDTH)	2	
		Height (HEIGHT)	2	
		Individual Judgement (P JUDGE)	1	Output data OK=1, NG=0
		Judged Character (RCHAR)*	No	
		Recognition rate (RECOG)	2	

Note

When judged characters have been registered for numerical calculation, decimal values converted from ASCII code of characters are input in the operation expression.

Label	ASCII	Value	Label	ASCII	Value	Label	ASCII	Value
0	30	**48**	**P**	50	**80**	**o**	6F	**111**
1	31	**49**	**Q**	51	**81**	**p**	70	**112**
2	32	**50**	**R**	52	**82**	**q**	71	**113**
3	33	**51**	**S**	53	**83**	**r**	72	**114**
4	34	**52**	**T**	54	**84**	**s**	73	**115**
5	35	**53**	**U**	55	**85**	**t**	74	**116**
6	36	**54**	**V**	56	**86**	**u**	75	**117**
7	37	**55**	**W**	57	**87**	**v**	76	**118**
8	38	**56**	**X**	58	**88**	**w**	77	**119**
9	39	**57**	**Y**	59	**89**	**x**	78	**120**
A	41	**65**	**Z**	5A	**90**	**y**	79	**121**
B	42	**66**	**a**	61	**97**	**z**	7A	**122**
C	43	**67**	**b**	62	**98**	**-**	2D	**45**
D	44	**68**	**c**	63	**99**	**/**	2F	**47**
E	45	**69**	**d**	64	**100**	**.**	2E	**46**
F	46	**70**	**e**	65	**101**	*****	2A	**42**
G	47	**71**	**f**	66	**102**	**(**	28	**40**
H	48	**72**	**g**	67	**103**	**)**	29	**41**
I	49	**73**	**h**	68	**104**	**<**	3C	**60**
J	4A	**74**	**i**	69	**105**	**>**	3E	**62**
K	4B	**75**	**j**	6A	**106**	**&**	26	**38**
L	4C	**76**	**k**	6B	**107**	**$**	24	**36**
M	4D	**77**	**l**	6C	**108**	**:**	3A	**58**
N	4E	**78**	**m**	6D	**109**	**+**	2B	**43**
O	4F	**79**	**n**	6E	**110**			

Note

Table of ASCII codes

				bit7	0	0	0	0	1	1	1	1
				bit6	0	0	1	1	0	0	1	1
				bit5	0	1	0	1	0	1	0	1
bit4	**bit3**	**bit2**	**bit1**		**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
0	0	0	0	**0(0)**	NUL	DLE	SP	**0**	@	**P**	′	**p**
0	0	0	1	**1(1)**	SOH	DC1	!	**1**	**A**	**Q**	**a**	**q**
0	0	1	0	**2(2)**	STX	DC2	"	**2**	**B**	**R**	**b**	**r**
0	0	1	1	**3(3)**	ETX	DC3	#	**3**	**C**	**S**	**c**	**s**
0	1	0	0	**4(4)**	EOT	DC4	**$**	**4**	**D**	**T**	**d**	**t**
0	1	0	1	**5(5)**	ENQ	NAC	%	**5**	**E**	**U**	**e**	**u**
0	1	1	0	**6(6)**	ACK	SYN	**&**	**6**	**F**	**V**	**f**	**v**
0	1	1	1	**7(7)**	BEL	ETB	'	**7**	**G**	**W**	**g**	**w**
1	0	0	0	**8(8)**	BS	CAN	**(**	**8**	**H**	**X**	**h**	**x**
1	0	0	1	**9(9)**	HT	EM	**)**	**9**	**I**	**Y**	**i**	**y**
1	0	1	0	**10(A)**	LF/NL	SUB	*****	**:**	**J**	**Z**	**j**	**z**
1	0	1	1	**11(B)**	VT	ESC	**+**	;	**K**	[	**k**	{
1	1	0	0	**12(C)**	FF	FS	,	**<**	**L**	\	**l**	|
1	1	0	1	**13(D)**	CR	GS	**-**	=	**M**	]	**m**	}
1	1	1	0	**14(E)**	SO	RS	**.**	**>**	**N**	^	**n**	~
1	1	1	1	**15(F)**	SI	US	**/**	?	**O**	_	**o**	DEL

Data R/W

"Yes" in the "Change" column indicates the value of the cell is modifiable from Data R/W sheet.

			Change	Statistics type
Parameter	Area Setting	Start Point X	Yes	No
		Start Point Y	Yes	No
		End Point X	Yes	No
		End Point Y	Yes	No
		Center X	Yes	No
		Center Y	Yes	No
		Radius X	Yes	No
		Radius Y	Yes	No
	Image Filter	Grayscale Preprocess	Yes	No
		Threshold method	Yes	No
		Slice Level	Yes	No
		Segment Color	Yes	No
		Background (Dynamic)	Yes	No
		Background (Auto)	Yes	No
		Average Size	Yes	No
		Offset	Yes	No
		Segment pre-process filter	Yes	No
		Filter X	Yes	No
		Filter Y	Yes	No
		Slant Angle	Yes	No
	Segmentation Condition	Max. Area	Yes	No
		Min. Area	Yes	No
		Max. Width	Yes	No
		Min. Width	Yes	No
		Max. Height	Yes	No
		Min. Height	Yes	No
		Segment Direction	Yes	No
		Boundary	Yes	No
		Partition	Yes	No
		Character Width	Yes	No
	Inspection Condition	Recognize Reversed Character	Yes	No
		Number of Lines	Yes	No
		Recognition rate method	Yes	No
		Method	Yes	No
		Filter	Yes	No
		Subtraction Threshold	Yes	No
		Recognition Rate Character Judgement	Yes	No
	Judgement Limits 1	Judgement type	Yes	No
		Judgement Character (0-15)	Yes	No
		Judgement Character (16-31)	Yes	No
		Judgement Character (32-47)	Yes	No
		Judgement Character (48-63)	Yes	No
		Judgement Character (64-79)	Yes	No
		No. of Characters Judgement	Yes	No
		No. of Characters	Yes	No
		Judgement Character Size	Yes	No
		Max. Area per Judge. Char.	Yes	No
		Min. Area per Judge. Char.	Yes	No
		Max. Width per Judge. Char.	Yes	No
		Min. Width per Judge. Char.	Yes	No
		Max. Height per Judge. Char.	Yes	No
		Min. Height per Judge. Char.	Yes	No
		Max. Area per Dic. Label	Yes	No

			Change	Statistics type
		Min. Area per Dic. Label	Yes	No
		Max. Width per Dic. Label	Yes	No
		Min. Width per Dic. Label	Yes	No
		Max. Height per Dic. Label	Yes	No
		Min. Height per Dic. Label	Yes	No
Parameter	Judgement Limits 2	Period Identification	Yes	No
		Max. Period Width	Yes	No
		Max. Period Height	Yes	No
		Period Recog. rate Result	Yes	No
		Individual Judgement	Yes	No
		Min. recognition rate	Yes	No
		Min recognition rate per judgement character	Yes	No
		Min. recognition rate per dictionary label	Yes	No
	Calendar Condition	Calendar Format	Yes	No
		Delimiter	Yes	No
		Digits of Month and Day	Yes	No
		Digits of Year	Yes	No
		Offset	Yes	No
		Year	Yes	No
		Month	Yes	No
		Day	Yes	No
		Hour	Yes	No
Result		Judgement Results	No	1
		Inspection Time	No	2
		No. of Objects	No	2
		Judgement date	No	No
		Area	No	2
		Width	No	2
		Height	No	2
		Individual Judgement	No	1
		Judged characters	No	No
		Judged Character (0-15)	No	No
		Judged Character (16-31)	No	No
		Judged Character (32-47)	No	No
		Judged Character (48-63)	No	No
		Judged Character (64-79)	No	No
		Recognition rate	No	2

Chapter 3

Code Reader Checker

3.1 About Code Reader

What is Code Reader?

Code Reader is a function that recognizes the shapes of various bar codes and 2D codes and decodes (restores) them to characters or symbols.

For QR code, Shift-JIS characters can be recognized, displayed and output.

Up to 80 characters (one-byte character) can be read for one area.

Two-byte code is not supported for display (only Shift-JIS can be displayed) and judgement condition. However, it can be output to external devices.

Supported Codes

Bar codes (25 types)

- Code 2 of 5, ITF
- NW-7, CODE39,CODE93, CODE128
- JAN/EAN-13, JAN/EAN-13 Add-On2, JAN/EAN-13 Add-On5
- JAN/EAN-8, JAN/EAN-8 Add-On2, JAN/EAN-8 Add-On5
- UPC-A, UPC-A Add-On2, UPC-A Add-On5
- UPC-E, UPC-E Add-On2, UPC-E Add-On5
- PharmaCode,
- GS1 DataBar Omnidir., GS1 DataBar Truncated, GS1 DataBar Stacked
- GS1 DataBar StackedOmnidir., GS1 DataBar Limited, GS1 DataBar Expanded
- GS1 DataBar ExpandedStacked

Two-dimensional codes (2 types)

- Data Matrix
- QR code

Flow of Setup

1.	**Setting Inspection area.**	Set the range to read code.
2.	**Setting the condition to read code.**	Set the code type to be read and the reading condition.
3.	**Executing Test.**	Check whether the read result is the one you desired.

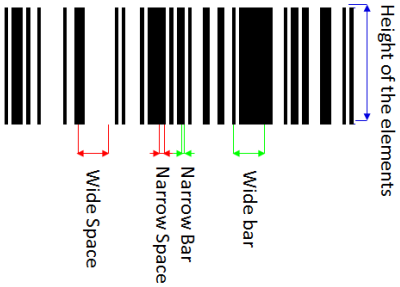
Selection of view range

To stably read codes with the code reader of PV230, it is important to maintain enough view range to recognize elements and modules.

■Barcode

Set the view range to make the narrowest elements (bar and space) to be four pixels or more.

Set the view range to make the height of the elements to be 8 pixels or more.

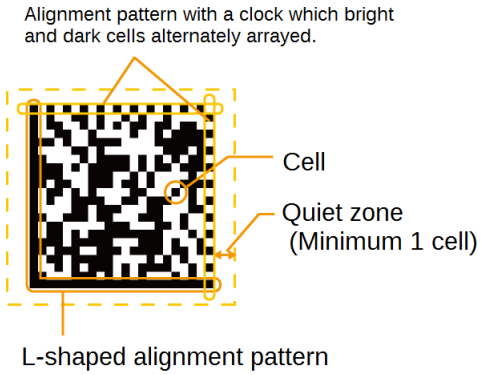


Also, a quiet zone the size of which is 10 narrow bars is necessary on the right and left sides of general bar code to detect the both ends.

GS1 DataBar can be read without quiet zones.

■Data Matrix

■Data matrix structure

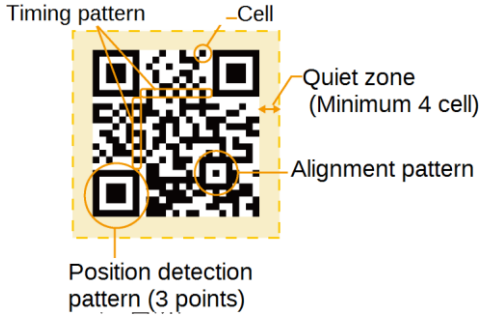


Cell	Square or dot which is the minimum unit that composes Data Matrix code.
L-shaped alignment pattern	Mark to detect the position of a code.
L-shaped alignment pattern	Pattern where bright cells and dark cells are alternately arrayed linearly.

- The position of Data Matrix code is identified using the L-shaped alignment pattern and the alignment pattern with a clock which bright cells and cark cells are alternately arrayed.
- Set the view range to make one module to be 4x4 pixels or more.
- One module of quiet zone is necessary around the code to recognize it.

■QR Code

■QR Code structure



Cell	Square or dot which is the minimum unit that composes QR code.
Position detection patter	Mark to detect the position of a code. It is located in three corners of the code.
Alignment pattern	Pattern to correct the distortion of a captured pattern. (This pattern is arrayed in QR code at regular intervals and corrects distortion.)
Timing pattern	Pattern where bright cells and dark cells are alternately arrayed linearly.

- Set the view range to make one module to be 3x3 pixels or more.
- Four modules of quiet zones are necessary around the code to recognize it.

Note

The required minimum number of pixels for each element or module of a code may increase depending on the printing condition of the code. Also, note codes that are less than the minimum number of pixels may not be read.

3.2 Setting Items relating to Inspection Area

Items set in "Area Setting" menu are described below.

In Code Reader checker, the inspection area size cannot be adjusted using Area Size Adjustment and a Mask Area cannot be set.

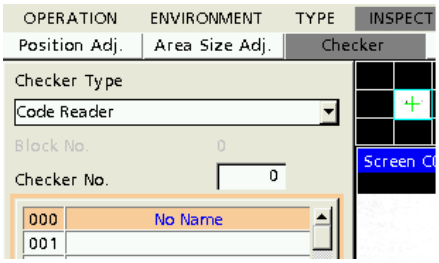
Specifying Checker No.

1. **Select "Code Reader" in "Checker Type".**

2. **Select the checker No. list and specify a checker number to set.**

3. **Press the ENTER key to determine the checker No.**

"Code Reader" setting window is displayed.



About the number of settable Code Reader checkers

The maximum number of Code Reader checkers available for a type is 100. The settable number does not change even when the number of blocks have been added.

For example, when the number of blocks has been set to "2", available Code Reader checkers are 100.

As there is no restriction on the Code Reader checker No. to be created, Code Reader checkers can be created in any numbers between No.0 and No.199 when the number of blocks is 2.

Selecting a Camera

Select a camera image to set Code Reader checker.

1. **Select a camera No. in "Camera".**

The image of the selected camera is displayed.

Note

Select "Switch Disp." shown by pressing the F1 key to change the displayed image type (Live/Memory and Gray/Binary) or size.

Selecting Usage of Color Image in Inspection

Set this when using a color camera.

Select "Converted Gray Img." or "Extracted Color Img.".

Refer to Chapter 4.6 in the PV200 User's Manual for the details of setting procedure.

Selecting Position Adjustment

Position Adjustment is helpful when position or angle of an inspection object printed with code is unstable.

Select a Position Adjustment checker that has been already set. Refer to Chapter 4.8 in the PV200 User's Manual for details of position adjustment.

1. **Select "Position Adjustment".**

The list of position adjustment is displayed.

Note

If a position adjustment checker is not created, “Position Adj.” cannot be selected.

2. **Select a Position Adjustment No. from the list.**

Setting Inspection Area

Set the range to read a code.

In Code Reader Checker, the inspection area size cannot be adjusted using Area Size Adjustment and a Mask Area cannot be set.

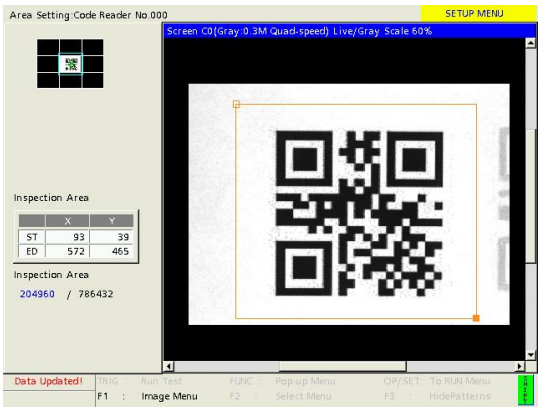
The settable shape for inspection area is rectangle only.

1. Select "Area Setting".

"Area Setting" window is displayed.

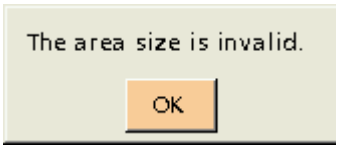
2. Draw an area.

Set an area to enclose the code.
Enter the coordinates of the area in order of start point and end point. Entering the end point returns to the Code Reader checker setting window.



Note

The maximum size of settable area is 786,432 pixels.
Note that the area exceeding the maximum size cannot be set.



Note

A quiet zone (blank space) is necessary around the code to be read. Set the area considering the shift amount of code and the quiet zone.
Required quiet zones vary according to code types.

Examples of quiet zones

Data Matrix: 1 module

QR Code: 4 modules

General bar codes:
Width of 10 narrow bars

Note

GS1 DataBar can be read without quiet zones.

3.3 Setting Conditions to Read Codes

Set the conditions to read code in the "Inspection Condition" menu

Setting Procedure

Inspection Condition

Grayscale Preprocess	This is a preprocess filter for captured images. This is shared with other checkers.
Code Type	Select a code type to be read from 27 types.
Code Model Parameter	Set the condition to read the code. Bar code: Manual 2D code: Standard / Enhanced / Manual (Training)
Background	Select a background color of the code.
Recognize Reversed Code	It can be selected only for bar codes. Select the reverse condition of the code, upside-down or left-to-right.
Quality Check	It can be selected only for 2D codes. Select whether to disable or enable the quality check of the code.
Error Output	Set the string to be output when a reading error occurs.

3.3.1 Inspection Condition

Select "Inspection Condition" from the Code Reader setting window.

Grayscale Preprocess

Select a maximum of 10 types from the following 21 filters for a captured gray image. The combination is called a preprocess group, and a maximum of 16 preprocess groups (A to P) for 1 type and 1 camera can be stored.

This preprocess function is the data common to all checkers.

1. **Select one from preprocessing group A to P in "Grayscale Preprocess".**

2. **Select "Filter Type" and specify the desired filter from 21 types.**

Selectable preprocessings are as follows.
Dilation / Erosion / Erosion -> Dilation / Dilation -> Erosion / Auto Correct. / Gray Cut / Area Averaging / Correction Setting / Median / Smoothing / Sobel / Prewitt / Laplacian / Edge Extract. X / Edge Extract. Y / Sharpen / Tophat / Dynamic / Frequency Extract. / Rotation / Reflect

▼Refer to▼
Refer to Chapter 4.6.5 in the PV200 User's Manual for the details of preprocess filters and setting procedure.

▶ Note
If a part of module or bar is missing due to uneven print density, the image can be improved by effectively performing preprocessing and the reading stability is improved.

Code Type

Select a code to be read from 27 types.

The table below describes the codes supported by PV230.

1. Select a code to be read from "Code Type".

	Codeword	Details
Bar Code	Code 2 of 5	Other name: 2/5 Industrial
	ITF	Other name: 2/5 Interleaved
	NW-7	Other name: Codabar
	CODE 39	
	CODE 93	
	CODE 128	
	JAN/EAN-13	
	JAN/EAN-13 Add-On 2	
	JAN/EAN-13 Add-On 5	
	JAN/EAN-8	
	JAN/EAN-8 Add-On 2	
	JAN/EAN-8 Add-On 5	
	UPC-A	
	UPC-A Add-On 2	
	UPC-A Add-On 5	
	UPC-E	
	UPC-E Add-On 2	
	UPC-E Add-On 5	
	Pharmacode	
	GS1 DataBar Omnidir. (Abbreviation of Omnidirectional)	Old name:RSS-14
	GS1 DataBar Truncated	Old name:RSS-14 Truncated
	GS1 DataBar Stacked	Old name:RSS-14 Stacked
	GS1 DataBar Stacked Omnidir. (Abbreviation of Omnidirectional)	Old name:RSS-14 Stacked Omnidirectional
	GS1 DataBar Limited	Old name:RSS Limited
	GS1 DataBar Expanded	Old name:RSS Expanded
2D code	Data Matrix	Data Matrix ECC 200
	QR Code	

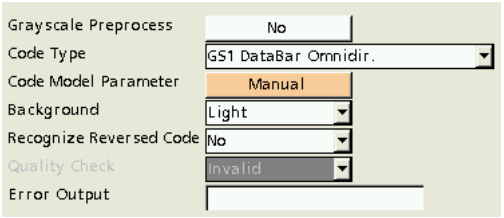
3.3.2 Code Model Parameter

Bar Code

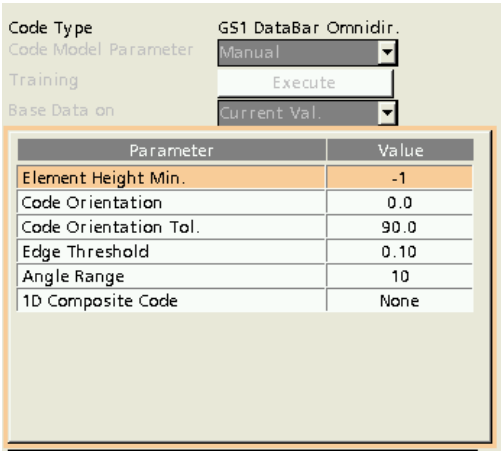
1. Select a bar code type in "Code Type".

2. Select "Manual" in "Code Model Parameter".

The "Code Model Parameter" for bar codes is "Manual" only.



3. Various conditions are displayed. Change them if necessary.



▶ Note

As the widths of bars and spaces composing codes differ depending on code types, the defaults of parameters differ depending on code types.

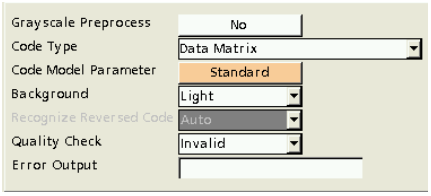
Parameter item	Settable range	Description
Element Height Min.	-1, 8 to 200	Min. value of the height of a bar code (unit: pixel) By specifying "-1", the height is automatically detected and the code is read. It should be set to read codes which are extremely higher or lower than standard codes Default: -1
Code Orientation	-90.0 to 90.0	Specify the orientation of a bar code in degrees. (unit: degree) When Rotation Adjustment or Calibration is not used, X axis is 0 degree and clockwise is positive angle. When the coordinate conversion by calibration is executed, the X axis after the conversion is 0 degree. If it follows Position/Rotation Adjustment, the adjusted angle is 0 degree. Default: 0.0

Parameter item	Settable range	Description
Code Orientation Tol.	0.0 to 90.0	Specify the tolerance of the orientation of a bar code in degrees. (unit: degree) Default: 90.0
Edge Threshold	0.01 to 1.00	Threshold for detecting edges of bars and spaces Default: 0.10
Angle Range	2 to 20	Specify the tolerance of the angle of a bar code in degrees. (unit: degree) Default: 10
Composite Code	None / CC-A/B	Specify whether it is a composite code or not. (This item is selected for only GS1 DataBar.) Composite code is composite symbols used to indicate items such as expiration date and serial number in addition to product code. Default: None

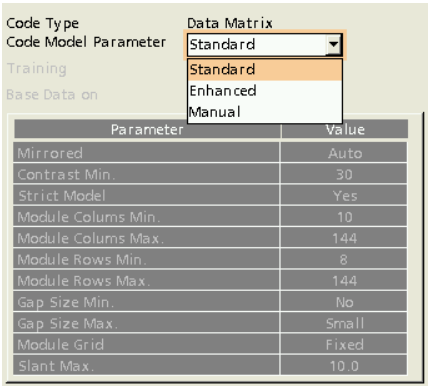
Data Matrix

1. Select "Data Matrix" in "Code Type".

2. Select "Code Model Parameter".



3. Select "Standard", "Enhanced" or "Manual" in "Code Model Parameter".



Standard Select this when printing is in good condition. The reading speed tends to be fast.

Enhanced Select this when printing is not in good condition. The reading speed tends to be slow.

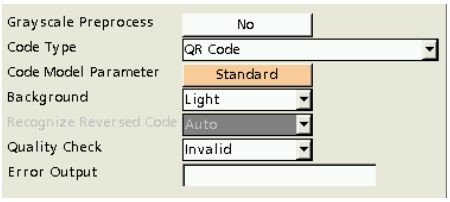
Manual Set parameters manually.

By executing "Training", you can newly register the detection result of the current code or additionally register it to the current setting values. For details of the auto adjustment, refer to Chapter 3.3.3.

Parameter item	Standard Setting value	Enhanced Setting value	Manual		Description
			Setting range	Default	
Mirrored	Auto	Auto	No / Yes / Auto	Auto	Specify whether to recognize a mirrored code (matrix inversion) or not.
Contrast Min.	30	10	1 to 100	10	Min. value of the contrast between code and background
Strict Model	Yes	Yes	Yes / No	Yes	Specify whether to comply with module conditions or not.
Module Columns Min.	10	10	10 to 144	10	Specify the min. value (even number) of modules (columns).
Module Columns Max.	144	144	10 to 144	144	Specify the max. value (even number) of modules (columns).
Module Rows Min.	8	8	8 to 144	8	Specify the min. value (even number) of modules (rows).
Module Rows Max.	144	144	8 to 144	144	Specify the max. value (even number) of modules (rows).
Gap Size Min.	No	No	No / Small	No	Specify the min. value of a gap between modules.
Gap Size Max.	Small	Big	No / Small / Big	Big	Specify the max. value of a gap between modules.
Module Grid	Fixed	Auto	Fixed / Variable / Auto	Auto	Specify whether to allow the size variation of code or not.
Slant Max.	10.0	30.0	0.0 to 30.0	30.0	Specify the max. deviation of the angle of L-shaped finder pattern. (unit: degree)

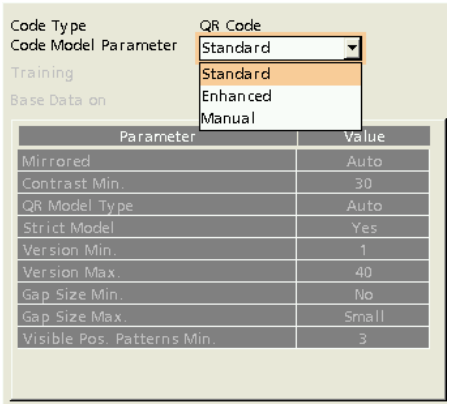
QR Code

1. Select "QR Code" in "Code Type".



2. Select "Code Model Parameter".

3. Select "Standard", "Enhanced" or "Manual" in "Code Model Parameter".



Standard Select this when printing is in good condition. The reading speed tends to be fast.

Enhanced Select this when printing is not in good condition. The reading speed tends to be slow.

Manual Set parameters manually.

By executing "Training", you can newly register the detection result of the current code or additionally register it to the current setting values. For details of the auto adjustment, refer to Chapter 3.3.3.

Parameter item	Standard Setting value	Enhanced Setting value	Manual		Description
			Setting range	Default	
Mirrored	Auto	Auto	No / Yes / Auto	Auto	Specify whether to recognize a mirrored code (matrix inversion) or not.
Contrast Min.	30	10	1 to 100	10	Min. value of the contrast between code and background
QR Model Type	Auto	Auto	Auto / 1 / 2	Auto	The QR code models 1 and 2 are supported.
Strict Model	Yes	Yes	Yes / No	Yes	Specify whether to comply with module conditions or not.
Version Min.	1	1	1 to 40	1	Specify the min. value of the recognized version.
Version Max.	40	40	1 to 40	40	Specify the max. value of the recognized version.
Gap Size Min.	No	No	No / Small	No	Specify the min. value of a gap between modules.
Gap Size Max.	Small	Small	No / Small / Big	Small	Specify the max. value of a gap between modules.
Visible Pos. Patterns Min.	3	2	2 / 3	2	It is set when the finder pattern is partly incomplete. 3: Complete, 2: Incomplete

3.3.3 Training (2D Code Only)

What is Training?

Training is a function to read the status of the code captured and automatically set the code model parameter.
By repeating trainings with multiple samples based on the specified "Current Value", it makes it easier for flawed codes to be read.

Setting Example 1 (Reading Codes of Different Sizes)

To describe the setting method, it shows the example using two codes.

Code 1（DataMatrix）

No. of modules: 16x16 modules

Module size: Min. 9 pixels to Max. 10 pixels

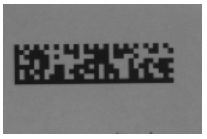
Code 2 (DataMatrix)

No. of modules: 32x8 modules

Module size: Min. 6 pixels to Max. 7 pixels

Code 1

Code 2



About "Base Data on"

"Current val."

Additionally registers the result of training to the current settings.

"Default Val."

Clears the current settings and registers the result of training.

1. **Registering default values**

3-1. Registering default values

Select "Default Val." in "Base Data on", adjust the view range to capture the code 1 within the inspection area, and execute "Training".

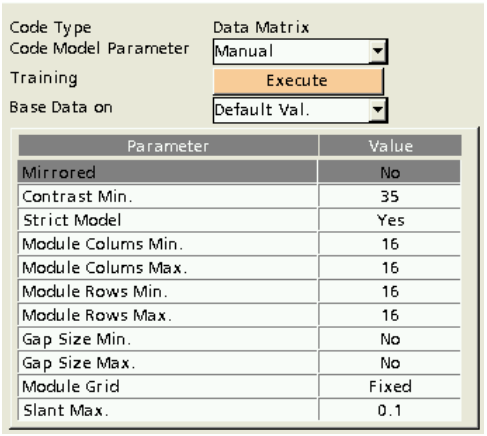
The settings of code 1 are registered in the parameters.

Module Columns Min.: 16

Module Columns Max.: 16

Module Rows Min.: 16

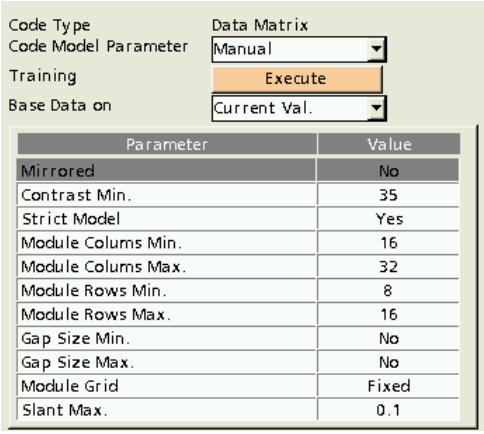
Module Rows Max.: 16



2. Executing additional registration

Select "Current Val." in "Base Data on", adjust the view range to capture the code 2 within the inspection area, and execute "Training".

Additionally registers the parameters of code 2 to those of code 1.



Module Columns Min.: 16

Module Columns Max.: 16 -> 32

Module Rows Min.: 16 -> 8

Module Rows Max.: 16

Other reading parameters are also updated.

Under this condition, the both code 1 and 2 can be recognized. By additionally registering parameters for codes in N ways, the condition to recognize them can be set.

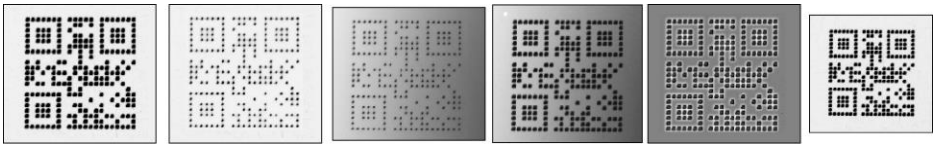
▶ Note

Use the same code type for Code 1 to Code N. Also, if N is large, note that the inspection time may get longer.

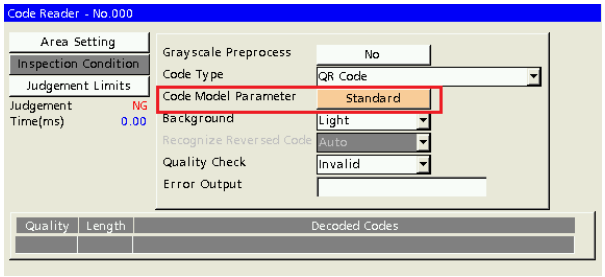
Setting Example 2 (Certainly Reading Codes with Variations in Printings)

The followings are six QR codes. The sizes of dots vary and some dots are missing. Some codes cannot be read when the setting of Code Model Parameter is "Standard". Take the folloing procedure to read all the codes.

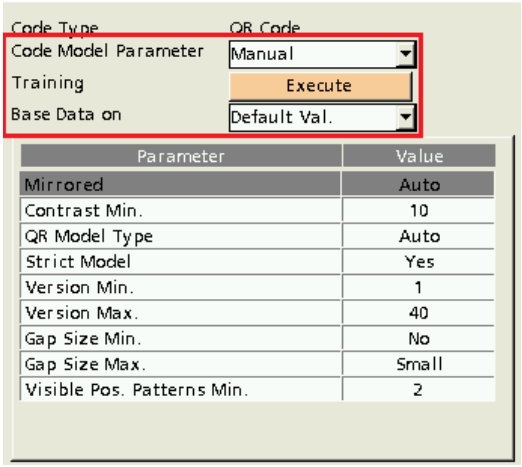
Image No.0 Image No.1 Image No.2 Image No.3 Image No.4 Image No.5



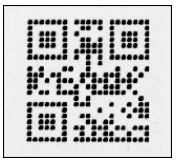
1. Select “Code Model Parameter”.



2. **Select "Manual" for "Code Model Parameter", and "Default Val." for "Based Data on".**

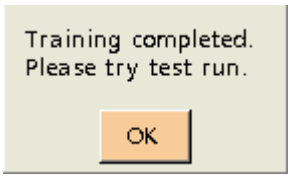


3. **Capture the code on the Screen window, and press the ENTER key on the "Execute" button for "Training".**



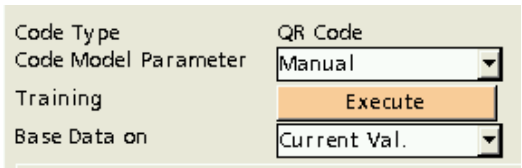
4. **Once the training is complete successfully, the message shown in the right figure appears.**

Now the setting for the value to read the code captured in step 3 is complete.

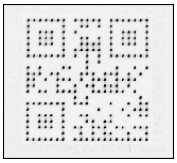


5. **Set "Current Val." for "Based Data on".**

This setting adds the reading condition to the value currently specified.



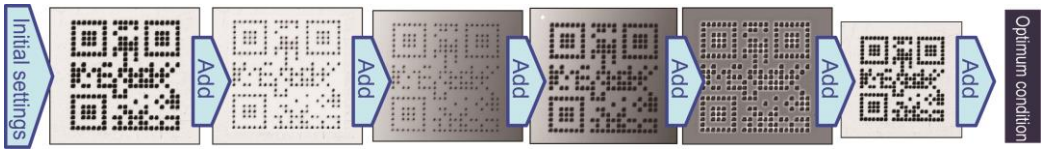
6. **Capture another code on the Screen window.**



7. **Press the ENTER key on the "Enter" button for "Training".**

8. **Repeat the above steps 6 and 7.**

Every time "Training" is executed, the conditions are added.



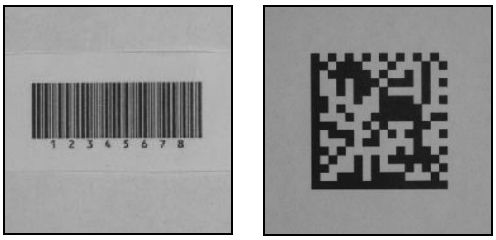
In the case of this setting, the "Set value" changes to a reliable value for reading the image No. 0 by the first "Training". By the second "Training", the value changes to a value that the image No.1 is also read. By the third "Training", it changes to a value that the image No.2 is also read. By repeating this operation for the images No.3 to 5, all the images used for Training can be certainly read.

3.3.4 Other Inspection Conditions

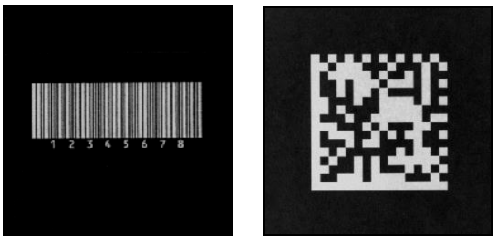
Background

Select whether the background is lighter or darker than the code to be read.

Background: Light — When the background is lighter than the code, select "Light".



Background: Dark — When the background is darker than the code, select "Dark".



Background: Auto — When you want to read the code in both cases that the background is darker and lighter than the code, select "Auto".

Note

"Auto" cannot be selected when a bar code is selected in "Code Type".
When Code Type is 2D code, the selectable items in Background differ according to the setting of Code Model Parameter.

Code Model Parameter	Selectable items
Standard	"Background" can be selected from "Light" or "Dark".
Enhanced	"Background" is "Auto" only. It is not necessary to select this item.
Manual	"Background" can be selected from "Light", "Dark" or "Auto".

Recognize Reversed Code

Select the reverse condition of a code.
This item can be set for bar code only.

No	Set when the code is not reversed.
Up-Down	Set when the code is reversed upside down.
Left-Right	Set when the code is reversed left to right.

Quality Check

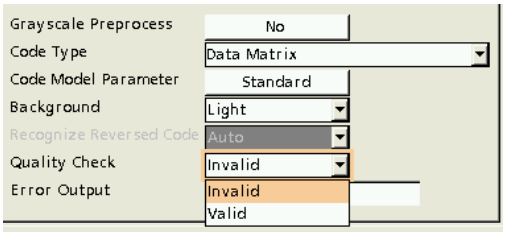
Select whether to disable or enable the quality check.
The quality check is performed for 2D code only.
When "Quality Check" is set to "Valid", the processing time gets longer.

Note

When "Quality Check" is set to "Valid", the processing time gets longer. Select "Invalid" if it is not necessary.

1. Select "Invalid" or "Valid" in "Quality Check".

Select "Valid" to perform the quality check.
By performing the quality check, the processing time gets longer.

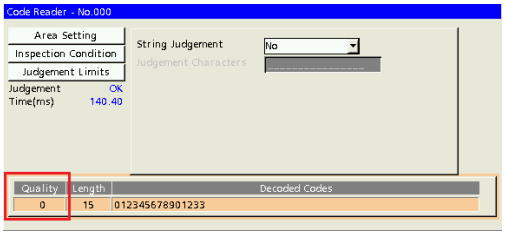


2. The result of quality check is displayed.

The result of quality check is displayed together with the code length and decoded result.
The quality is shown in five levels, 0 to 4. Level 4 is the highest level.
The lowest value of detailed items is output.

Note

The result of quality check can be referred in Numerical Calculation or Data R/W.

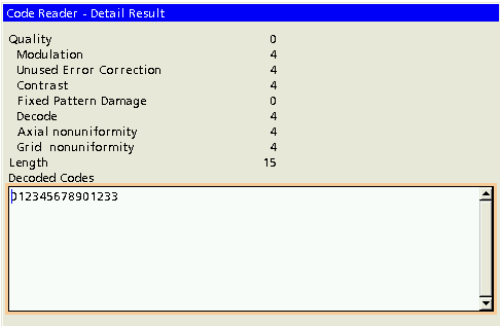


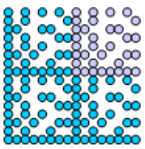
3. The detailed result of quality check is displayed.

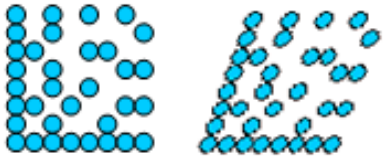
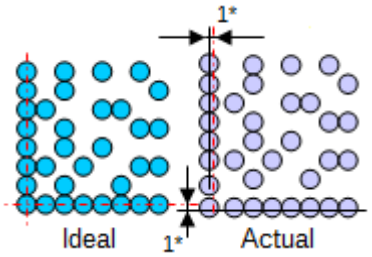
Selecting the decoded result shows the detailed result of quality check.
The items except for "Decode" are evaluated in five levels, 0 to 4. Level 4 is the highest level.
"Decode" is evaluated in two levels, 0 (Decode is not available) and 4 (Decode is available).

Note

The detailed result of quality check can be referred in Numerical Calculation or Data R/W.



Detailed item	Description
Modulation	To evaluate the variation in the contrast of data parts (contents to be decoded) in a 2D code. If the contrast of the data parts is not clear for some reason such as ink bleed, it may be judged as a flaw that is too large to be corrected with the correction function of 2D code, and it may not be read. This item is to control the contrast of data parts to prevent a reading failure from being caused by bad printing conditions. The formula to calculate modulation is as follows. Modulation Mod = 2*(ABS(R-GT)) /SC R: Grayscale value that is the closest to GT in data parts. GT: Global threshold: (Max. luminance + Min. luminance)/2 SC: Contrast of fixed patterns (L-shaped alignment pattern, Alignment pattern with a clock which bright cells and dark cells are alternately arrayed or position detection pattern (3 points)) [Values in quality inspection] Modulation 4 : Mod ≧ 0.50 Modulation 3 : Mod ≧ 0.40 Modulation 2 : Mod ≧ 0.30 Modulation 1 : Mod ≧ 0.20 Modulation : Mod < 0.20  The left Data Matrix is composed of four Data Matrixes to be one 2D code. The modulation evaluates these four matrixes individually, and outputs the one with the lowest contrast. (The upper right part in the left figure)
Unused Error Correction	To evaluate the ratio of unused error corrections.
Contrast	To evaluate the difference between the maximum and minimum luminance in fixed patterns. If the contrast of fixed patterns is not clear, an segmentation (position detection) error in 2D code occurs. This item is to control the contrast of fixed patterns to prevent a segmentation error. Fixed pattern Data Matrix: L-shaped alignment pattern, Alignment pattern with a clock which bright cells and dark cells are alternately arrayed QR Code: Position detection pattern (3 points) When Max. luminance is Rmax and Min. luminance is Rmin, it calculates the rate of the difference between the luminance (Rmax-Rmin) regarding the variation of 255 as 100% (1), and rates it on a scale of 0 to 4. Rate of difference in luminance (SC) = (Rmax-Rmin)/255 Contrast 4 : SC ≧ 0.70 Contrast 3 : SC ≧ 0.55 Contrast 2 : SC ≧ 0.40 Contrast 1 : SC ≧ 0.20 Contrast 0 : SC < 0.20
Fixed Pattern Damage	To evaluate the degree of damage of a fixed pattern, finder pattern, clock pattern or quiet zone.
Decode	To evaluate whether decoding succeeded or failed.

Axial nonuniformity	To evaluate the skew of a code. 
Grid nonuniformity	To evaluate the shift length of actual modules, compared to the ideal coordinates of modules.  1*:Shift Length

Error Output

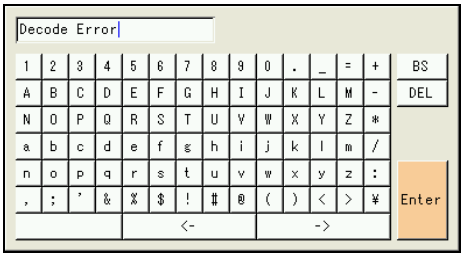
Specify the string to be output when a reading error occurs.

1. Select "Error Output".

Now you can set output characters.

2. Input error output characters.

Enter a string you want to output with the software keyboard. Select "Enter" to finish the input of characters.



3. Output when an error occurs.

The specified characters are output when the decode error occurs.

3.3.5 Outputting Read Code

For outputting read characters, select the setting from "General Output" ("ENVIRONMENT" -> "Input/Output"). You cannot set individually whether to output or not for each Code Reader checker.

The characters to be output are read characters. They are not "judged characters" like Optical Character Recognition checker.

For 2-byte codes, the output characters get garbled.

"General Output" setting

1. Select "ENVIRONMENT" -> "Input/Output" -> "General Output" from the menu bar.

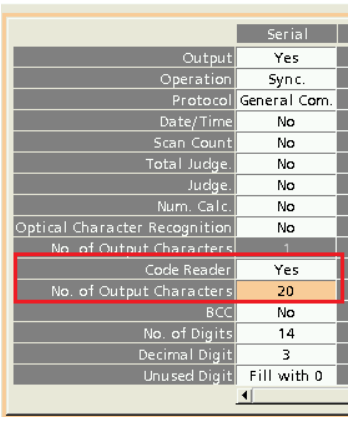
2. Select "Yes" for "Output" of the port (Serial/Ethernet/SD Card) to which strings are output.

3. Select "General Com." or "PLC Com." in "Protocol".

4. Select "Yes" in "Code Reader".

5. Specify "No. of Output Characters".

Available numbers of characters are 1 to 80.
Specify the number of characters per code reader checker.



▶ Note

When the number of characters recognized with each Code Reader checker has exceeded "No. of Output Characters", only the recognized characters of the specified number from the beginning are output.
If the content of a code is ten characters "12345abcde", only five characters "12345" from the beginning are output when "No. of Output Characters" is set to 5.

6. Select "Unused Digit" from "Fill with 0" or "Comma Sep.".

If you select "Comma Sep.", procedure No.7 will be valid.

7. Specify "Start"*,"Data Delimiter"*, "End"*.

*Available from PV230Ver.1.30.
*Available only for General Communication Protocol.
*These items are are valid if you setting "Unused Digit" to "Comma Sep."

Item	Description	Default
Start	It is added to the beginning of general result output data.	None
Data Delimiter	It is added between output data as a delimiter.	,
End	It is added before the terminal CR* of general result output data. (* When BCC is added, it is added before BCC.)	None

Setting values (Start,Data Delimiter,End)	None
	,
	Space
	;
	Tab
	-
	*
	:
	@
	#
	$
	&

Output Examples

Output string:	Code Reader No.0	**123456789**
	Code Reader No.1	**ABCDEFG**
Output Condition:	Code Reader:	**Output**
	All others:	**Not output**

When "No. of Output Characters" is "10" and "Unused Digit" is "Fill with Zeros".

Outputs in fixed length.

1	2	3	4	5	6	7	8	9		A	B	C	D	E	F	G				CR
Judged characters of Code Reader No. 0										Judged characters of Code Reader No. 1										

When "No. of Output Characters" is "10" and "Unused Digit" is "Comma Separated".

Outputs in comma separated data.

1	2	3	4	5	6	7	8	9	,	A	B	C	D	E	F	G	CR
Judged characters of Code Reader No. 0										Judged characters of Code Reader No. 1							

When "No. of Output Characters" is "10", "BCC" is " Yes" , "Unused Digit" is "Comma Separated".,"Start" is "@", "Data Delimiter" is "Space" and "End" is "#".

@	1	2	3	4	5	6	7	8	9		A	B	C	D	E	F	G	#	BCC	CR
	Judged characters of Code Reader No. 0										Judged characters of Code Reader No. 1								2-digit block Check Code	

Note

- BCC will be output in 2 characters of ASCII.

Storing Character data in case of Outputting via PLC communication

When "Protocol" has been set to "PLC Communication", 2 characters are stored in each data register starting from the lower 8 bits of the specified data register.

Example)
Condition: No. of Output Characters = 5
Characters to be output: ABCDE
Start Register: 100

Output Result:

Register No.	Higher 8 bits	Lower 8 bits
100	B	A
101	D	C
102	(Space)	E

3.4 Setting Judgement Condition

General Information on Judgement Condition

With Code Reader checker, passing status can be judged by comparing the decoded codes with the specified string. Set the criteria and conditions for passing status in Judgement Condition menu.

Decoded codes

Judgement characters

Judgement = NG

Note

The judgement result can be output to "Judgement", " Numerical Calculation" and "Data R/W".

Setting Judgement Condition

1. Select "Yes" or “Set Characters Only” in "String Judgement".

Note

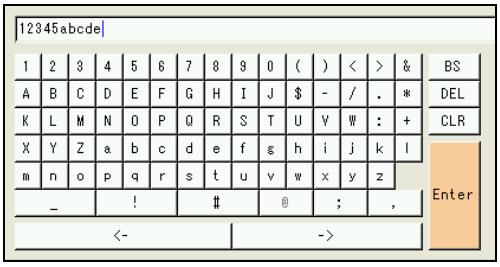
When set to “Set Characters Only”, judgement will be made only by the number of judgement characters if the number of decoded codes exceeds the number of judgement characters.

2. Select "Judgement Characters".

The window to enter the judgement characters is displayed.

Note

Selecting the "CLR" deletes all the character strings.



3. Input the characters to be compared with read characters.

It is also possible to specify a character type with particular symbols as well as characters and specify not to execute the comparison.

No character specification: "_" (Default)

Not judged. For example, when specifying "123_", only the 4th character is not judged.
When specifying "_ _ _ _", all the four characters are not judged. So, the judgement is OK as read characters are equal to judged characters. However, in this case, the "_" marks more than the number of read characters should be set. When the specified "_" characters are less than the number of read characters, the judgement is NG.

Number specification: "#”

Judgement is OK when read characters are numbers.

Alphabet specification: " ! " / " ; " / " , "

" ! ": Judgement is OK when read characters are alphabets (uppercase or lowercase).
" ; ": Judgement is OK when read characters are uppercase alphabets.
" , ": Judgement is OK when read characters are lowercase alphabets.

Note **<Setting example>**

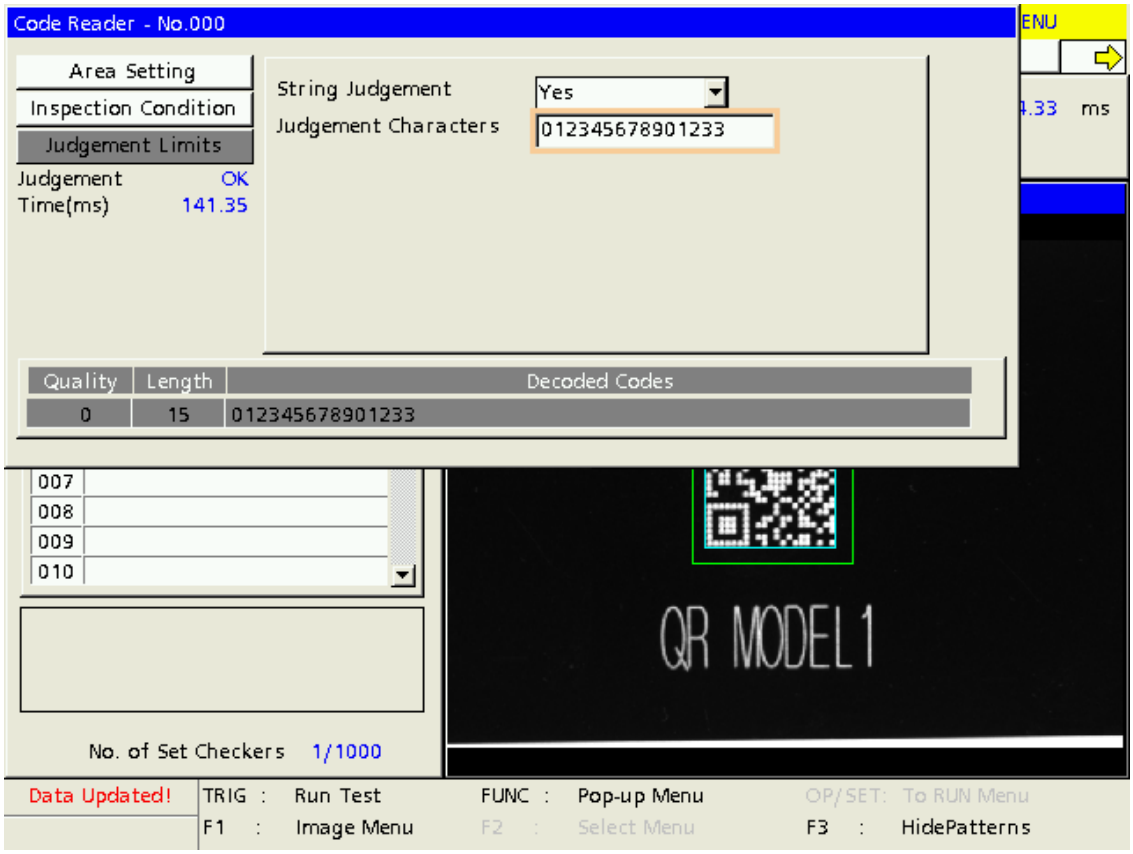
To judge the character string (five numbers and five lowercase alphabets) as OK, specify "#####,,,,," for the judgement characters.

3.5 Executing Test

Press the TRIG key to execute a test. Check whether or not the code could be read properly with the setting specified so far.

1. Press the TRIG key to execute a test.

The judgement, execution time, detected coordinates, result of quality check, code length and decoded code are displayed.



3.6 List of Output to Numerical Calculation, Judgement and Data R/W

Judgement

Code Reader (CDR) No.0-999	Judgement (JUDGE)	The read code should be the specified code and meet other specified judgement conditions.

Numerical calculation and Data R/W

Note

When the items in "Result" of numerical calculation and data R/W has been selected and "Statistics" has been selected, the compiled statistics data vary according to items.

Statistics type	Numeric Statistics	All Statistics	OK Statistics	NG Statistics
1	Judgment Statistics If the judgement of checker is OK, calculates “All Statistics” and “OK Statistics”. If the judgement is NG, calculates “All Statistics” and “NG Statistics”. When referring the statistics of judgments(JRC/JDC) during in RUN mode, the latest result is referred.	Scan Count (Judgment Count)	OK count	NG count
2	Statistics of checker results If the judgement of checker is OK, calculates “All Statistics” and “OK Statistics”. If the judgement is NG, calculates “All Statistics” and “NG Statistics”.	Minimum	OK Judge. Min.	NG Judge. Min.
		Maximum	OK Judge. Max.	NG Judge. Max.
		Average	OK average	NG average
		Range	OK range	NG range
		Variance	OK variance	NG variance

Numerical Calculation

Item	Result No.	Result Type	Statistics type	Output Value, etc	Supported Codes
Code Reader (CDR) No.0-999	---	Judgement (JUDGE)	1	OK=1, NG=0	All codes
		Inspection Time (TIME)	2		
		Quality (QUO)	2	0 - 4	
		Modulation (MODU)	2	0 - 4	
		Unused Error Correction (UERROR)	2	0 - 4	
		Contrast (CONTRAS)	2	0 - 4	
		Fixed Pattern Damage (FPD)	2	0 - 4	
		Decode (DEC)	2	0, 4	
		Axial nonuniformity (AXIAL)	2	0 - 4	
		Grid nonuniformity (GRID)	2	0 - 4	
		Length (LENGTH)	2	0 - 80	
	0 - 79	Decoded Codes (RCHAR)	2	ASCII code	All codes

Note When decoded codes have been registered for numerical calculation, decimal values converted from ASCII code of characters are input in the operation expression. For details of ASCII code, refer to Chapter 1.9.

Data R/W

"Yes" in the "Change" column indicates the value of the cell is modifiable from Data R/W sheet.

			Change	Statistics type	Supported Codes
Parameter	Area Setting	Start Point X	**Yes**	No	All codes
		Start Point Y	**Yes**	No	
		End Point X	**Yes**	No	
		End Point Y	**Yes**	No	
	Inspection Condition	Grayscale Preprocess	**Yes**	No	
	Judgement Limits	String Judgement	**Yes**	No	
		Judgement Character (0-15)	**Yes**	No	
		Judgement Character (16-31)	**Yes**	No	
		Judgement Character (32-47)	**Yes**	No	
		Judgement Character (48-63)	**Yes**	No	
		Judgement Character (64-79)	**Yes**	No	
Result		Judgement	No	1	
		Inspection Time	No	2	
		Quality	No	2	
		Modulation	No	2	
		Unused Error Correction	No	2	
		Contrast	No	2	
		Fixed Pattern Damage	No	2	
		Decode	No	2	
		Axial nonuniformity	No	2	
		Grid nonuniformity	No	2	
		Length	No	2	
		Decoded Codes	No	No	
		Decoded Codes (0-15)	No	No	
		Decoded Codes (16-31)	No	No	
		Decoded Codes (32-47)	No	No	
		Decoded Codes (48-63)	No	No	
		Decoded Codes (64-79)	No	No	

MEMO

Chapter 4

Communication Commands

4.1 General Output of Date and Time Information

PV has features of outputting judgements of inspections and results of numerical calculations through the I/O terminal block, and the ports, and writing them in an attached SD memory card. Also, inspected images can be output to a PC through Ethernet, or saved in a attached SD memory card.
With the former products, date and time information cannot be output when the output destination is Serial. With Ver.1.20, however, the information can be output to external devices as general results. In this section, the setting method of general output of date and time information is described.

▼Refer to▼

For information on the settings for other output data such as judgement results or numerical calculation, refer to the PV200 User's Manual "11.2.2 Setting General Communication".

Setting Inspection Environment

To output date and time information to external devices, make the operation setting in ENVIRONMENT menu first. This setting is reflected in the setting window of "General Output" in Input/Output menu.

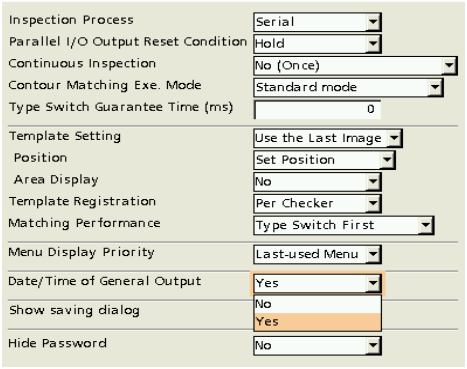
1. **Displays the setting window.**

2. **Select "ENVIRONMENT" > "system Settings" > "Operation" from the menu bar.**

3. **Select "Date/Time of Genera Output".**

"Yes": Date and time can be set in the setting window of "General Output".
"No": Date and time cannot be set.

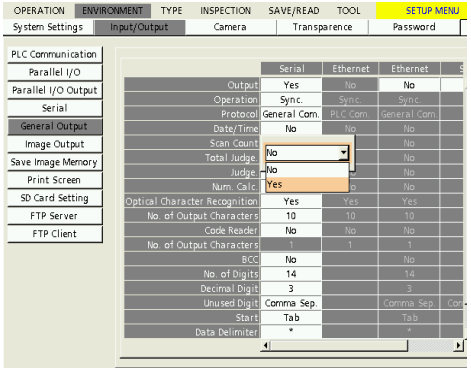
The default is "Yes".



▶ Note

- When reading the setting data of Ver.1.20 or earlier, "Date/Time" in "General Output" is set to "No". For outputting date and time information using the setting data of old versions, make the above setting.。

General Output Setting



1. **Select "ENVIRONMENT" > "Input/Output" > "General Output" from the menu bar.**

2. **Put the cursor on the item of "Date/Time", and select "Yes" or "No".**

"Yes": Date and time information is output as general results.
"No": Date and time information is not output as general results.

The default is "Yes".

▶ Note

- It is not possible to output date and time information only. Make the settings for outputting other items such as Judgement output and numerical calculation to "Yes" before the output setting of date and time. When all other output items are "No", "Date/Time" is grayed out and cannot be set.
- The settings displayed in a horizontal row are changed and reflected together in the output data of "General Output" setting window.

▼Refer to▼

For information on the output examples of general results, refer to the PV200 User's Manual "11.2.3 Outputting Data Through General Communication".

4.2 Communication Commands

4.2.1 List of Commands

The commands described in this chapter are the common commands for the ports to change or read the parameters of character recognition checker through RS-232C interface and Ethernet interface. For the details of other commands, refer to Chapter 11.2.4 in the PV200 User's Manual. Also, for the details of reading SD dictionary, refer to page 110 “4.4 Reading SD Dictionary with External Device”.

▶ Note

Port number of Ethernet interface to send/ receive commands for PV230 is “8604”.

List of Commands related to Character recognition

			Command	Parameter
Judged characters		**Read**	%PR	OCRccc:STRING
		Change	%PW	OCRccc:STRING = Judgement characters
Calendar Offset	**Year**	**Read**	%PR	OCRccc:YEAR
		Change	%PW	OCRccc:YEAR = Offset value
	Month	**Read**	%PR	OCRccc:MONTH
		Change	%PW	OCRccc:MONTH = Offset value
	Day	**Read**	%PR	OCRccc:DAY
		Change	%PW	OCRccc:DAY = Offset value
	Hour	**Read**	%PR	OCRccc:HOUR
		Change	%PW	OCRccc:HOUR = Offset value
Reading SD dictionary			%DR	??
Reading all dictionary data			%AD	??
Min. recognition rate		**Read**	%PR	OCRccc:RECOG
		Change	%PR	OCRccc:RECOG=Min. recognition rate
Min. recognition rate (Individual)		**Read**	%PR	OCRccc:RECOG_C(L)
		Change	%PR	OCRccc:RECOG_C(L)=Min. recognition rate 1, to Min. recognition rate 80

List of Commands related to Code reader

		Command	Parameter
Judged characters	**Read**	%PR	CDRccc:STRING
	Change	%PW	CDRccc:STRING = Judgement characters

▶ Note

- "ccc" in commands indicates checker numbers (000 to 999).
- Both reading and writing cannot be executed in SETUP menu when the PV230 stops.

4.2.2 Details of Commands

"SEND" described in this chapter indicates the commands given from external devices to PV230. On the other hand, "Receive" indicates the responses for the sent commands from PV230 to external devices.

About Response at Error

When sending a command message from the external device, an error response message containing 3-digit error code may be returned. This message is returned when the sent command is wrong or PV230 cannot receive the command.

The response differs depending on commands except the following common responses. Refer to the descriptions of each command.

Error Response Message Common to Commands

%	**!**	**1**	**0**	**0**	**BCC(35)**	**CR**

- This message is sent when Block Check Code (BCC) error occurred or an undefined command (unrecognizable command) is received.
- Error signal turns on.

%	**!**	**1**	**1**	**0**	**BCC(34)**	**CR**

- Receive buffer overflow of PV230. This might occur when inputting multiple commands in a row from the external device to PV230. If you receive this error response, decrease commands to send to PV230.
- Error signal turns on.

Character Recognition: Read judgement characters

Send

%	P	R		O	C	R	c	c	c	:	S	T	R	I	N	G	BCC	CR

ccc = 000 - 999 (Checker No.)

Receive

%	P	R	$	O	C	R	c	c	c	:	S	T	R	I	N	G	=	Judgement characters	BCC	CR

Error (Error signal = ON)

%	P	R	!	Error code (3-digit)	BCC	CR

Error Code

200 Cannot be executed as operation is stopped.

251 Specification of the parameter is wrong. (Undefined parameter is specified.)

252
- Uncreated checker is specified.
- "Calendar" is specified for Judgement Type.

Character Recognition: Write judgement characters

Send

%	P	W		O	C	R	c	c	c	:	S	T	R	I	N	G	=	Judgement characters	BCC	CR

ccc = 000 - 999 (Checker No.)

Receive

%	P	W	$	O	C	R	c	c	c	:	S	T	R	I	N	G	BCC	CR

Error (Error signal = ON)

%	P	W	!	Error code (3-digit)	BCC	CR

Error Code

200 Cannot be executed as operation is stopped.

251 Specification of the parameter is wrong. (Undefined parameter is specified.)

252
- Uncreated checker is specified.
- "Calendar" is specified for Judgement Type.
- Character string with more than 80 characters is specified.
- Characters other than provided dictionary labels (0-9, A-Z, a-z, - , / , . , * , (,) , < , > , & , $, : , +) are included.

Read calendar offset

Offset: Year

Send

%	P	R		O	C	R	c	c	c	:	Y	E	A	R	BCC	CR

ccc = 000 - 999 (Checker No.)

Receive

%	P	R	$	O	C	R	c	c	c	:	Y	E	A	R	=	Offset	BCC	CR

Offset = -99 to 99

Offset: Month

Send

%	P	R	:	O	C	R	c	c	c	:	M	O	N	T	H	BCC	CR

ccc = 000 - 999 (Checker No.)

Receive

%	P	R	$	O	C	R	c	c	c	:	M	O	N	T	H	=	Offset	BCC	CR

Offset = -11 to 11

Offset: Day

Send

%	P	R		O	C	R	c	c	c	:	D	A	Y	BCC	CR

ccc = 000 - 999 (Checker No.)

Receive

%	P	R	$	O	C	R	c	c	c	:	D	A	Y	=	Offset	BCC	CR

Offset = -30000 to 30000

Offset: Hour

Send

%	P	R		O	C	R	c	c	c	:	H	O	U	R	BCC	CR

ccc = 000 - 999 (Checker No.)

Receive

%	P	R	$	O	C	R	c	c	c	:	H	O	U	R	=	Offset	BCC	CR

Offset = -23 to 23

Receive at Error Common to Reading Offset

Error — Error signal = ON

Receive

%	P	R	!	Error code (3-digit)	BCC	CR

Error Code

200 Cannot be executed as operation is stopped.

251 Specification of the parameter is wrong. (Undefined parameter is specified.)

252
- Uncreated checker is specified.
- " Character String" is specified for Judgement Type.

Write (modify) calendar offset

Offset: Year

Send

%	P	W		O	C	R	c	c	c	:	Y	E	A	R	=	Offset	BCC	CR

- ccc = 000 - 999 (Checker No.)
- Offset = -99 to 99

Receive

%	P	W	$	O	C	R	c	c	c	:	Y	E	A	R	BCC	CR

Offset: Month

Send

%	P	W		O	C	R	c	c	c	:	M	O	N	T	H	=	Offset	BCC	CR

- ccc = 000 - 999 (Checker No.)
- Offset = -11 to 11

Receive

%	P	W	$	O	C	R	c	c	c	:	M	O	N	T	H	BCC	CR

Offset: Day

Send

%	P	W		O	C	R	c	c	c	:	D	A	Y	=	Offset	BCC	CR

- ccc = 000 - 999 (Checker No.)
- Offset = -30000 to 30000

Receive

%	P	W	$	O	C	R	c	c	c	:	D	A	Y	BCC	CR

Offset: Hour

Send

%	P	W		O	C	R	c	c	c	:	H	O	U	R	=	Offset	BCC	CR

- ccc = 000 - 999 (Checker No.)
- Offset = -23 to 23

Receive

%	P	W	$	O	C	R	c	c	c	:	H	O	U	R	BCC	CR

Receive at Error Common to Writing Offset

Error — Error signal = ON

Receive

%	P	W	!	Error code (3-digit)	BCC	CR

Error Code

200 Cannot be executed as operation is stopped.

251 Specification of the parameter is wrong. (Undefined parameter is specified.)

252
- Uncreated checker is specified.
- " Character String" is specified for Judgement Type.
- Offset out of range is specified.

Optical Character Recognition: Read minimum recognition rate

Send

%	P	R		O	C	R	c	c	c	:	R	E	C	O	G	BCC	CR

- ccc = 000 - 999 (Checker No.)

Receive

%	P	R	$	O	C	R	c	c	c	:	R	E	C	O	G	=	Min. recognition rate	BCC	CR

- Min. recognition rate = 0 to 100

Error (Error signal = ON)

%	P	R	!	Error code (3-digit)	BCC	CR

Error Code

200 Cannot be executed as operation is stopped.

251 Specification of the parameter is wrong. (Undefined parameter is specified.)

252 Uncreated checker is specified.
"String Judgement" is set to "No".

Optical Character Recognition: Write minimum recognition rate

Send

%	P	W		O	C	R	c	c	c	:	R	E	C	O	G	=	Min. recognition rate	BCC	CR

- ccc = 000 - 999 (Checker No.)
- Min. recognition rate = 0 to 100

Receive

%	P	W	$	O	C	R	c	c	c	:	R	E	C	O	G	BCC	CR

Error (Error signal = ON)

%	P	W	!	Error code (3-digit)	BCC	CR

Error Code

200 Cannot be executed as operation is stopped.

251 Specification of the parameter is wrong. (Undefined parameter is specified.)

252 Uncreated checker is specified.
"String Judgement" is set to "No".

Optical Character Recognition: Read minimum recognition rate (Individual)

Send

%	P	R		O	C	R	c	c	c	:	R	E	C	O	G	_	C(L)	BCC	CR

- ccc = 000 – 999 (Checker No.)
- RECOG_C: Per judgement character (total 80 points) RECOG_L: Per dictionary label (Total 74 points '1' to '+')

Receive

%	P	R	$	O	C	R	c	c	c	:	R	E	C	O	G	=	Min. recognition rate 1	,	to

Min. recognition rate 80	,	BCC	CR

- Min. recognition rate = 0 to 100

Error (Error signal = ON)

%	P	R	!	Error code (3-digit)	BCC	CR

Error Code

200 Cannot be executed as operation is stopped.

251 Specification of the parameter is wrong. (Undefined parameter is specified.)

252 Uncreated checker is specified.
"String Judgement" is set to "No".

Optical Character Recognition: Write minimum recognition rate (Individual)

Send

%	P	R	$	O	C	R	c	c	c	:	R	E	C	O	G	_	C(L)	=	Min. recognition rate 1	,	to

Min recognition rate 80	,	BCC	CR

- ccc = 000 – 999 (Checker No.)
- Min. recognition rate = 0 to 100
- RECOG_C: Per judgement character (total 80 points) RECOG_L: Per dictionary label (Total 74 points '1' to '+')

Receive

%	P	W	$	O	C	R	c	c	c	:	R	E	C	O	G	_	C(L)	BCC	CR

Error (Error signal = ON)

%	P	W	!	Error code (3-digit)	BCC	CR

Error Code

200 Cannot be executed as operation is stopped.

251 Specification of the parameter is wrong. (Undefined parameter is specified.)

252 Uncreated checker is specified.
"String Judgement" is set to "No".

Code Reader: Read judgement characters

Send

%	P	R		C	D	R	c	c	c	:	S	T	R	I	N	G	BCC	CR

ccc = 000 - 999 (Checker No.)

Receive

%	P	R	$	C	D	R	c	c	c	:	S	T	R	I	N	G	=	Judgement characters	BCC	CR

Error (Error signal = ON)

%	P	R	!	Error code (3-digit)	BCC	CR

Error Code

200 Cannot be executed as operation is stopped.

251 Specification of the parameter is wrong. (Undefined parameter is specified.)

252
- Uncreated checker is specified.
- "String Judgement" is set to "No".

Code Reader: Write judgement characters

Send

%	P	W		C	D	R	c	c	c	:	S	T	R	I	N	G	=	Judgement characters	BCC	CR

ccc = 000 - 999 (Checker No.)

Receive

%	P	W	$	C	D	R	c	c	c	:	S	T	R	I	N	G	BCC	CR

Error (Error signal = ON)

%	P	W	!	Error code (3-digit)	BCC	CR

Error Code

200 Cannot be executed as operation is stopped.

251 Specification of the parameter is wrong. (Undefined parameter is specified.)

252
- Uncreated checker is specified.
- Character string with more than 80 characters is specified.
- Characters other than those that can be input (0-9, A-Z, a-z, -/.*()<>&$:+) are included.
- "String Judgement" is set to "No".

4.3 PLC Communication Commands

4.3.1 Read Command Parameters

Character recognition (Read)

Command		Response result	
CIR	0A02 h	COR	Result output completion=1
CIR+1	1100 h	COR+1	Normal end=0 or Error code
CIR+2	6		
CIR+3	Code	COR+2	n
CIR+4,CIR+5	Checker No.	From COR+3	Result

The value of COR+2 is "4" for calendar offset. For reading judgement characters, however, it varies according to the number of judgement characters. The number of bytes of judgement characters is stored.

		Code	Minimum	Maximum
Judgement characters		1100 h		
Calendar Offset	Year	1101 h	-99	99
	Month	1102 h	-11	11
	Day	1103 h	-30000	30000
	Hour	1104 h	-23	23
Min. recognition rate		1111h	0	100

Optical character recognition: Min. recognition rate (Individual) (Read)

Command		Response result	
CIR	0A02 h	COR	Result output completion=1
CIR+1	1100 h	COR+1	Normal end=0 or Error code
CIR+2	6		
CIR+3	Code	COR+2	n
CIR+4,CIR+5	Checker No.	COR+3,COR+4	Result Per judgement character ('No.0') Per dictionary label ('1')
		to	
		COR+149,COR+150	Result Per judgement character ('No.73') Per dictionary label ('+')
		to	
		COR+161,COR+162	Result Per judgement character ('No.79')

	Code	Minimum	Maximum
Min. recognition rate (Individual) (Per judgement character)	1112h	0	100
Min. recognition rate (Individual) (Per dictionary label)	1113h	0	100

Code reader (Read)

Command		Response result	
CIR	0A02 h	COR	Result output completion=1
CIR+1	1200 h	COR+1	Normal end=0 or Error code
CIR+2	6		
CIR+3	Code	COR+2	n
CIR+4,CIR+5	Checker No.	From COR+3	Result

	Code
Judgement characters	1200 h

Note

For reading judgement characters, the value of COR+2 varies according to the number of judgement characters. The number of bytes of judgement characters is stored.

4.3.2 Write Command Parameters

Character recognition (Write)

Command	
CIR	0A12 h
CIR+1	1100 h
CIR+2	n
CIR+3	Code
CIR+4,CIR+5	Checker No.
From CIR+6	Data

Response result	
COR	Result output completion = 1
COR+1	Normal end=0 or Error code
COR+2	0

The value of CIR+2 is "10" for calendar offset. For writing judgement characters, however, it varies according to the number of judgement characters. Specify the number of bytes from CIR+3 to the end of judgement characters.

		Code	Minimum	Maximum
Judgement characters		1100 h		
Calendar Offset	Year	1101 h	-99	99
	Month	1102 h	-11	11
	Day	1103 h	-30000	30000
	Hour	1104 h	-23	23
Min. recognition rate		1111h	0	100

Optical character recognition: Min. recognition rate (Individual) (Write)

Command		Response result	
CIR	0A02 h	COR	Result output completion =1
CIR+1	1100 h	COR+1	Normal end =0 or Error code
CIR+2	0146h (Per judgement character) *1 012Eh (Per dictionary label) *2	COR+2	0
CIR+3	Code		
CIR+4,CIR+5	Checker No.		
CIR+6,CIR+7	Data Per judgement character ('No.0') Per dictionary label ('1')		
	to		
CIR+152,COR+153	Data Per judgement character ('No.73') Per dictionary label ('+')		
	to		
CIR+164,COR+165	Data Per judgement character ('No.79')		

Note

*1: For "Per judgement character", it is possible to specify the size, the number of judgement characters 4 bytes + 6 bytes.
*2: For "Per dictionary label", all data must be written because symbol and element positions, '1' to '0', 'A' to 'Z', 'a' to 'z' are fixed.

	Code	Minimum	Maximum
Min. recognition rate (Individual) (Per judgement character)	1112h	0	100
Min. recognition rate (Individual) (Per dictionary label)	1113h	0	100

Code reader (Write)

Command		Response result	
CIR	0A12 h	COR	Result output completion = 1
CIR+1	1200 h	COR+1	Normal end=0 or Error code
CIR+2	n		
CIR+3	Code	COR+2	0
CIR+4,CIR+5	Checker No.		
From CIR+6	Data		

	Code
Judgement characters	1200 h

4.4 Reading SD Dictionary with External Device

Up to five dictionaries can be registered in the PV230. When performing character recognition using more dictionaries, dictionaries saved in a SD card can be read by the instruction from an external device.

There are three methods to read dictionaries using an external device.

- Read by parallel input
- Read by general-purpose communication command
- Read by PLC communication command

Dictionary Data and Contents to be Read

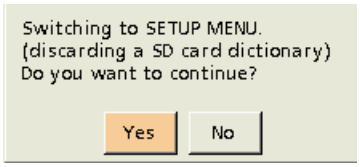
Details of dictionary data	
Dictionary learning data	This data is necessary to perform character recognition.
Dictionary image data	This data is not necessary for character recognition, but necessary to calculate recognition rate.

Details of dictionary data to be read	
Reading dictionary data	Only dictionary data is read. As image data is not read, recognition rate cannot be used. (Note that recognition rate is calculated using dictionary images used in SETUP menu.)
Reading all dictionary data	Both dictionary learning data and image data are read. Recognition rate can be used for reading.

▶ Note

When reading dictionary data in RUN menu and switching to SETUP menu, a message saying "Switching to SETUP MENU. (discarding a SD card dictionary) Do you want to continue? Yes/No" is displayed. Select "No" to return to RUN menu.

If selecting "Yes" and changing to SETUP menu, the dictionary read from the external device will be deleted and the previous dictionary will be available.



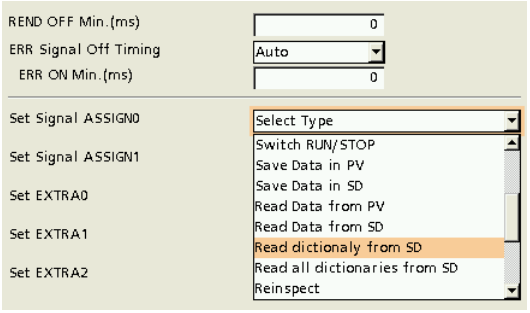
4.4.1 Reading SD Dictionary by Parallel Input

To read SD dictionary data by parallel input, "Read dictionary from SD" function should be assigned to any one of ASSIGN0 to 1 and EXTRA0 to 2.

1. Select "ENVIRONMENT" > "Input/Output".

2. Select a signal to be assigned in "Parallel"

Select "Read dictionary from SD" as an assigned signal.



IN0 - 7: Input data

For reading dictionary data, specify the dictionary number to be read in IN0 to 7 using binary data.

Example) To read Dictionary No. 11

IN7	IN6	IN5	IN4	IN3	IN2	IN1	IN0
0	0	0	0	1	0	1	1

4.4.2 Reading SD Dictionary by General-purpose Communication Command

Reading dictionary (Learning data only)

Send

%	D	R	?	?	BCC	CR

?? = 00 - 99 (Dictionary No.)

Receive

%	D	R	$	BCC	CR

Error (Error 1 signal = ON)

%	D	R	!	Error code (3-digit)	BCC	CR

Reading all dictionary data

Send

%	A	D	?	?	BCC	CR

?? = 00 - 99 (Dictionary No.)

Receive

%	A	D	$	BCC	CR

Error (Error signal = ON)

%	A	D	!	Error code (3-digit)	BCC	CR

4.4.3 Reading SD Dictionary by PLC Communication Command

Reading dictionary (Learning data only)

Command		Response result	
CIR	0600 h	COR	Result output completion = 1
CIR+1	0242h	COR+1	Normal end=0 or Error code
CIR+2	4		
CIR+3,CIR+4	Dictionary No.	COR+2	0

Reading all dictionary data

Command		Response result	
CIR	0600 h	COR	Result output completion = 1
CIR+1	0252h	COR+1	Normal end=0 or Error code
CIR+2	4		
CIR+3,CIR+4	Dictionary No.	COR+2	0

4.4.4 Error Codes

200 Cannot be executed as operation is stopped.

205 Command timeout

212 Other number than 00-99 is specified for dictionary number.

213 No SD memory card is attached, the card cannot be accessed, or the specified data does not exist.

251 Specification of the parameter is wrong. (Undefined parameter is specified.)

214 The dictionary file is compatible.

▶ Note

The command timeout occurs when the command is input while READY signal is off and when it does not turn on within one second. When "Recognition rate method" has been set to an item other than "No" in Optical Character Recognition, the error code 180 is displayed if executing an inspection after reading dictionary (learning data only), and the Err signal turns on.

Chapter 5

Other Functions

5.1 Other Functions

5.1.1 Hide Password

Input characters of the soft keyboard when setting a password can be displayed as asterisk(*).
(Available from PV230 Ver.1.30)

Screens in which Hide Password setting is available

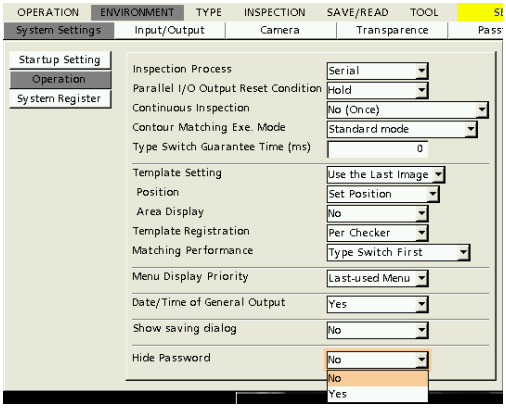
RUN menu

- “Account” -> “Switch User” screen
- Password setting screen (Switching to SETUP Menu)

SET UP menu

- User registration in FTP Server setting
- User registration in FTP Client setting
- Password setting
- Account setting

Setting "Hide Password"

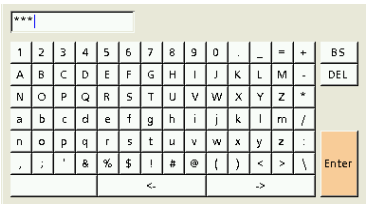


1. **Select “ENVIRONMENT” -> “System Settings” -> “Operation” from the menu bar.**

2. **Select "No" or ”Yes” in “Hide Password”.**

“No” : Displays the password.(Default)
“Yes” : Displays the password in “ * ”.

When selecting "Yes", the keyboard input of a password is displayed as below.



Index

Record of Changes

Manual No.	Date	Revision detail
WME-PV230-OP-01	April 2012	1st edition
WME-PV230-OP-02	June 2014	2nd edition ・Revision and addition along with version update to Ver.1.2
WME-PV230-OP-03	June 2017	3rd edition ・Revision and addition along with version update to Ver.1.3
WME-PV230-OP-04	April 2021	4th edition ・Revision and addition along with version update to Ver.1.5

Version Upgraded Items

Items available for PV230 Ver.1.3

■Unique upgraded functions of PV230

	Item	Reference section of this manual
1	Extended the settable range of offset date for the calendar function of character recognition. Versions before 1.3: Settable range : -364 to 364 Version 1.3: Settable range : -30000 to 30000	[2.6.3Judgement Type - Calendar]
2	Added the following functions for General Output. • Header and footer function. • Function to change delimiter	OCR Checker : [2.5 Setting Inspection Condition] Code Reader Checker [3.3.5 Outputting Read Code]
3	The asterisk display (*) becomes available when entering a password.	[5.1.1 Hide Password]

■Additional functions from PV200

The PV230 Ver.1.3 supports the following standard functions of PV200. For the details of the following items, refer to each chapters of PV200 User's Manual.

	Item	Reference section of PV200 User's Manual
1	Added "Circle/Feature Rotation" to Position Adjustment.	"4.8.3 Setting Position Adjustment"
2	A screen currently being set can be switched to RUN menu.	"3.1.3 Switching the Screen Currently Being Set to RUN Menu"
3	A message confirming whether to save setting data can be displayed before switching SETUP menu to RUN menu.	"4.6.6 Preprocess Image Switch Function"
4	Added the switch function between preprocess images and original images.	
5	Camera type can be set from "TYPE" > "Type Setting" > "Camera".	-
6	The error log display is available.	"10.2.4 Error Log Display Function"
7	Added the display color changing function of Data R/W.	"4.19.1 Setting Data R/W"
8	Added the reference of Judgement Result (JRC/JDC) to the file name of Image Output.	"4.17.2 Outputting Inspection Images to External Device"
9	Added Account Function.	"7.2.5 Setting User Account"
10	FTP Client Function is available.	"6.3.5 FTP Client Function"
11	Added FTP Server Function.	"6.3.4 Setting FTP Server"
12	Checkers can be copied between different types.	"4.7.2 Creating a Checker"

* The chapter numbers of the manual are those as of June, 2017. The numbers may change in accordance with the revision of the manual.

Items available for PV230 Ver.1.5

■Unique upgraded functions of PV230

	Item	Reference section of this manual
1	Added " Recognition rate judgement" to the character recognition inspection conditions.	"2.5 Setting Inspection Condition"
2	Added a function that makes judgement only by the number of judgement characters if the number of decoded codes exceeds the number of judgement characters.	"3.4 Setting Judgement Condition"

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