

Chapter 5

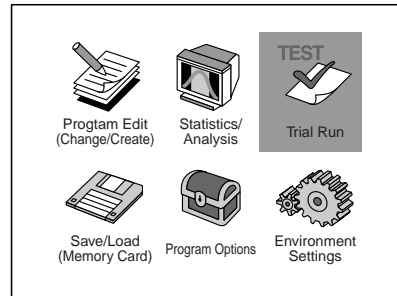
Run and Trial Run

Trial Run

Trial run operates in the same way as the Run mode, except it does not perform the RUN output. You can check whether the setup is appropriate for the work piece by activating the actual line.

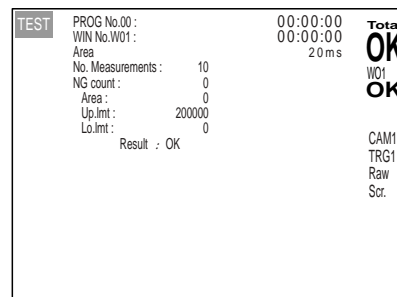
Operating the trial run

- 1 Press the [MENU] button of the remote control console to display the initial screen of the CV-2100.
- 2 Select [Trial Run].



The screen switches to that of the trial run. Input a trigger to start the trial run.

During the trial run, [TEST] is indicated on the upper right of the screen.



Refer to [Run] (page 5-2) for the operation during the trial run.

Run

Performs an actual inspection based on the specified settings.

Starting and Ending the Run

1 Press the selector switch of the remote control console to switch the CV-2100 to the run mode.

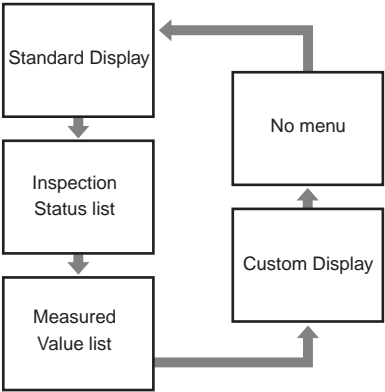
2 Input a trigger.
Starts the run.

RUN	PROG No.00 :	00:00:00	Total
	WIN No.W01 :	00:00:00	OK
	Area	20 ms	W01
	No. Measurements :	0	OK
	NG count :	0	
	Area :	0	
	Up.lmt :	200000	
	Lo.lmt :	0	
	Result : OK		
			CAM1
			TRG1
			Raw
			Scr.

During the run, the measurement result or the inspection status is displayed.

Displaying the Screen During the Run

When you press the [VIEW] button of the remote control console, only the items that are set on [Run Mode Display Select.] (page 6-6) in the [Option Settings] screen are displayed in the following order.



The contents of the displayed items are shown below.

Standard Display

Displays the following.

- RUN indication
- PROG No. and name
- Overall inspection status
- Window No. and name
- Measurement value and inspection result of the window
- Process time
- Current camera and trigger number
- Screen type (raw, process 1, process 2)

RUN	PROG No.00 :	00:00:00	Total
	WIN No.W01 :	00:00:00	OK
	Area	20 ms	W01
	No. Measurements :	0	OK
	NG count :	0	
	Area :	0	
	Up.lmt :	200000	
	Lo.lmt :	0	
	Result : OK		
			CAM1
			TRG1
			Raw
			Scr.

To switch the displayed window number

Move the [ENTER] button of the remote control console up and down.

To see multiple measurement values

In the case of the pattern multi position or the blob measurement mode, the measurement values are displayed on multiple screens. If you want to confirm other measurement values, move the [ENTER] button of the console to the right and left.

Inspection Status list

Displays the window that has been set, and the inspection status list of value calculation.

RUN	PROG No.00 :	Result	WIN No.	Result	Total
	WIN No.W01 :				OK
	01	OK	16	--	
	02	NG	17	--	
	03	OK	18	--	
	04	OK	19	--	
	05	OK	20	--	
	06	--	21	--	
	07	--	22	--	
	08	--	23	--	
	09	--	24	--	
	10	--	25	--	
	11	--	26	--	
	12	--	27	--	
	13	--	28	--	
	14	--	29	--	
	15	--	30	--	

To see the inspection status of a window that is not displayed

Move the [ENTER] button of the remote control console to the right and left.

Measured Value list

Displays the window that has been set, and the inspection status list of value calculation.

RUN	PROG No.01 :	Total
	WIN No.W01-Area	OK
	Area :	200000
	WIN No.W02-Edge position	WD1
	X Pos :	300,000
	Y Pos :	160,000
	No. edges :	005

To see the inspection status of a window that is not displayed

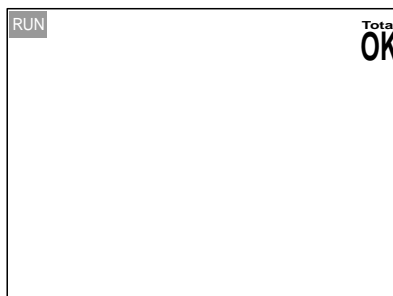
Move the [ENTER] button of the remote control console to the right and left.

Custom Display

Displays the display items that are set at [Custom Display Setting] in the [Optional Settings] screen. Refer to "Selecting the Contents of the Custom Display [Custom display setting]" (page 6-7) for details.

No menu

Displays only the image from the cameras, and the overall inspection status.



Operation during the Run Mode

Switching the screen

Every time you press the [SCREEN] button of the console, the screen switches to the raw screen, selected window process screen, and entire window process screen.

Raw screen

Displays the captured image from the camera.

Selected window process screen (process screen 1)

- Scans the measurement window of the selected window. When the position adjustment is set, the position window for the selected window is also displayed.
- The image to be displayed is the processing image that is set in the selected window.
 - When the area measurement mode or blob measurement mode is selected, the binarized image is displayed.
 - When the pre-process of image is set, the pre-processed image is displayed.

Entire window process screen (process screen 2)

- Scans the measurement window of the entire window.
- The image to be displayed is the same as the one in the process screen 1. However, when the area measurement mode or blob measurement mode is selected, the image before binarizing is displayed.

Other operations

Saving the displayed screen as an image (Capture)

Press the [VIEW] button while pressing the [FNC] button.

Re-measuring (Retry)

Press the [TRIGGER] button while pressing the [FNC] button.

Overwriting the setting during the Run mode

Press the [MENU] button while pressing the [FNC] button (page 6-14).

Switching the display camera during the Run mode

Move the [ENTER] button up and down while pressing the [FNC] button (pages 6-20, 6-22).

Inputting the reset signal to the CV-2000

Press the [ESCAPE] button while pressing the [FNC] button.

Performance during the Run Mode

When the [STOP] input (Level input) is implemented for the terminal block

- [STOP] is displayed on the bottom right of the screen.
- The Trigger input is prohibited, and all outputs are turned off. In the case of the internal trigger, the internal trigger is stopped.
- While measurement is taking place or the data is being output, all outputs are turned off after the measurement or output process.

When the [RESET] input is implemented for the terminal block

- Accumulated data, number of measurements, NG count, and multiple triggers in progress are reset.
- While measurement is taking place or the data is being output, all outputs are turned off after the measurement or output process.

Chapter 6

Changing the Settings for a Program No. [Program Options]

Overview of the [Program Options] Menu

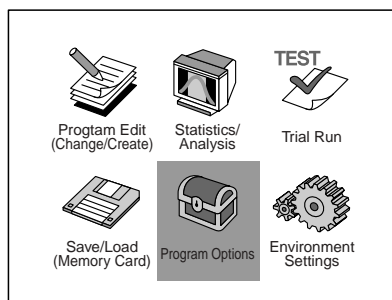
What is the [Program Options] Menu?

From the [Program Options] menu, you can change the settings of the CV-2100 including illumination adjustments and run mode settings for the currently selected Program No. You can change the settings for the following seven options:

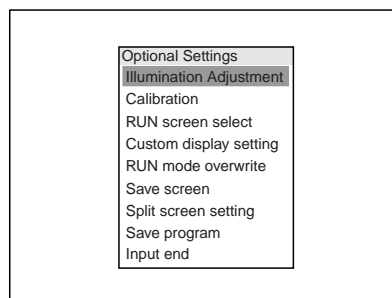
- [Illumination adjust] (page 6-2)
- [Calibration] (page 6-3)
- [RUN screen select] (page 6-6)
- [Custom display setting] (page 6-7)
- [RUN mode overwrite] (page 6-14)
- [Save screen] (page 6-15)
- [Split screen setting] (page 6-19)
- [Save Program] (page 6-23)

To display the [Program Options] menu:

- 1 Open the initial screen of the CV-2100 by pressing the [MENU] button on the remote control console
- 2 Select [Program Options].



The [Optional Settings] screen appears.



Adjusting the Illumination [Illumination adjust]

You can adjust the illumination to ensure stable detection even if the illumination intensity changes with time.

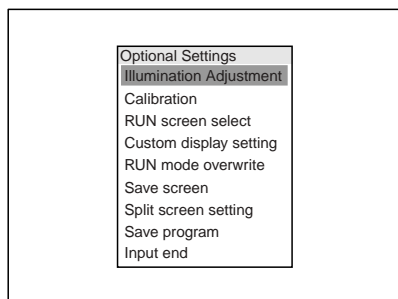
Note

- This feature cannot cope with a sudden change in intensity.
- The first trigger after the start-up is not adjusted.
- If you have selected [Multi-trig] under [Multi-measurement] (page 4-11), the screen for Trigger 1 is used as the reference for illumination adjustment and the screens for the other triggers are adjusted based on the value of Trigger 1.

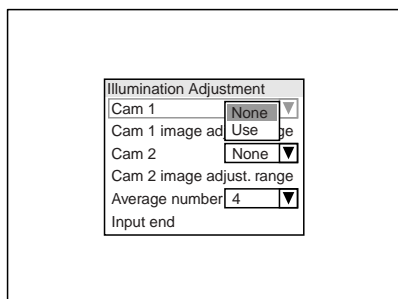
Reference

Select an area with a medium level of lightness as the reference range for illumination adjustment. If you select an area that is too light or too dark, a slight change in lightness will cause the illumination adjustment to saturate and you may not be able to obtain a stable result.

1 Select [Illumination adjust] on the [Optional Settings] screen.



2 Select [Cam 1], then specify whether you want to adjust the illumination.

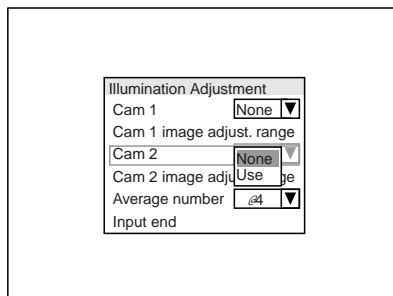


- **[None]** (default): Illuminations for Camera 1 is not adjusted.
- **[Use]**: Illumination for Camera 1 is adjusted.

3 If you selected to adjust the illumination for Camera 1, select [Cam 1 image adjust. range], then specify the adjustment target range.

If you selected not to adjust the illumination for Camera 1, go to step 4.

4 Select [Cam 2], then specify whether you want to adjust the illumination.



- **[None]** (default): Illumination for Camera 2 is not adjusted.
- **[Use]**: Illumination for Camera 2 is adjusted.

5 If you selected to adjust the illumination for Camera 2, select [Cam 2 image adjust. range], then specify the adjustment target range.

If you selected not to adjust the illumination for Camera 2, go to step 6.

6 Select [Average number], then select the number of measurements you want to use to obtain the average value for the adjustment.

The average value calculated from the adjustment values obtained through each measurement is used as the illumination adjustment value. The default is 4 times.

Reference

To make the device less subject to sudden changes in illumination intensity, specify a large number for [Average number].

7 When the setting is complete, select [Input end].

8 If you wish to make other configuration changes as well, continue the operation.

9 Save the changes.

Refer to "Saving the Optional Settings [Save Program]" (page 6-23) for details.

Note

The changes you made are not saved until you select [Save Program].

Displaying Measurement Values in Absolute Sizes [Calibration]

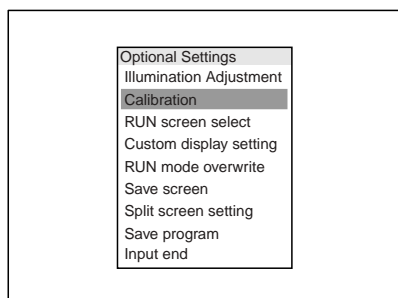
The CV-2100 processes screens in pixels internally, but it is possible to view the measurement values displayed on screens in their absolute sizes. This process is called “calibration.”

In the CV-2100, you can use either of the following two methods to convert measurement values:

- **Manual conversion:** Measurement values are multiplied by the coefficients you specify to be converted to absolute sizes (page 6-3).
- **Auto conversion:** The ratios are automatically set when you specify absolute sizes based on the measurement values obtained at the time of screen registration (page 6-4).

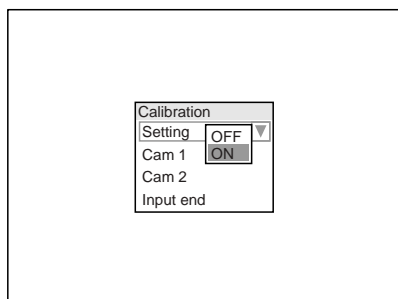
Converting Measurement Values by Multiplying Them by Specified Coefficients [Manual Convrns]

- 1 Select [Calibration] on the [Optional Settings] screen.

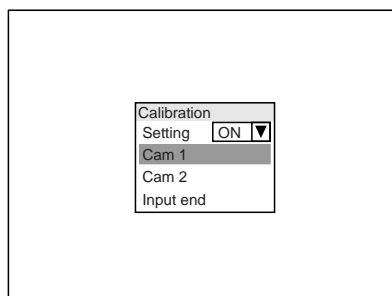


The [Calibration] screen appears.

- 2 Select [Setting], then select [ON].

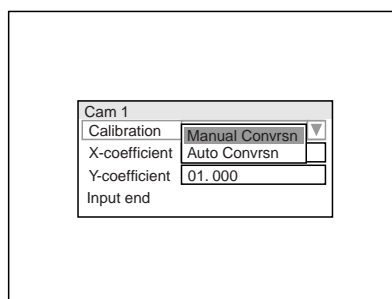


- 3 Select [Cam1 setting] to calibrate Camera 1



The [CAM1] screen appears.

- 4 Select [Calibration], then select [Manual Convrns].



- 5 Select [X-coefficient], then specify the desired ratio. Repeat the same process for [Y-coefficient].

The ratios you specify here are used to multiply the actual measurement values. The results are displayed on the screen as well as on external devices. Specify ratios that produce values close to the actual sizes. (The default value for both coefficients is 1.000. The range you can specify is from 0.001 to 10.000.)

For example, if you specify “2.000” for a coefficient and the actual measurement value is “30 pixels”, the measurement value is displayed as “60” (you can use any unit such as mm) on the screen and external devices.

- **[X-coefficient]:** Specify the ratio for the X-axis (horizontal).
- **[Y-coefficient]:** Specify the ratio for the Y-axis (vertical).

- 6 When the setting is complete, select [Input end].

- 7 To calibrate Camera 2, select [Cam2 setting] in step 3 and repeat steps 4 to 6.

8 When the setting is complete, select [Input end].

9 If you wish to make other configuration changes as well, continue the operation.

10 Save the changes.

Refer to “Saving the Optional Settings [Save Program]” (page 6-23) for details.

Note

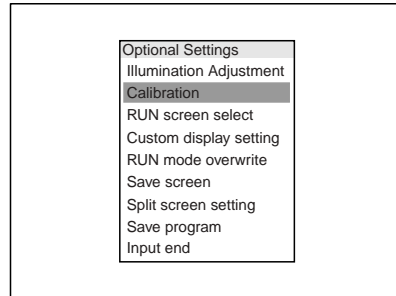
The changes you made are not saved until you select [Save Program].

To remove the calibration settings:

Select [Setting] on the [Calibration] screen in step 3 above, then select [OFF] to remove the calibration settings. Be sure to save the changes (page 6-23) after you remove the calibration settings.

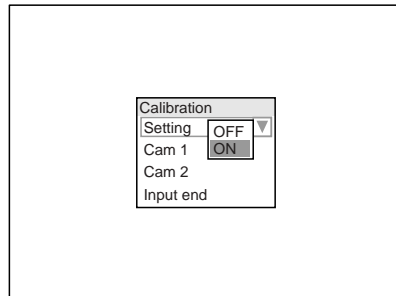
Specifying the Desired Absolute Size Based on the Actual Measurement Value [Auto Convrsn]

1 Select [Calibration] on the [Optional Settings] screen.

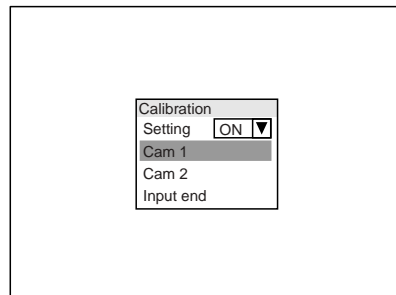


The [Calibration] screen appears.

2 Select [Setting], then select [ON].



3 Select [Cam1 setting] to calibrate Camera 1.

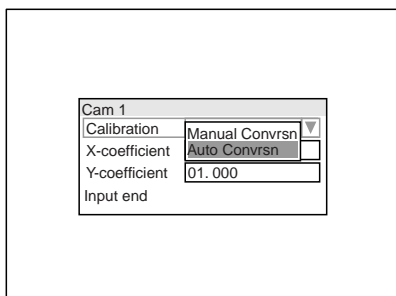


The [CAM1] screen appears.





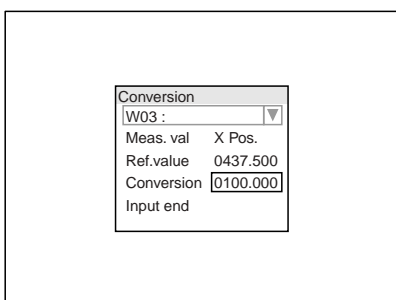
4 Select [Calibration], then select [Auto Convrns].



5 Select [X-coefficient].

The [Conversion] screen appears.

6 Specify the settings required to convert the X-axis value.



Window name

Select the window for which you want to convert the measurement values.

► Note

Certain windows may not appear in the drop-down list depending on the measurement type assigned to them.

[Meas. Val]

Select the value that is used as the reference for conversion.

- **[X Pos.]**: Horizontal (X-axis) position
- **[X Gap]**: Horizontal (X-axis) gap
- **[X Pitch]**: Horizontal (X-axis) pitch
- **[Cent grav. X]**: Horizontal (X-axis) center of gravity

► Note

The values you can select depend on the selected window name.

[Ref. Val]

The measurement value obtained on the registered screen is displayed as the reference value.

[Conversion]

Specify the target absolute size to which you want to convert the reference value. The conversion ratio is automatically set based on the reference value and the specified conversion value. (The default value for the conversion value is 1.000. The range you can specify is from 0.001 to 10.000.)

For example, if you specify "60" (you can use any unit such as mm) as the conversion value when the reference value is "30", the conversion ratio is automatically set to "2.000" and a measurement value of "60" is displayed on the screen and external devices.

► Note

A change in the window selection is not reflected in the calibration settings. If you change the window used for conversion after selecting [Auto Convrns] under [Calibration], you must specify the calibration settings again.

7 When the setting is complete, select [Input end].

8 Return to step 5 and select [Y-coefficient]. Then repeat steps 6 and 7 to specify the settings for the conversion of Y-axis.

9 To calibrate Camera 2, select [Cam2 setting] in step 3 and repeat steps 4 to 8.

10 When the setting is complete, select [Input end].

11 If you wish to make other configuration changes as well, continue the operation.

12 Save the changes.

Refer to "Saving the Optional Settings [Save Program]" (page 6-23) for details.

► Note

The changes you made are not saved until you select [Save Program].

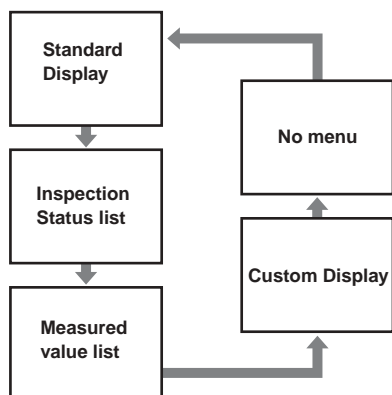
To remove the calibration settings:

Select [Setting] on the [Calibration] screen in step 3 above, then select [OFF] to remove the calibration settings. Be sure to save the changes (page 6-23) after you remove the calibration settings.

Selecting the Screen to View during Operation [RUN screen select]

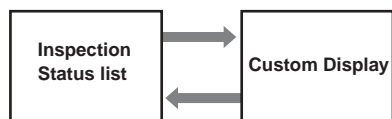
Pressing the [VIEW] button while operating the CV-2000 will switch the information displayed on the screen in the following order:

- **Standard Display:** The standard screen display.
- **Inspection Status list:** Lists inspection status.
- **Measured value list:** Lists measurement values.
- **Custom Display:** Displays the information specified using [Custom display setting] (page 6-7).
- **No menu**



You can select to display or hide these screens as needed. It is also possible to switch only between the screens you want to view.

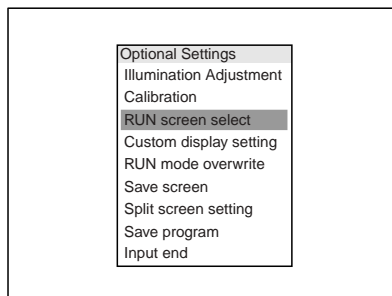
Example: Using only the Inspection Status list and the Custom Display



When you press the [VIEW] button, the display switches between these two screens.

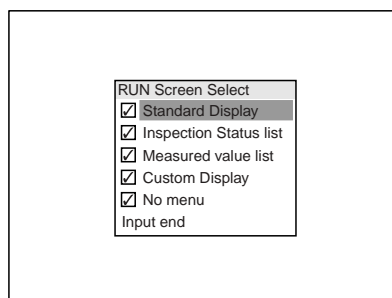
For details on the contents of each screen, refer to "Displaying the Screen During the Run" (page 5-2) or "Selecting the Contents of the Custom Display [Custom display setting]" (page 6-7).

- 1 Select [RUN screen select] on the [Optional Settings] screen.**



- 2 Select one or more items you want to view during operation to apply checkmarks in the corresponding checkboxes.**

By default, all items are checked. Remove the checkmarks from the items you want to hide.



- **Standard Display:** The standard screen display.
- **Inspection Status list:** Lists inspection status.
- **Measured value list:** Lists measurement values.
- **Custom Display:** Displays the information specified using [Custom display setting] (page 6-7).
- **No menu**

- 3 When the setting is complete, select [Input end].**

- 4 If you wish to make other configuration changes as well, continue the operation.**

- 5 Save the changes.**

Refer to "Saving the Optional Settings [Save Program]" (page 6-23) for details.

► Note

The changes you made are not saved until you select [Save Program].

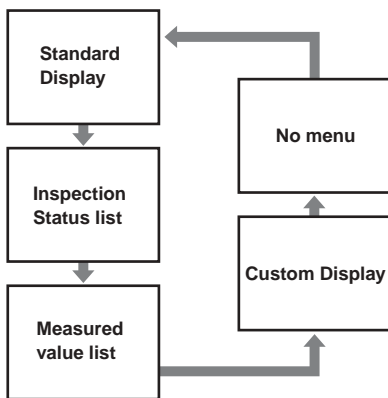
Selecting the Contents of the Custom Display

[Custom display setting]

What is the Custom Display?

Pressing the [VIEW] button while operating CV-2000 will switch the information displayed on the screen in the following order:

- **Standard Display:** The standard screen display.
- **Inspection Status list:** Lists inspection status.
- **Measured value list:** Lists the measurement values.
- **Custom Display:** Displays the information specified using [Custom display setting] (page 6-7.)
- **No menu**



For the Custom Display, you can select or change the contents displayed on the screen as needed. You can customize the display by specifying to display certain graphics so that you can see the operation status at a glance, as well as by selecting the types of information displayed.

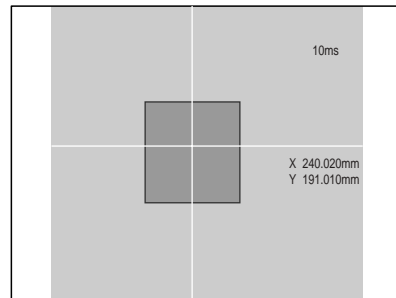
For details on other screens, refer to "Displaying the Screen During the Run" (page 5-2.)

Selecting the Standard Items Displayed on the Custom Display [Display stand. items]

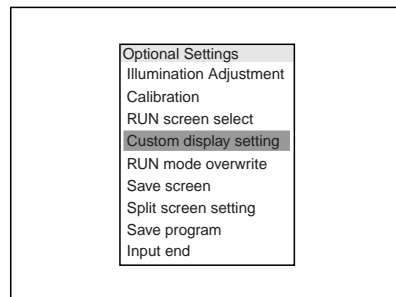
You can select the standard items displayed on the Custom Display as follows.

Example of the display:

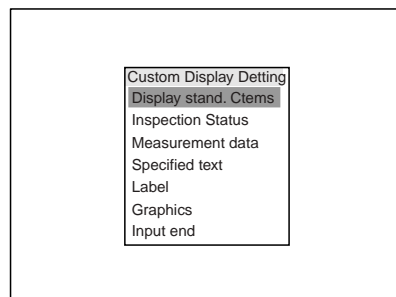
Selecting to display only the measurement values, process time, and graphics (horizontal and vertical lines)



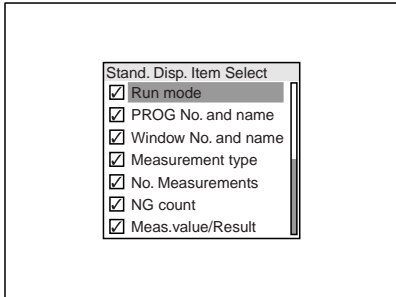
1 Select [Custom display setting] on the [Optional Settings] screen.



2 Select [Display stand. items].



- 3** Select one or more items you want to show on the Custom Display to apply checkmarks in the corresponding checkboxes.



You can select from the following items:

- [Run mode]
- [PROG. No. and name]
- [Window No. and name]
- [Measurement type]
- [No. Measurements]
- [NG count]
- [Meas. value/Result]
- [Date/time]
- [Total Insp. Status]
- [Process time]
- [Current camera]
- [Screen type]

Reference

- [No. Measurements] is the same as the number in the accumulated data. When an external reset input is received, this number is reset to zero.
- [NG count] is reset to zero as well when an external reset input is received.

- 3** When the setting is complete, select [Input end].

- 4** If you wish to make other configuration changes as well, continue the operation.

- 5** Save the changes.

Refer to “Saving the Optional Settings [Save Program]” (page 6-23) for details.

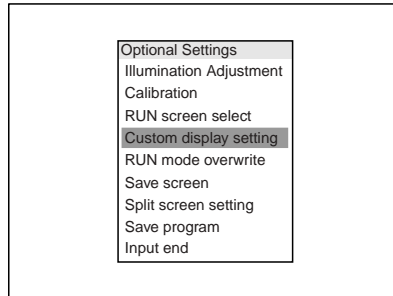
Note

The changes you made are not saved until you select [Save Program].

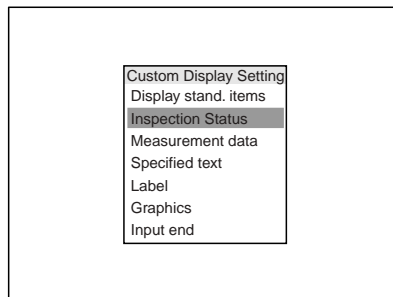
Specifying the Display Settings for Inspection Statuses on the Custom Display [Inspection Status]

You can select the inspection statuses to display on the Custom Display and how to display them. The maximum number of inspection statuses that can be displayed is 32.

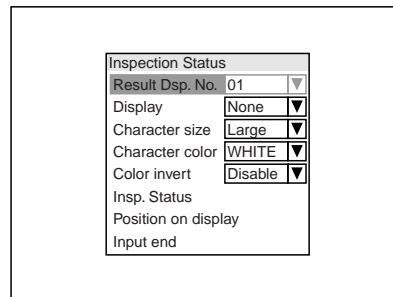
- 1** Select [Custom display setting] on the [Optional Settings] screen.



- 2** Select [Inspection Status].



- 3** Specify the display settings for inspection statuses.



[Result Dsp. No.]

Select the number (01 to 32) of the inspection status for which you want to specify the settings. You can change the display settings for each inspection status number. An asterisk (*) is displayed next to the numbers for which the settings have already been specified.





[Display]

Specify whether you want to show the inspection status.

- **[No]** (default): Hides the inspection status.
- **[Yes]**: Shows the inspection status.

[Character size]

Select the size of the characters used for displaying the inspection status from the following: [Large], [Medium], [Small].

[Character color]

Select the color of the characters used for displaying the inspection status.

[Color invert]

Specify whether you want to invert the color of the characters used for displaying the inspection status.

- **[Disable]**: The color is not inverted.
- **[Enable]**: The color is inverted.

[Insp. Status]

Select the inspection items you want to display.

Select [Insp. Status], then select the name of the target window and inspection items.

[Position on display]

Select the position in the Custom Display where you want to show the inspection status.

When the positioning frame appears, move the [ENTER] button to select the desired position, then press the [ENTER] button.

4 When the setting is complete, select [Input end].

5 If you wish to make other configuration changes as well, continue the operation.

6 Save the changes.

Refer to "Saving the Optional Settings [Save Program]" (page 6-23) for details.

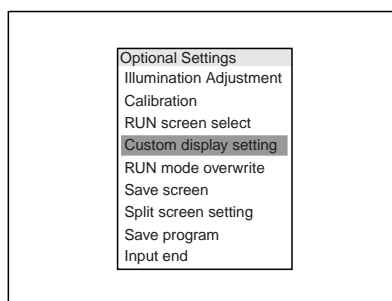
► Note

The changes you made are not saved until you select [Save Program].

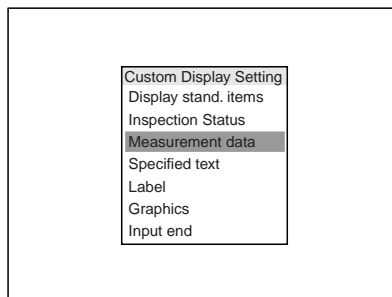
Specifying the Display Settings for Measurement Data on the Custom Display [Measurement data]

You can select the measurement data to display on the Custom Display and how to display calculated values. The maximum number of measurement data that can be displayed is 32.

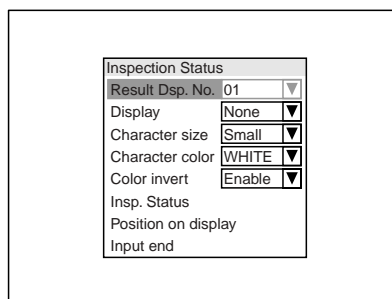
1 Select [Custom display setting] on the [Optional Settings] screen.



2 Select [Measurement data].



3 Specify the display settings for measurement data.



[Meas. data Dsp. No.]

Select the number (01 to 32) of the measurement data for which you want to specify the settings. You can change the display settings for each measurement data number. An asterisk (*) is displayed next to the numbers for which the settings have already been specified.



[Display]

Specify whether you want to show the measurement data.

- **[No]** (default): Hides the measurement data.
- **[Yes]**: Shows the measurement data.

[Character size]

Select the size of the characters used for displaying the measurement data from the following: [Large], [Medium], [Small].

[Character color]

Select the color of the characters used for displaying the measurement data.

[Color invert]

Specify whether you want to invert the color of the characters used for displaying the measurement data.

- **[Disable]**: The color is not inverted.
- **[Enable]**: The color is inverted.

[Meas. data selection]

Select the measurement data items you want to display. Select [Meas. data selection], then select the name of the target window and the measurement data items.

[Position on display]

Select the position in the Custom Display where you want to show the measurement data.

When the positioning frame appears, move the [ENTER] button to select the desired position, then press the [ENTER] button.

4 When the setting is complete, select [Input end].

5 If you wish to make other configuration changes as well, continue the operation.

6 Save the changes.

Refer to "Saving the Optional Settings [Save Program]" (page 6-23) for details.

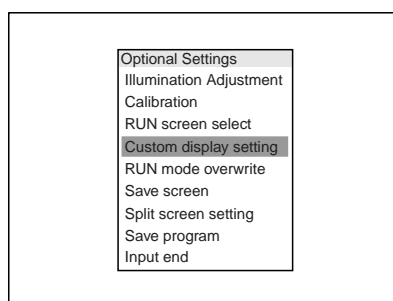
► Note

The changes you made are not saved until you select [Save Program].

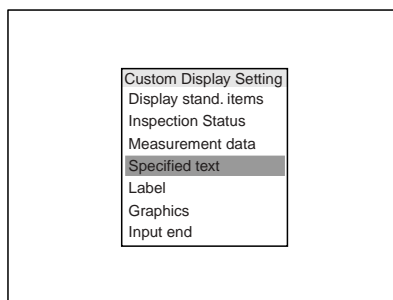
Displaying a Specified Text on the Custom Display [Specified text]

You can select to display a text you specified (up to 10 characters) on the Custom Display in addition to the operating information such as measurement data and inspection statuses. This feature is useful, for instance, when you want the type of the work to be constantly displayed.

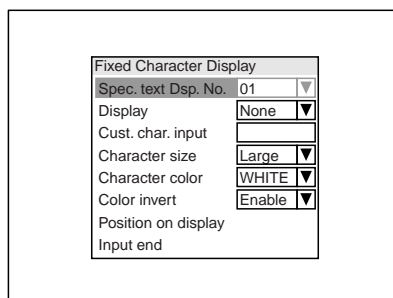
1 Select [Custom display setting] on the [Optional Settings] screen.



2 Select [Specified text].



3 Specify the text to display and its display settings.





[Spec. text Dsp. No.]

Select the number (01 to 32) of the specified text for which you want to specify the settings. You can change the display settings for each specified text number. An asterisk (*) is displayed next to the numbers for which the settings have already been specified.

[Display]

Specify whether you want to show the specified text.

- **[No]** (default): Hides the specified text.
- **[Yes]**: Shows the specified text.

[Cust. char. Input]

In the character input screen that appears, type the text (up to 10 characters) you want to display. Refer to "Input Texts" (page 3-4) for details on how to enter characters.

[Character size]

Select the size of the specified text from the following: Large, Medium, Small.

[Character color]

Select the color of the specified text.

[Color invert]

Specify whether you want to invert the color of the specified text.

- **[Disable]**: The color is not inverted.
- **[Enable]**: The color is inverted.

[Position on display]

Select the position in the Custom Display where you want to show the specified text.

When the positioning frame appears, move the [ENTER] button to select the desired position, then press the [ENTER] button.

4 When the setting is complete, select [Input end].

5 If you wish to make other configuration changes as well, continue the operation.

6 Save the changes.

Refer to "Saving the Optional Settings [Save Program]" (page 6-23) for details.

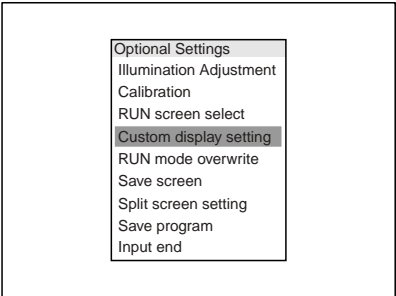
Note

The changes you made are not saved until you select [Save Program].

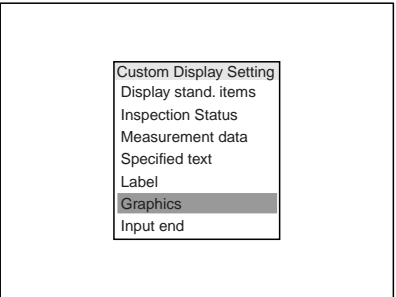
Displaying Graphics or Lines on the Custom Display [Graphics]

You can select to display up to 8 graphics you specified on the Custom Display in addition to the operating information such as measurement data and inspection statuses. This feature is useful, for instance, when you want the reference line to be constantly displayed.

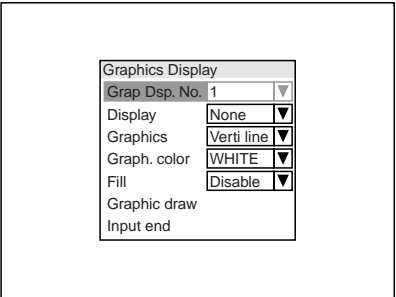
1 Select [Custom display setting] on the [Optional Settings] screen.



2 Select [Graphics].



3 Specify the graphic to display and its settings.





[Grap Dsp. No.]

Select the number of the graphic for which you want to specify the settings. You can change the display settings for each graphic number. An asterisk (*) is displayed next to the numbers for which the settings have already been specified.

[Display]

Specify whether you want to show the graphic.

- **[No]** (default): Hides the graphic.
- **[Yes]**: Shows the graphic.

[Graphics]

Select the type of graphic. You can select from the following:

- [Horiz line]
- [Verti line]
- [Crosspoint]
- [Circle]
- [Rectangle]

[Graphic color]

Select the color of the graphic.

[Fill]

Specify whether you want to fill the graphic.

- **[Disable]**: Only the outline of the graphic is displayed.
- **[Enable]**: The graphic is filled with the selected color.

Graphic draw

Draw the graphic you want to display.

For information on how to draw graphics, refer to "Drawing a Measurement Window" (page 3-5.)

4 When the setting is complete, select **[Input end]**.

5 If you wish to make other configuration changes as well, continue the operation.

6 Save the changes.

Refer to "Saving the Optional Settings [Save Program]" (page 6-23) for details.

► Note

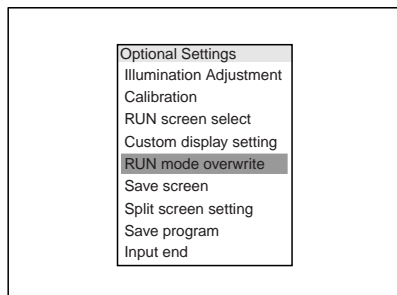
The changes you made are not saved until you select [Save Program].

Enabling Setting Changes during Operation

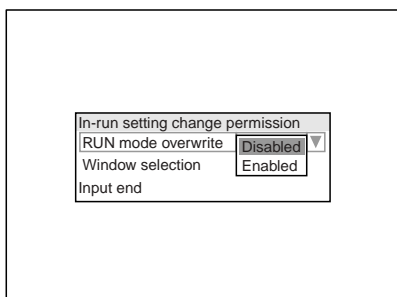
[RUN mode overwrite]

By default, the settings of the CV-2100 are protected from being overwritten during operation. You can remove this protection and allow the tolerance (upper limit value and lower limit value) and binary level (for Area and Blob measurement modes only) settings to be changed.

- 1 Select [RUN mode overwrite] on the [Optional Settings] screen.

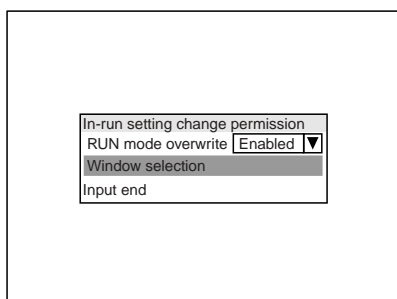


- 2 Select [RUN mode overwrite], then specify whether you want to allow settings to be changed during operation.



- **[Disable]** (default): Settings cannot be changed during operation.
- **[Enable]**: Settings can be changed during operation.

- 3 Select [Window selection].



- 4 Select the window for which you want to allow settings to be changed during operation to apply a checkmark in the corresponding checkbox.

- 5 Select the setting item for which you want to allow changes during operation to place a checkmark in the corresponding checkbox.

- 6 When the setting is complete, press the [ESCAPE] button to return to the [Window selection] screen and continue specifying settings for other windows.

- 7 When all the settings are complete, press the [ESCAPE] button to return to the [In-run setting change permission] screen, then select [Input end].

- 8 If you wish to make other configuration changes as well, continue the operation.

- 9 Save the changes.
Refer to "Saving the Optional Settings [Save Program]" (page 6-23) for details.

Note

The changes you made are not saved until you select [Save Program].

To change settings during operation:

- 1 While operating the CV-2100, select the window for which you want to change settings.

- 2 Press the [MENU] button while pressing the [FNC] button on the remote control console.

- 3 Change the settings as needed, then select [Input end].

The CV-2100 resumes operation.

Note

Changing the tolerance value can greatly affect the evaluation of OK/NG status. Proceed with caution if you need to change tolerance settings.

Changing the Save Screen Settings [Save screen]

The CV-2100 can save up to 54 screens captured during operation or in trial run mode so that they can be retrieved at a later time. You can retrieve the screens to re-measure and verify the measurement values. This feature is useful if you want to check afterward a screen captured when an NG occurred during operation.

► Note

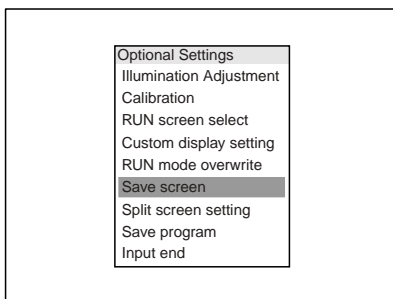
- You can save screens using the following procedure only during operation or in trial run mode. Screens cannot be saved when you are specifying settings.
- If you save a screen when there are already 54 screens saved, the oldest screen will be overwritten.
- You can only save up to 54 screens even if you are working with two cameras or performing a multi-measurement.
- Screens are saved to the internal memory of the controller; they will be lost when you turn off the power of the CV-2100. If you need to keep the screens, save them to a compact flash memory (page 9-1).

Reference

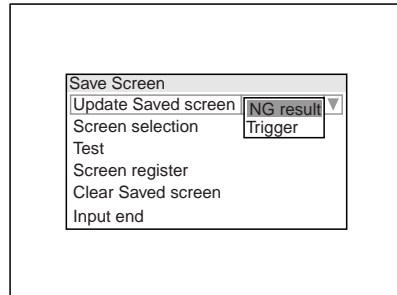
- You can retrieve a saved screen and use it as the registered screen (page 6-17).
- Saving screens has no effect on the process time.

Specifying the Timing for Saving Screens [Update Saved screen]

- 1 Select [Save screen] on the [Optional Settings] screen.



- 2 Select [Update Saved screen], then select the timing for saving screens.



- **[NG result]** (default): Saves the screen when the result is evaluated as NG.
- **[Trigger]**: Saves the screen on each trigger input.

- 3 When the setting is complete, select [Input end].

- 4 If you wish to make other configuration changes as well, continue the operation.

- 5 Save the changes.

Refer to "Saving the Optional Settings [Save Program]" (page 6-23) for details.

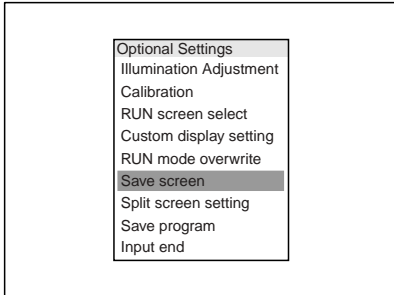
► Note

The changes you made are not saved until you select [Save Program].

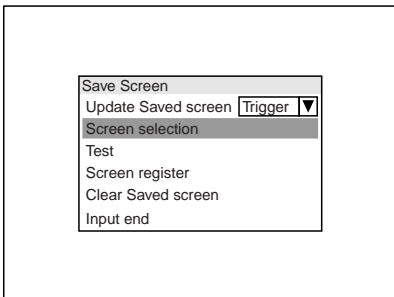
Selecting the Screen to Display [Screen selection]

You can select the screen to display from the saved screens as follows:

1 Select [Save screen] on the [Optional Settings] screen.



2 Select [Screen selection].



The [Screen Selection] screen appears.

In the [Screen Selection] screen, the date and time the screens were saved and their measurement orders are shown.

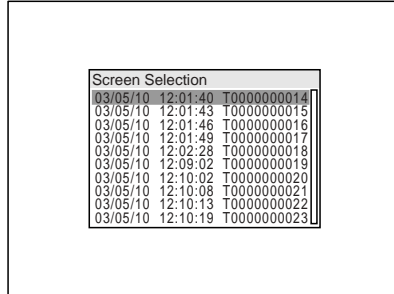
- **Screen name starting with T** such as “T0000000001”:
A screen saved in response to a trigger input. The number following T is the unique number designated to the screen.
- **Screen name starting with L** such as “L0000000001”:
A screen retrieved from a compact flash memory or via connection. The number following L designates the retrieved order and is a sequential number starting from 1.

Reference

The number following L is reset to 1 when you turn off the power of the CV-2100.

3 Select the screen you want to display.

If you are working with two cameras or performing a multi-measurement, select the camera and the trigger used to save the screen.



The selected screen appears in the background.

Note

- When you use multiple screens for a single measurement such as when you are using two cameras or performing a multi-trig, you can select a screen only if all of the screens for that particular measurement are available. For example, if you are using two cameras, the screen for Camera 1 and the screen for Camera 2 are required.
- You can retrieve a screen only if all of the screens for that particular measurement are available as well.

Reference

You can view the background screen of the [Screen Selection] screen while specifying the settings by pressing the [VIEW] button on the remote control console. The screen switches in the following order every time you press the [VIEW] button: [Screen Selection] screen, translucent mode, background screen only.

4 When the setting is complete, select [Input end].

5 If you wish to make other configuration changes as well, continue the operation.

6 Save the changes.

Refer to “Saving the Optional Settings [Save Program]” (page 6-23) for details.

Note

The changes you made are not saved until you select [Save Program].

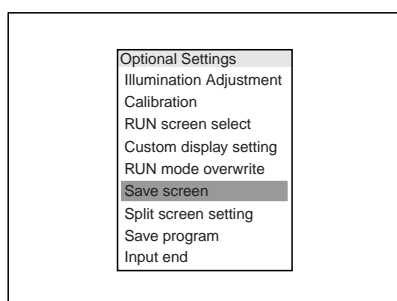
Re-measuring Using the Displayed Screen [Test]

You can re-measure using the displayed screen as follows. If you are working with two cameras or performing a multi-measurement, you must also select the other screens used for the original measurement.

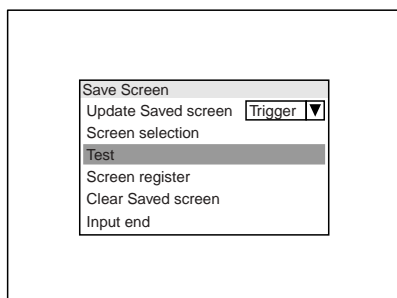
► Note

If multi-measure is specified (page 4-12), the screen that was captured last is used for re-measurement.

- 1 Select [Save screen] on the [Optional Settings] screen.



- 2 Select [Test].



Re-measurement is performed and the result is displayed.

- 3 When you finish reviewing the result, press the **ESCAPE** button to return to the [Save screen] screen, then select [Input end].

Reference

By pressing the [TRIGGER] button while pressing the [FNC] button on the remote control console, you can perform a measurement test even during operation or in trial run mode. This feature is useful when you have enabled settings to be changed during operation (page 6-14).

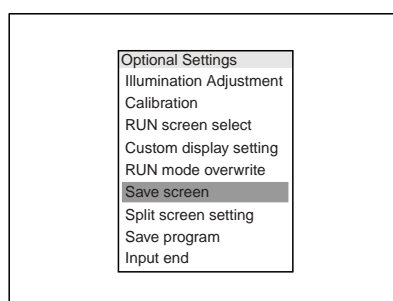
Saving the Displayed Screen as the Registered Screen [Screen register]

You can save the displayed screen as the registered screen for the current setting as follows.

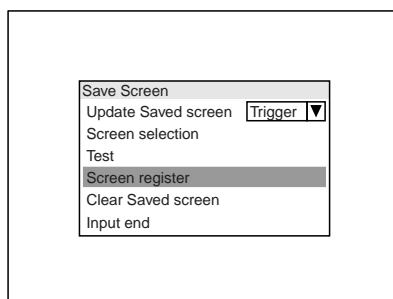
Reference

To register a screen saved to the internal memory of the CV-2000 such as an NG screen, display the desired screen beforehand following the procedure under "Selecting the Screen to Display [Screen selection]" (page 6-16).

- 1 Select [Save screen] on the [Optional Settings] screen.



- 2 Select [Screen register].



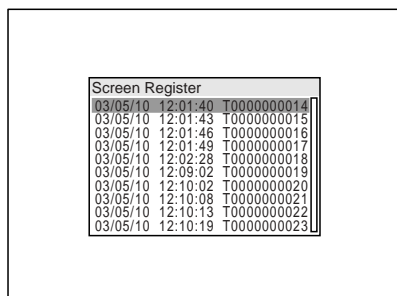
The [Screen Registration] screen appears.

In the [Screen Registration] screen, the date and time the screens were saved and their measurement orders are shown.



3 Select the screen you want to register.

If you are working with two cameras or performing a multi-measurement, select the camera and the trigger used to save the screen.



A confirmation screen appears.

4 Select [Yes].

The displayed screen is saved as the registered screen for the current setting.

To cancel the registration:

Select [No].

5 When the setting is complete, select [Input end].

6 If you wish to make other configuration changes as well, continue the operation.

7 Save the changes.

Refer to "Saving the Optional Settings [Save Program]" (page 6-23) for details.

Note

The changes you made are not saved until you select [Save Program].

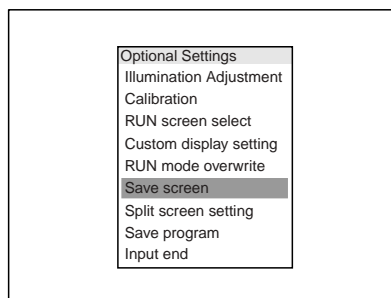
Deleting Saved Screens [Clear Saved screen]

You can delete all of the screens saved on CV-2100 as follows.

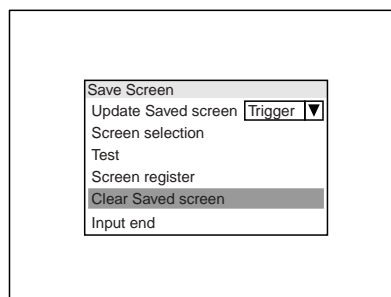
Note

You cannot retrieve the screens after deleting them. If necessary, save the screens to an external storage device such as a compact flash memory before performing the following procedure.

1 Select [Save screen] on the [Optional Settings] screen.



2 Select [Clear Saved screen].



A confirmation screen appears.

3 Select [Yes].

All of the screens saved on the CV-2100 are deleted.

To cancel the deletion:

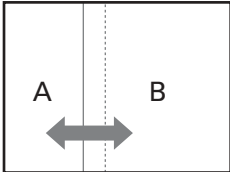
Select [No].

4 When the setting is complete, select [Input end].

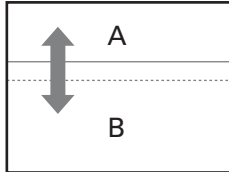
Displaying Two Camera Screens during Operation

[Split screen setting]

You can split the screen to display two camera screens during operation or in trial run mode. You can adjust the display proportions and display areas of the cameras as needed, as well as select to split the screen horizontally or vertically.



Displaying the contents of Camera 1 (A) and Camera 2 (B) side by side (vertical split.)

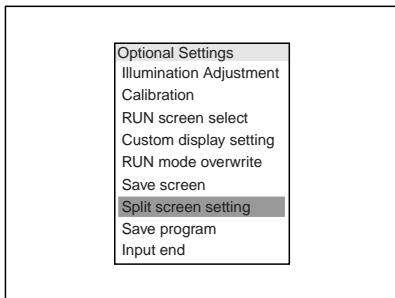


Displaying the contents of Camera 1 (A) and Camera 2 (B) one above the other (horizontal split.)

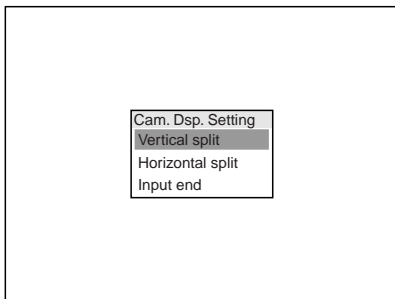
Displaying Two Camera Screens in Vertical Split [Vertical split]

You can vertically split the screen as follows.

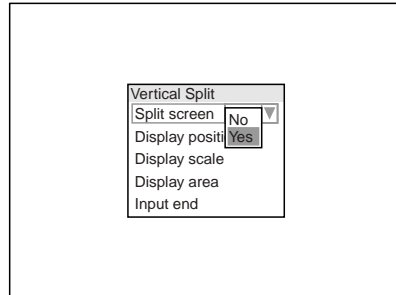
- 1 Select [Split screen setting] on the [Optional Settings] screen.



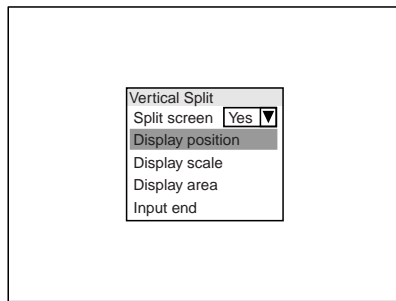
- 2 Select [Vertical split].



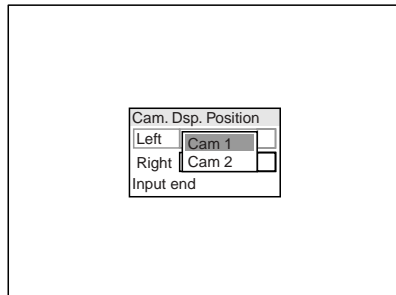
- 3 Select [Split screen], then select [Yes].



- 4 Select [Display position].



- 5 Select [Left], then select the camera and trigger you want to display on the left side of the screen.

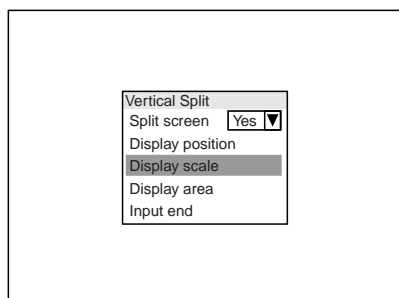


- 6 Select [Right], then select the camera and trigger you want to display on the right side of the screen.

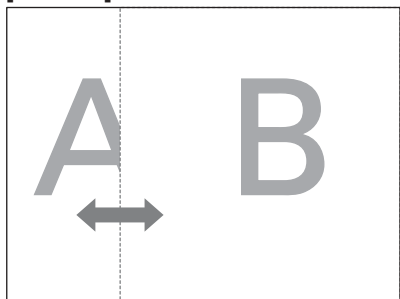
- 7 Select [Input end].



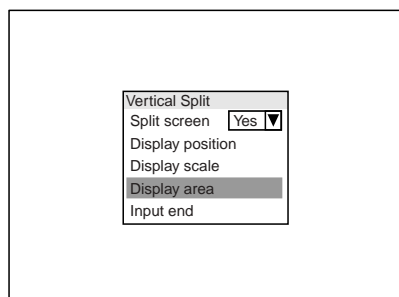
8 Select [Display scale].



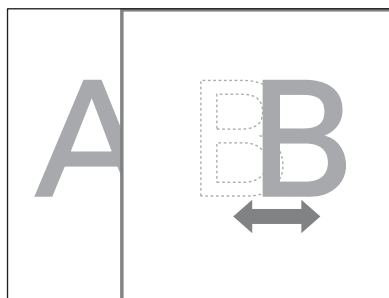
9 Move the [ENTER] button right or left to specify the desired display proportion, then press the [ESCAPE] button on the remote control console.



10 Select [Display area].



11 Move the [ENTER] button right or left to specify the portion of the image captured by the camera that you want to display on the screen.



- Press the [SCREEN] button on the remote control console to adjust the display area in the other frame.
- When you finish adjusting the area, press the [ESCAPE] button on the remote control console.

12 Select [Input end] to return to the [Cam. Dsp. Setting] screen.

13 When the setting is complete, select [Input end].

14 If you wish to make other configuration changes as well, continue the operation.

15 Save the changes.

Refer to "Saving the Optional Settings [Save Program]" (page 6-23) for details.

Note

The changes you made are not saved until you select [Save Program].

To split the screen during operation

1 Press the [SCREEN] button on the remote control console to switch to raw screen display mode.

You cannot split the screen in other display modes.

2 During operation or in trial run mode, move the [ENTER] button up or down while pressing the [FNC] button on the remote control console.

The background screen switches in the following order: Screen from Camera 1, screen from Camera 2, vertical split, horizontal split.

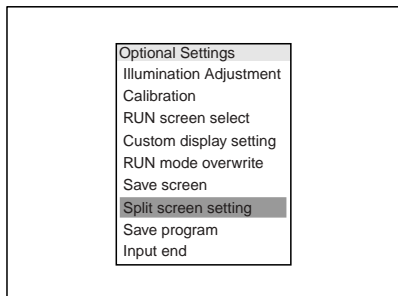
Reference

ⁱFor a multi-trigger, the screen switches between each trigger.

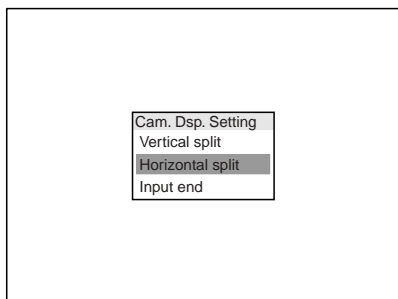
Displaying Two Camera Screens in Horizontal Split [Horizontal split]

You can horizontally split the screen as follows.

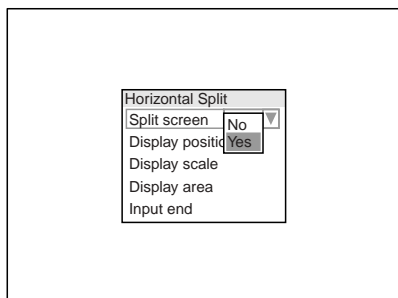
- 1 Select [Split screen setting] on the [Optional Settings] screen.



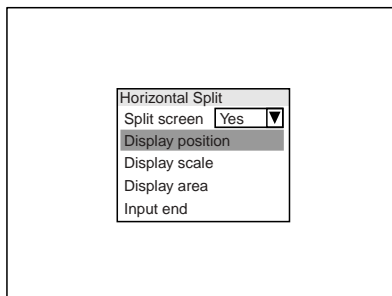
- 2 Select [Horizontal split].



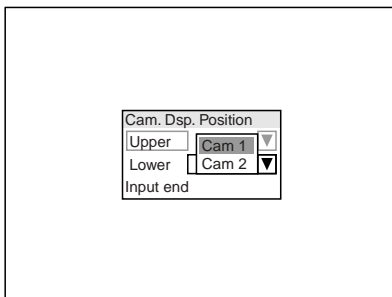
- 3 Select [Split screen], then select [Yes].



- 4 Select [Display position].



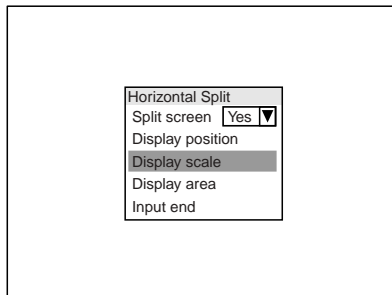
- 5 Select [Upper], then select the camera and trigger you want to display in the top frame of the screen.



- 6 Select [Lower], then select the camera and trigger you want to display in the bottom frame of the screen.

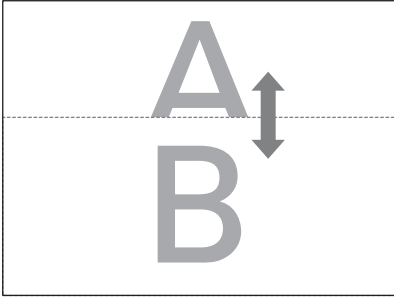
- 7 Select [Input end].

- 8 Select [Display scale].

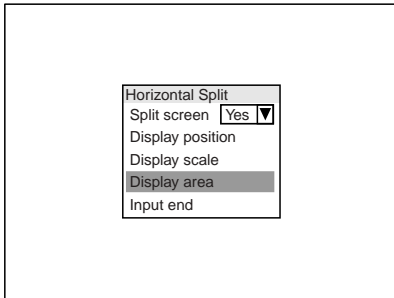




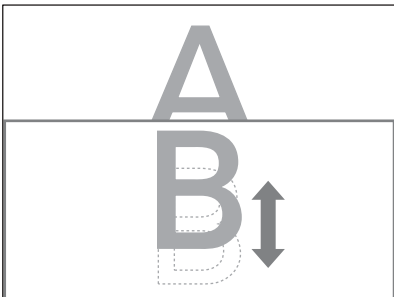
- 9** Move the [ENTER] button up or down to specify the desired display proportion, then press the [ESCAPE] button on the remote control console.



- 10** Select [Display area].



- 11** Move the [ENTER] button up or down to specify the portion of the image captured by the camera that you want to display on the screen.



- Press the [SCREEN] button on the remote control console to adjust the display area in the other frame.
- When you finish adjusting the area, press the [ESCAPE] button on the remote control console.

- 12** Select [Input end] to return to the [Cam. Dsp. Setting] screen.

- 13** When the setting is complete, select [Input end].

- 14** If you wish to make other configuration changes as well, continue the operation.

- 15** Save the changes.

Refer to "Saving the Optional Settings [Save Program]" (page 6-23) for details.

Note

The changes you made are not saved until you select [Save Program].

To split the screen during operation

- 1** Press the [SCREEN] button on the remote control console to switch to raw screen display mode.

You cannot split the screen in other display modes.

- 2** During operation or in trial run mode, move the [ENTER] button up or down while pressing the [FNC] button on the remote control console.

The background screen switches in the following order: Screen from Camera 1, screen from Camera 2, vertical split, horizontal split.

Reference

For a multi-trigger, the screen switches between each trigger.

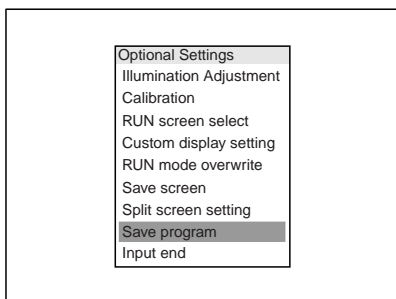
Saving the Optional Settings [Save Program]

You can save the changes you made on the [Optional Settings] screen to the CV-2100 as follows.

► Note

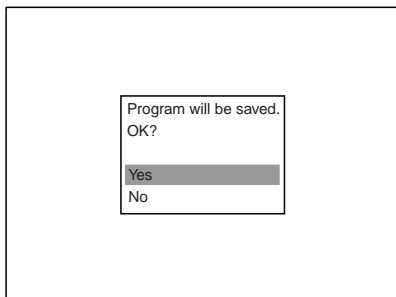
- The changes you made are not saved until you perform the following procedure.
- Do not turn off the power while saving the settings. The internal data may become corrupted.

1 Select [Save Program] on the [Optional Settings] screen.



A confirmation screen appears.

2 Select [Yes].



The changes you made on the [Optional Settings] screen and the settings for the current Program No. are saved to the CV-2100.

To cancel:

Select [No] in step 2.



Chapter 7

Analyzing the Run Result

(Statistics/Analysis)

Overview of the [Statistics/Analysis] Menu

What is the [Statistics/Analysis] Menu?

You can check the statistical value of the measurement in the run/trial run for each window by selecting [Statistics/Analysis] on the initial screen. By specifying the window to be the statistical target (page 7-2), you can check the NG history by windows (page 7-2) or check the measurement result using the histogram or trend graph (page 7-3).

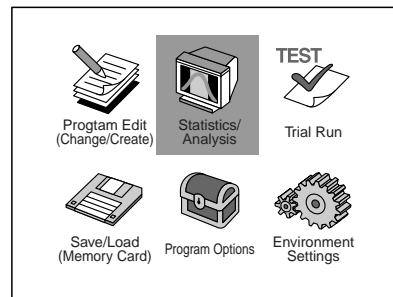
This menu is used to implement the test measurement and to adjust the optimal tolerance while checking the measured result before introducing the inspection system that uses the CV-2100 into the line.

Note

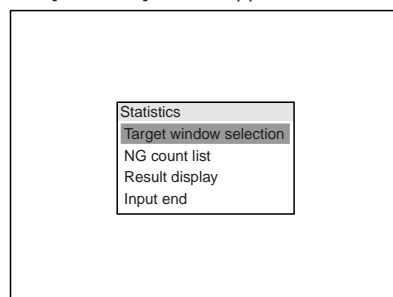
- You can record the number of measurements up to 11,264 times. If you increase the number of windows to be recorded, the number of measurements that can be recorded is reduced.
- If you have already recorded the maximum number of measurements, additional measurement data cannot be recorded.
- To delete the recorded data, turn off the power of the unit and turn it on again, or issue "Reset" from the terminal block or remote control console, or input "Reset" via the communication command.
- You cannot save the statistical data.

To display the [Statistics/Analysis] menu

- 1 Press the [MENU] button on the remote control console to display the CV-2100 initial screen.
- 2 Select [Statistics/Analysis].



The [Statistics] screen appears.



Specifying the Window to be Recorded

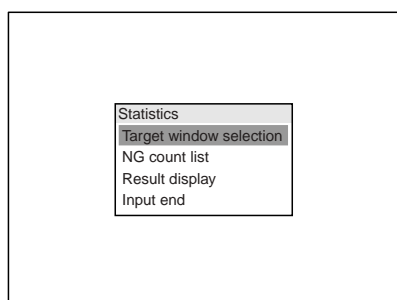
([Target window selection])

You can specify the target window for statistical analysis from the measurement windows or calculation windows.

► Note

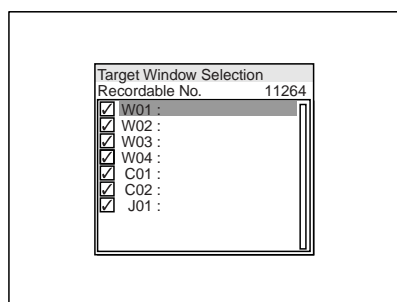
iùThe measurement data of the window that are not specified as the target window are not subject to statistics/analysis.

1 Select [Target window selection] on the [Statistics] screen.



The [Target Window Selection] screen appears.

2 Select the windows that you want to specify as the target window and place a checkmark in the box next to the name of the window.



3 After specifying the windows, press the [ES-CAPE] button on the remote control console.

4 Start run or trial run.

The measured data of the windows specified in Step 2 are stored as the target of the statistics/analysis in the internal memory of the CV-2100.

► Note

- You can record the number of measurements up to 11,264 times. If you increase the number of windows to be recorded, the number of measurements that can be recorded is reduced.
- If you have already recorded the maximum number of measurements, additional measurement data cannot be recorded.

Checking the NG History in the List

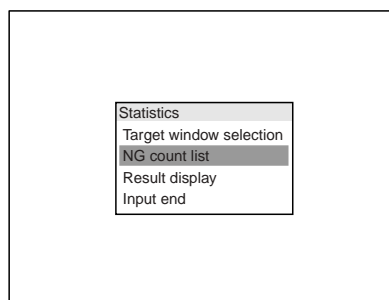
([NG count list])

You can check the NG history of the window specified as the target of the statistics in the list ([NG count list]).

Reference

The measured data can be recorded only in the operation mode or the trial run mode.

1 Select [NG count list] on the [Statistics] screen.



The [NG Count List] screen appears.

2 Check the NG history.

NG Count List	
No. Measure.	6
Total NG count	6
Window name	NG count
W01 :	3
W02 :	0
W03 :	0
W04 :	0
C01 :	0
C02 :	1
J01 :	0

- [No. Measure.]: Indicates the number of measurements.
- [Total NG count]: Indicates the total number of NGs for the window specified as a target of the statistics.
- [Window name/NG count]: Indicates the number of NGs for each window.

3 After checking the NG history, press the [ES-CAPE] button on the remote control console.

The [Statistics] screen reappears.

Displaying the Statistics ([Result display])

You can check the measured values of the windows specified as a statistics target in a variety of ways. This is useful when investigating the cause of NGs by checking the screens when an NG occurs, or when you adjust the tolerance while checking the distribution of measured values in the histogram.

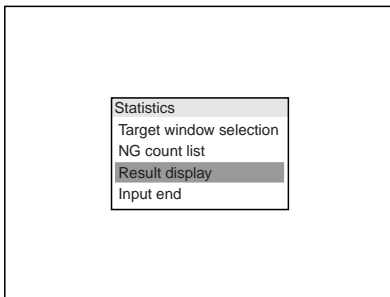
Reference

Whereas the [NG Count List] screen displays the number of NGs generated during the actual measurements, the [Result Display] screen displays how the number of OK/NG result changes when the tolerance is changed by using the accumulated measured results.

Displaying the Measured Value ([Measured value])

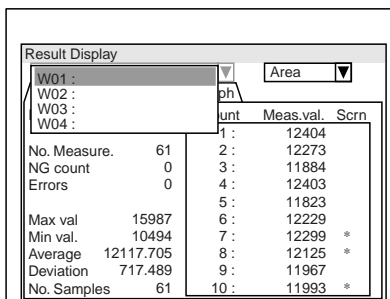
You can display and check not only the number of measurements, number of NGs, or maximum/minimum value, but also the measured value for each measurement or the screens when an NG occurs.

1 Select [Result display] on the [Statistics] screen.

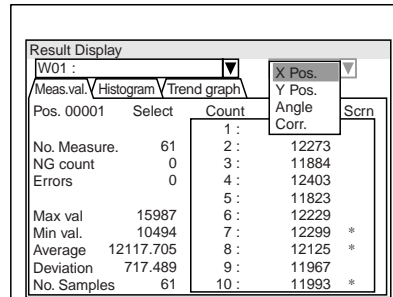


The [Result Display] screen appears.

2 Select the window(s) where you want to display the statistics.



3 Move the [ENTER] button to the right or left to select the measurement item, and then select the detection item(s) whose statistics you want to display.

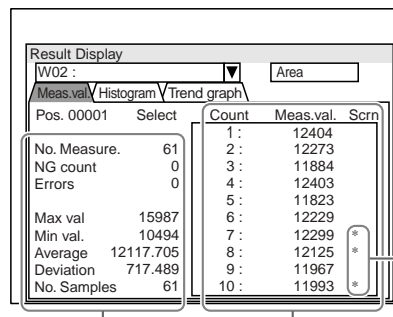


The statistics are displayed in the [Measured value] tab.

Note

When there is only one measurement item, no selection can be made in Step 3.

Statistics that are displayed:



General statistics

List of measured data

Indication of stored screens

Note

The indication of stored screens appears only when the measurement window is selected.

4 To check the measured value for each window, move the [ENTER] button to the right, left, up and down to select the [Select] in the [Measured value] tab.

- You can move the cursor to the measured data list and check the result.
- By selecting [Pos.] in the [Measured value] tab and entering the value that corresponds to the number of measurement, you can display the measured data of the specified number of measurement.
- The measured value when an NG occurs is displayed in red.

Result Display				
W02 :		Area		
Meas.val		Histogram Trend graph		
Pos. 00001	Select	Count	Meas.val.	Scrn
No. Measure.	61	1 :	12404	
NG count	0	2 :	12273	
Errors	0	3 :	11884	
		4 :	12403	
		5 :	11823	
Max val	15987	6 :	12229	
Min val.	10494	7 :	12299 *	
Average	12117.705	8 :	12125 *	
Deviation	717.489	9 :	11967	
No. Samples	61	10 :	11993 *	

To sort the measured values in the list by number of measurements, measured value, or existence/absence of stored screens

Move the cursor to the items (number of times, measured value, screen) that you want to re-arrange, then press the [ENTER] button.

- [Count]: Lists the measured values in the order of the number of measurements.
- [Meas. val.]: Lists the measured values in the order of values.
- [Scrn]: Lists first the measured values with the stored screens, and then those without.

You can display the respective list in reverse order by pressing the [ENTER] button.

Reference

The measurement is counted as an "error" when measurement is impossible or the window of the position adjustment cannot be measured. Errors are included in the number of NGs, but not included in the number of samples.

5 You can display the respective list in reverse order by pressing the [ENTER] button.

- Select the number of measurements marked with an asterisk (*) if you want to display the screen at the time of the measurement.
- If you place the cursor on the number of measurements marked with an asterisk (*), the stored screen is loaded.

Note

You can check the screen behind the [Result Display] screen by pressing the [VIEW] button on the remote control console.

Result Display				
W02 :		Area		
Meas.val		Histogram Trend graph		
Pos. 00001	Select	Count	Meas.val.	Scrn
No. Measure.	61	1 :	12404	
NG count	0	2 :	12273	
Errors	0	3 :	11884	
		4 :	12403	
		5 :	11823	
Max val	15987	6 :	12229	
Min val.	10494	7 :	12299 *	
Average	12117.705	8 :	12125 *	
Deviation	717.489	9 :	11967	
No. Samples	61	10 :	11993 *	

By pressing the [ENTER] button, you can perform re-measurement and display the result and the measurement screen.

RUN		PROG No.00 :	00:00:00	Total
		WIN No.W02 :	00:00:00	OK
		Area	20 ms	W02
		No. Measurements :	0	OK
		NG count :	0	
		Area :	12301	
		Up.lmt :	200000	
		Lo.lmt :	0	
		Result :	OK	
				CAM1
				TRG1
				Raw
				Scr.

You can display the previous screen by pressing the [ESCAPE] button on the remote control console.

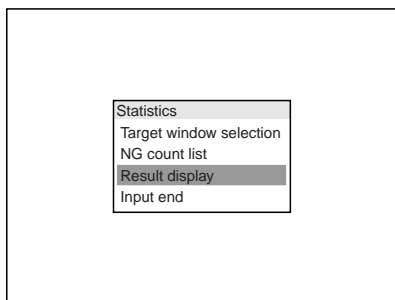
6 After checking the measured value, press the [ESCAPE] button on the remote control console.

The [Statistics] screen reappears.

Displaying the Distribution of the Measured Value ([Histogram])

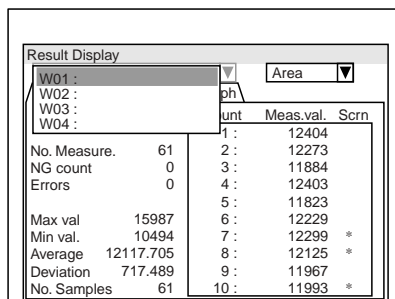
You can visually grasp the dispersion of the measured values by displaying their distribution in the histogram. This is useful when you adjust the tolerance because the upper and lower limits of the tolerance that are set for the window are also displayed in the chart.

- 1 Select the [Result display] on the [Statistics] screen.

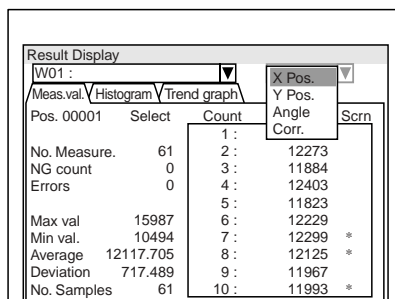


The [Statistics] screen appears.

- 2 Select the window whose histogram you want to display.



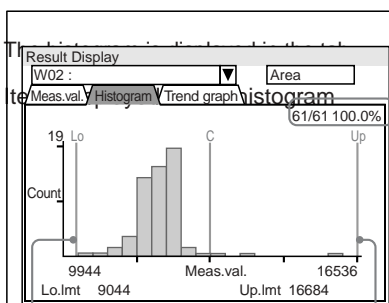
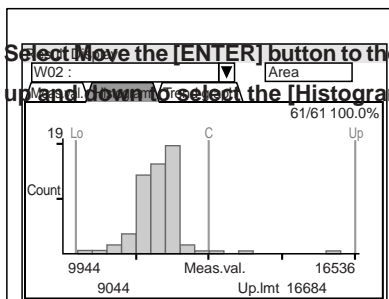
- 3 Move the [ENTER] button to the right and left to select the measurement item, and then select the detection item(s) whose histogram you want to display.



Note

When there is only one measurement item, no selection can be made in Step 3.

- 4 Select the [ENTER] button to the right, left, up and down to select the [Histogram] tab.

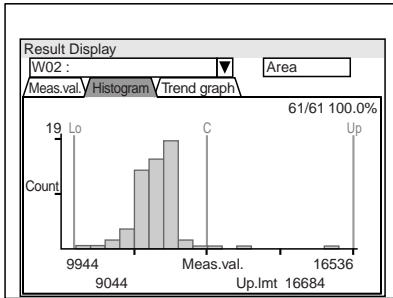


[Lo]: Lower limit of the tolerance

[Up]: Upper limit of the tolerance

"OK/Number of measurements" as of the current settings

- 5** If you want to adjust the tolerance, select the [Up] (upper limit of the tolerance) bar or [Lo] (lower limit of the tolerance) bar, and move it to the right or left.



- The upper limit or the lower limit of the tolerance changes automatically as you move the [Up] or [Lo] bar.
- Enlarge the histogram if you want to fine-tune the tolerance.

Note

If you change the tolerance in the histogram, the tolerance shown in the measurement window that is set in the [Limit Setup] screen is also changed.

To enlarge or reduce the specified portion of the histogram

When you select "C" and move the [ENTER] button up or down, you can enlarge (moving the [ENTER] button up) or reduce (moving the [ENTER] button down) the specified portion of the histogram with the "C" position as its center.

- If the X-axis (measured values) is difficult to read due to the excessive number of statistical data, enlarging the histogram makes the data easier to read.
- If it is difficult to grasp the overall distribution only by viewing the X-axis (measured values) area of the histogram with scattered measured values displayed, reducing the histogram makes the distribution of data easier to grasp.

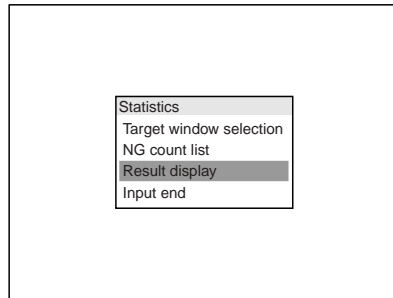
- 6** After checking the measured value, press the [ESCAPE] button on the remote control console.

The [Statistics] screen reappears.

Displaying the Measured Value along the Time-line ([Trend graph])

You can display the measured values along the time-line. This is useful when you want to grasp how the running time of the line affects the measured values of the work piece.

- 1** Select [Result display] on the [Statistics] screen.



The [Statistics] screen appears.

- 2** Select the window whose trend graph you want to display.

	1	2	3	4	5	6	7	8	9	10
No. Measure.	61	12273	11884	12403	11823	12229	12299 *	12125 *	11967	11993 *
NG count	0									
Errors	0									
Max val.	15987									
Min val.	10494									
Average	12117.705									
Deviation	717.489									
No. Samples	61									

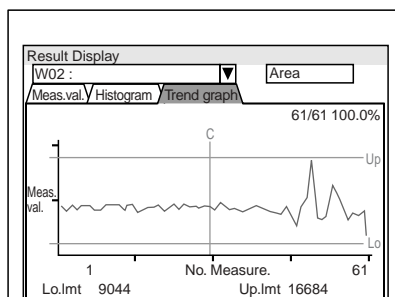
- 3** Move the [ENTER] button to the right or left to select the measurement item, and then select the detection item(s) whose trend graph you want to display.

	1	2	3	4	5	6	7	8	9	10
No. Measure.	61	12273	11884	12403	11823	12229	12299 *	12125 *	11967	11993 *
NG count	0									
Errors	0									
Max val.	15987									
Min val.	10494									
Average	12117.705									
Deviation	717.489									
No. Samples	61									

Note

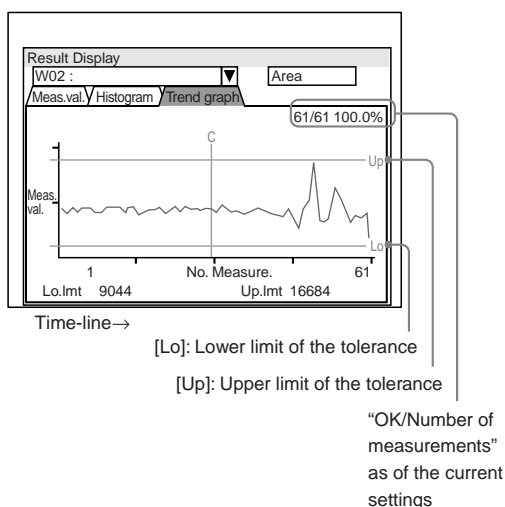
When there is only one measurement item, no selection can be made in Step 3.

- 4** Move the [ENTER] button to the right, left, up, and down to select the [Trend graph] tab.

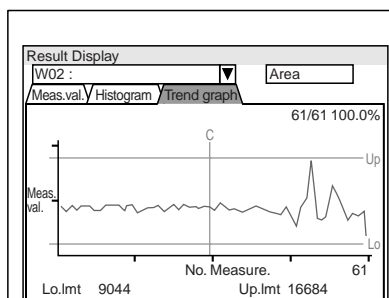


The trend graph is displayed in the tab.

Items displayed on the trend graph



- 5** If you want to adjust the tolerance, select the [Up] (upper limit of the tolerance) bar or [Lo] (lower limit of the tolerance) bar and move it to the right or left.



- The upper limit or the lower limit of the tolerance changes automatically as you move the [Up] or [Lo] bar.
- Enlarge the histogram if you want to fine-tune the tolerance.

Note

When you change the tolerance in the trend graph, the tolerance shown in the measurement window that is set in the [Limit Setup] screen is also changed.

To enlarge or reduce the specified portion of the trend graph

When you select "C" and move the [ENTER] button up or down, you can enlarge (moving the [ENTER] button up) or reduce (moving the [ENTER] button down) the specified portion of the histogram with the "C" position as its center.

- If the X-axis (measured values) is difficult to read due to the excessive number of statistical data, enlarging the trend graph makes the data easier to read.
- If it is difficult to grasp only by viewing the X-axis (measured values) area, reducing the graph makes the overall trend easier to grasp.

- 6** After checking the measured value, press the [ESCAPE] button on the remote control console.

The [Statistics] screen reappears.



Chapter 8

Changing the Environment Settings of the CV-2100 (Environment Settings)

Overview of [Environment Settings] Menu

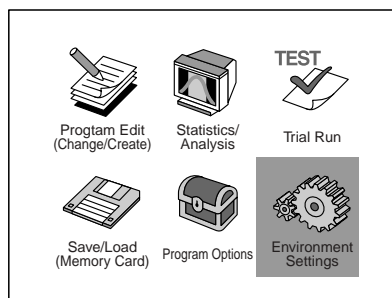
What is the [Environment Settings] menu?

By selecting [Environment Settings] from the Initial window, it becomes possible to change various settings on the equipment other than the measurement conditions, such as window settings. The settings specified in the [Environment Settings] menu apply to all setting numbers. The setting items you can change are as follows:

- Terminal output (page 8-2)
- RS-232C (page 8-3)
- Ethernet (page 8-4)
- Start mode (page 8-5)
- Screen update mode (page 8-5)
- Raw screen transmit (page 8-6)
- Start-up screen (page 8-6)
- Language (page 8-7)
- I/O Monitor (page 8-7)
- Available memory indication (page 8-11)
- Password setting (page 8-10)
- Date and time setting (page 8-11)
- Save (8-12)

To display the [Environment Settings] menu:

- 1 Display the Initial screen of the CV-2100 by pressing the MENU button on the remote control console.
- 2 Select [Environment Settings].

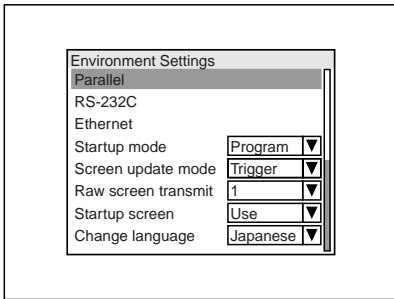


The [Environment Settings] menu screen appears.

Changing Terminal Output Settings (Terminal output)

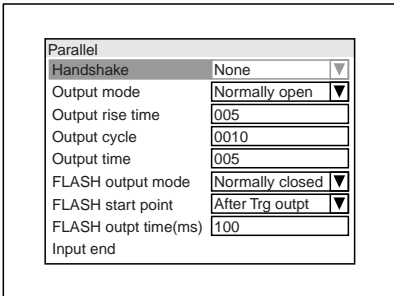
You can change the settings for data input/output on the CV-2100's terminal outputs (via the parallel I/O connector and the terminal block). For signal input/output from/to external equipment, also refer to "Communication via Parallel Port and Terminal Block" (page 13-1) and "Input/Output Timing" (page 13-6).

1 Select [Terminal Output] on the [Environment Settings] screen.



The [Terminal Output] screen appears.

2 Change any of the settings as necessary.



Selected protocol

Select [No handshake] (default) or [Handshake] for the terminal I/O protocol.

Output method

Select [Normal open] (default) or [Normal closed] for the output system of terminal I/O.

Output startup time

Set the length of time from completion of output data setting to the leading edge of STO within the range of 1-999 (ms). (Default: 5 ms)

Output period

Set the length of time from a leading edge of STO to the next leading edge of STO within the range of 2-100 (ms). (Default: 10 ms)

Output time

Set the time from the leading edge of STO to the trailing edge of STO within the range of 1-999 (ms). (Default: 5 ms)

FLASH output system

Select [Normally open] or [Normally closed] (default) for the FLASH signal output system.

FLASH output starting point

Select [Before image capture] (default) or [After image capture] for the starting point of FLASH signal output.

FLASH output time

Set the FLASH signal output time within the range of 1-999 (ms). (Default: 100 ms)

3 When you have finished specifying the settings, choose [Input end].

4 If you wish to make other Environment Setting changes, continue the operation.

5 Save the changes.

Refer to "Saving Environment Setting Changes" (page 8-12) for details.

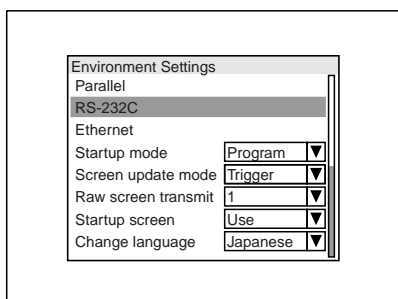
Note

Unless you perform the save operation, the changes you have made will not be saved.

Changing the RS-232C Communication Method (RS-232C)

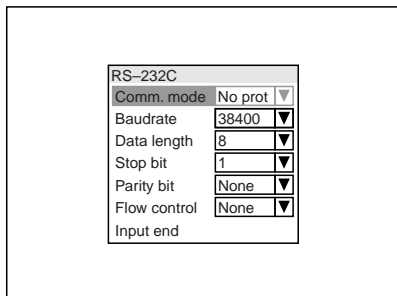
You can change various settings for inputting/outputting various data via the CV-2100's RS-232C port. For information about signal input/output from/to external equipment, refer to "Communication via RS-232C Port (Non-procedural Mode)" (page 10-1) and "Using the CV-2100 Combined with PLC" (page 11-1) as well.

1 Select [RS-232C] on the [Environment Settings] screen.



The [RS-232] screen appears.

2 Change any of the settings as necessary.



► Note

When [PLC link] is selected for [Communication mode] and [KV-L20] is selected for [PLC Type], there are the following restrictions:

- Data length: fixed to [8].
- Stop bit: fixed to [1]
- Parity bit: fixed to [Odd]
- Flow control: fixed to [No]

If you have made any changes, power up the CV-2100 again.

Communication mode

Select [No prot] (default) or [PLC link] for the communication mode.

Baud rate

Select 9600, 19200, 38400 (default), 57600, or 115200 (bps) for the transfer rate.

Data length

Select 7 or 8 (default) for the data length.

Stop bit

Select 1 (default) or 2 for the stop bit.

Parity bit

Select None (default), Odd, or Even for the parity bit.

Flow control

Select None (default), XON/XOFF, or CTS/RTS for the flow control.

PLC link setting

Displayed only when [PLC] is selected for the communication mode. For more information about this setting item, refer to "Using the CV-2100 Combined with PLC" (page 11-1).

3 When you have finished specifying the settings, choose [Input end].

4 If you wish to make other Environment Setting changes, continue the operation.

5 Save the changes.

Refer to "Saving Environment Setting Changes" (page 8-12) for details.

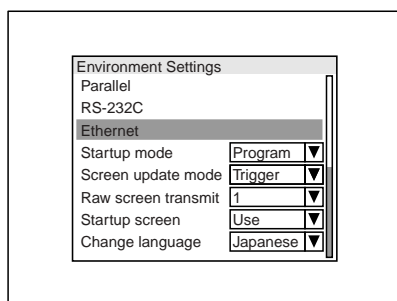
► Note

Unless you perform the save operation, the changes you have made will not be saved.

Changing Network Settings (Ethernet)

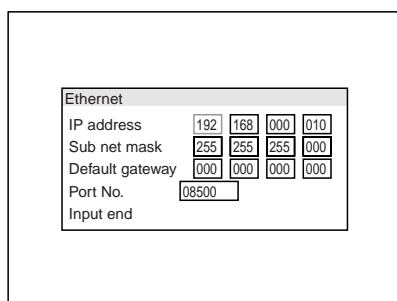
You can change settings for various data inputs/outputs on the Ethernet port on the CV-2100. For more information about signal input/output from/to external equipment, refer to "Communication via Ethernet Port" (page 12-1) as well.

- 1 Select [Ethernet] from the Configuration screen.
The Ethernet screen appears.



The Ethernet screen appears.

- 2 Change any of the settings as necessary.



Note

If any setting is made incorrectly, not only the CV-2100 but also other equipment on the network may become unable to work properly. Consult your system administrator or network administrator about setting values.

IP address

Enter the CV-2100's IP address. (Default value: 192.168.0.10)

Subnet mask

Enter a subnet mask. (Default value: 255.255.255.0)
Default gateway

Enter a default gateway IP address. (Default: 0.0.0.0)

Default gateway

Enter a default gateway IP address. (Default: 0.0.0.0)

Port number

Enter the port number used for data I/O on the CV-2100. (Default: 8500)

- 3 When you have finished specifying the settings, choose [Input end].

- 4 If you wish to make other Environment Setting changes, continue the operation.

- 5 Save the changes.

Refer to "Saving Environment Setting Changes" (page 8-12) for details.

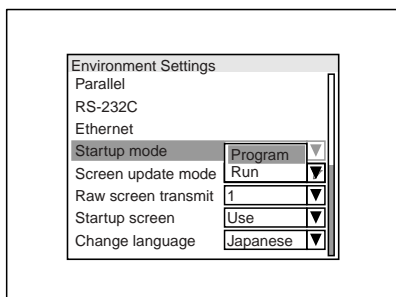
Note

Unless you perform the save operation, the changes you have made will not be saved.

Setting the Startup-time Operating Mode (Start mode)

You can select which operating mode the CV-2100 enters immediately after system power-up: Program mode or Run mode.

- 1 Select **[Startup Mode]** on the **[Environment Settings]** screen, and select the desired operating mode.



- **Program** (default): Upon powering up, the CV-2100 starts up in the Program mode.
- **Run**: Upon powering up the system, the CV-2100 starts up in the Run mode.

- 2 If you wish to make other Environment Setting changes, continue the operation.

- 3 Save the changes.

Refer to "Saving Environment Setting Changes" (page 8-12) for details.

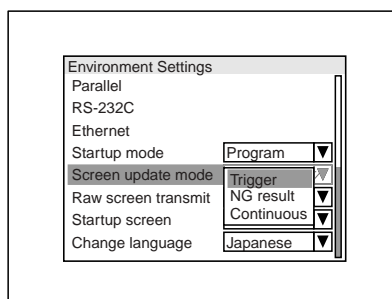
► Note

Unless you perform the save operation, the changes you have made will not be saved.

Setting the Screen Update Timing (Screen update mode)

This is used to set when to update the screen display while the system is in operation.

- 1 Select **[Screen update mode]** on the **[Environment Settings]** screen, and select a desired update timing.



- **Trigger** (default): Updates the screen only at the time of trigger input.
- **NG result**: Updates the screen only when a defective part has been detected (judged to be no good) by measurement.
- **Continuous**: Always displays the latest information on the screen.

► Note

- When **[NG result]** is selected and the Inspection status is **[OK]** (passed), the screen is not updated.
- If you make any change in the screen display while **[NG result]** is selected, the **[NG]** display is turned off and the latest trigger result image appears instead.
- When **[Continuous]** is selected, although the screen is always updated, measurements will not be performed unless a trigger is input.
- When **[Continuous]** is selected, there is a time lag of "shutter speed + image capture time" at maximum between a trigger input and the actual image capture.

- 2 If you wish to make other Environment Setting changes, continue the operation.

- 3 Save the changes.

Refer to "Saving Environment Setting Changes" (page 8-12) for details.

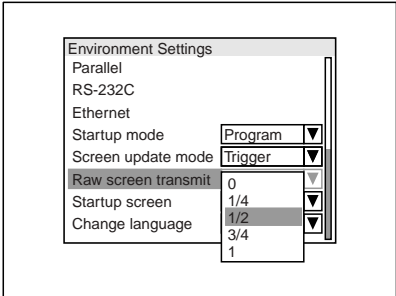
► Note

Unless you perform the save operation, the changes you have made will not be saved.

Changing the Transparency of Display Images (Raw screen transmit)

You can set the degree of transparent display of images captured by the camera while the CV-2000 is in operation mode. This setting is useful when, for example, the captured image is bright and text on the screen is hard to read.

- 1 Select [Raw screen transmit] on the [Environment Settings] screen, and select a desired transparency.



Select any transparency of from 0 to 1 (default). Selecting 0 makes images non-transparent, while selecting 1 makes images totally transparent. Transparency values may lie between 0 and 1.

- 2 If you wish to make other Environment Setting changes, continue the operation.

- 3 Save the changes.
Refer to "Saving Environment Setting Changes" (page 8-12) for details.

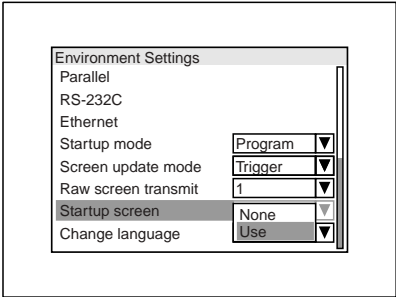
Note

Unless you perform the save operation, the changes you have made will not be saved.

Changing the Startup-Time Display Setting (Startup screen)

You can set whether to display the initial screen (KEYENCE Logo)

- 1 Select [Startup screen] on the [Environment Settings] screen, and choose whether or not to display the initial screen.



- **[Yes]** (default): When the CV-2000 is powered up, the initial screen (with the KEYENCE logo) appears.
- **[No]**: When the CV-2000 is powered up, the initial screen is not shown.

- 2 If you wish to make other Environment Setting changes, continue the operation.

- 3 Save the changes.
Refer to "Saving Environment Setting Changes" (page 8-12) for details.

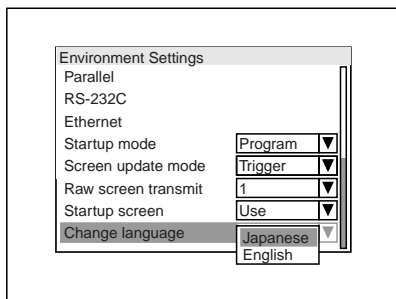
Note

Unless you perform the save operation, the changes you have made will not be saved.

Switching the User Interface Language (Language)

You can switch the user-interface language between Japanese and English.

- 1 Select **[Change language]** on the **[Environment Settings]** screen, and specify your preferred language.



- **Japanese** (Default): Displays in Japanese.
- **English**: Displays in English.

- 2 If you wish to make other Environment Setting changes, continue the operation.

- 3 Save the changes.

Refer to "Saving Environment Setting Changes" (page 8-12) for details.

► Note

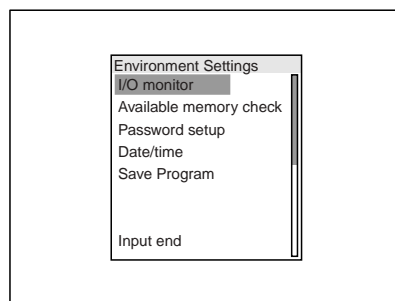
Unless you perform the save operation, the changes you have made will not be saved.

Viewing the Connection Status of Input/Output Signals (I/O Monitor)

You can view the connection status of incoming and outgoing signals that pass through the parallel I/O connector, the terminal block, and the RS-232C connector of the CV-2100. This feature comes in very handy in checking the connection status of the CV-2100's terminals under conditions of being hooked up to external equipment if and when data cannot be appropriately exchanged between the CV-2100 and any of the connected equipment.

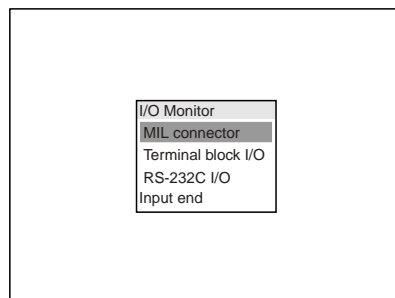
Viewing parallel I/O connector wiring

- 1 Select **[I/O Monitor]** on the **[Environment Settings]** screen.



The [I/O Monitor] screen appears.

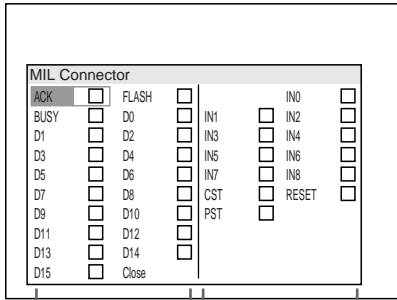
- 2 Select **[MIL Connector Output/Input]**.



The [MIL Connector] screen appears.

3 Check the wiring conditions.

Output terminals are shown on the left while input terminals are shown on the right.

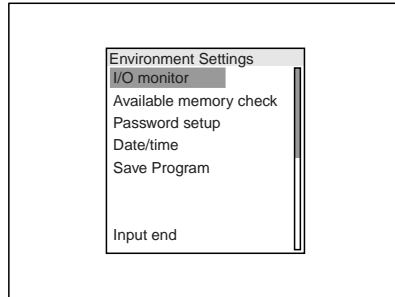


- The input terminal status display is updated in real time in response to the incoming/outgoing status of the signals, and [ON] (shorted) terminals are check-marked.
- Selecting an output terminal by adding a checkmark turns on the terminal (shorted).

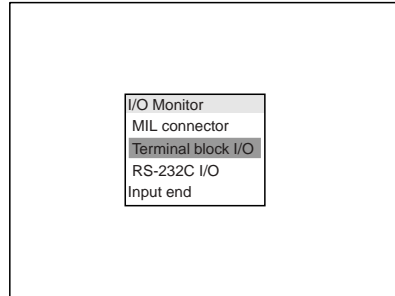
4 After completion of checking, choose [Finish Viewing].

Checking wiring on the terminal block

1 Select [I/O Monitor] on the [Environment Settings] screen.



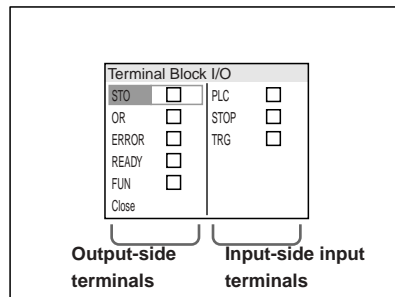
2 Select [Terminal Block Input/Output].



The [Terminal Block Input/Output] screen appears.

3 Check the wiring status.

Output terminals are shown on the left while input terminals are shown on the right.

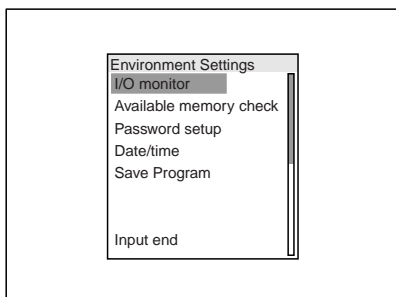


- The input terminal status display is updated in real time in response to the incoming/outgoing status of the signals, and [ON] (shorted) terminals are check-marked. For information, the [TRG] input terminal changes its display state every time it is turned on or off.
- Selecting an output terminal by adding a checkmark turns on the selected terminal (shorted).

4 After completion of checking, choose [Finish Viewing].

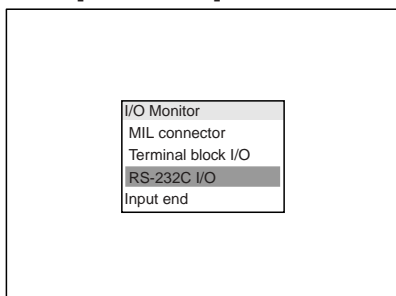
Checking the RS-232C Communication Status

- 1 Select [I/O Monitor] on the [Environment Settings] screen.



The [I/O Monitor] screen appears.

- 2 Select [RS-232C I/O].

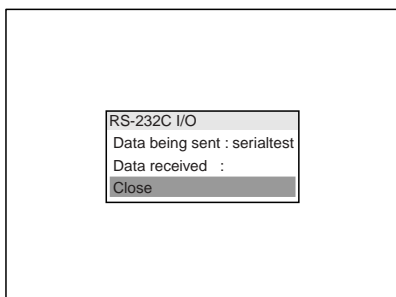


The [RS-232C I/O] screen appears.

- 3 Check the status of RS-232C inputs and outputs.

Checking the input status

Incoming data is displayed up until a delimiter (r) is received. The largest character count that can be held until the receipt of a delimiter is 10 characters, and any character string received in excess of this length is discarded on a first-in-first-out basis. Make certain that the CV-2100 can correctly receive data from externally connected equipment via the RS-232C port.



Checking the output status

From the moment the [RS-232C I/O] screen appears, a character string of [serialtest] is transmitted repeatedly from the RS-232C connector of the CV-2100. Check to make certain that the [serialtest] string can be received correctly on the external equipment which is connected to the CV-2100 through the RS-232C connector.

Reference

While the [RS-232C I/O] screen remains displayed, the [serialtest] string continues to be transmitted at all times.

- 4 After completion of checking, choose [Finish Viewing].

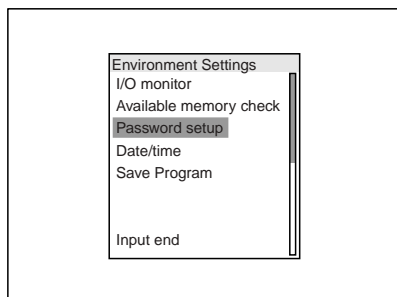
Protecting Against Erroneous Operation (Password setting)

You can set a password on the CV-2100. This is useful, for example, when you want to protect settings from being erroneously changed. You can set password protection for settings made from the remote control console as well as for the execution of commands through communications.

Note

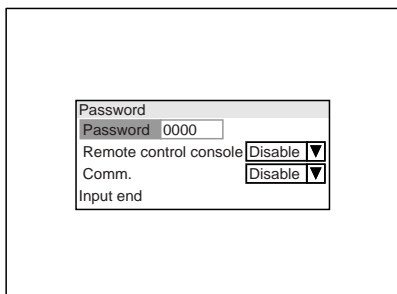
- When password protection is enabled for remote control console operations, you may be prompted for a password when you switch from the operation mode to the setting mode.
- When password protection is enabled for communications commands, a password specification command becomes necessary every time a communication command is transmitted to the CV-2100.
- After you have set a password, if you attempt to change the enable/disable status of password protection, the password entry screen appears. Enter the password you have set and then proceed with the operation.

1 Select [Password setting] on the [Environment Settings] screen.



The [Password] screen appears.

2 Select [Password].



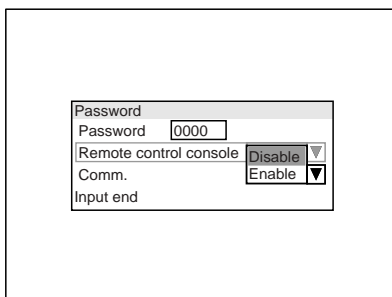
3 Enter a password.

A password may be up to 4 numerals long, consisting of digits 0 through 9.

The default password is [0000].

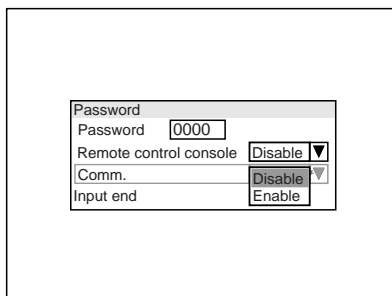
4 Select [Remote control console] to turn on/off password protection for settings made using the remote control console.

- **Disable** (Default): Password protection is not used. You can perform manipulations as usual.
- **Enable**: When an attempt is made to perform a setting operation from the remote control console, the password entry screen appears.



5 Select [Communication] to turn on/off password protection for the execution of commands through communications.

- **Disable** (Default): Password protection is not used. You can execute commands as usual.
- **Enable**: Password protection is used for communication-based command execution. Refer to "Precautions relating to command input/output" (page 10-6) for details.



6 When you have finished specifying the settings, choose [Input end].

7 Save the changes.

Refer to "Saving Environment Setting Changes" (Page 8-12).

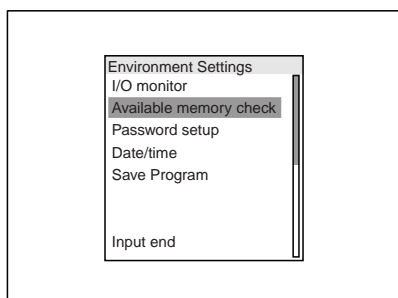
If you forget the password,

turn on the CV-2100 while pressing and holding down the remote control console's [FNC] and [ESCAPE] buttons. This causes the CV-2100 to come on with the password setting alone set back to the default.

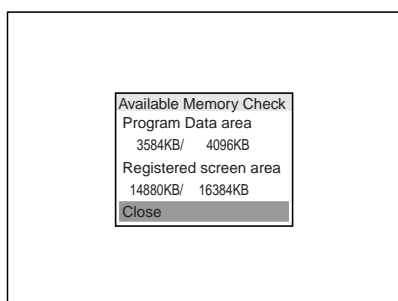
Checking How Much Internal Memory is Available (Available memory indication)

The CV-2100's internal memory stores various measurement-related settings and captured screens. To check how much internal memory capacity is available, do the following.

- 1 On the [Environment Settings] screen, select [Available memory check].



The [Available memory indication] screen appears. The amounts of remaining memory are indicated in the format [Remaining amount/Total amount] for both the setting No. data area and the registered image area.



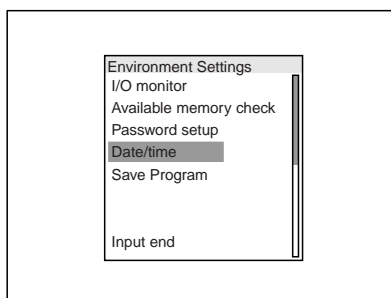
- **Setting No. data area:** This area is used for storing various measurement-related settings and settings to be made on the option screens (described on page 6-1).
- **Registered image area:** This area is used for storing images.

- 2 When you have finished viewing, select [Close]. The system returns to the [Environment Settings] screen.

Setting the Internal Clock (Date and time setting)

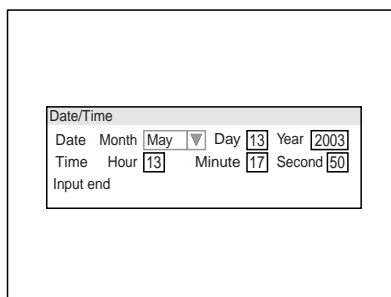
Using the following procedure, you can set the CV-2100's built-in clock. The clock's date and time information is used for time stamping purposes, such as when data is written to compact flash memory from the CV-2100.

- 1 On the [Environment Settings] screen, select [Date/time setting].



The [Date/Time] screen appears.

- 2 Select the year box to enter the current year.



- 3 Likewise, select and fill in the [month] box, the [day] box, the [hour] box, the [minute] box, and the [second] box.

- 4 When you have finished specifying the settings, choose [Input end].

- 5 Save the changes. Refer to "Saving Environment Setting Changes" (Page 8-12) for details.

Saving Environment Setting Changes (Save)

Save the changes that have been made on the [Environment Settings] screen to the CV-2100 as follows.

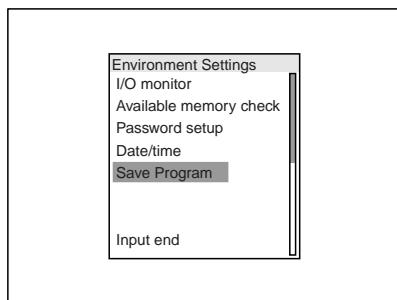
Note

- Unless you perform the save operation, the changes you have made will not be saved.
- Even when you do not perform a save operation, the Environment Setting changes you have made remain effective until you turn off the CV-2100.
- Never turn off the CV-2100 while saving Environment Setting changes. If turned off, internal data may become corrupted.

Reference

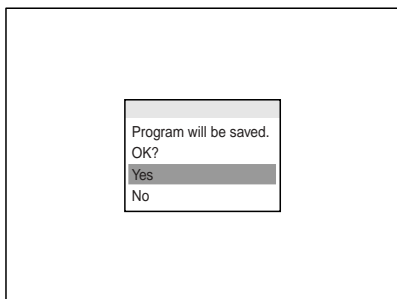
You can also specify [Save] on the [Settings] screen to save the changes that you have made on the [Environment Settings] screen. Refer to “4-8 Saving the settings (Save)” (Page 4-125).

1 Select [Save] on the [Environment Settings] screen.



The confirmation screen appears.

2 Select [Yes].



The changes you have made on the [Environment Settings] screen are saved to the CV-2100.

To cancel saving,
select [NO] in Step 2.

Chapter 9

Saving or Loading Data of the CV-2100 to/from an External Memory

Overview of the [Save/Load] Menu

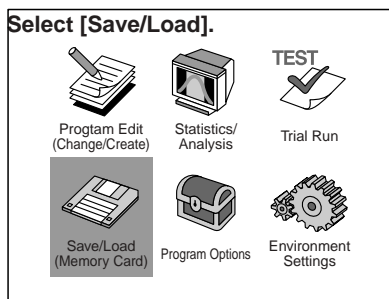
What is the [Save/Load] Menu?

[Save/Load] Menu is a screen for saving data such as the settings of the CV-2100 to a compact flash memory inserted to the CV-2100.

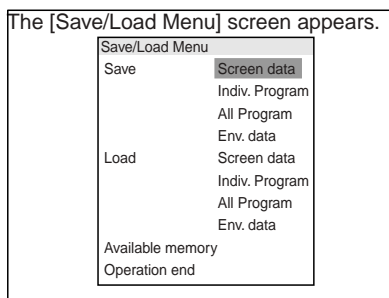
To display the [Save/Load] Menu

1 Open the initial screen of the CV-2100 by pressing the [MENU] button on the remote control console.

2 Select [Save/Load].



The [Save/Load Menu] screen appears.



► Note

You can only use single-byte alphanumeric characters for names of folders and files to be saved on a compact flash memory. If you assign names including double-byte characters to folders or files using your computer, they will not be properly loaded to the CV-2100.

Inserting or Removing a Compact Flash Memory Card

You can save the settings of the CV-2100 and captured screens to a compact flash memory.

Supported models of compact flash memory card

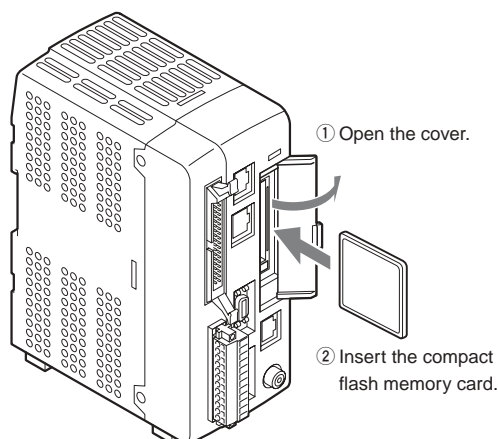
The optional NR-M32 (32 MB) and GR-M256 (256 MB) from KEYENCE are supported on the CV-2100.

► Note

The CV-2100 does not support a compact flash memory in a FAT32 format. Before you format a compact flash memory, make sure that the file system is FAT (FAT16.)

Inserting a Compact Flash Memory Card

Open the cover of the compact flash memory card slot on the CV-2100, then insert the memory card.

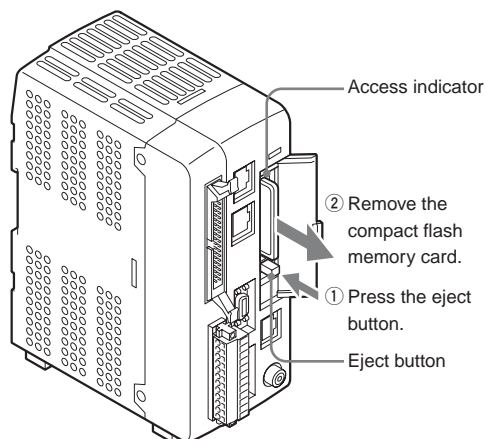


► Note

- Verify the orientation of the card when you insert it. Inserting the card in a wrong orientation can damage the compact flash memory card and the data stored on it.
- You cannot save to or load from the compact flash memory when the slot cover is open. Make sure you close the slot cover after you insert the card.

Removing a Compact Flash Memory Card

Press the eject button located in the compact flash memory card slot of the CV-2100 to remove the inserted memory card.



► Note

Do not remove the compact flash memory card while the machine is being accessed (while the access indicator is on). Otherwise you may damage the compact flash memory card and the data stored on it.

Saving or Loading Screen Data [Screen data]

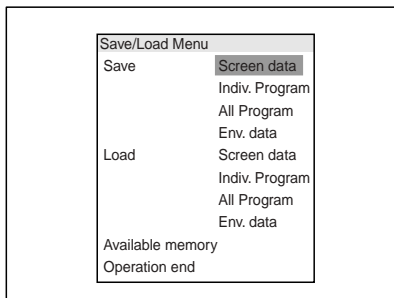
Saving Screen Data [Save Screen data]

You can save screens stored on the CV-2100 to a compact flash memory in the Windows bitmap format (.bmp).

- 1 Insert a compact flash memory card (optional) to the compact flash memory card slot of the CV-2100.

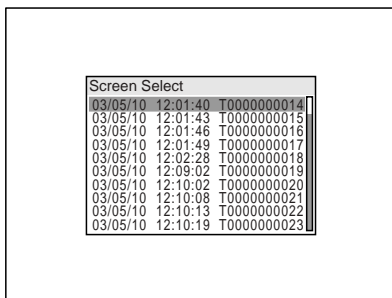
Refer to page 9-2 for details.

- 2 Select [Save Screen data] on the [Save/Load Menu] screen.



The [Screen Selection] screen appears.

- 3 Select the screen you want to save.



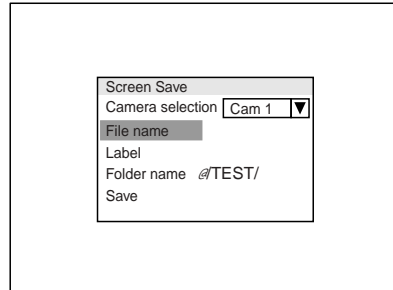
The [Screen Save] screen appears.

- 4 If the screen you selected on step 3 is a screen captured using multiple triggers/multiple cameras, select [Camera selection] before selecting the screen you want to save.

Note

As you select each trigger, the background screen switches to the screen captured on that particular trigger.

- 5 Select [File name], then specify a file name for the screen.



- The file name must not be longer than 8 characters.
- Refer to "Inputting Texts" (page 3-4) for details.

Note

You must specify a file name in order to save a screen.

- 6 Select [Label], then enter any notes as needed.

- It is useful to enter information regarding the stored screen such as its corresponding work.
- The label must not be longer than 10 characters.
- Refer to "Inputting Texts" (page 3-4) for details.

- 7 Specify the destination folder as required.

To save the screen to a folder other than the displayed folder, select the [Folder name], then select the folder to which you want to save the screen in the [Folder Selection] screen.

Note

- To save the screen to a different folder, you must create it beforehand using your computer.
- You can only use single-byte alphanumeric characters and single-byte katakanas in a folder name and it must not be longer than 128 characters.

- 8 Select [Save].

The specified screen file (.bmp) and its attribute file (.atr) containing screen information are saved to the compact flash memory.

- 9 To save another screen data, repeat steps 3 to 8.

- 10 When you finish saving screen data, press the [ESCAPE] button, then select [Input end].

Loading Screen Data [Load Screen data]

You can load screens stored on a compact flash memory into the CV-2100.

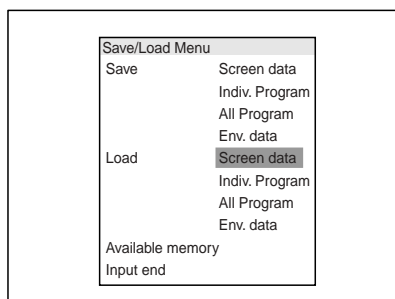
Note

An attribute file (.atr) containing screen information as well as the screen file (.bmp) itself is required to load a screen file. A screen file cannot be loaded into the CV-2100 without its corresponding attribute file.

1 Insert a compact flash memory card (optional) to the compact flash memory card slot of the CV-2100.

Refer to page 9-2 for details.

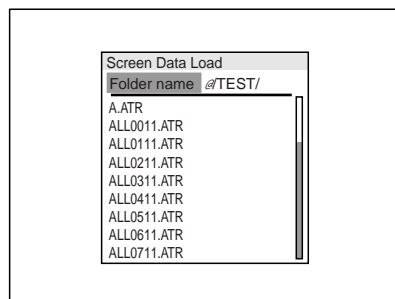
2 Select [Load Screen data] on the [Save/Load Menu] screen.



The [Screen Data Load] screen appears.

3 Select the screen you want to load.

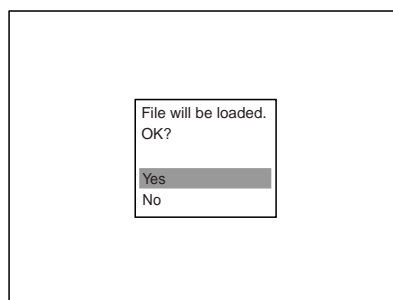
If the desired screen is located in a folder other than the displayed folder, select [Folder name], then select the folder from which you want to load the screen in the [Folder Selection] screen.



Note

- The maximum number of files displayed is 256.
- When loading screens to be handled according to the [Save screen] settings (refer to page 6-15), in order to use loaded screens for a measurement requiring multiple screens (when working with two cameras or performing a multi-tirg), you must load all of the screens required for that particular measurement. For example, if you are working with two cameras, you need to load two screens: one for Camera 1 and one for Camera 2.
- To load multiple screens as a set for a particular measurement, load them consecutively without leaving the [Screen Data Load] screen. If you move to another screen, then the next loaded screen will be considered as a screen for a different measurement.

4 Select [Yes].



The loaded screens will be handled according to the [Save screen] settings (refer to page 6-15.) To view the loaded screens, refer to "Selecting the Screen to Display [Screen selection]" (page 6-16).

Note

- When more than 54 screens are loaded, the oldest screen will be overwritten.
- On the [Screen selection] screen, each loaded screen will have a name starting with an L such as "L0000000001." The number following L designates the loaded order and is a sequential number starting from 1. This number is reset to 1 when you turn off the power of CV-2100.

5 To load another screen data, repeat steps 3 to 4.

6 When you finish loading screen data, press the [ESCAPE] button, then select [Input end].



Saving or Loading the Settings for a Program No. [Indiv. Program]

Saving the Settings for a Program No. [Save Indiv. Program]

You can save the settings for a particular Program No. stored on the CV-2100 to a compact flash memory.

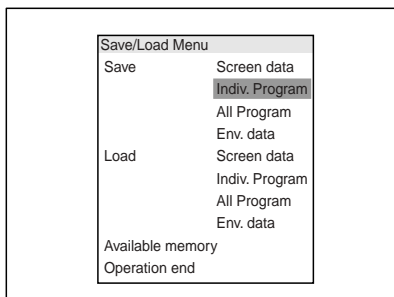
Reference

Various option settings that are established by the selected PROG No. are saved at the same time.

- 1 Insert a compact flash memory card (optional) to the compact flash memory card slot of the CV-2100.

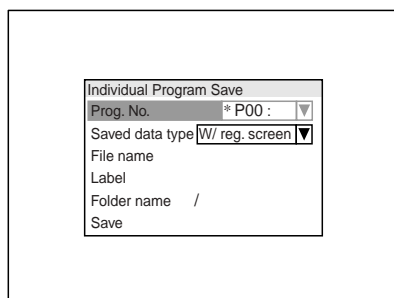
Refer to page 9-2 for details.

- 2 Select [Save Indiv. Program] on the [Save/Load Menu] screen.



The [Individual Program Save] screen appears.

- 3 Select [Prog. No.], then select the program number for which you want to save the settings.



- 4 Select [Saved data type], then specify whether you want to save the registered screen included in the program number as well.

- [W/ reg screen](default): the registered screen included in the Program No. is saved with the rest of the data.
- [W/o reg. screen]: all of the data included in the Program No. except the registered screen is saved.

- 5 Select [File name], then specify a file name.

- The file name must not be longer than 4 characters.
- Refer to "Inputting Texts" (page 3-4) for details.

Note

You must specify a file name in order to save the settings.

- 6 Select [Label], then enter any notes as needed.

- It is useful to enter information regarding the stored settings such as their corresponding work.
- The label must not be longer than 10 characters.
- Refer to "Inputting Texts" (page 3-4) for details.

- 7 Specify the destination folder as required.

To save the settings to a folder other than the displayed folder, select [Folder name], then select the folder to which you want to save the settings in the [Folder Selection] screen.

Note

- To save the screen to a different folder, you must create it beforehand using your computer.
- You can only use single-byte alphanumeric characters in a folder name and it must not be longer than 128 characters.

- 8 Select [Save].

The settings for the selected program number are saved to the compact flash memory.

- 9 Select [Input end].

Loading the Settings for a Program No. [Load Indiv. Program]

You can load the settings for a particular program number stored on a compact flash memory to the CV-2100.

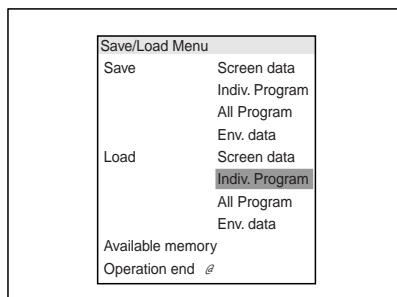
Note

Various optional settings included in the stored Program No. are also loaded.

- 1 Insert a compact flash memory card (optional) to the compact flash memory card slot of the CV-2100.

Refer to page 9-2 for details.

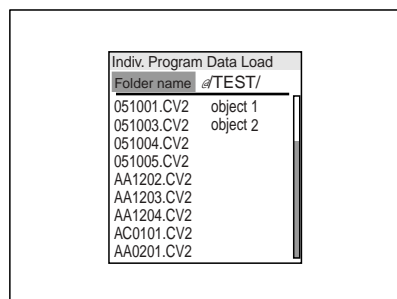
- 2 Select [Load Indiv. Program] on the [Save/Load Menu] screen.



The [Indiv. Program Data Load] screen appears.

- 3 Select the set of settings you want to load.

If the desired set of settings is located in a folder other than the displayed folder, select [Folder name], then select the folder from which you want to load the set of settings in the [Folder Selection] screen.

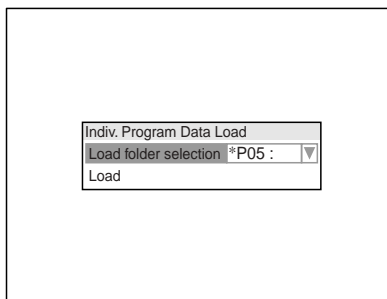


The [Indiv. Program Data Load] screen appears. Labels are shown after the file names.

Note

The maximum number of files displayed is 256.

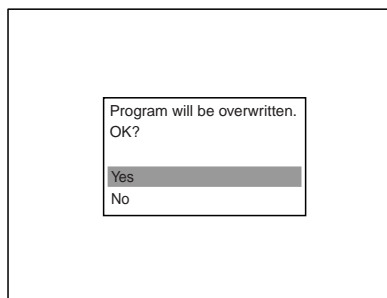
- 4 Select [Load folder selection], then specify the Program No. under which you want to save the set of settings you selected on step 3.



- 5 Select [Load].

A confirmation screen appears.

- 6 Select [Yes].



The settings for the selected Program No. are loaded.

- 7 To load another set of settings, repeat steps 3 to 6.

- 8 When you finish loading the settings, press the [ESCAPE] button, then select [Input end].

Saving or Loading the Settings for All Program No.'s [All Program]

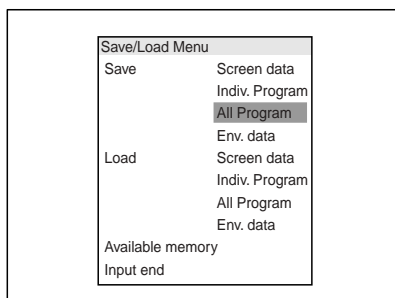
Saving the Settings for All Program No.'s [Save All Program]

You can save all Program No.'s and their optional settings (refer to page 6-1) stored on the CV-2100 to a compact flash memory.

1 Insert a compact flash memory card (optional) to the compact flash memory card slot of the CV-2100.

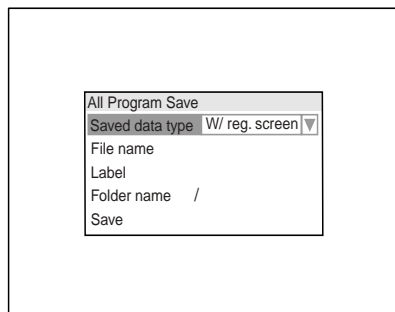
Refer to page 9-2 for information on how to insert a compact flash memory card.

2 Select [Save All Program] on the [Save/Load Menu] screen.



The [All Program Save] screen appears.

3 Select [Saved data type], then specify whether you want to save the registered screens included in the Program No.'s as well.



- [W/ reg screen](default): The registered screens included in the Program No.'s are saved with the rest of the data.
- [W/o reg. screen]: All of the data included in the Program No.'s except the registered screens is saved.

4 Select [File name], then specify a file name.

- The file name must not be longer than 4 characters.
- Refer to "Inputting Texts" (page 3-4) for details on how to enter characters.

► Note

You must specify a file name in order to save the settings.

5 Select [Label], then enter any notes as needed.

- It is useful to enter information regarding the stored settings such as their corresponding work.
- The label must not be longer than 10 characters.
- Refer to "Inputting Texts" (page 3-4) for details on how to enter characters.

6 If necessary, specify the destination folder.

To save the settings to a folder other than the displayed folder, select [Folder name], then select the folder to which you want to save the settings in the [Folder Selection] screen.

► Note

- To save the screen to a different folder, you must create it beforehand using your computer.
- You can only use single-byte alphanumeric characters in a folder name and it must not be longer than 128 characters.

7 Select [Save].

The settings for all Program No.'s are saved to the compact flash memory.

8 Select [Input end].

Loading the Settings for All Program No.'s [Load All Program]

You can load the Program No.'s and their optional settings (refer to page 6-1) stored on a compact flash memory to the CV-2100 to overwrite the current settings for all Program No.'s.

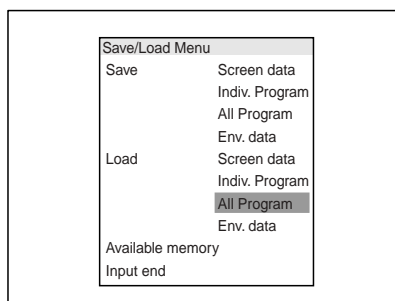
Note

If necessary, save the settings to a compact flash memory before you perform the following procedure since all of the existing settings for the Program No.'s will be overwritten.

1 Insert a compact flash memory card (optional) to the compact flash memory card slot of the CV-2100.

Refer to page 9-2 for details.

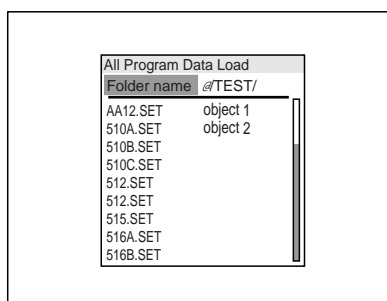
2 Select [Load All Program] on the [Save/Load Menu] screen.



The [All Program Data Load] screen appears.

3 Select the set of settings you want to load.

If the desired set of settings is located in a folder other than the displayed folder, select [Folder name], then select the folder from which you want to load the set of settings in the [Folder Selection] screen.



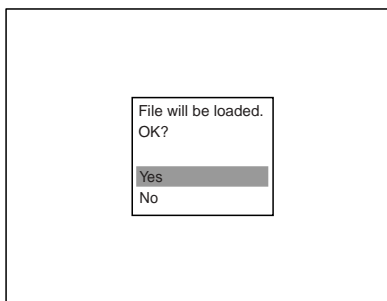
A confirmation screen appears.

Labels are shown after the file names.

Note

The maximum number of files displayed is 256.

4 Select [Yes].



The settings for all Program No.'s are loaded.

5 Select [Input end].

Saving or Loading the Environment Settings of the CV-2100 [Environment Settings]

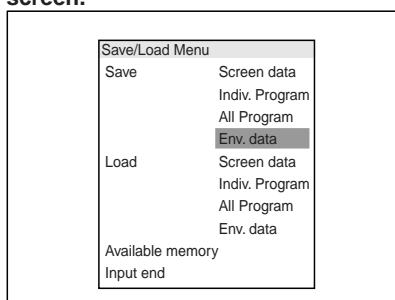
Saving the Environment Settings [Save Env. data]

You can save the settings you specified on the [Environment Settings] screen (refer to page 8-1) stored on the CV-2100 to a compact flash memory.

- 1 **Insert a compact flash memory card (optional) to the compact flash memory card slot of the CV-2100.**

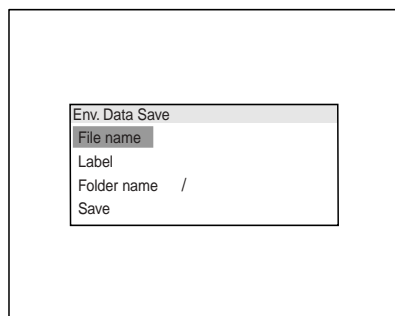
Refer to page 9-2 for details.

- 2 **Select [Save Env. data] on the [Save/Load Menu] screen.**



The [Env. Data Save] screen appears.

- 3 **Select [File name], then specify a file name.**



- The file name must not be longer than 8 characters.
- Refer to “Inputting Texts” (page 3-4) for details on how to enter characters.

► Note

You must specify a file name in order to save the settings.

- 4 **Select [Label], then enter any notes as needed.**

- It is useful to enter information regarding the stored settings such as their corresponding work.
- The label must not be longer than 10 characters.
- Refer to “Inputting Texts” (page 3-4) for details on how to enter characters.

- 5 **If necessary, specify the destination folder.**

To save the settings to a folder other than the displayed folder, select [Folder name], then select the folder to which you want to save the settings in the [Folder Selection] screen.

► Note

- To save the screen to a different folder, you must create it beforehand using your computer.
- You can only use single-byte alphanumeric characters in a folder name and it must not be longer than 128 characters.

- 6 **Select [Save].**

The environment settings data are saved to the compact flash memory.

- 7 **Select [Input end].**

Loading the Environment Settings [Load Env. data]

You can load the settings from the [Environment Settings] screen (refer to page 8-1) stored on a compact flash memory to the CV-2100 to overwrite the current environment settings.

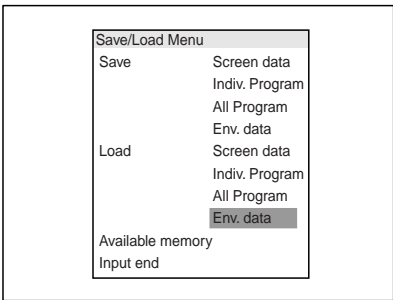
► Note

If necessary, save the environment settings to a compact flash memory before you perform the following procedure since all of the existing environment settings will be overwritten.

1 Insert a compact flash memory card (optional) to the compact flash memory card slot of the CV-2100.

Refer to page 9-2 for information on how to insert a compact flash memory card.

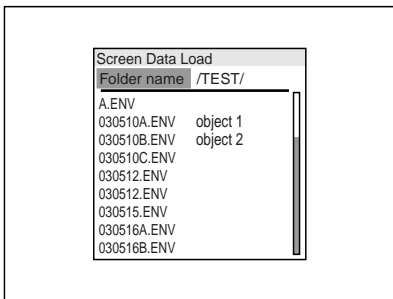
2 Select [Load Env. data] on the [Save/Load Menu] screen.



The [Env. Data Load] screen appears.

3 Select the set of settings you want to load.

If the desired set of settings is located in a folder other than the displayed folder, select [Folder name], then select the folder from which you want to load the set of settings in the [Folder Selection] screen.

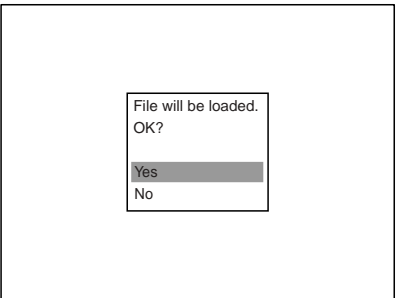


Labels are shown after the file names.

► Note

The maximum number of files displayed is 256.

4 Select [Yes].



The selected settings are loaded.

5 Select [Input end]



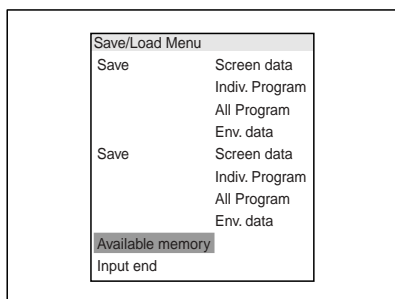
Checking the Available Space on a Compact Flash Memory [Available memory]

You can check the available space on a compact flash memory card inserted to the CV-2100 as follows.

- 1 Insert a compact flash memory card (optional) to the compact flash memory card slot of the CV-2100.**

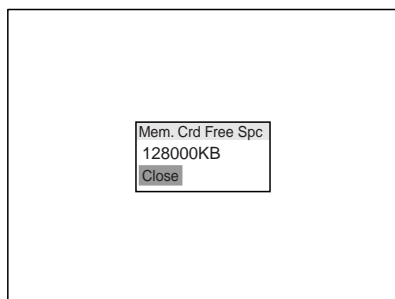
Refer to page 9-2 for details.

- 2 Select [Available memory] on the [Save/Load Menu] screen.**



The [Mem. Crd Free Spc] screen appears.

- 3 Check the amount of available memory.**

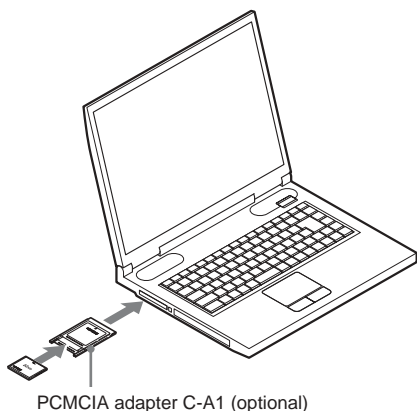


- 4 Select [Close].**

Loading Saved Data into your Computer

You can load the CV-2100 data saved to a compact flash memory onto your computer and save them to other media including hard disks and CD-ROMs.

- 1 **Set the compact flash memory card in the PCMCIA adapter C-A1 (optional), then insert the adapter in the PC card slot of your computer.**



Reference

Refer to the instruction manual of your computer for more information.

- 2 **Open “My Computer” on the desktop and double-click the drive icon for the compact flash memory card.**

The data stored on the memory card are displayed. If the drive icon for the compact flash memory card does not appear in “My Computer”, refer to “When the compact flash memory card is not recognized.”

- 3 **To save the data from the compact flash memory to another medium, copy the desired data by dragging-and-dropping them onto the icon of the destination medium.**

When the compact flash memory card is not recognized

When using the compact flash memory card for the first time, you must specify its driver settings as follows.

Note

The actual screen displayed may slightly vary depending on the version of Windows you are using and the model of your computer.

- 1 **Set the compact flash memory card in the PCMCIA adapter C-A1 (optional), then insert the adapter in the PC card slot of your computer. When the following screen appears, click [Next].**



Reference

The driver file for the compact flash memory card are included with Windows; it is not necessary to insert any floppy disk.

- 2 **Click [Finish].**

The driver for the compact flash memory card is now configured.

To open a saved file on your computer

You can open files with the extension of “.bmp” using an image processing application such as “Paint” included with Windows.

Note

The contents of files with extensions other than “.bmp” cannot be viewed using a computer.

File Types Saved to a Compact Flash Memory

The following table lists the types of files that are saved to a compact flash memory when you perform the procedures described in this chapter and the data contained in those files.

Note

- If a file with the same name already exists on the compact flash memory, it will be overwritten when you save a new file.
- The sequential number (nnnn) in the file names "Cnnnn.bmp" and "Rnnnn.dat" is reset to 0001 when you turn on the power of the CV-2100.
- Files "Tctnnnn.bmp", "Tctnnnn.atr", "Cnnnn.bmp", and "Rnnnn.dat" are automatically saved under "\CV2100" folder. This folder is automatically created on the compact flash memory.
- The names of the files saved under "\CV2100" folder are automatically generated.

File name	Data contained
xxxxxxx.bmp, xxxxxxxx.atr	The bitmap data (.bmp) and the attribute data (.atr) saved or loaded when you save or load screen data (refer to page 9-3).
Tctnnnn.bmp, Tctnnnn.atr	<p>The bitmap data (.bmp) and the attribute data (.atr) saved when you output a screen (refer to page 4-124). The "nnnn" in the file names indicates the last 4 digits of their measurement number.</p> <ul style="list-style-type: none">• "c" indicates the camera number: 1 specifies Camera 1, 2 specifies Camera 2.• "t" indicates the trigger number: 1 specifies Trigger 1, 2 specifies Trigger 2, 3 specifies Trigger 3, 4 specifies Trigger 4.
Cnnnn.bmp, Cnnnn.atr	<p>The bitmap data (.bmp) and the attribute data (.atr) saved when you capture a screen (refer to page 1-4). The file name is automatically and sequentially assigned starting from C0001.</p>
xxxx.set	The list of settings that is saved or loaded when you save or load the settings for all Program No.'s (refer to page 9-7).
xxxnn.cv2	The settings data that are saved or loaded when you save or load the settings for a Program No. (refer to page 9-5). The last two digits (nn) of the file name indicate the Program No.
xxxnnct.bmp, xxxnnct.atr	<p>The bitmap data (.bmp) and the attribute data (.atr) saved if you select to include the registered screen(s) when saving settings for all Program No.'s or for a particular Program No.</p> <ul style="list-style-type: none">• "nn" indicates the Program No.• "c" indicates the camera number: 1 specifies Camera 1, 2 specifies Camera 2.• "t" indicates the trigger number: 1 specifies Trigger 1, 2 specifies Trigger 2, 3 specifies Trigger 3, 4 specifies Trigger 4.

File name	Data contained
xxxxxxx.env	The settings data that are saved or loaded when you save or load the environment settings (refer to page 9-9.)
Rnnnn.dat	The output data file containing data such as measurement results. The items specified in "Changing the Output Setting to the Compact Flash Memory (Memory Card)" (page 4-123) are recorded to this file. The file name is automatically and sequentially assigned starting from R0001. Note that the sequential number "nnnn" is not reset but incremented when a reset input is received or the Program No. is switched.
<div>► Note</div> <p>If a file with the same name already exists, the new data are appended to the existing file.</p>	



Chapter 10

Communication via RS-232C Port (Non-procedural Mode)

Overview of RS-232C Communications with this Unit

This unit has two modes for communicating with an external unit using RS-232C: Non-procedural mode (page 10-3) and PLC link mode (page 11-1). The details of the communication process differ depending on the communication mode, so use the mode that is appropriate for your environment. For details of switching between communication modes, see “Changing the RS-232C Communication Method” (page 8-3).

The RS-232C Interface

Basic specifications

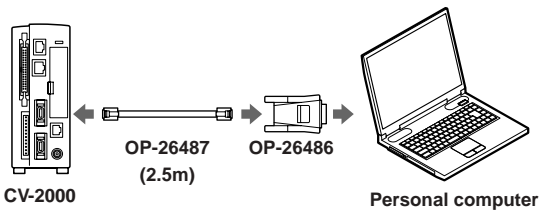
The EIA (Electronic Industries Association) RS-232 standard must be satisfied.

Item	Corresponding function
Communication method	Full duplex
Synchronization method	Start/stop system
Transfer code	ASCII (partial binary)
Data bit length	8 bits/7 bits
Stop bit length	1 bit/2 bits
Parity check	None/odd/even
Communication speeds	9,600/19,200/38,400/57,600/115,200 bps
Data partitioning	Cr
Flow control	None, CTS/ RTS
Maximum cable length	15m

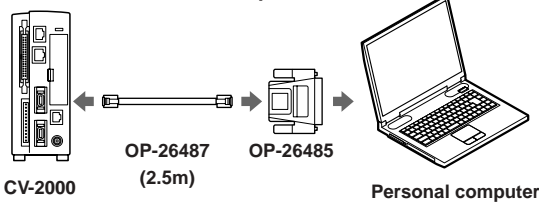
Connection to the PC

Connection to the PC requires a specific optional cable.

When there is a D-sub 9-pin connector on the PC side



When there is a D-sub 25-pin connector on the PC side

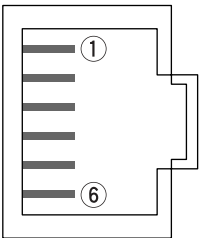


Note

In the connection examples shown above, hard flow control is impossible. If hard flow control is needed, connect by the method shown on page 11-6.

Connector specifications

The RS-232C port specifications of this unit are as shown below.



No.	Signal	Signal explanation	Signal direction
1	RS (RTS)	data send request	output
2	Unused	—	—
3	RD (RXD)	data receive	input
4	SG (GND)	GND	—
5	SD (TXD)	data send	output
6	CS (CTS)	data send authorization	input

Overview of Commands

Commands that can be used in this unit

Commands that are used for measurement processing in this unit

Trigger (page 10-7)

Processes the trigger input.

Retry (page 10-16)

Executes processing corresponding to the currently selected program number on the immediately preceding measurement image and images acquired from a compact flash memory card.

Commands used to change the operation mode of this unit

Change to run mode (page 10-7)

Changes this unit's operation mode to run mode.

Change to communication mode (page 10-7)

Changes this unit's operation mode to communication mode.

Commands that rewrite data in this unit

Window number change (page 10-8)

Changes the currently selected window number.

Program number change (page 10-8)

Changes the currently selected program number.

Image data rewrite (page 10-9)

Writes image data specified in the compact flash memory or image data sent by a communications command into the image buffer.

Image registration (page 10-10)

Specifies the camera number and trigger number, and registers the last image taken into the image buffer as the registered image.

Image buffer clear (page 10-11)

Clears all image data in the image buffer.

Program number data write-in (page 10-11)

Writes in data having the program number specified by the compact flash memory or a communications command as the program number specified for this unit.

Environmental data setting write-in (page 10-14)

Writes in environmental setting data specified by the compact flash memory or a communications command as the environmental setting data of this unit.

Tolerance setting write-in (page 10-16)

Sets the tolerance specified by a communications command.

Binary data write-in (page 10-17)

Sets the binary data specified by a communications command.

Reset (page 10-17)

Resets statistical data, number of measurements and number of failures. At the same time, clears the image buffer.

Output setting write-in (page 10-18)

Changes the output settings for RS-232C, Ethernet, parallel and compact flash memory.

Data and time setting write-in (page 10-20)

Sets the data and time on the clock built into this unit.

Commands that refer to data of this unit

Window number read-out (page 10-8)

Reads out the value of the currently selected window number.

Program number read-out (page 10-8)

Reads out the value of the currently selected program number.

Image data read-out (page 10-10)

Specifies the camera number and trigger number, and saves the last image taken into the buffer in compact flash memory or outputs it via communication.

Screen capture (page 10-11)

Saves the image currently displayed on the screen in compact flash memory, or outputs it via communication.

Program number data read-out (page 10-11)

Saves the specified program number data in compact flash memory, or outputs them via communication.

Environmental setting data read-out (page 10-15)

Saves all environmental setting data information in compact flash memory, or outputs it via communication.

Tolerance setting read-out (page 10-16)

Reads out the tolerance specified by a communications command.

Binary data read-out (page 10-17)

Reads out the binary data specified by a communications command.

Repeat read-out of measurement results (page 10-17)

Repeats output of the immediately preceding measurement.

Output setting read-out (page 10-18)

Outputs the output setting specified by the "input/output media" set by the communications command in accordance with the specified output format.

Date and time setting read-out (page 10-20)

Reads out the data and time on the clock built into this unit.

Other commands

Saving the settings (page 10-18)

Saves the changed contents of settings changed for this unit by a communications command in the memory of this unit. Settings made by a communications command become effective immediately, but are not Saved in this unit until this command is executed.

Password (page 10-18)

Switches the password function on and off.

Remote control console pseudo input (page 10-19)

Provides the equivalent of remote control console input via a communications command.

Remote control console input prohibition/permission (page 10-20)

Switches between remote control console operation prohibited and permitted.

Operation Modes and Input Permission Commands of this Unit

○ = Input permitted.

	Command	Run mode	Test run mode	Program mode	Communications mode
Trigger	T1	○	○		
Change of operation mode	R0				○
Change of communication mode	O0	○			
Window number change	UW				○
Window number readout	UR				○
Program number change	PW				○
Program number readout	PR				○
Image data write-in	BW				○
Image data read-out	BR				○
Image registration	BS				○
Screen capture	BC	○	○	○	○
Image buffer clear	BE				○
Program number data write-in	SW				○
Program number data read-out	SR				○
Environmental data write-in	SB				○
Environmental data read-out	SA				○
Retry	RT	○	○		
Tolerance setting write-in	DW	○	○		○
Tolerance setting read-out	DR	○	○		○
Binary data write-in	JW	○	○		○
Binary data read-out	JR	○	○		○
Reset	RS	○	○		○
Repeat read-out of measurement result	M0	○	○		○
Output settings write-in	AW				○
Output settings read-out	AR				○
Saving the settings	SS				○
Password	PS	○	○	○	○
Remote control console pseudo input	KY	○	○	○	
Date and time settings write-in	TW				○
Date and time settings read-out	TR				○
remote control console input prohibited/permitted	CK			○	○

Precautions relating to command input/output

If the password is set to enabled during communication:

Reception of commands other than the password-protected command is prohibited.

Reception of one command is permitted only when the correct password specified for the password-protected command is entered. When reception of a command is permitted and one command is received and executed, the system returns to the command reception prohibited state.

A password specification command is necessary for each command.

Consequently, when the system is in password-enabled mode while communication is in progress, it is necessary to resend the password specification command with each command.

If an error occurs when a command is received:

An error response of the form "ER.○○.nnnr" is received.

The contents of errors are as follows.

- ○○Received command that caused the error
Example: If No. 32 is specified in a program number change command, "ER.PW.22cr" (ER.program number change.data number error cr) is sent.
- nn ASCII 2-digit error codes
 - 00: Command error (the corresponding command does not exist)
 - 01: Command action prohibited (the received command cannot be performed)
 - 20: Command data length error (the specified command length and number of data are out of range)
 - 22: Data range error (the specified data values are out of range)
 - 80: Password error (the specified password does not match)
 - 81: Command reception prohibited (a command was received while the password was enabled and command reception was prohibited)
 - 90:Checksum error (checksum error)
 - 91:Time limit exceeded error

Details of Communication Com- mands

Trigger

Input trigger

send T1 CR

receive T1, numerical data CR

Regarding the numerical data, see “Output Data Format” (page 10-21).

When automatic image output is set

The following responses are sent, timed to match the image output timing.

Receive TB, Cn, Tn, yy, mo, dd, hh, mi, ss, nnnnnnn, image data CS

- Cn (camera number): 1 or 2
- Tn (trigger number): 1 to 4
- yy: Last 2 digits of year by Western calendar 00 to 99) (For the year 2003, this would be 03.)
- mo: month (01 to 12)
- dd: day (01 to 31)
- hh: hour (on 24-hour clock) (00 to 23)
- mi: minute (00 to 59)
- ss: second (00 to 59)
- nnnnnnn: data length (0246839 bytes for image data, including checksum)
- Image data: binary
- CS: checksum

Change mode

Change to communication mode.

send O0 CR

receive O0 CR

Change to run mode

send R0 CR

receive R0 CR

Window number

Change the window number.

send UW, nn CR

Reeceive UW CR

- nn (window number): 01 to 64

Read out the window number

send UR CR

receive UR, nn CR

- nn (window number): 01 to 64

Program number

Change the program number.

send PW, nn CR

receive PW CR

- nn (program number intended to be set): 00 to 31

Read out the Program number.

send PR CR

receive PR, nn CR

- nn (the currently-set program number): 00 to 31

Image data

Write-in image data (write into main unit memory)

When communication is specified

send BW, CM, Cn, Tn, Pn, yy, mo, dd, hh, mi, ss, nnnnnnn, image data CS

receive BW CR

- Cn (camera number): 1 or 2
- Tn (trigger number): 1 to 4
- Pn (handling of load number):
0: Write into the current load number.
1: Add +1 to the load number and write in.
- yy: digits of year by Western calendar 00 to 99) (For the year 2003, this would be 03.)
- mo: month (01 to 12)
- dd: day (01 to 31)
- hh: hour (on 24-hour clock) (00 to 23)
- mi: minute (00 to 59)
- ss: second (00 to 59)
- nnnnnnn: data length (0246839 bytes for image data, including checksum)
- Image data: binary
- CS: checksum

When compact flash memory is specified

Read in the image data from the file whose name is specified from the compact flash memory, and write into the image buffer.

send BW, CF, Cn, Tn, Pn, folder name, file name CR

receive BW CR

- Cn (camera number): 1 or 2
- Tn (trigger number): 1 to 4
- Pn (handling of load number):
0: Write into the current load number.
1: Add +1 to the load number and write in.
- Folder name: up to 128 characters (example: CV\ABC\)
- File name: up to 8 characters, without extension

► Note

If the specified directory and file do not exist in compact flash memory, an error response is output.

Read out image data

When communication is specified:

- send BR, CM, Cn, Tn CR
- receive BR, yy, mo, dd, hh, mi, ss, nnnnnnn, image data CS
- Cn (camera number): 1 or 2
 - Tn (trigger number): 1 to 4
 - yy: Last 2 digits of year by Western calendar 00 to 99) (For the year 2003, this would be 03.)
 - mo: month (01 to 12)
 - dd: day (01 to 31)
 - hh: hour (on 24-hour clock) (00 to 23)
 - mi: minute (00 to 59)
 - ss: second (00 to 59)
 - nnnnnnn: data length (0246839 bytes for image data, including check-sum)
 - Image data: binary
 - CS: check sum

When compact flash memory is specified (saving in compact flash memory)

- send BR, CF, Cn, Tn, folder name , file name, memo name CR
- receive BR CR
- Folder name: up to 128 bytes (example: CV\ABC\)
 - File name: up to 8 characters, without extension
 - Memo name: up to 10 characters

Register the image

Specify the camera number and trigger number, then register the last image that was taken into the image buffer as the registered image.

- send BS, Cn, Tn CR
- receive BS CR
- Cn (camera number): 1 or 2
 - Tn (trigger number): 1 to 4

Save the Current Screen (Screen Capture)

When communication is specified:

send BC, CM CR

receive BC, nnnnnnn, screen data CS

- nnnnnnn: Data length (capture image: 0921655 bytes, including checksum)
- Image data: binary
- s: Checksum

When compact flash memory is specified

send BC, CF CR

receive BC CR

Clear saved images

send BE CR

receive BE CR

Write In/Read Out Program Number Data

Write in program number data

send SW, CM, DT, nn, setting data CR

receive SW CR

- nn (write-in destination program number): 00 to 31, CP
- Setting data: setting data for 1 setting

Read out program number data

send SR, CM, DT, nn CR

receive SR, CM, DT, setting data CR

- nn (read-out program number): 00 to 31, CP
- Setting data: setting data for 1 setting

Reference

When nn is set to CP, the setting data are read or written to the current program number.

Take In Program Number Data from Compact Flash Memory/Save

Take in program number data from compact flash memory

Case in which one setting datum is taken in (no registered image)

send SW, CF, DT, nn, folder name, file name CR

receive SW CR

- nn (write-in destination program number): 00 to 31, CP
- Folder name: up to 128 characters (example: CV\ABC\)
- File name: 8 characters, without extension

Case in which one setting datum is taken in (with registered image)

send SW, CF, BD, nn, folder name, file name CR

receive SW CR

- nn (write-in destination program number): 00 to 31, CP
- Folder name: up to 128 characters (example: CV\ABC\)
- File name: 8 characters, without extension

Case in which all setting data are taken in (without registered image)

send SW, CF, DT, AL, folder name, file name CR

receive SW CR

- Folder name: up to 128 characters (example: CV\ABC\)
- File name: 8 characters, without extension

Case in which all registered data are taken in (with registered image)

send SW, CF, BD, AL, folder name, file name CR

receive SW CR

- Folder name: up to 128 characters (example: CV\ABC\)
- File name: 8 characters, without extension

Reference

When nn is set to CP, the setting data are read or written to the current program number.

Save Program Number Data in Compact Flash Memory

Case in which one setting datum is saved (without registered image)

send SR, CF, DT, nn, folder name, file name, memo name CR

receive SR CR

- nn (write-in destination program number): 00 to 31, CP
- Folder name: up to 128 characters (example: CV\ABC\)
- File name: 4 characters, without extension
- Memo name: up to 10 characters

Case in which one setting datum is saved (with registered image)

send SR, CF, BD, nn, folder name, file name, memo name CR

receive SR CR

- nn (write-in destination program number): 00 to 31, CP
- Folder name: up to 128 characters (example: CV\ABC\)
- File name: 4 characters, without extension
- Memo name: up to 10 characters

Case in which all setting data are saved (without registered image)

send SR, CF, DT, AL, folder name, file name, memo name CR

receive SR CR

- Folder name: up to 128 characters (example: CV\ABC\)
- File name: 4 characters, without extension
- Memo name: up to 10 characters

Case in which all registered data are saved (with registered image)

send SR, CF, BD, AL, folder name, file name, memo name CR

receive SR CR

- Folder name: up to 128 characters (example: CV\ABC\)
- File name: 4 characters, without extension
- Memo name: up to 10 characters

Write In/Read Out Registered Image

Write in registered image

send SW, CM, BD, nn, Cn, Tn, ddddddd, image data **CS**

receive SW **CR**

- nn: Program number from 00 to 31
- Cn: (Camera number): 1 or 2
- Tn (Trigger number): 1 to 4
- ddddddd: Data length (image data: 0246839 bytes, including checksum)
- Image data: Binary
- **CS**: Checksum

Read out registered image

send SR, CM, BD, nn, Cn, Tn **CR**

receive SR, CM, BD, ddddddd, image data **CS**

- nn: Write-in destination program number from 00 to 31
- Cn: (Camera number): 1 or 2
- Tn (Trigger number): 1 to 4
- ddddddd: Data length (image data: 0246839 bytes, including checksum)
- Image data: Binary
- **CS**: Checksum

Write In/Read Out Environmental Setting Data

Write in environmental setting data

When communication is specified:

send SB, CM, environmental data **CR**

receive SB **CR**

- Environmental data: Binary

When compact flash memory is specified

send SB, CF, folder name, file name CR

receive SB CR

- Folder name: up to 128 characters (Example: C:\ABC\)
- File name: up to 8 characters, without extension

Read out environmental setting data**When communication is specified:**

send SA, CM CR

receive SA, CM, environmental data CR

- Environmental data: Binary

When compact flash memory is specified

send SA, CF, folder name, file name, memo name CR

receive SA CR

- Folder name: up to 128 characters (Example: C:\ABC\)
- File name: up to 8 characters, without extension
- Memo name: up to 10 characters

Retry

send RT CR

receive RT, numerical data CR

Regarding the numerical data, see “Output Data Format” (page 10-21).

When image output is set

The following commands are output, matching the retry timing.

TB, Cn, Tn, yy, mo, dd, hh, mi, ss, nnnnnnn, image data CS

- Cn (camera number): 1 or 2
- Tn (trigger number): 1 to 4
- yy: Last 2 digits of year by Western calendar (00 to 99) (For the year 2003, this would be 03.)
- mo: month (01 to 12)
- dd: day (01 to 31)
- hh: hour (on 24-hour clock) (00 to 23)
- mi: minute (00 to 59)
- ss: second (00 to 59)
- nnnnnnn: data length (0246839 bytes for image data, including checksum)
- Image data: binary
- CS: Checksum

Write in/read out tolerance (upper limit/lower limit)

Set the specified tolerance of the specified window. For the method of setting the tolerance, see “Method of Setting Tolerance” (page 10-25).

Write in the tolerance

send DW, tolerance setting CR

receive DW CR

Read out the tolerance

send DR, tolerance setting CR

receive DW, nnnnnn CR

- nnnnnn: The tolerance value that has been read out.

Write-In/Read-Out of Binary Data

Perform a binary data setting for a specified window.

► Note

If there are no binary data, an error response is received.

Write in binary data

send JW, nn, xxx, yyy CR

receive JW CR

- nn (window number): 01 to 64
- xxx (upper limit of binary data): 000 to 255
- yyy (lower limit of binary data): 000 to 255

Write out binary data

send JR, nn CR

receive JR, xxx, yyy CR

- nn (window number): 01 to 64
- xxx (upper limit of binary data): 000 to 255
- yyy (lower limit of binary data): 000 to 255

Reset

send RS CR

receive RS CR

Repeat Output of Latest Processing Result

send M0 CR

receive M0, numerical data CR

Also see "Output Settings Specification Format" (page 10-29).

Write In/Read Out Output Settings

Write in output settings

- send AW, xx, output setting specification CR
- receive AW CR
- xx: Output setting specification destination
PP: terminal post
SR: RS-232C port
ET: Ethernet port
CF: Compact flash memory
 - Output setting specification: For the specification method, see “Output Setting Specification Format” (page 10-29).

Read out output settings

- send AR, xx CR
- receive AR, output setting specification CR
- xx: Output setting specification destination
PP: terminal post
SR: RS-232C port
ET: Ethernet port
CF: Compact flash memory
 - Output setting specification: For the specification method, see “Output Setting Specification Format” (page 10-29).

Save Settings

- send SS CR
- receive SS CR

Password

Enable password

- send PS, ON CR
- receive PS, ON CR

Disable password

send PS, OF CR

receive PS, OF CR

Specify password

send PS, NO, nnnn CR

receive PS, NO CR

- nnnn (password): 0000 to 9999

Remote control console Pseudo Input

Pseudo input can be sent to the remote control console. This command can be sent from a personal computer during run, trial run or program mode, thus allowing a kind of key macros to be used.

send KY, xx CR

receive KY, CR

- xx: Remote control console input code

FN: FNC button	LD: ENTER button downward and leftward direction input
BK: ESCAPE button	RU: ENTER button upward and rightward direction input
TG: TRIGGER button	RD: ENTER button downward and rightward direction input
MC: SCREEN button	DS: Run/program selection switch
DC: VIEW button	FD: FNC button + VIEW button
MN: MENU button	FT: FNC button + TRIGGER button
EN: ENTER button	FM: FNC button + MENU button
UP: ENTER button upward direction input	FE: FNC button + ENTER button
DN: ENTER button downward direction input	FS: FNC button + ESCAPE button
LT: ENTER button leftward direction input	F+: FNC button + ENTER button upward direction input
RT: ENTER button rightward direction input	F-: FNC button + ESCAPE button downward direction input
LU: ENTER button upward and leftward direction input	EE: Equivalent to pressing ENTER button twice in succession

Write-In/Read-Out of Date and Time Settings

Write-in of date and time settings

- send TW, yy, mo, dd, hh, mi, ss CR
- receive TW CR
 - yy: Last 2 digits of year by Western calendar 00 to 99) (For the year 2003, this would be 03.)
 - mo: month (01 to 12)
 - dd: day (01 to 31)
 - hh: hour (on 24-hour clock) (00 to 23)
 - mi: minute (00 to 59)
 - ss: second (00 to 59)

Read-out of date and time settings

- send TR CR
- receive TR, yy, mo, dd, hh, mi, ss CR
 - yy: Last 2 digits of year by Western calendar 00 to 99) (For the year 2003, this would be 03.)
 - mo: month (01 to 12)
 - dd: day (01 to 31)
 - hh: hour (on 24-hour clock) (00 to 23)
 - mi: minute (00 to 59)
 - ss: second (00 to 59)

Remote control console Input Prohibited/Permitted

This command prohibits or permits key input from the remote control console.
Even if input from the remote control console is prohibited, control by pseudo remote control console commands is possible.

Prohibit remote control console input

- send CK, OF CR
- receive CK, OF CR

Permit remote control console input

- send CK, ON CR
- receive CK, ON CR

Output Data Format

Data such as evaluation results and measurement values specified by output settings (page 4-119) are output according to the output sequence. The output data formats are the same regardless of whether the output destination is (for example) RS-232C, Ethernet or compact flash memory.

Note

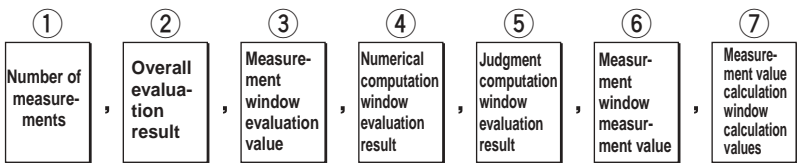
The output format differs depending on the measurement mode.

Reference

RS-232C and Ethernet output settings can be changed with an "AW" command. For details, see "Read In/Write Out Output Settings" (page 10-18).

Data Output Sequence

The data are delimited by commas.



- ① **Number of measurements (10 digits)**
- ② **Overall evaluation result (evaluation result 1 digit): 1 → OK; 0 → NG**
- ③ **Measurement window evaluation value (evaluation result 1 digit): 1 → OK; 0 → NG**
- ④ **Numerical computation window evaluation result (evaluation result 1 digit): 1 → OK; 0 → NG**
- ⑤ **Judgment computation window evaluation value (evaluation result 1 digit): 1 → OK; 0 → NG**
- ⑥ **Measurement window measurement value:**
For details of measurement values, see "Measurement Value Output Formats for Each Measurement Method" (page 10-22).
- ⑦ **Measurement value calculation window calculation values:**
(sign)whole number part of computation result (7 digits) • decimal part of computation result (3 digits)

Example of output

Output example when the evaluation values for the 12th measurement are all OK and the calculation result is "17345.555" (1 window of each type is used)
0000000012, 1, 1, 1, 1, (measured value measurement window), +0017345.555

Measurement Value Output Formats for Each Measurement Method

When “area” is measured

- ① **Area** (example: 001200)
number of pixels (6 digits)

When “pattern search” is measured

- ① **Position X** (Example: +0320.000)
(sign) whole number part (4 digits) . decimal part (3 digits)
- ② **Position Y** (Example: +0240.000)
(sign) whole number part (4 digits) . decimal part (3 digits)
- ③ **Angle** (Example: +135.000)
(sign) whole number part (3 digits) . decimal part (3 digits)
- ④ **Correlation** (Example: 095.0)
whole number part (3 digits) . decimal part (1 digit)

When “multiple pattern search” is measured

Measurements ② to ⑤ below are repeated the set number of times and output for each detection.

- ① **Number of patterns** (Example: 16)
number of patterns (2 digits)
- ② **Position X** (Example: +0320.000)
(sign) whole number part (4 digits) . decimal part (3 digits)
- ③ **Position Y** (Example: +0240.000)
(sign) whole number part (4 digits) . decimal part (3 digits)
- ④ **Angle** (Example: +135.000)
(sign) whole number part (3 digits) . decimal part (3 digits)
- ⑤ **Correlation** (Example: 095.0)
whole number part (3 digits) . decimal part (1 digit)

When “edge position” is measured

When the measurement area is rectangular:

- ① **Number of edges** (example: 0150)
number of edges (4 digits)
- ② **Position X** (Example: +0320.000)
(sign) whole number part (4 digits) . decimal part (3 digits)
- ③ **Position Y** (Example: +0240.000)
(sign) whole number part (4 digits) . decimal part (3 digits)

When the measurement area is a “rotated rectangle”:

- ① **Number of edges** (example: 0150)
number of edges (4 digits)
- ② **Position** (Example: 0320.000)
(sign) whole number part (4 digits) . decimal part (3 digits)

When the measurement area is a “ring/ arc”:

- ① **Number of edges** (example: 0150)
number of edges (4 digits)
- ② **Angle** (Example: 135.000)
(sign) whole number part (3 digits) . decimal part (3 digits)

When “edge gap” is measured

When the measurement area is a “rectangle/ rotated rectangle”

- ① **Number of edges** (example: 0150)
number of edges (4 digits)
- ② **Gap** (example: 0240.000)
whole number part (4 digits) . decimal part (3 digits)

When the measurement area is a “ring/ arc”:

- ① **Number of edges** (example: 0150)
number of edges (4 digits)
- ② **Angle gap** (Example: 135.000)
whole number part (3 digits) . decimal part (3 digits)

When “Edge pitch” is measured

When the measurement area is a “rectangle”:

- ① **Number of pitches** (example: 0012)
number of pitches (4 digits)
- ② **Gap — maximum** (example: 0135.000)
whole number part (4 digits) . decimal part (3 digits)

③ **Gap — minimum** (example: 0110.000)
whole number part (4 digits) . decimal part (3 digits)

④ **Gap — average** (example: 0120.000)
whole number part (4 digits) . decimal part (3 digits)

When the measurement area is a “ring/arc”:

① **Number of pitches** (example: 0012)
Number of pitches (4 digits)

② **Angle gap — maximum** (example: 150.000)
whole number part (3 digits) . decimal part (3 digits)

③ **Angle gap — minimum** (example: 120.000)
whole number part (3 digits) . decimal part (3 digits)

④ **Angle gap — average** (example: 135.000)
whole number part (3 digits) . decimal part (3 digits)

When “number of edges” is measured

① **Number of edges** (example: 0024)
number of edges (4 digits)

When “edge angle” is measured

① **Angle** (example: +05.000)
(sign) whole number part (2 digits) . decimal part (3 digits)

When “stain” is measured

① **Stain quantity (number of stains)** (example: 000120)
stain quantity (6 digits)

When “blob” is measured

In measurements 2 to 9 below, when “all” is specified in the measurement label (page 4-84), the calculation is repeated and then the result is output 64 times. When “select” is specified in the measurement label, output is performed only once per one specified label.

① **Number of labels** (example: 0024)
number of labels (4 digits)

② **Area** (example: 012000)
number of pixels (6 digits)

③ **Center of gravity position X** (example: +0320.000)
(sign) whole number part (4 digits) . decimal part (3 digits)

④ **Center of gravity position Y** (example: +0240.000)
(sign) whole number part (4 digits) . decimal part (3 digits)

⑤ **Feret diameter X** (example: 0320.000)
whole number part (4 digits) . decimal part (3 digits)

⑥ **Feret diameter Y** (example: 0240.000)
whole number part (4 digits) . decimal part (3 digits)

⑦ **Angle** (example: +35.000)
(sign) whole number part (2 digits) . decimal part (3 digits)

⑧ **Perimeter** (example: 002400)
ring length (6 digits)

⑨ **Roundness** (example: 0.129)
whole number part (1 digit) . decimal part (3 digits)

When “trend edge position” is measured

When the measurement area is a “rectangle”:

① **Number of edges — maximum** (example: 0026)
number of edges (4 digits)

② **Number of edges — minimum** (example: 0022)
number of edges (4 digits)

③ **Number of edges — average** (example: 0024.5)
whole number part (4 digits) . decimal part (1 digit)

④ **Position — maximum** (example: +0330.000)
(sign) whole number part (4 digits) . decimal part (3 digits)

⑤ **Position — minimum** (example: +0310.000)
(sign) whole number part (4 digits) . decimal part (3 digits)

⑥ **Position — average** (example: +0320.000)
(sign) whole number part (4 digits) . decimal part (3 digits)

When the measurement area is a “rotated rectangle”:

① **Number of edges — maximum** (example: 0026)
number of edges (4 digits)

② **Number of edges — minimum** (example: 0022)
number of edges (4 digits)

- ③ **Number of edges — average** (example: 0024.5)
whole number part (4 digits) . decimal part (1 digit)
- ④ **Position — maximum** (example: 0330.000)
whole number part (4 digits) . decimal part (3 digits)
- ⑤ **Position — minimum** (example: 0310.000)
whole number part (4 digits) . decimal part (3 digits)
- ⑥ **Position — average** (example: 0320.000)
whole number part (4 digits) . decimal part (3 digits)

When the measurement area is a “ring/arc”:

- ① **Number of edges — maximum** (example: 0026)
number of edges (4 digits)
- ② **Number of edges — minimum** (example: 0022)
number of edges (4 digits)
- ③ **Number of edges — average** (example: 0024.5)
whole number part (4 digits) . decimal part (1 digit)
- ④ **Radius gap — maximum** (example: 0150.000)
whole number part (4 digits) . decimal part (3 digits)
- ⑤ **Radius gap — minimum** (example: 0120.000)
whole number part (4 digits) . decimal part (3 digits)
- ⑥ **Radius gap — average** (example: 0135.000)
whole number part (4 digits) . decimal part (3 digits)

When “trend edge gap” is measured

**When the measurement area is a “rectangle/
rotating rectangle”:**

- ① **Number of edges — maximum** (example: 0026)
number of edges (4 digits)
- ② **Number of edges — minimum** (example: 0022)
number of edges (4 digits)
- ③ **Number of edges — average** (example: 0024.5)
whole number part (4 digits) . decimal part (1 digit)
- ④ **Gap — maximum** (example: 0330.000)
whole number part (4 digits) . decimal part (3 digits)
- ⑤ **Gap — minimum** (example: 0310.000)
whole number part (4 digits) . decimal part (3 digits)

- ⑥ **Gap — average** (example: 0320.000)
whole number part (4 digits) . decimal part (3 digits)

When the measurement area is a “ring/arc”:

- ① **Number of edges — maximum** (example: 0026)
number of edges (4 digits)
- ② **Number of edges — minimum** (example: 0022)
number of edges (4 digits)
- ③ **Number of edges — average** (example: 0024.5)
whole number part (4 digits) . decimal part (1 digit)
- ④ **Radius gap — maximum** (example: 0150.000)
whole number part (4 digits) . decimal part (3 digits)
- ⑤ **Radius gap — minimum** (example: 0120.000)
whole number part (4 digits) . decimal part (3 digits)
- ⑥ **Radius gap — average** (example: 0135.000)
whole number part (4 digits) . decimal part (3 digits)

When “density inspection” is measured

- ① **Average density** (example: 200.000)
whole number part (3 digits) . decimal part (3 digits)
- ② **Deviation of density** (example: 015.000)
whole number part (3 digits) . decimal part (3 digits)
- ③ **Maximum density** (example: 240)
whole number part (3 digits)
- ④ **Minimum density** (example: 180)
whole number part (3 digits)

Method of Specifying the Tolerance

Write In the Tolerance

send DW, nn . aa . bb, nnnnnn CR

receive DW CR

- nn: Measurement window W01 to W64, or numerical computation window C01 to C64
- aa: Type of tolerance (For details, see "List of Types of Tolerance" (page 10-26).)
- bb: Upper limit/lower limit specification (HL: upper limit specification; LL: lower limit specification).
- nnnnnn: Tolerance setting (The number of lines differs depending on the type; see "List of Types of Tolerances" (page 10-26).)

► Note

nn.aa.bb are delimited by dots, not commas.

Example: To change the upper limit of measurement window 01 (area) to 1200:

send DW, W01 . AR . HL, 001200 CR

receive DW CR

Read Out the Tolerance

send DR, nn . aa . bb CR

receive DR, nnnnnn CR

- nn: Measurement window W01 to W64, or numerical computation window C01 to C64
- a: Type of tolerance (For details, see "List of types of tolerance" (page 10-26).)
- bb: Upper limit/lower limit specification (HL: upper limit specification; LL: lower limit specification).
- nnnnnn: Tolerance setting (The number of lines differs depending on the type; see "List of Types of Tolerances" (page 10-26).)

► Note

nn.aa.bb are delimited by dots, not commas.

Example: To read out the X coordinate lower limit (256.030) of measurement window 07 (pattern search)

send DR, W07 . X . LL CR

receive DR, +0256.030 CR

List of Tolerance Types

This section explains not only the tolerance types but also the upper limit, lower limit and tolerance setting.

When “area” is measured

Area (example: AR.LL.001200)

AR.(HL or LL).whole number part (6 digits)

When “pattern search” is measured

Position X (Example: X.HL.+0320.000)

X.(HL or LL).(sign)whole number part (4 digits).decimal part (3 digits)

Position Y (Example: Y.LL.+0240.000)

X.(HL or LL).(sign)whole number part (4 digits).decimal part (3 digits)

Angle (example: T.LL.+135.000)

T(HL or LL).(sign)whole number part (3 digits).decimal part (3 digits)

Correlation (Example: C.HL.095.0)

C.(HL or LL).whole number part (3 digits).decimal part (1 digit)

When “multiple pattern search” is measured

Number of patterns (example: N.HL.16)

N.(HL or LL).number of patterns (2 digits)

Position X (example: X.HL.+0320.000)

X.(HL or LL).(sign)whole number part (4 digits).decimal part (3 digits)

Position Y (example: Y.LL.+0240.000)

Y.(HL or LL).(sign)whole number part (4 digits).decimal part (3 digits)

Angle (example: T.LL.+135.0000)

T.(HL or LL).(sign)whole number part (3 digits).decimal part (3 digits)

Correlation (example: C.HL.095.0)

C.(HL or LL).whole number part (3 digits).decimal part (1 digit)

When “edge position” is measured

When the measurement area is a “rectangle”:

Number of edges (example: N.HL.0150)

N.(HL or LL).whole number part (4 digits)

Position X (example: X.HL.+0320.000)

X.(HL or LL).(sign)whole number part (4 digits).decimal part (3 digits)

Position Y (example: Y.LL.+0240.000)

Y.(HL or LL).(sign)whole number part (4 digits).decimal part (3 digits)

When the measurement area is a “rotated rectangle”:

Number of edges (example: N.HL.0150)

N.(HL or LL).whole number part (4 digits)

Position P (example: P.HL.+0320.050)

P.(HL or LL).whole number part (4 digits).decimal part (3 digits)

When the measurement area is a “ring/arc”:

Number of edges (example: N.HL.0150)

N.(HL or LL).whole number part (4 digits)

Angle (example: T.LL. 135.000)

T.(HL or LL).whole number part (3 digits).decimal part (3 digits)

When “edge gap” is measured

When the measurement area is a “rectangle/rotated rectangle”:

Number of edges (example: N.HL.0150)

N.(HL or LL).whole number part (4 digits)

Gap (example: W.HL.0320.050)

W.(HL or LL).whole number part (4 digits).decimal part (3 digits)

When the measurement area is a “ring/arc”

Number of edges (example: N.HL.0150)

N.(HL or LL).whole number part (4 digits)

Angular width (example: WT.LL.045.050)

WT.(HL or LL).whole number part (3 digits).decimal part (3 digits)

When “edge pitch” is measured

When the measurement area is a “rectangle”:

Number of pitches (example: N.HL.0150)

N.(HL or LL).whole number part (4 digits)

Gap — maximum (example: WH.HL.0322.050)

WH.HL.whole number part (4 digits).decimal part (3 digits)

Gap — minimum (example: WL.LL.0320.050)

WL.LL whole number part (4 digits).decimal part (3 digits)

When the measurement area is a “ring/arc”

Number of pitches (example: N.HL.0150)

N.(HL or LL).whole number part (4 digits)

Angle gap — maximum (example: WTH.HL.055.050)

WTH.HL.whole number part (3 digits).decimal part (3 digits)

Angle gap — minimum (example: WTL.LL.052.050)

WTL.LL.whole number part (3 digits).decimal part (3 digits)

When “number of edges” is measured

Number of edges (example: N.HL.0150)

N.(HL or LL).whole number part (4 digits)

When “edge angle” measurement

Edge angle (example: N.HL.+05.050)

T.(HL or LL).(sign)whole number part (2 digits).decimal part (3 digits)

When “stain” is measured

Stain quantity (number of stains) (example:

SL.HL.000120)

SL.HL.whole number part (6 digits)

When “blob” is measured

Number of labels (example: N.HL.0150)

N.(HL or LL).whole number part (4 digits)

Area (example: AR.LL.001200)

AR.(HL or LL).whole number part (6 digits)

Center of gravity position X (example:

X.HL.+0320.000)

X.(HL or LL).(sign)whole number part (4 digits).decimal part (3 digits)

Center of gravity position Y (example:

Y.HL.+0240.000)

Y.(HL or LL).(sign)whole number part (4 digits).decimal part (3 digits)

Feret diameter X (example: FX.HL.0320.000)

FX.(HL or LL).whole number part (4 digits).decimal part (3 digits)

Feret diameter Y (example: FX.LL.0240.000)

FX.(HL or LL).whole number part (4 digits).decimal part (3 digits)

Main axis (example: T.LL.+50.000)

T.(HL or LL).(sign)whole number part (2 digits).decimal part (3 digits)

Perimeter length (example: CL.HL.001200)

CL.(HL or LL).whole number part (6 digits)

Roundness (example: CD.HL.0.985)

CD.(HL or LL).whole number part (1 digit).decimal part (3 digits)

When “trend edge position” is measured

When measurement area is a “rectangle”:

Number of edges — maximum (example:

N.HL.0026)

NH.HL.whole number part (4 digits)

Number of edges — minimum (example: N.LL.0022)

NH.HL.whole number part (4 digits)

Number of edges — average (example:

N.LL.0024.5)

NA.LL.whole number part (4 digits).decimal part (1 digit)

Position — maximum (example: PH.HL.+0330.000)

PH.HL.(sign)whole number part (4 digits).decimal part (3 digits)

Position — minimum (example: PH.LL.+0310.000)

PH.LL.(sign)whole number part (4 digits).decimal part (3 digits)

When the measurement area is a “rotated rectangle”:

Number of edges (example: N.HL.0150)

N.(HL or LL).whole number part (4 digits)

Position — maximum (example: PH.HL.+0322.050)

PH.HL.whole number part (4 digits).decimal part (3 digits)

Position — minimum (example: PH.LL.+0005.050)

PH.LL.whole number part (4 digits).decimal part (3 digits)

When the measurement area is a “ring/arc”:

Number of edges (example: N.HL.0150)

N.(HL or LL).whole number part (4 digits)

Radius gap — maximum (example:

RWH.HL.0550.050)

RWH.HL.whole number part (4 digits).decimal part (3 digits)

Radius gap — minimum (example:

RWL.LL.0520.050)

RWL.LL.whole number part (4 digits).decimal part (3 digits)

When “trend edge width” is measured

When the measurement area is a “rectangle/rotated rectangle”:

Number of edges (example: N.HL.0150)

N.(HL or LL).whole number part (4 digits)

Gap — maximum (example: WH.HL.0322.050)

WH.HL.whole number part (4 digits).decimal part (3 digits)

Gap — minimum (example: WL.LL.0320.050)

WL.LL.whole number part (4 digits).decimal part (3 digits)

When the measurement area is a “ring/arc”:

Number of edges (example: N.HL.0150)

N.(HL or LL).whole number part (4 digits)

Radius width — maximum (example:

RWH.HL.0550.050)

RWH.HL.whole number part (4 digits).decimal part (3 digits)

Radius gap — minimum (example:

RWL.LL.0520.050)

RWL.LL.whole number part (4 digits).decimal part (3 digits)

When “density inspection” is measured

Average density (example: DA.HL.055.050)

DA.(HL or LL).whole number part (3 digits).decimal part (3 digits)

Density deviation (example: DD.HL.050.050)

DD.(HL or LL).whole number part (3 digits).decimal part (3 digits)

Maximum density (example: DH.HL.060)

DH.HL.whole number part (3 digits)

Minimum density (example: DL.LL.020)

DL.LL.whole number part (3 digits)

When performing measurement value calculation

MS.(HL or LL).(sign)whole number part (7 digits).decimal part (3 digits)

Example of rewriting the upper limit of the tolerance for measurement value calculation window C01

send DW,C01.MS.HL. +1234567.123 CR

receive DW CR

Example of readout of lower limit of tolerance for measurement value calculation window C01

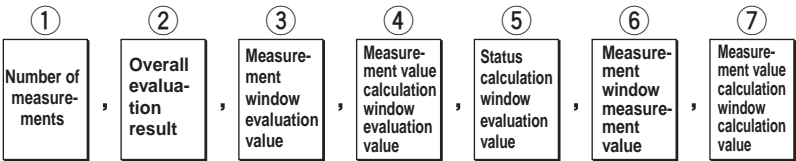
send DR,C01.MS.LL CR

receive DR, -1234567.123 CR

Output Settings Specification Format

Output Settings Specification Sequence

The data are delimited by commas.



- ① Number of measurements: MSC
- ② Overall evaluation result: JGA
- ③ Measurement window evaluation value: Wxx.JG
- ④ Measurement value calculation window evaluation value: Cxx.JG
- ⑤ Status calculation window evaluation value: Jxx.JG
- ⑥ Measurement window measurement value: Wxx.aa
- ⑦ Measurement value calculation window calculation value: Cxx.MS
 - xx: Window number
 - aa: Type of result (For details, see “List of Types of Results” (page 10-31).)

► Note

xx and what follows are delimited by dots, not commas.

Write In Output Settings

send AW, xx, output settings specification **CR**

receive AW **CR**

- xx (output settings specification destination):
 - terminal post → PP
 - RS-232C → SR
 - Ethernet → ET
 - Compact flash memory → CF

Examples of output specification settings

Example 1:

The numbers of measurements in measurement window 01 (area) and measurement window 02 (pattern search: X coordinate, Y coordinate, correlation), total status, window evaluation status and window measurement value are output via the RS-232C.

```
send    AW, SR, MSC, JGA, W01.JG, W02.JG, W01.AR, W02.X,  
        W02Y, W02.S CR  
  
receive AW CR
```

Example 2

The total status of measurement window 01 (edge position: X coordinate) and measurement window 02 (edge position: Y coordinate), window measurement value, and calculation value in measurement value calculation window C01 are output via the RS-232C.

```
send    AW, SR, JGA, C01.JG, W01.X, W02.Y,C01.MS CR  
  
receive AW CR
```

► Note

Window number and type of result are delimited by dots, not commas.

Read Out Output Settings

```
send    AR, xx CR  
  
receive AR, output setting specification CR  
  
    • Terminal post → PP  
      RS-232C → SR  
      Ethernet → ET  
      Compact flash memory → CF
```

List of Result Types

When “area” is measured

- Area: AR

When “pattern search” is measured

- Position X: X
- Position Y: Y
- Angle: T
- Correlation: C

When “multiple pattern search” is measured

- Number of patterns: N
- Position X: X
- Position Y: Y
- Angle: T
- Correlation: C

When “edge position” is measured

When the measurement area is a “rectangle”:

- Number of edges: N
- Position X: X
- Position Y: Y

When the measurement area is a “rotated rectangle”:

- Number of edges: N
- Position: P

When measurement area is a “ring/arc”:

- Number of edges: N
- Angle: T

When “edge gap” is measured

When measurement area is a “rectangle/ rotating rectangle”:

- Number of edges: N
- Gap: W

When measurement area is a “Circumference/arc”

- Number of edges: N
- Angle gap: WT

When “edge pitch” is measured

When measurement area is a “rectangle”:

- Number of pitches: N
- Gap — maximum: WH
- Gap — minimum: WL
- Gap — average: WA

When measurement area is a “ring/arc”:

- Number of pitches: N
- Angle gap — maximum: WTH
- Angle gap — minimum: WTL
- Angle gap — average: WTA

When “number of edges” is measured

- Number of edges: N

When “edge angle” is measured

- Angle: T

When “stain” is measured

- Stain quantity (number of stains): SL

When “probe” measurement

- Number of labels: N
- Area: AR
- Center of gravity position X: X
- Center of gravity position Y: Y
- Feret diameter X: FX
- Feret diameter Y: FY
- Angle : T
- Perimeter: CL
- Roundness: CD

When “trend edge position” is measured

When measurement area is a “rectangle/ rotating rectangle”

- Maximum number of edges: NH
- Minimum number of edges: NL
- Average number of edges: NA
- Position — maximum: PH
- Position — minimum: PL
- Position — average: PA

When measurement area is a “ring/arc”:

- Maximum number of edges: NH
- Minimum number of edges: NL
- Average number of edges: NA
- Radius gap — maximum: RWH
- Radius gap — minimum: RWL
- Radius gap — average: RWA

When “trend edge gap” is measured

When measurement area is a “rectangle/ rotating rectangle”:

- Maximum number of edges: NH
- Minimum number of edges: NL
- Average number of edges: NA
- Gap — maximum: WH
- Gap — minimum: WL
- Gap — average: WA

When measurement area is a “ring/arc”:

- Maximum number of edges: NH
- Minimum number of edges: NL
- Average number of edges: NA
- Radius gap — maximum: RWH
- Radius gap — minimum: RWL
- Radius gap — average: RWA

When “density inspection” is measured

- Density average: DA
- Density deviation: DD
- Maximum density: DH
- Minimum density: DL

Output of measurement value calculation results

Cxx.MS

- xx: Measurement value calculation window number (01 to 32)

Using the CV-2100 Combined with PLC

Outline of the CV-2100 PLC Link Functions

You can write the measurement result, and read and execute the specified command by connecting to a PLC using the RS-232C.

► **Note**

The PLC of any manufacturer can only be connected via the link unit.

- Refer to "Machines that Support PLC Link Connection" (page 11-2) for the types of PLC that can be used with the CV-2100.
- Refer to "RS-232C Interface" (page 10-2) for the basic specifications of the interface and of the connector.

Machines that Support PLC Link Connection

The types of PLC whose PLC link is supported by the CV-2100 are listed below.

► Note

The PLC of any manufacturer can only be connected via the link unit.

PLC Manufactured by KEYENCE CORPORATION

Series	System	Link unit	PLC operation mode	CV-2100 setting mode
KV	KV-700	KV-L20	KV-Builder mode	KV-L20

PLC Manufactured by Mitsubishi Electric Corporation

Series	System	Link unit	PLC operation mode	CV-2100 setting mode
MELSEC-AnS	A1S, A1SH, A1SJ A1SJH1, A2S, A2SH, A171S, A171SH	A1SJ71 (U) C24-R2 A1SJ71 (U) C24-PRF	Dedicated protocol format 1	AnN series
	A1CPUC24-R2	Calculator's link port	Dedicated protocol format 1	AnN series
	A2US, A2USH	A1SJ71 (U) C24-R2, A1SJ71 (U) C24-PRF	Dedicated protocol format 1	AnN series
MELSEC-A0J2	A0J2A, 0J2H	A0J2-C214-S1	Dedicated protocol format 1	AnN series
MELSEC-AnN	A1N, A2N, A3N	AJ71C24, AJ71C24-S3 AJ71C24-S6, AJ71C24-S8, AJ71UC24	Dedicated protocol format 1	AnN series
MELSEC-AnA	A2A, A3A	AJ71C24-S6, AJ71C24-S8, AJ71UC24	Dedicated protocol format 1	AnN series
MELSEC-AnU	A2U, A3U, A4U	AJ71C24-S6 AJ71C24-S8, AJ71UC24	Dedicated protocol format 1	AnN series
MELSEC-QnA	Q2A, Q2A-S1 Q3A, Q4A	AJ71QC24 (N) AJ71QC24 (N) R2 AJ71QC24 (N) R4	Dedicated protocol format 1	AnN series
	Q2AS, Q2AS-S1, Q2ASH, Q2ASH-S1	A1SJ71QC24 A1SJ71QC24-R2	Dedicated protocol format 1	AnN series
MELSEC-Q	Q00CPU, Q01CPU	QJ71C24, QJ71C24-R2	MC protocol format 5	Q series
	Q02CPU, Q02HCPU Q06HCPU, Q12HCPU Q25HCPU	QJ71C24, QJ71C24-R2	MC protocol format 5	Q series
	Q02CPU-A, Q02HCPU-A Q06HCPU-A	A1SJ71 (U) C24-R2 A1SJ71 (U) C24-PRF	Dedicated protocol format 1	AnN series

PLC Manufactured by OMRON Corporation

Series	System	Link unit	PLC operation mode	CV-2100 setting mode
SYSMAC SPM1	SRM1-C01 SRM1-C02	CPM1-C1F01	Host link (SYSWAY)	SYSMAC-C series
SYSMAC CPM1 SYSMAC CPM1A	CPM1 CPM1A	CPM1-C1F01	Host link (SYSWAY)	SYSMAC-C series
SYSMAC CPM2A	CPM2A-30CD□□ CPM2A-40CD□□ CPM2A-60CD□□	CPM1-C1F01	Host link (SYSWAY)	SYSMAC-C series
SYSMAC CPM2C	CPM2C-10CD□□ CPM2C-20CD□□	CPM1-C1F01 CPM2C-C1F01	Host link (SYSWAY)	SYSMAC-C series
SYSMAC CQM1H	CQM1H-CPU11* CQM1H-CPU21* CQM1H-CPU51/61	CPM1-C1F01 CQM1H-SCB41	Host link (SYSWAY)	SYSMAC-C series
SYSMAC C	C120, C120F	C120-LK201-V1	Host link (SYSWAY)	SYSMAC-C series
	C200H	C200H-LK201 (-V1)	Host link (SYSWAY)	SYSMAC-C series
	C200HS-CPU01 C200HS-CPU03 C200HS-CPU21/23 C200HS-CPU31/33	C200H-LK201 (-V1)	Host link (SYSWAY)	SYSMAC-C series
	C500, C500F C1000H, C1000HF C2000, C2000H	C120-LK201-V1 C500-LK201-V1 C500-LK203	Host link (SYSWAY)	SYSMAC-C series
	C200HE-CPU11 C200HE-CPU32 C200HE-CPU42	C200H-LK201 (-V1)	Host link (SYSWAY)	SYSMAC-C series
SYSMAC α	C200HG-CPU33 C200HG-CPU43 C200HG-CPU53 C200HG-CPU63	C200H-LK201 (-V1)	Host link (SYSWAY)	SYSMAC-C series
	C200HX-CPU34 C200HX-CPU44 C200HX-CPU54 C200HX-CPU64 C200HX-CPU65-Z C200HX-CPU85-Z	C200H-LK201 (-V1)	Host link (SYSWAY)	SYSMAC-C series

*The link unit of CQM1H-SCB41 cannot be used.

Changing the Settings of the CV-2100 for PLC Link

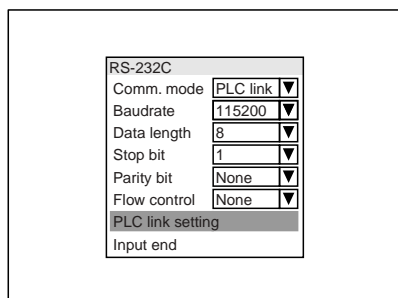
You can change the RS-232C setting of the CV-2100 to the one for the PLC link.

1 Select [RS-232C] in the Configuration Menu screen (page 8-1).

The [RS-232C] screen appears.

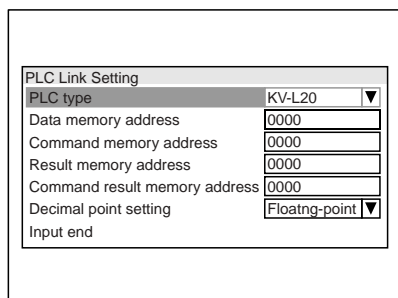
2 Select [PLC link] from the [Comm. mode] box.

3 Select [PLC link setting].



The [PLC Link Setting] screen appears.

4 Change the settings as required.



[PLC type]

Select the PLC type from [KV-L20] (KEYENCE, default), [AnN series] (Mitsubishi), [Q series] (Mitsubishi), and [SYSMAC-C series] (OMRON).

► Note

If you selected [PLC link] in the [Comm. mode] and [KV-L20] in the [PLC type], the following restriction applies.

- [Data length]: Fixed at [8]
- [Stop bit]: Fixed at [1]
- [Parity bit]: Fixed at [Even]
- [Flow control]: Fixed at [None]
- After changing the setting, turn off the power of the CV-2100, and turn on again.

[Data memory address]

You can specify the head address of the data memory area where the CV-2100 outputs the data (32 bits) to the PLC.

The data memory address range that is used for data output differs according to the specifications of the output settings (page 4-119). (Two words are used for one data output.)

[Command memory address]

When executing the command from the PLC to the CV-2100, you can specify the head address of the data memory area where the command code (16 bits) and the parameter (16 bits) are stored. Two words are used for the command code and the parameter.

[Result memory address]

You can specify the address of the data memory area where the data output result (16 bits) from the PLC to the CV-2100 is stored.

[Command result memory address]

You can specify the address of the data memory area where the result of the command execution process (16 bits) from the PLC to the CV-2100 is stored.

► Note

Note the following when setting the address of the data memory area.

- Do not duplicate the items or addresses.
- When you change the PLC type, all of the specified addresses are initialized as [0000].

[Decimal point setting]

Select how the data are to be expressed.

- **[Fixed-point]** : Magnifies the measured value of the target that you write 1,000 times, and sets the low 16 bits to the data memory +0, and the high 16 bits to the data memory +1.
- **[Floating-point]** (Default) : Expresses bit 15 whose data memory is +0 as a sign bit, bits 14 to 7 as the characteristic, and bits 6 to 0 and the 16 bits whose data memory is +1 as the fixed-point part.

5 When the setting is completed, select [Input end].

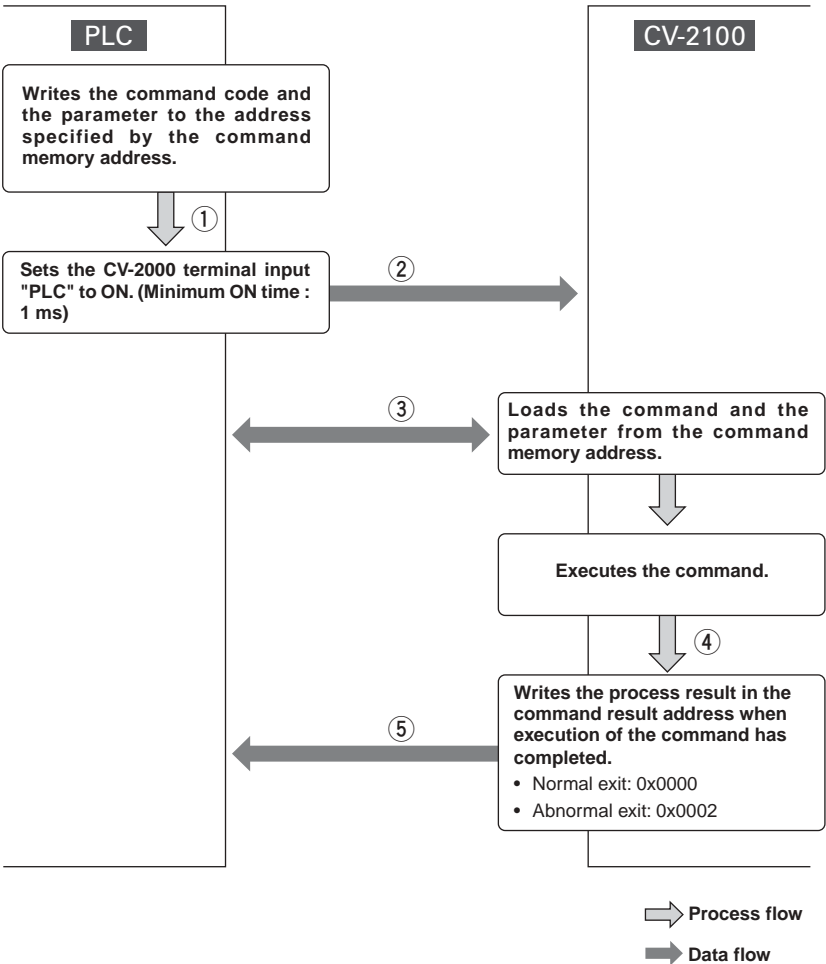
6 If you wish to change other settings of the RS-232C, continue operation.

7 Perform Step 4 and later operations as described in “Changing the RS-232C Communication Method (RS-232C)” (page 8-3).

Executing Commands

(Command Processing Flow)

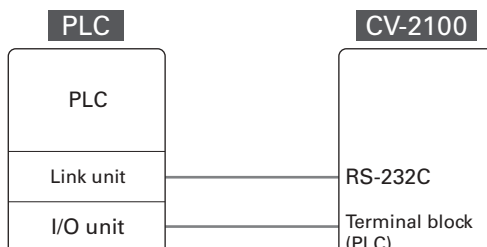
The following diagram shows the command execution procedure between the CV-2100 and PLC.



Wiring Diagram

1. Overview of the Wiring

The wiring between the CV-2100 and PLC is shown below.

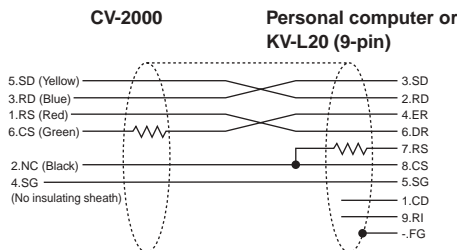


Refer to page 13-4 for an example of the wiring to the input "PLC" terminal on the terminal block.

2. Wire Connection for the PLC Link

To connect the PLC to the Keyence KV-L20 (without hardware flow control)

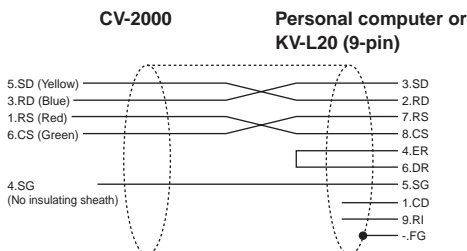
Use OP-26486 (D-sub 9-pin female connector) and OP-26487 (2.5 m straight cable).



- The resistance is 3.9 k .
- The color indicated in parentheses () is the color of the insulating sheath when the OP-26487 is inserted in the CV-2000.

To connect the PLC to the Keyence KV-L20 (with hardware flow control)

Fabricate the OP-26487 (2.5 m straight cable) locally at your site as shown in the following diagram and connect it.



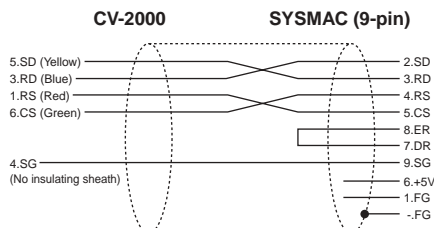
The color indicated in parentheses () is the color of the insulating sheath when the OP-26487 is inserted in the CV-2000.

Reference

The same wiring should be performed for communication using the hardware flow control.

To connect the PLC to the SYSMAC (with hardware flow control)

Fabricate the OP-26487 (2.5 m straight cable) locally at your site as shown in the following diagram and connect it.



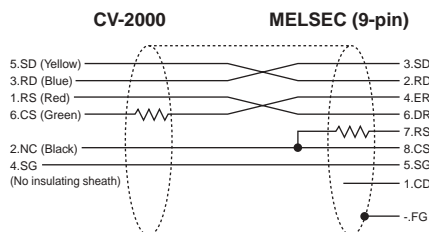
The color indicated in parentheses () is the color of the insulating sheath when the OP-26487 is inserted in the CV-2000.

WARNING

Do not connect OP-26486 and OP-26487 without any fabrication. Doing so may cause failure of the CV-2000 and the connected devices.

To connect the PLC to the MELSEC (with hardware flow control)

Use OP-26486 (D-sub 9-pin female connector) and OP-26487 (2.5 m straight cable). However, OP-26486 must be converted with the D-sub 9-pin male connector. Prepare the commercially available conversion connector (D-sub 9-pin female → D-sub 9-pin male, straight).



- The resistance is 3.9 k .
- The color indicated in parentheses () is the color of the insulating sheath when the OP-26487 is inserted in the CV-2000.

Communicating in the PLC Link Mode

You can write the measurement result, and read and execute the specified command corresponding to the PLC link unit specified in the communication settings.

Order of Data Output

The CV-2000 writes the result of the data specified at the output setting (page 4-119) in the data memory address specified at the communication setting (page 11-4), and then writes 0x0001 in the result address specified at the communication setting. Data is output from the specified data output memory address in the order from the smaller window number.

Note

The data can be output in the PLC link mode only during run or test-run mode. Data is not output when the CV-2000 is in the setting mode.

① Number of times of measurement

(Number of times of measurement: 10 digits, 32 bits)

② Total evaluation (Total evaluation result: 1 digit, OK: 1/NG: 0, 32 bits)

③ Window evaluation value

Output by 32 bits as shown below.

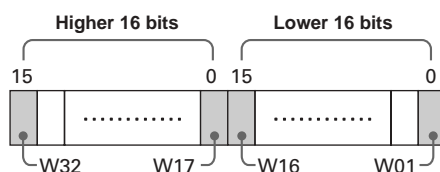
- (A) Measurement windows 1 to 31 (Evaluation result 1 digit, OK: 1/NG: 0, 32 bits)
 - Higher 16 bits: The evaluation result of windows 32 to 17
 - Lower 16 bits: The evaluation result of windows 16 to 1
- (B) Measurement windows 32 to 64 (Evaluation result 1 digit, OK: 1/NG: 0, 32 bits)
 - Higher 16 bits: The evaluation result of windows 64 to 49
 - Lower 16 bits: The evaluation result of windows 48 to 33
- (C) Numeric calculation windows 1 to 31 (Evaluation result 1 digit, OK: 1/NG: 0, 32 bits)
 - Higher 16 bits: The evaluation result of windows 32 to 17
 - Lower 16 bits: The evaluation result of windows 16 to 1
- (D) Status calculation windows 1 to 31 (Evaluation result 1 digit, OK: 1/NG: 0, 32 bits)
 - Higher 16 bits: The evaluation result of windows 32 to 17
 - Lower 16 bits: The evaluation result of windows 16 to 1

Note

If there is any evaluation value whose output is specified in the windows of groups (A) to (D), the entire group of 32 bits are output. The window whose output is not specified is output as "0".

Reference

The following diagram illustrates the output of the window evaluation value for the measurement windows 1 to 31.



④ Window measured value

The output content differs according to the specifications of the window type and [Decimal point setting] (page 11-4).

- Measurement windows 1 -:
 - **When the [Decimal point setting] is set to [Fixed-point]** : Writes the data which is the 1,000-times magnification of the measurement data in the data memory as 32-bit fixed decimal point data (Address m: low 16 bits, address m + 1: high 16 bits).
 - **When the [Decimal point setting] is set to [Floating-point]** : Writes the measurement result in the data memory as single precision floating decimal point data (32 bits)
- Numeric calculation windows 1 - (Calculation result integer part: 6 digits, Calculation result decimal part: 3 digits, 32 bits):
 - **When the [Decimal point setting] is set to [Fixed-point]** : Writes the data which is the 1000-times magnification of the measurement data in the data memory as 32-bit fixed decimal point data (Address m: low 16 bits, address m + 1: high 16 bits).
When the integer part of the calculation result becomes 7 digits, ± 999999.999 is written in the data memory (Either + or – is used).
 - **When the [Decimal point setting] is set to [Floating-point]** : Writes the measurement result in the data memory as single precision floating decimal point data (32 bits)

Executing Command

[If you set the terminal input "PLC" to ON (minimum ON time: 1 ms), the CV-2000 reads the command code and the parameter from the specified command memory address, and executes the command.

- The command code is the specified command memory address, and the parameter is the command address +1.
- When execution of the command has been completed, the process result can be written in the command memory address.
 - Normal completion: 0x0000
 - Abnormal completion: 0x0002
- The operation mode while the PLC communication is running can only be run mode or test-run mode. Command input cannot be accepted when the CV-2000 is in the setting mode or the communication mode.

Command Code List

Write the program No.

You can change the current program No. to the one specified by the parameter.

- **Command code** : 0x5057
- **Parameter** : 0 to 31

Write the window No.

You can change the current window No. to the one specified by the parameter.

- **Command code** : 0x5557
- **Parameter** : 0 to 63 (Specified in the window number 1.)

Switch the screen

You can switch the screen to the one specified by the parameter.

- **Command code** : 0x4D43
- **Parameter** : 0: Raw screen, 1: Process screen 1, 2: Process screen 2

Register the screen

You can register the update measurement screen in the registered screen with the camera and trigger position specified by the parameter.

- **Command code** : 0x4253
- **Parameter** : 0: Cam 1 (Trig 1), 1: Cam 1 Trig 2, 2: Cam 1 Trig 3, 3: Cam 1 Trig 4, 4: Cam 2 (Trig 1), 5: Cam 2 Trig 2

Capture the screen

You can save the currently displayed screen in the compact flash memory in the compact flash memory slot of the CV-2000.

- **Command code** : 0x4243
- **Parameter** : None

Switch the display

You can switch the display mode of the screen to the one specified by the parameter. If you specify a display mode that is not defined as a parameter, an abnormal end is set in the command result memory address by invalidating the request, and the program is terminated.

- **Command code** : 0x4443
- **Parameter** : 0: [Standard display], 1: [Inspection status list], 2: [Measured value list], 3: [Custom display], 4: [No menu]

Switch the camera

You can switch the screen to the display mode specified by the parameter. If you specify a display mode that is not defined as the parameter, an abnormal end is set in the command result memory address by invalidating the request, and the program is terminated.

- **Command code** : 0x4343
- **Parameter** : 0: Depend on the displayed window, 1: [Cam 1 (Trig 1)], 2: [Cam 1 Trig 2], 3: [Cam 1 Trig 3], 4: [Cam 1 Trig 4], 5: [Cam 2 Trig 1], 6: [Cam 2 Trig 2], 7: [Vertical split], 8: [Horizontal split]

Chapter 12

Communication via Ethernet Port

Outline of the CV-2100 Ethernet Communication

The command system of the communication using the Ethernet port of the CV-2100 is identical to that of the non-procedural mode of the RS-232C. Refer to “Communication via RS-232C Port (Non-procedural Mode)” (page 10-1).

The settings such as the IP address, port number, subnet mask, and default gateway are used in the communication.

Refer to “Changing Network Settings (Ethernet)” (page 8-4) for the Ethernet settings in the Environment Settings screen.

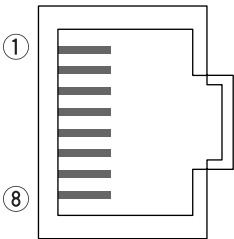
Ethernet Interface

Basic Specifications

- Connector: RJ-45
- Media: 10BASE-T/100BASE-TX
- Basic protocol: TCP/IP

Connector Specifications

The Ethernet port specifications of the CV-2100 are described below.



No.	Signal	Signal description	Signal direction
1	TX+	Differential data transmission	Output
2	TX-	Differential data transmission	Output
3	RX+	Differential data reception	Input
4	TBD	—	—
5	TBD	—	—
6	RX-	Differential data reception	Input
7	TBD	—	—
8	TBD	—	—

Controlling the CV-2100 via Ethernet

You can control the CV-2100 via Ethernet by connecting it to your personal computer with the Ethernet cable. Not only measured values and inspection status, but also data including images can be communicated.

► Note

- When you connect the CV-2100 to an existing LAN, consult with the systems administrator or network administrator. If an inappropriate setting is made, not only the CV-2100, but also the other devices connected to the network may malfunction.
- You cannot use multiple computers on the network to control the CV-2100 simultaneously.
- Depending on the network situation, the output data from the CV-2100 may be skipped. (It is not retransmitted when a packet is lost.)

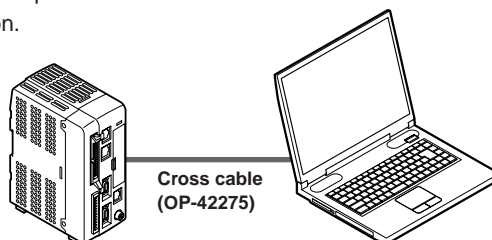
Communication specifications

The communication specifications of the CV-2100 via Ethernet are described below.

- Communication protocol: TCP/IP
- Connection topology: Peer-to-Peer

Operating the CV-2100 in a 1-to-1 Connection to a Personal Computer

This section describes how to control the CV-2100 1-to-1 connection to a personal computer without using the connection via LAN. The optional cross cable OP-42275 is used for connection.



Preparation

1 Change the TCP/IP setting of the CV-2100.

Refer to "Changing Network Settings (Ethernet)" (page 8-4).

When you connect the CV-2100 to a personal computer directly with a cross cable, you do not need to change the default values.

2 Change the TCP/IP setting of the personal computer.

When you connect the CV-2100 to the personal computer directly with the cross cable, set the IP address between 192.168.0.1 and 192.168.0.255 excluding 192.168.0.10.

- **Windows 95/98/Me:** Change the setting by using "Network" in the control panel.
- **Windows 2100:** Change the setting by using "Network and dial-up connection" in the control panel.
- **Windows XP:** Change the setting by using "Network and internet connection" in the control panel.

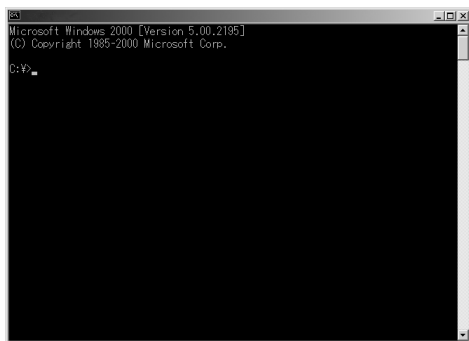
Refer to the Instruction Manual of your personal computer or LAN card.

3 After turning off the power of the CV-2100 and the personal computer, connect the Ethernet to the Ethernet connector of your personal computer with the cross cable.

Check whether the settings and connection have been made correctly.

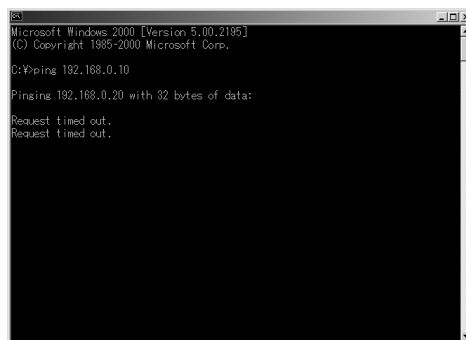
4 Turn on the power of the CV-2100 and your personal computer.

5 Start up the “MS-DOS prompt” on your personal computer.



When the display indicates “Request timed out”

If the display indicates “Request timed out” even though you specified the IP address of the CV-2100 in the ping command, the setting and connection of the CV-2100 and your personal computer have not been made correctly.



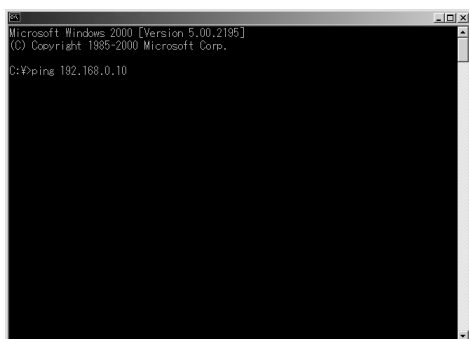
6 Enter “ping (the IP address of the CV-2100)” in one-byte characters, and then press the ENTER key on your personal computer.

Check steps 1 to 3 on the previous page again.

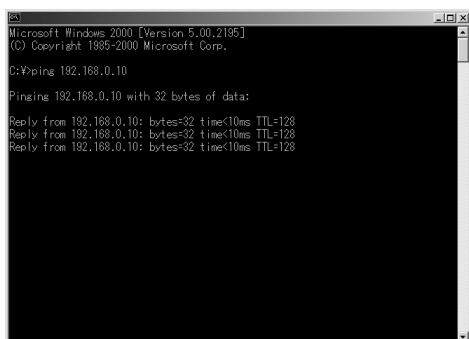
When the IP address of the CV-2100 is

“192.168.0.10”

Enter "ping 192.168.0.10".



If the setting and connection have been made correctly, the message “Reply from XXX (where XXX is the IP address of the CV-2100)” appears after a while.



To communicate with the CV-2100

You can communicate with the CV-2100 using Telnet software on your computer. This section describes the operation using "Tera Term" (Freeware) as an example.

Reference

Refer to <http://hp.vector.co.jp/authors/VA002416/> (as of January, 2003).

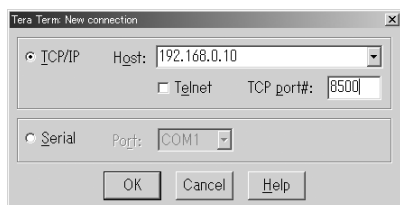
1 Prepare the Telnet software on your computer.

Prepare the Telnet software such as Tera Term (Freeware).

2 Start up the Telnet software on your computer, and set the destination.

- Destination: Enter the IP address of the CV-2100 (default value: 192.168.0.10).
- Communication port: Enter the communication port specified on the CV-2100 (default value: 8500).

Example of the destination settings using Tera Term

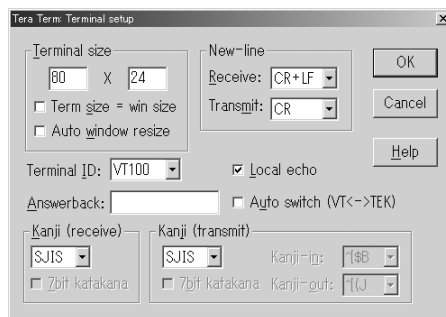


3 Connect to the destination.

If using Tera Term, set the determination, and then click [OK].

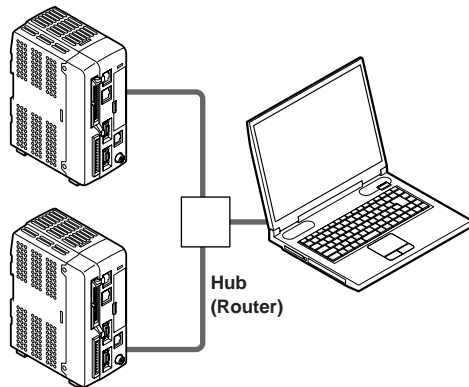
The command system of the communication is identical to that of the non-procedural mode of the RS-232C. Refer to "Communication via RS-232C Port (Non-procedural Mode)" (page 10-1).

Example of Tera Term Terminal Setup



Operating the CV-2100 in a 1-to-n Connection to a Personal Computer

This section describes how to control the CV-2100 from multiple personal computers via LAN.



Caution on 1-to-n connection

- You cannot use multiple computers on the network to control the CV-2100 simultaneously.
- You cannot communicate data between the CV-2100s on the network or have them control interdependently.
- When you want to connect the CV-2100 to an existing LAN, consult with the systems administrator or network administrator. If an inappropriate setting is made, not only the CV-2100, but also the other devices connected to the network may malfunction.

Differences from 1-to-1 connection

Most of the preparation and control procedures are identical to those for the 1-to-1 connection. However, note the following differences.

- To connect multiple CV-2100, hubs or routers supporting 100BASE-TX or 10BASE-T must be used.
- To connect the CV-2100 to a hub (or router), use a commercially available straight cable.
- The IP address of the CV-2100 and that of your personal computer on the network should not be the same.

Example of using a second CV-2100

- IP address of the first CV-2100: 192.168.0.10 (default value)
 - IP address of the second CV-2100: 192.168.0.11 (changed to avoid the same address as the default value)
 - IP address of personal computer: 192.168.0.12 (Set the address different from the CV-2100 and other devices on the network.)
- If you use a router, change the Ethernet settings of the CV-2100 according to the router. Refer to the Instruction Manual of the router or consult with the systems administrator or network administrator for details.

Chapter 13

Communication via Parallel Port and Terminal Block

Parallel Interface

Connector Specifications

The parallel port specifications for this unit are as follows.

Connector

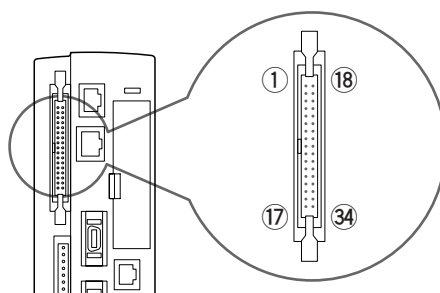
D7934-B500 FL (Sumitomo 3M)

Strain relief

D3448-7934 (Sumitomo 3M)

Matching electric cable

AWG28 stranded wire (equivalent to UL2651)



Pin Arrangement: Cable colors are those when the cable OP-42341 (optional accessory) is used.

No.	Signal	Signal description	Signal direction	Cable color
1	COMIN2	Common terminal for connector input	–	Brown
18	IN0	Command input bit 0 (LSB)	Input	Red
2	IN1	Command input bit 1	Input	Orange
19	IN2	Command input bit 2	Input	Yellow
3	IN3	Command input bit 3	Input	Green
20	IN4	Command input bit 4	Input	Blue
4	IN5	Command input bit 5 (MSB)	Input	Purple
21	IN6	Command input bit 6	Input	Gray
5	IN7	Command input bit 7	Input	White
22	IN8	Command input bit 8	Input	Black
6	CST	Command set input	Input	Brown
23	RESET	Reset	Input	Red
7	PST	Output data selector input	Input	Orange
24	COMOUT2	Common terminal for connector output	–	Yellow
8	ACK	Receipt of command input is completed	Output	Green
25	FLASH	Strobe output	Output	Blue
9	BUSY	BUSY signal	Output	Purple
26	OUT0	Data output bit 0 (LSB)	Output	Gray
10	OUT1	Data output bit 1	Output	White
27	OUT2	Data output bit 2	Output	Black
11	OUT3	Data output bit 3	Output	Brown
28	OUT4	Data output bit 4	Output	Red
12	OUT5	Data output bit 5	Output	Orange
29	OUT6	Data output bit 6	Output	Yellow
13	OUT7	Data output bit 7	Output	Green
30	OUT8	Data output bit 8	Output	Blue
14	OUT9	Data output bit 9	Output	Purple
31	OUT10	Data output bit 10	Output	Gray
15	OUT11	Data output bit 11	Output	White
32	OUT12	Data output bit 12	Output	Black
16	OUT13	Data output bit 13	Output	Brown
33	OUT14	Data output bit 14	Output	Red
17	OUT15	Data output bit 15 (MSB)	Output	Orange
34	COMOUT2	Common terminal for connector output	–	Yellow

► Note

- COMOUT2 of pin-24 and pin-34 is the common pin.
- Power voltages 0 V, COMIN1, COMIN2, COMOUT1, COMOUT2 are insulated each other.
- COMIN2 is the common input terminal exclusively for use with connectors; COMOUT2 is the common output terminal exclusively for use with connectors.
- Numerical data output from OUT0 to OUT15 are in the two's- complement binary format.

Terminal Block Interface

Connector Specifications

The terminal block specifications for this unit are as follows.

Socket block

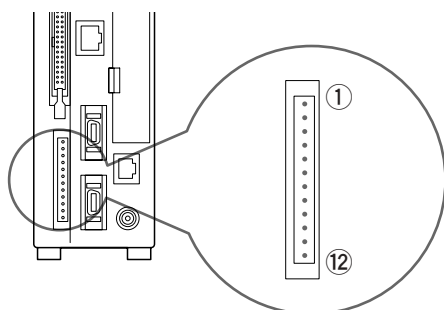
161588 (Nihon Weidmüller)

Matching power cable

AWG14 to AWG22

Terminal block screwing torque

0.2 Nm to 0.4 Nm



No.	Signal	Signal description	Signal direction
1	COMIN1	Common terminal for terminal block input	—
2	PLC	PLC device read request	Input
3	STOP	Output/ measurement stop input	Input
4	TRG	Trigger input	Input
5	STO	Output strobe signal output	Output
6	OR	Total status output	Output
7	ERROR	Error output	Output
8	READY	Trigger input enable	Output
9	RUN	Operation in progress	Output
10	COMOUT1	Common terminal for terminal block output	—
11	24V DC	Positive (+) power supply (DC24 V) Input	—
12	0V	Negative (–) power supply (0 V) Input	—

► Note

- Power voltages 0 V, COMIN1, COMIN2, COMOUT1 and COMOUT2 are insulated each other.
- COMIN1 is the common terminal used exclusively for connector input; COMOUT1 is the common terminal used exclusively for connector output.

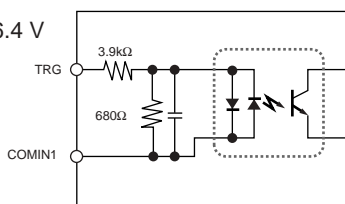
Input / Output Circuit

Input Section

Input circuit diagram

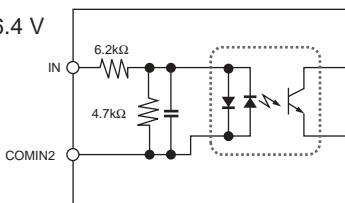
TRG terminal

- Maximum applicable voltage: 26.4 V
- ON voltage: 10.8 V or more
- ON current: 3 mA or more
- OFF voltage: 5 V or less
- OFF current: 1 mA or less



Other terminals (IN1 to 8, CST, PST, RESET, PLC, STOP)

- Maximum applicable voltage: 26.4 V
- ON voltage: 10.8 V or more
- ON current: 2 mA or more
- OFF voltage: 3 V or less
- OFF current: 0.3 mA or less

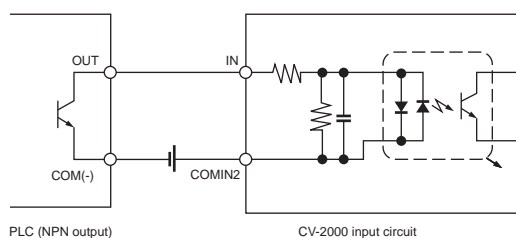


► Note

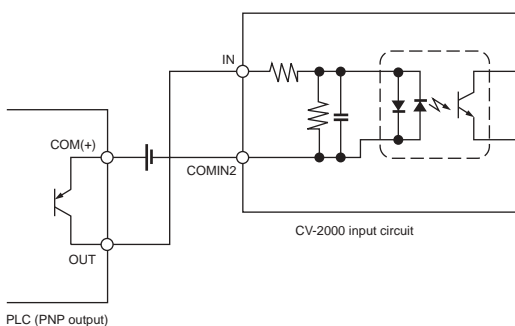
- The COMIN1 terminal is GND for the IN1 to 8, CST and RESET terminals.
- The COMIN2 terminal is GND for the PLC and STOP terminals.

Example of connection

When PLC having NPN output is connected to CV-2100 input.



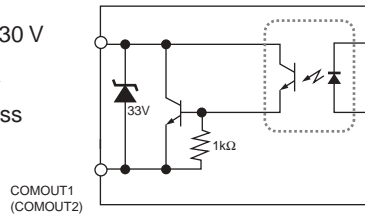
When PLC having PNP output is connected to CV-2100 input.



Output Section

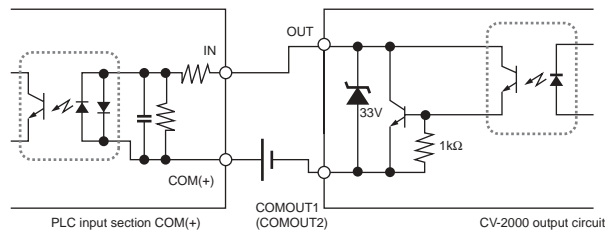
Output circuit diagram

- Maximum applicable voltage: 30 V
- Maximum sink current: 50 mA
- Leakage current: 0.1 mA or less
- Residual voltage: 1 V or less

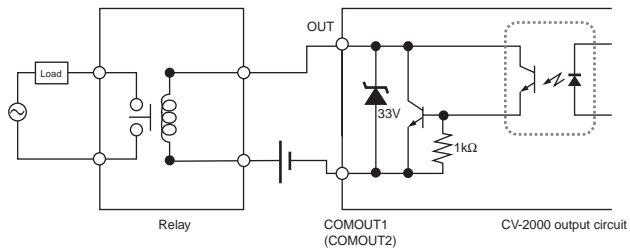


Example of connection

When the NPN output of the CV-2100 is connected to the PLC input via the COM (+) pin



When the NPN output of the CV-2100 is connected to the relay input

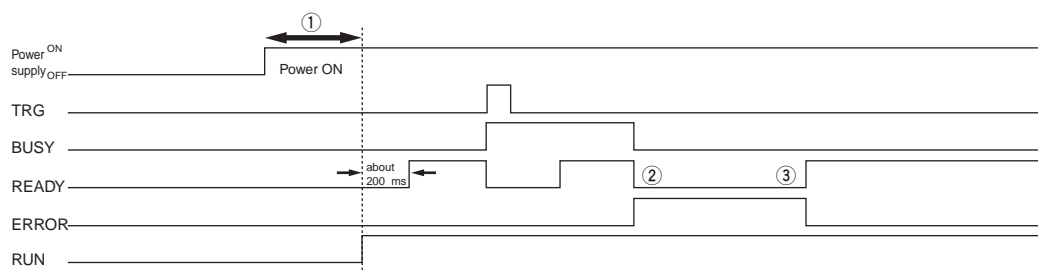


► Note

- GND of the output terminal from the terminal block is the COMOUT1 terminal.
- GND of the output terminal from the I/O connector output terminal is the COMOUT2 terminal.

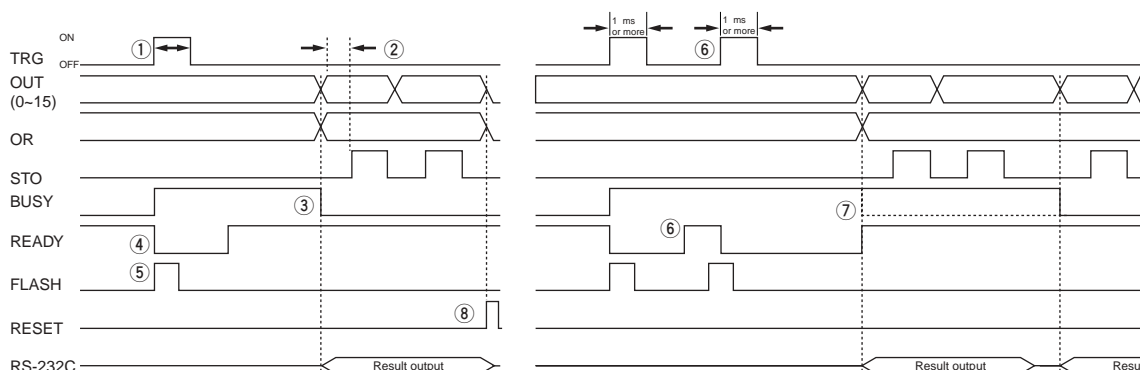
Input / Output Timing

1. Operation at Startup



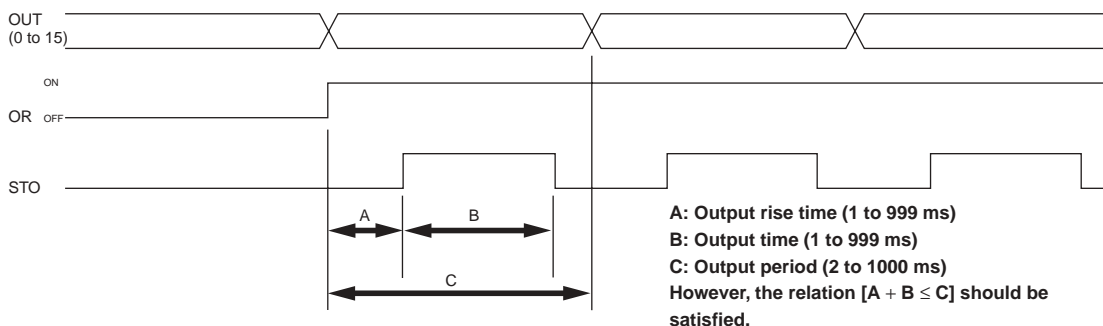
- ① This is the time required to start operation after the power is turned on (about 4.5 seconds).
- ② When an error occurs, the ERROR output is turned on and the READY output is turned off. At this time, internal operation stops.
- ③ The system resumes normal operation by the error release operation depending on the contents of the error.

2. Typical Operation When External Trigger is Input (No Handshake)



- ① The TRG input signal must be on for 1 ms or more.
- ② The STO output turns on after the elapse of the output rise time (can be varied by setting) when data is output. Refer to "Terminal Data Output Timing (No Handshake)" for details (page 13-7).
- ③ The BUSY output signal goes to the low level at the time when image processing is completed.
- ④ The READY output indicates that trigger input is enabled. Trigger input can be received while the READY output is on. When the trigger is input, the READY output goes off for a certain period of time (shutter speed + image transfer time).
- ⑤ The FLASH output is used to light up the illumination. Trigger input starts the FLASH output time (can be varied by setting). Refer to "FLASH Output Timing" (page 13-7) for details.
- ⑥ While image processing is in progress (the BUSY output is on), the image to be processed is taken in.
- ⑦ The BUSY output is not turned off in order to start the next image processing immediately after image processing is completed.
- ⑧ When RESET is input, the measurement result data OUT (0 to 15) and the OR-logic output are reset.

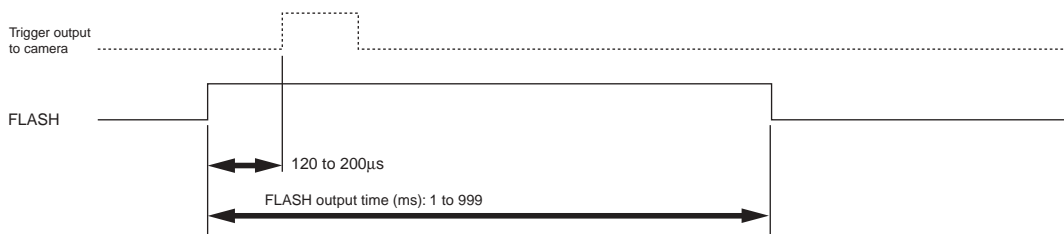
Terminal Data Output Timing (No Handshake)



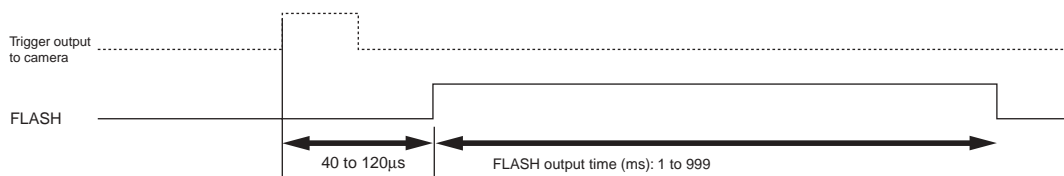
- Times A and B can be changed by setting. Refer to “Changing the Terminal Output Settings (Terminal output)” (page 8-2) for details.
- Measurement result data are output to OUT (0 to 15). Measurement result data are output by switching the OUT (0 to 15) terminal sequentially.
- When there is no handshake, the data are switched automatically at the set time intervals. The STO output is turned on every time the data is switched. The data is turned off after the output time has elapsed.

FLASH Output Timing

FLASH output start point: Before image capture starts



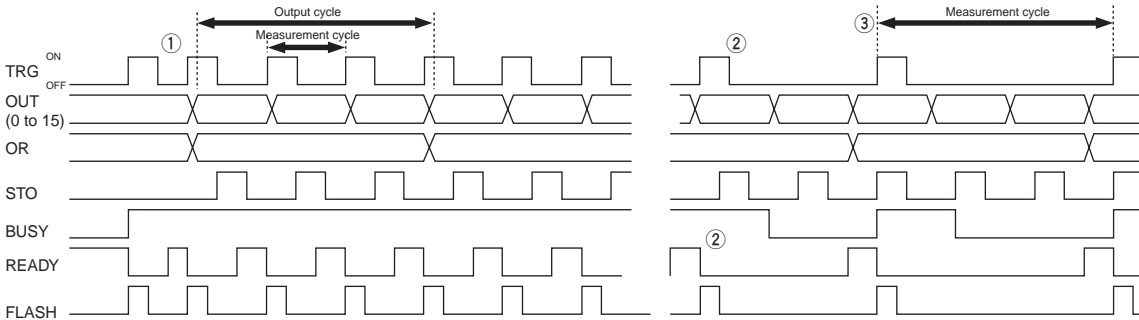
FLASH output start point: After taking image starts



- The FLASH output time can be adjusted by setting. Refer to “Changing the terminal output setting (Terminal output)” (page 8-2) for details.
- The FLASH output is turned on in synchronization with the trigger input. Use this function to turn on the illumination in time with image capture. You can select either one of the two timings, [Before trigger output] and [After trigger output], to match the application.
- The time difference between the trigger output timing to the camera and the FLASH output on timing is fixed. This cannot be adjusted by setting.
- The FLASH output can be switched to either [Normally open] or [Normally closed] by setting.

3. Typical Operation with External Trigger Input (No Handshake)

When the output cycle is longer than the measurement cycle

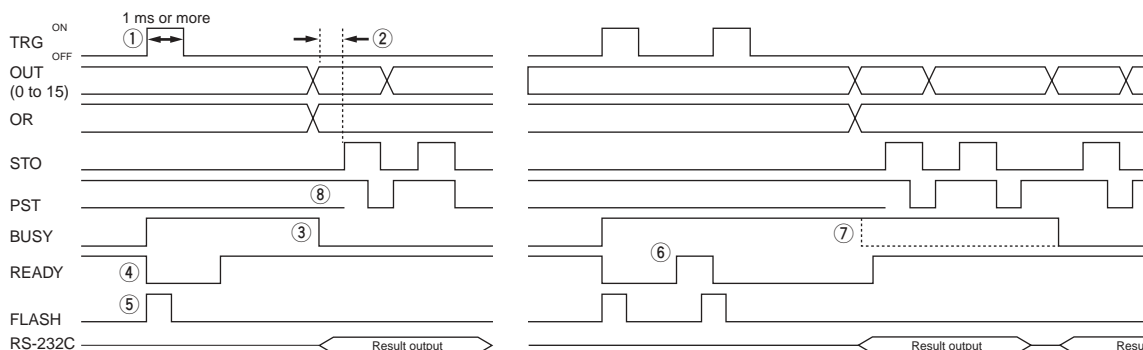


- ① When the output cycle is longer than the measurement cycle, output data are accumulated in the output buffer inside the CV-2100.
- ② When the output buffer becomes full, further measurement data cannot be received. The READY output signal remains off until vacant space is created in the output buffer. In this condition, trigger input cannot be received.

► Note

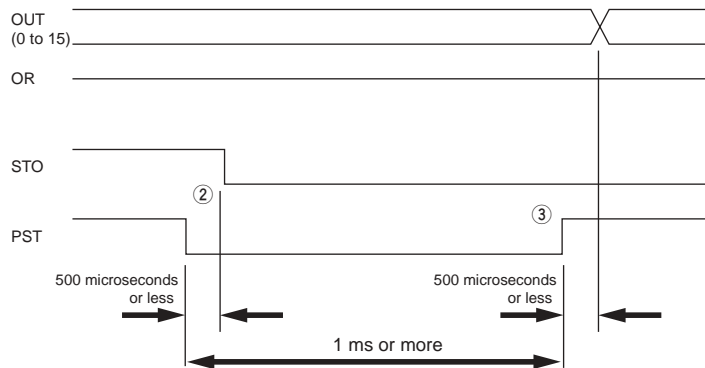
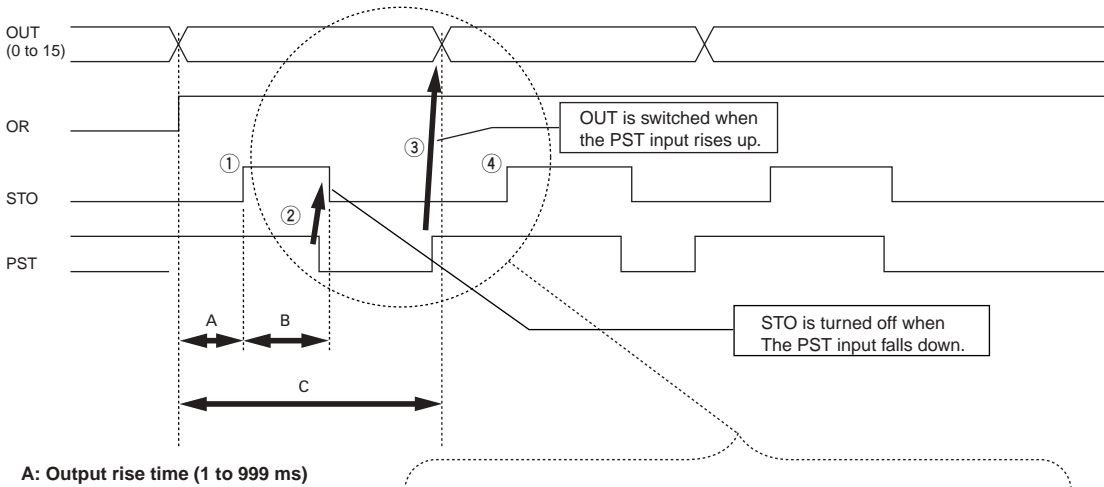
- To perform continuous measurement, set the trigger input interval to be longer than the output cycle of one measurement.
- The output destinations subject to the operations described above are the terminal block and the RS-232C (non-procedural, PLC link).
- In the cases of output to the compact flash memory or Ethernet, the output data are skipped if the data buffer is full.
- If the next trigger is input while image processing is still in progress, the waiting time until the previous processing is completed is also included in the on-screen processing time.

4. Typical Operation with External Trigger Input (With Handshake)



- ① The TRG input signal must be on for 1 ms or more.
- ② The STO output turns on after elapse of the output rise time (can be varied by setting) when data is output. For details on the output rise time, see page 8-2.
- ③ The BUSY output signal goes to the low level at the time when image processing is completed.
- ④ The READY output indicates that trigger input is enabled. Trigger input can be received while the READY output is on. When the trigger is input, the READY output goes off for a certain period of time (shutter speed + image transfer time).
- ⑤ The FLASH output is used to light up the illumination. Trigger input starts the FLASH output time (can be varied by setting). Refer to "FLASH Output Timing" (page 13-7) for details.
- ⑥ While image processing is in progress (the BUSY output is on), the image to be processed is taken in.
- ⑦ The BUSY output is not turned off in order to start the next image processing immediately after image processing is completed.
- ⑧ The STO output is turned off by switching the PST input from on to off after the STO output is turned on. When the PST input is turned on again, the output data is switched and the STO output is turned on after elapse of the output rise time (which can be changed by setting). Refer to "Terminal Data Output Timing (With Handshake)" (page 13-10) for details.

Terminal Data Output Timing (With Handshake)



- Measurement result data are output to OUT (0 to 15) by switching the OUT (0 to 15) terminal sequentially.
- When handshake is used, the data are switched in accordance with the PST input.

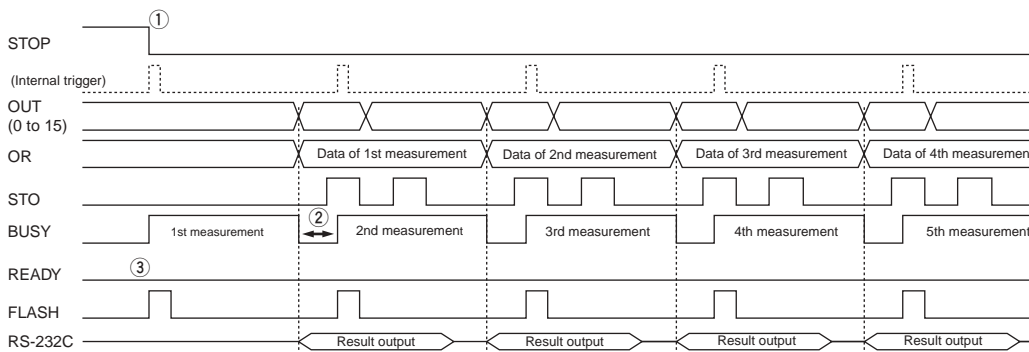
- ① After image processing is completed, the first data is output. Then, the STO output is turned on after elapse of A ms (output rise time).
- ② STO output goes off when PST input is switched from on to off.
- ③ Then, data are switched as the PST input is switched from off to on.
- ④ After data are switched, the STO output is turned on after elapse of A ms (output rise time).

The output data are switched sequentially by repeating steps (2) to (4). After all of the measurement result data have been output, no further data switching occurs even if the above operations are performed.

► Note

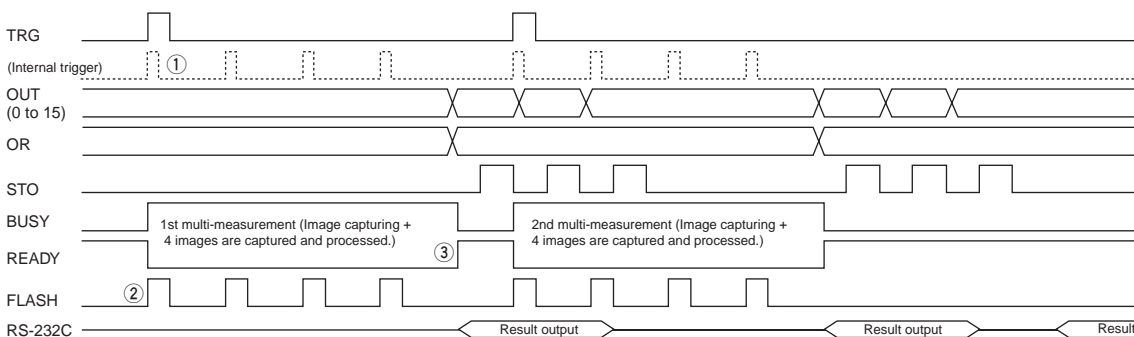
- If PST input does not switch from the off after STO output comes on, then the STO output automatically goes off after Bms (the output time) have elapsed.
- If PST input does not switch from off to on, Out is automatically switched when Cms (out cycle) after Out output have elapsed. In other words, if there is no handshake operation resulting from PST input, the same operation occurs with or without handshake.

5. Typical Operation with Internal Trigger (No Handshake)



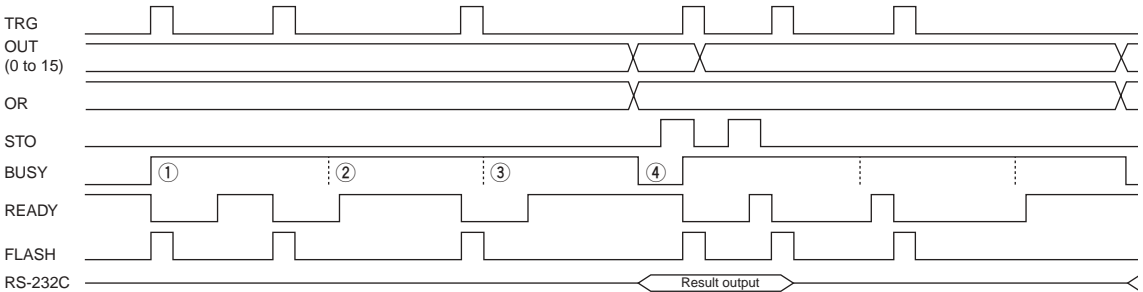
- ① When STOP input goes off, a trigger to the camera is produced internally and an image is captured and processed.
- ② When the interval time (which can be varied by setting) has elapsed after image processing is completed, the next trigger is produced and another image is captured and processed.
- ③ In internal trigger mode, external trigger input cannot be received, so the READY output goes off.

6. Typical Operation in Multi-Measurement (Measurement 4 Times, No Handshake, External Trigger)



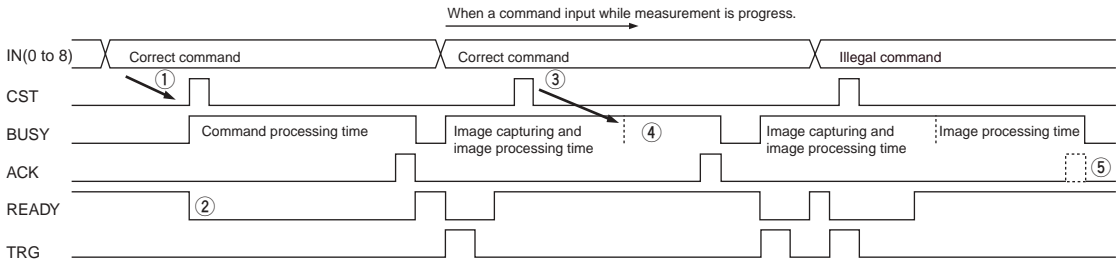
- ① When a trigger is input, 4 images in succession are captured and processed.
The trigger outputs to the camera for the 2nd and subsequent images are automatically produced internally.
- ② The FLASH output is used to light the illumination. Every time an image is captured the illumination comes on for the FLASH output time (which can be varied by setting). For details, see "FLASH output timing" (page 13-7).
- ③ In multi-measurement, the READY output goes off until the image processing is completed. During this time, permission for the next trigger input is not given.

7. Typical Operation in Multi-Trigger (3 Triggers, No Handshake, External Trigger)



- ① When a trigger is input, the 1st image is captured and image processing occurs on the windows that are set to W01 to W21.
- ② The 2nd image that is captured is processed on the windows set to W22 to W42.
- ③ The 3rd image captured is processed on the windows set to W43 to W64.
- ④ When processing for the number of triggers that have been set is completed, the BUSY output goes off.

8. Operation at the Time of Command Input



- ① After command input data have been finalized, CST input comes on.
- ② While command processing is in progress, trigger input is prohibited, so the READY output goes off.
- ③ If a command is input while image processing is in progress, it is executed after the image processing is completed.
- ④ If command processing starts following image processing, the BUSY output remains on until the command processing is completed.
- ⑤ If the command is incorrect, the ACK output does not come on, the BUSY output goes off and the command processing terminates. For details of the command types, see "Command Input" (page 13-13).

Note

- While command input processing is in progress (from CST input until ACK output), any new commands that are input are ignored.
- The ACK input on time is the same as the STO output time.
- Setting number switching and image registration command input are ignored while image processing is in progress (while BUSY input is on).

Command input

- After a command is input to IN (0 to 8), the command is finalized by CST input switching to on (signal rise recognition).
- Input to IN (0 to 5) is specified by binary input.
- The time during which ACK input is on is the same as the STO output time.

Command name	IN8	IN7	IN6	IN5	IN4	IN3	IN2	IN1	IN0
Display window switching	0	0	1	Window numbers 1 to 64 ^{a)}					
Screen switching	0	1	0	0: RAW screen; 1: PROCESS 1 screen 1; 2: PROCESS 2 screen					
Program number switching	0	1	1	Program numbers 0 to 31 ^{b)}					
Image registration	1	0	0	0 to 5 ^{c)}					
Screen capture	1	0	1	— ^{d)}					
Display switching	1	1	0	0 to 4 ^{e)}					
Camera switching	1	1	1	0 to 8 ^{f)}					
Open	0	0	0	—					

1: on (short circuit) 0: off (open)

a) The window number is specified by binary input.

Example: If window number 3 is set, it is specified by 2 in binary input.

b) The program number is specified by binary input.

Example: If program number 3 is set, it is specified as 3 in binary input.

c) 0: camera 1 (trigger 1); 1: Camera 1 trigger 2; 2: Camera 1 trigger 3; 3: Camera 1 trigger 4; 4: Camera 1 (trigger 2); 5: Camera 2 trigger 2

d) As in the case of screen capture from the remote control console (page 1-4), the captured image is stored in compact flash memory.

e) 0: standard display; 1: List of evaluation values; 2: List of measured values; 3: Custom screen; 4: No menu

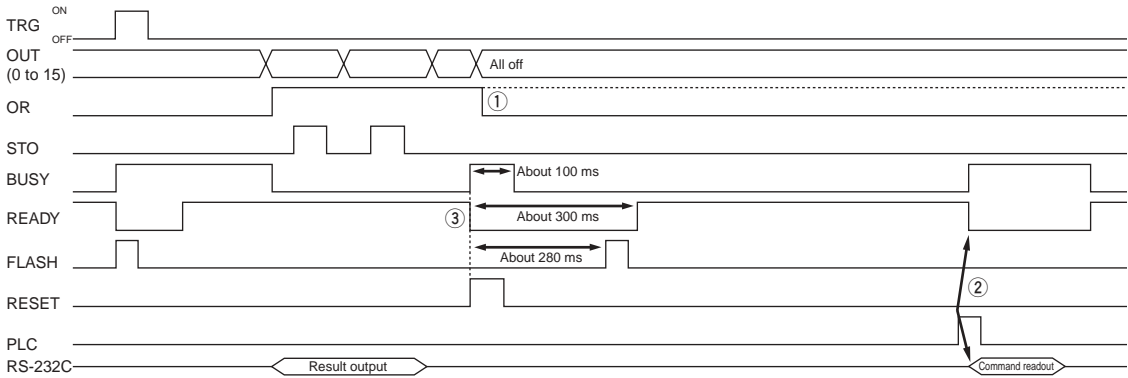
f) 0: Dependent on display window; 1: Camera 1 (trigger 1); 2: Camera 1 trigger 2; 3: Camera 1 trigger 3; 4: Camera 1 trigger 4; 5: Camera 2 (trigger 1); 6: Camera 2 trigger 2; 7: Vertical division; 8: Horizontal division

Examples of binary input specification for window numbers 1 to 64 and program numbers 0 to 31

IN5	IN4	IN3	IN2	IN1	IN0	Window No.	Program No.
0	0	0	0	0	0	1	0
0	0	0	0	0	1	2	1
0	0	0	0	1	0	3	2
0	0	0	0	1	1	4	3
0	0	0	1	0	0	5	4
:	:	:	:	:	:	:	:
0	1	1	1	1	1	32	31
1	1	1	1	1	0	63	—
1	1	1	1	1	1	64	—

1: on (short circuit); 0: off (open)

9. Operation at Time of RESET Input/PLC Input



- ① When the rise of the RESET input is detected, all outputs go off. The number of measurements and the number of failures are reset to 0.
- ② When PLC is input, the instruction code is read from the PLC command address, and the command is executed. During this time trigger input is prohibited.
- ③ When RESET is input, 1 screen is captured (measurement is not performed) at the end of the reset operation. The RESET input returns the system to the state immediately after the power is turned on.

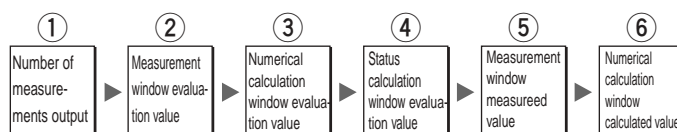
► Note

- PLC input is only effective when the communication mode is linked to the PLC (see page 11-4).
- If RESET is input while measurement is in progress, the measurement is canceled.

Output Data

Output sequence

Data set for output are output according to the following sequence.



Some output examples are shown on the next page.

Output data

The output data on each pin are as given in the following table.

① Number of measurements	Initial output OUT0 to OUT15: Bit 0 to Bit 15 2nd output OUT0 to OUT15: Bit 16 to Bit 31 (The lower 16 bits are output, followed by the upper 16 bits.)
② Measurement window evaluation values	OUT0 to OUT15: Measurement windows No.1 to No.16 (W01 to W16) OUT0 to OUT15: Measurement windows No.17 to No.32 (W17 to W32) OUT0 to OUT15: Measurement windows No.33 to No.48 (W33 to W48) OUT0 to OUT15: Measurement windows No.49 to No.64 (W49 to W64)
③ Numerical calculation window evaluation values	OUT0 to OUT15: Numerical calculation windows No.1 to No.16 (C01 to C16) OUT0 to OUT15: Numerical calculation windows No.17 to No.32 (C17 to C32)
④ Judgment operation window evaluation values	OUT0 to OUT15: Status calculation windows No.1 to No.16 (J01 to J16) OUT0 to OUT15: Status calculation windows No.17 to No.32 (J17 to J32)
⑤ Measurement window measured values (Other than number of pixels, number of scratches, circumference length) (Number of pixels, number of scratches, circumference length)	OUT0 to OUT15: Bit 0 to Bit 15 (Decimal digits are discarded.) Initial output OUT0 to OUT15: Bit 0 to Bit 15 (Decimal digits are discarded.) 2nd output OUT0 to OUT15: Bit 16 to Bit 31 (The lower 16 bits are output, followed by the upper 16 bits.)
⑥ Numerical calculation window calculation values	Initial output OUT0 to OUT15: Bit 0 to Bit 15 (Decimal digits are discarded.) 2nd output OUT0 to OUT15: Bit 16 to Bit 31 (The lower 16 bits are output, followed by the upper 16 bits.)

► Note

- Measured values and calculated values are output as whole numbers. If the decimal digits are also output, the numerical calculation function (page 4-110) is used to multiply the previously output data by 1000 so that they can be output as whole numbers.
- Numerical data are output in the two's-complement binary format.

Reference

If the system is set to output multiple values from multiple windows, the output is in order of window number. The same is true for calculated values from the numerical calculation window.

Examples of output

a. Assume that the measurement windows and numerical calculation windows are set as follows.

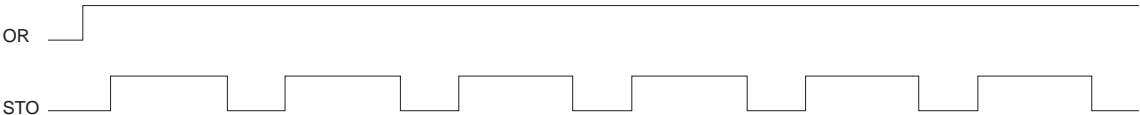
- Window No. 1: Area (evaluation value, number of pixels)
- Window No. 2: Blobs (evaluation value)
- Window No. 3: Edge gap (evaluation value)
- Window No. 4: Stain (evaluation value)
- Window No 5: Pattern position (evaluation value, X-axis, Y-axis)
- Numerical calculation window No. 1

b. The output settings are set as follows.

- 1 Number of measurements: Off
- 2 Measurement window judgment values: W01 to W05
- 3 Numerical computation window judgment value: C01
- 4 Result from status calculation window: None
- 5 Measurement window measured values: W01 (number of pixels), W05 (X-axis), W05 (Y-axis)

From a and b, the timing flow chart for the output signals in this case are as in the table below.

OUT0	Window 1 evaluation value	Numerical calculation No. 1 judgment value	Window 1 number of pixels Bits 0 to 15 (lower 16 bits)	Window 1 number of pixels Bits 16 to 31 (upper 16 bits)	Window 5 X-axis	Window 5 Y-axis
OUT1	Window 2 evaluation value	OFF				
OUT2	Window 3 evaluation value	OFF				
OUT3	Window 4 evaluation value	OFF				
OUT4	Window 5 evaluation value	OFF				
OUT5	OFF	OFF				
OUT6	OFF	OFF				
OUT7	OFF	OFF				
OUT8	OFF	OFF				
OUT9	OFF	OFF				
OUT10	OFF	OFF				
OUT11	OFF	OFF				
OUT12	OFF	OFF				
OUT13	OFF	OFF				
OUT14	OFF	OFF				
OUT15	OFF	OFF				



Main Specifications

Controller Main Unit (CV-2100)

Number of pixels			512 (H) x 480 (V)	
Camera input			2 inputs	
Processing cycle			100 times/second (It changes depending on the setting contents.)	
Setting registration			32 settings. Selection from outside is possible.	
Number of registration screens			64 screens (Maximum 4 screens/1 setting)	
Window setting	Measurement area		64 points/1 setting	
	Mask area		4 points/1 area	
Function	Measurement mode	Area sensor	Shapes are rectangle, circle, ellipse, circumference, arc, polygon (up to dodecagon) and edge detection area	
		Position detection	Pattern search	Number of multiple searches are supported. Shapes are rectangle, circle, ellipse, circumference, arc, polygon (up to dodecagon)
			Edge detection	Angle measurement is supported. Shapes are rectangle, rotating rectangle, circumference and arc.
			Gravity position	Shapes are rectangle, circle, ellipse, circumference, arc and polygon (up to dodecagon).
	Trend edge position		Shapes are rectangle, rotating rectangle, circumference and arc.	
	Inspection mode	Width measurement	Shapes are rectangle, rotating rectangle, circumference and arc.	
		Pitch measurement	Shapes are rectangle, circumference and arc.	
		Number of edges	Shapes are rectangle, rotating rectangle, circumference and arc.	
		Edge angle	Shape is rectangle.	
		Blob (Characteristic quantities)	Number of labels, center of gravity, main axis angle, area, feret diameter, surrounding length, cylindricity. Shapes are rectangle, circle, ellipse, circumference, arc and polygon (up to dodecagon).	
		Stain detection	Rectangle, circle, ellipse, circumference, arc and polygon (up to dodecagon). Edge detection area	
		Density inspection	Shapes are rectangle, circle, ellipse, circumference, arc and polygon (up to dodecagon). Edge detection area	
		Trend edge width	Shapes are rectangle, rotating rectangle, circumference and arc.	
		Multi measurement	Split reading	2 to 4 splits reading processing
			Continuous reading	1 to 32 times continuous reading processing (maximum value, minimum value, average value)
		CCD partial image reading		0 to 479 lines. Start line and end line can be freely specified.
		Correction function	Position correction	
	Camera gain adjustment		Sensitivity in 9 steps. Shift and span adjustments	
	Illumination correction		Illumination correction area 1-correction/setting (2 corrections when 2 cameras are used)	
	Filter function		Maximum 4 time, enlarge, shrink, average, median, edge enhance, edge extract (X, Y, XY)	
Calibration function			Setting X and Y magnification for each camera	
Calculation function	Numerical calculation	32 calculations/1 setting, operator (four operations, square, maximum, minimum, square root, absolute value, remainder, distance, angle, sin, cos, atan)		
	Judgment calculation	32 calculations/1 setting, operator (AND, OR, NOT, XOR)		

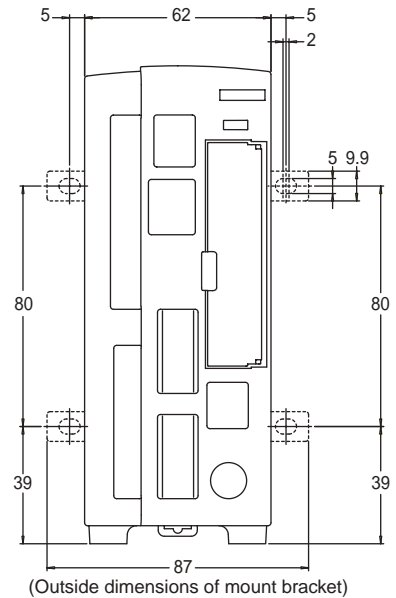
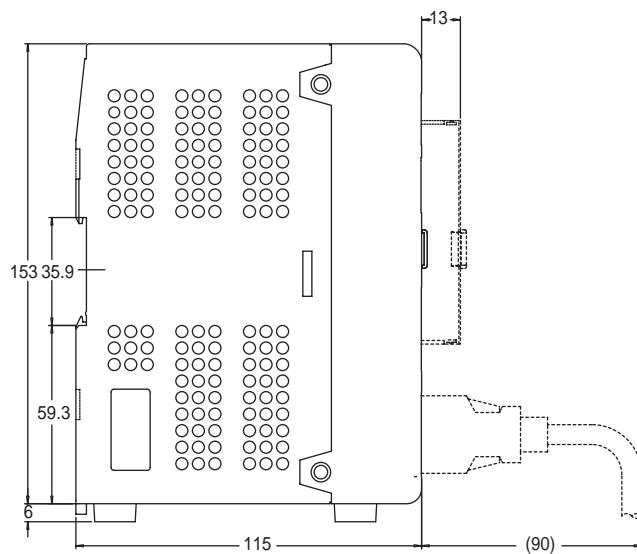
Supporting functions	Statistics function		Times of measurement, maximum value, minimum, average value, deviation and number of NG times of the maximum 11,264 measurements.
	Save screen		Maximum 54 screen in the memory of main unit
	Screen customize function		Character string: Measurement value, judgment result, arbitrary character, fixed character Figure: Straight line, cross-point, circle, square
	Setup re-write function while the machine is running		Tolerance re-writing and binarizing level change are possible while the machine is running
	CF memory save function		Measurement values, judgment result, number of NG times and screen can be saved in CF directly.
	Main functions		I/O monitoring, screen capture function, password function, re-test function
Memory card			Compact flash memory (NR-M32, GR-M256)
Interface	Control input	External trigger input	1 input, input rating 26.4 V or less, 3 mA or more
		Control input	9 inputs, setup selection, screen selection, window selection, screen registration, screen capture Input rating 26.4 V or less, 2 mA or more
	Control output	General purpose output	16 outputs, NPN open-collector, maximum 50 mA (less than 30 V)
		Overall judgment output	1 outputs, NPN open-collector, maximum 50 mA (less than 30 V)
	Video output		Conforms to NTSC system
	RS-232C		Numerical output, input/output of image data and control signal are possible (baud rate: switchable up to 115,000 bits/s)
	PLC link	Supported link unit	Keyence Corp.: KV-700 series, Mitsubishi Electric: A, Q series, OMRON: SYSMAC series. Respective units are supported.
	Ethernet		100BASE-TX/10BASE-T (Numerical output, input/output of image data and control signal are possible)
Languages on display			English/Japanese selectable
Rating	Power supply voltage		DC 24 V ±10%
	Current consumption		1 A
Environmental resistance characteristics	Ambient operating temperature		0 to +40°C
	Ambient operating humidity		35 to 85% RH (no dew condensation)
Mass			About 510 g

Camera Section (CV-020)

Imager element		1/3 type CCD imager, square element all pixels double-speed reading, 350,000 pixels
Scanning system		1/60 second progressive, 1/120 second interlaced
Transfer system		Digital serial transfer
Electronic shutter		1/60, 1/120, 1/240, 1/500, 1/1000, 1/2000, 1/5000, 1/10000, 1/20000
Lens mount		C-mount
Environmental resistance characteristics	Ambient operating temperature	0 to +50°C
	Ambient operating humidity	35 to 85% RH (no dew condensation)
Mass		About 100 g

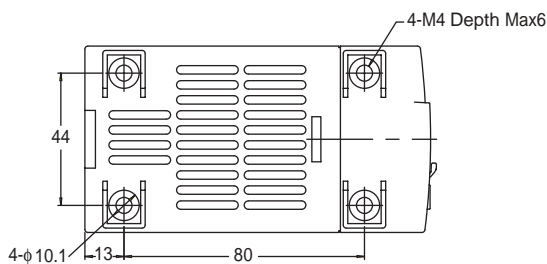
Outside Dimensions

Controller Unit (CV-2100)



(Outside dimensions of mount bracket)

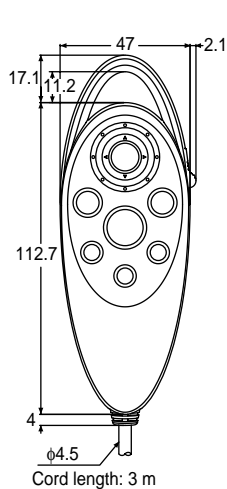
Unit: mm



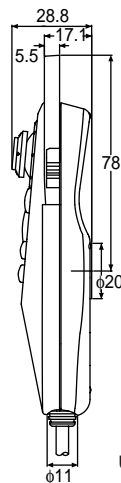
4-M4 Depth Max6

4- ϕ 10.1 13 80

Remote control console (OP-42342)

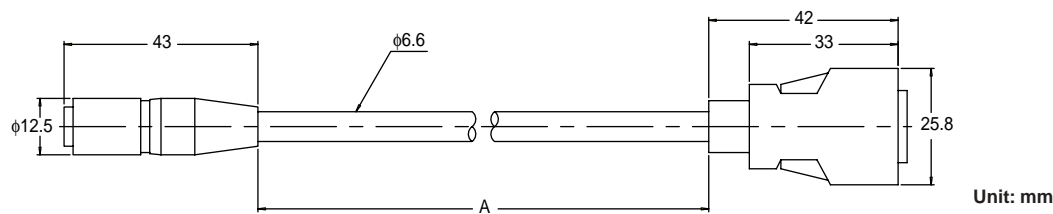


Cord length: 3 m



Unit: mm

Camera Cable



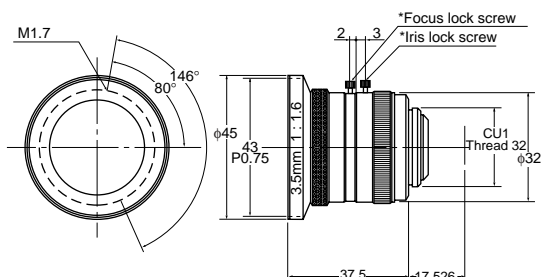
Model name	Cable length (A)	Mass
CV-C3	3m	220g
CV-C10	10m	660g
CV-C17	17m	1100g

Option

Lenses

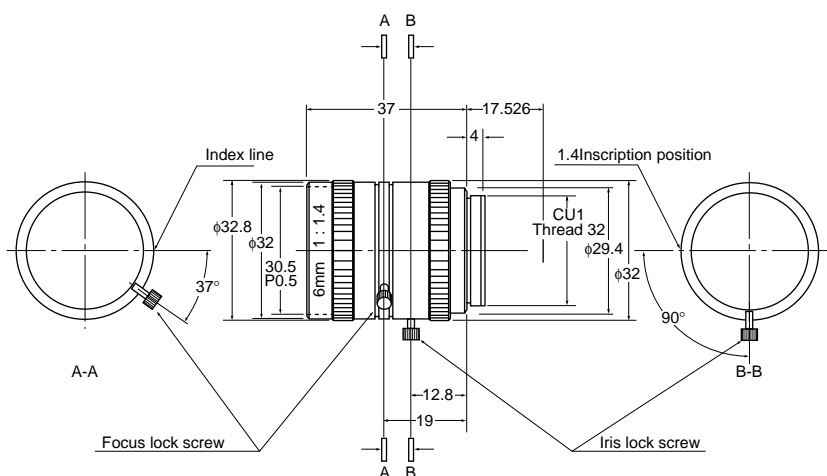
Outside Dimensions

3.5 mm lens (CV-L3)



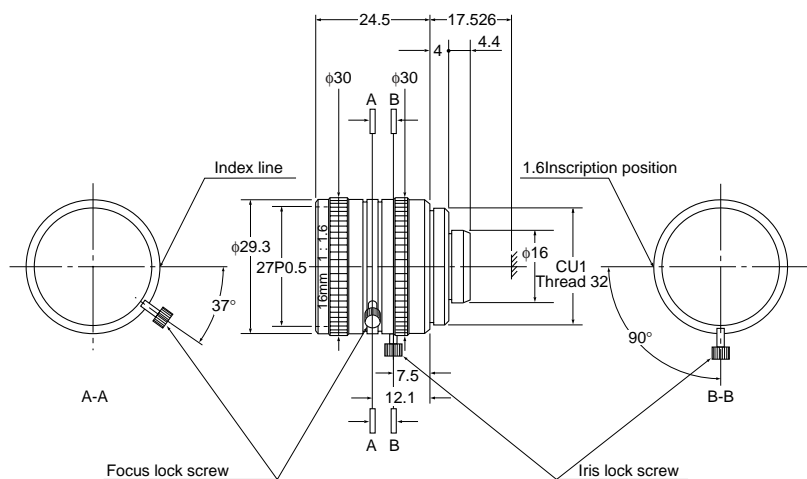
Unit: mm

6 mm lens (CV-L6)



Unit: mm

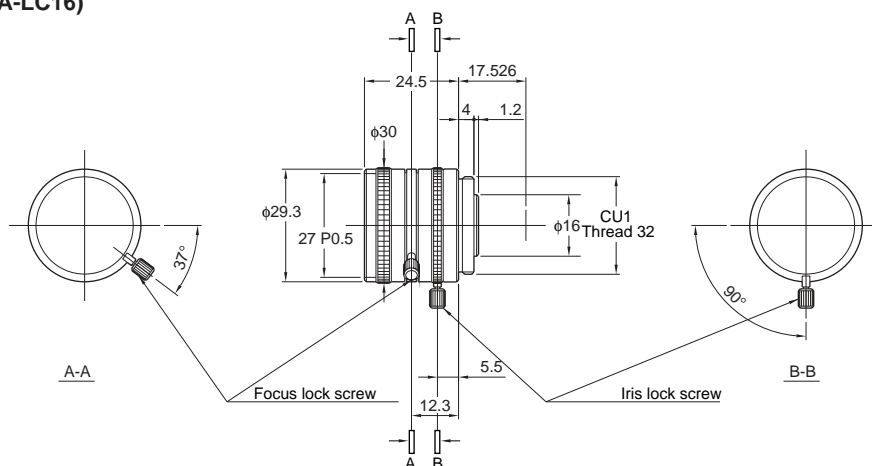
16 mm lens (CV-L16)



Unit: mm

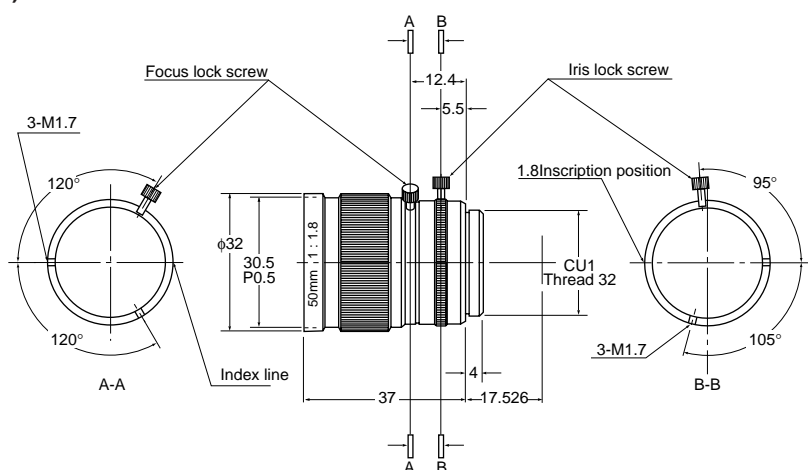
Option

16 mm lens (CA-LC16)



Unit: mm

50 mm lens (CV-L50)

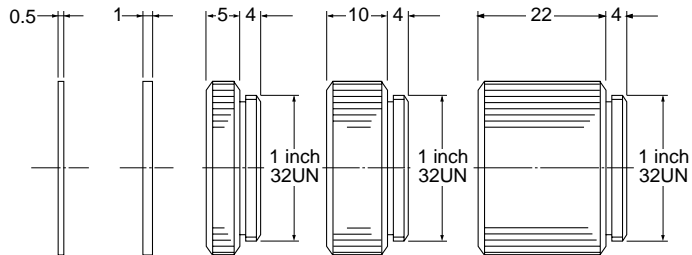


Unit: mm

Specifications

Model name	CV-L3	CV-L6	CV-L16	CA-LC16	CV-L50
Focal distance	3.5mm	6mm	16mm	16mm	50mm
Iris diaphragm	F1.6 to CLOSE	F1.4 to CLOSE	F1.6 to CLOSE	F1.4 to CLOSE	F1.8 to CLOSE
Minimum object distance	0.1m	0.2m	0.4m	0.4m	1.0m
Mount	C-mount	C-mount	C-mount	C-mount	C-mount
Filter screw diameter	43.0mm P0.75	30.5mm P0.5	27.0mm P0.5	27.0mm P0.5	30.5mm P0.5
Mass	about 90g	about 70g	about 44g	about 44g	about 55g

Close-up Ring (OP-35406)

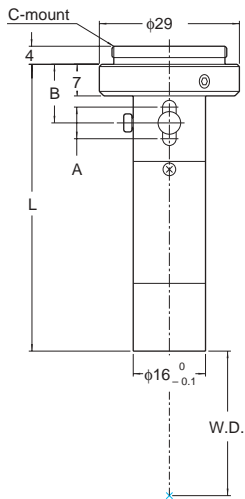


Unit: mm

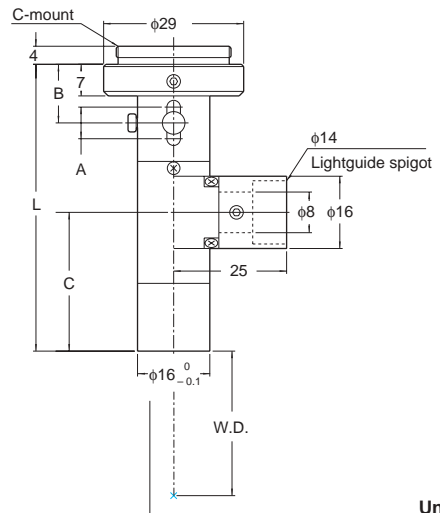
Macro Lens

Outside Dimensions

Straight type



Coaxial type



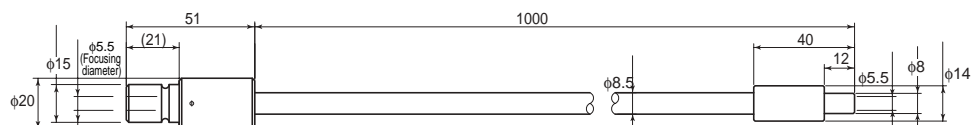
Unit: mm

Model name	CA-LM(A)2	CA-LM(A)4	CA-LM6	CA-LM8
L (length)	63.5mm	69.3mm	80.6mm	95.0mm
A (adjustment range)	7.0mm	9.3mm	7.7mm	7.6mm
B (adjustment position)	13.0mm	15.1mm	20.5mm	34.9mm
C (coaxial position)	30.7mm	31.8mm	—	—

Option

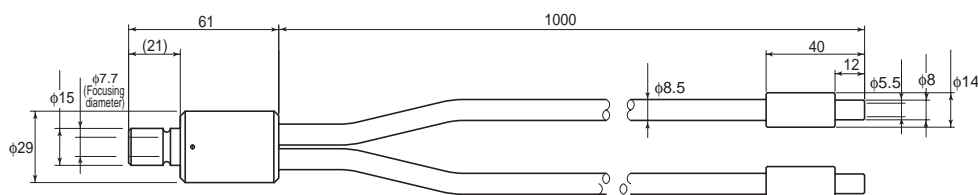
Fiber-optic lightguide for the coaxial type

OP-42323 (lightguide: single)



Unit: mm

OP-42323 (lightguide: twin)



Unit: mm

Specifications

Note

All the values in the specifications below are based on the optical design value. Individual differences can occur depending on the installation accuracy.

Model name	CA-LM2	CA-LM4	CA-LM6	CA-LM8	CA-CMA2	CA-LMA4
Shape	Straight	Straight	Straight	Straight	Coaxial	Coaxial
Optical magnification (reference magnification)	× 2	× 4	× 6	× 8	× 2	× 4
Magnification range	About ±5% relative to the reference magnification					
WD ¹⁾ (mm, in reference magnification)	66.9	70.3	64.4	64.5	66.9	70.3
Maximum fitting image file	Model 1/2					
Image reading field of view ²⁾ (mm, in reference magnification)	Model 1/3 1.8 × 2.4	0.9 × 1.2	0.6 × 0.8	0.45 × 0.6	1.8 × 2.4	0.9 × 1.2
	Model 1/2 2.4 × 3.2	1.2 × 1.6	0.8 × 1.07	0.6 × 0.8	2.4 × 3.2	1.2 × 1.6
Valid F value	15.4	26.5	39.3	52.4	15.4	26.5
Depth of field ³⁾ (μm)	400	172	111	79	400	172
TV distortion (Max)	−0.04%	−0.22%	−0.10%	−0.04%	−0.04%	−0.22%
Resolution ⁴⁾ (μm)	5.1	4.5	4.4	4.4	5.1	4.5
Mount	C-mount					
Operating temperature and humidity	0 to +50°C, 80% RH (no dew condensation)					
Mass	about 57g	about 58g	about 64g	about 67g	about 62g	about 66g

1) WD indicates the working distance when each lens is used in the standard magnification. It fluctuates when the magnification is adjusted.

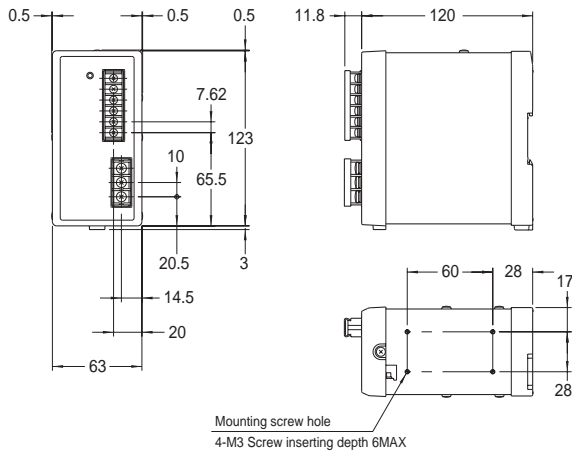
2) Image reading field of view means the standard field of view in each image size. It can be changed by ±5% by adjusting the magnification.

3) Depth of field is a simulation value assuming the 320 TV lines of horizontal resolution using the image of size 1/2 model. (Minimum circle of confusion diameter of 40 μm at the object side.)

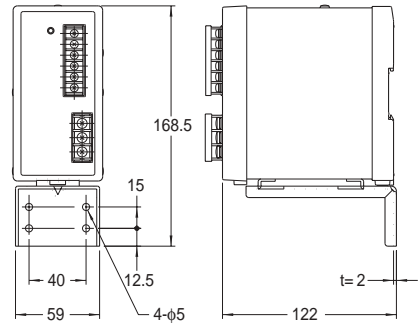
4) Resolution indicates the simulation value in 550 nm.

DC-24V Power Supply (CA-U2)

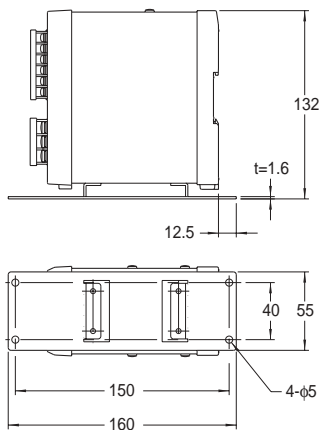
Outside Dimensions



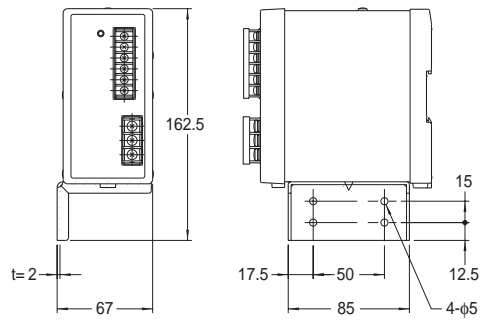
Mounting on the front (using OP-42174)



Mounting on the bottom (using OP-42175)



Mounting on the side (using OP-42176)



Unit: mm

Specifications

Input conditions	Rated input voltage	AC100 to 240V(±10%) 50/60Hz
	Efficiency	78 to 80%TYP
	Rated input current	1.2 A or less
	Power factor (AC 100/200 V)	7 0.99/0.95 TYP in maximum load
	Leak current (AC 100/200 V)	0.4/0.75 mA or less
	Inrush current (AC 100/200 V)	18/36 A (25° cold start) or less
	Overvoltage category	II
Output conditions	Rated output voltage	24 V, Class 2
	Rated output current	3.5 A (sum of 3 output terminals)
	Ripple noise voltage	1% (P-P) or less
	Input fluctuation	0.4% or less
	Load fluctuation	0.7% or less
	Start-up time (AC 100/200 V) ¹⁾	1500/1000 ms or less
	Output retention time	20 ms (AC 100 to 240 V) or more
Protection	Overcurrent protection ²⁾	3.6 A to 4.2 A or more Constant current drop or output shutdown
	Overvoltage protection ³⁾	Provided
Environmental resistance characteristics	Ambient operating temperature	−10 to +55°C (no freezing) (Refer to derating characteristics)
	Ambient operating humidity	25 to 85% RH (no dew condensation)
	Ambient preservation temperature	−20 to +70°C (no freezing)
	Degree of pollution	2
	Withstand voltage	AC 3.0 KV 50/60 Hz, 1 min (between input and output) AC 2.0 KV 50/60 Hz, 1 min (between input and GND) DC 500 V, 1 min (between output and GND)
	Crashworthiness	300 m/s ² , twice each in the 3 axis directions
	Vibration resistance	10 to 55 Hz Double amplitude of 1.5 mm or less 2 hours in X, Y, and Z direction respectively (9.8 m/s ² or less in DIN rail installation)
	Insulating resistance	100 MΩ or more in DC 500 V (between input and output) (between input and GND) (between output and GND)
	Safety standard	UL60950, UL508, CAN/CSA C-22.2 60950-00, EN60950, EN50178
	Noise terminal voltage	FCC part15B class A, EN55011 class A
	Radiated susceptible electrolytic strength	FCC part15B class A, EN55011 class A
	High-frequency current regulation	Complying to EN61000-3-2
Mass		About 700 g

1) Rating input voltage (AC 100 or 200 V) is defined as 100% load.

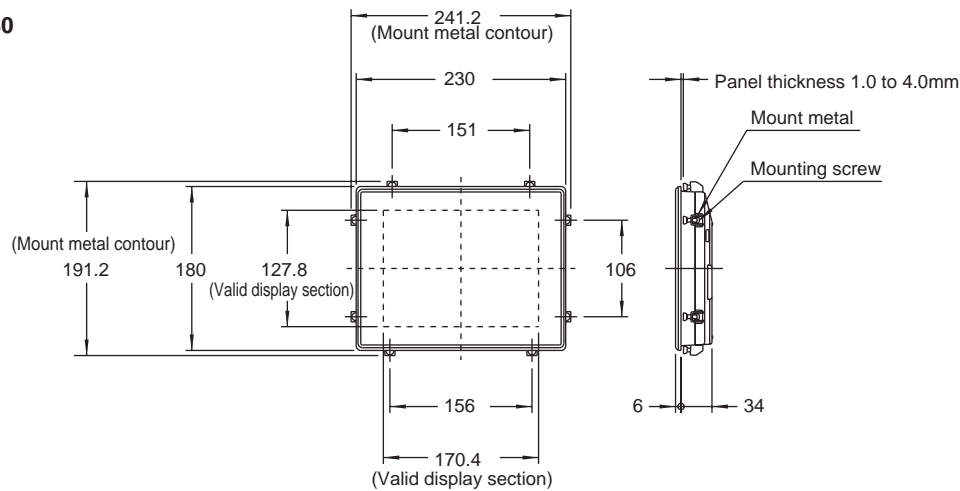
2) The system automatically recover when the constant current drop occurs. When the output is shut down, the system recovers when the input is turned on more than a minute after the input is turned off.

3) The output is shut down using the oscillation stop method. When the output is shut down, the system recovers when the input is turned on more than a minute after the input is turned off.

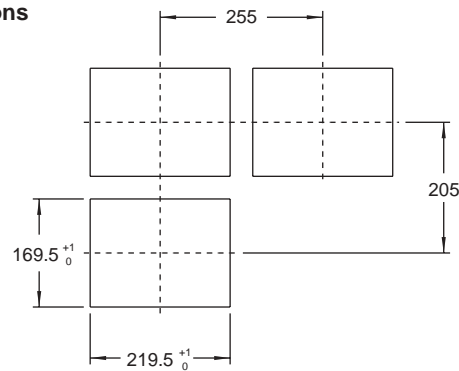
Monitor

Outside Dimensions

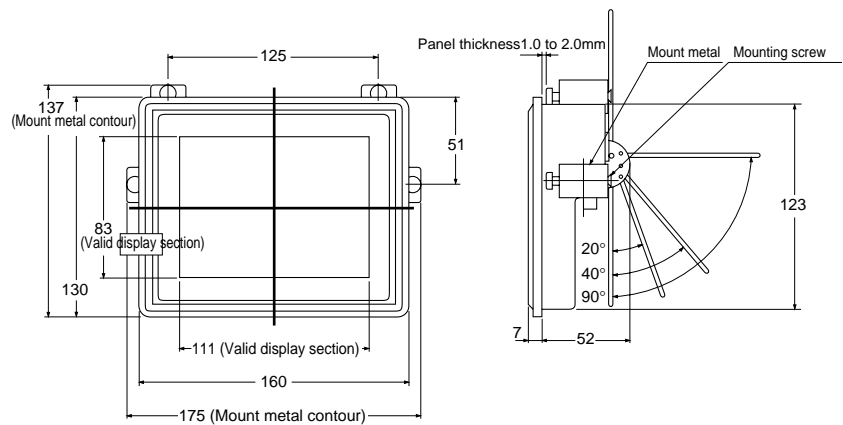
CA-MN80



Panel cut dimensions



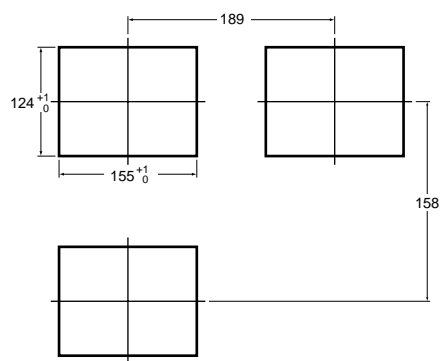
CV-M30



Unit: mm

Unit: mm

Panel cut dimensions



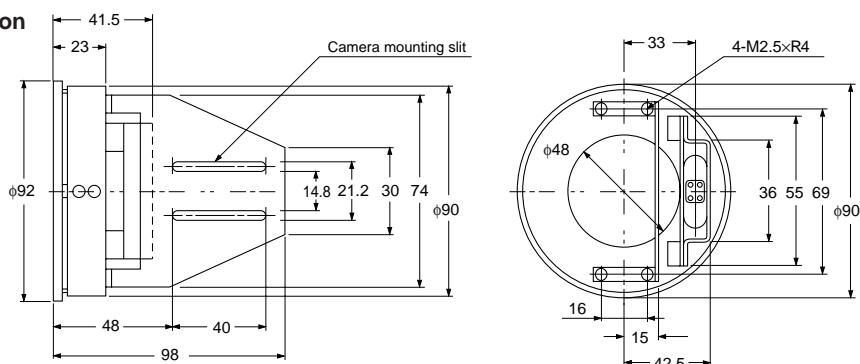
Specifications

Model name		CA-MN80	CV-M30
Liquid crystal panel	Display element	a-Si TFT Active Matrix method	TFT Active Matrix method
	Valid display area	170.9(W) × 128.2(H)mm	111.36(W) × 85.52(H)mm(MODEL 5.5)
	Number of display dots	640 (W) × 480 (H) dots	320 (W) × 240 (H) dots
	Display color	262,114 colors	Full color
Image input	Input signal	NTSC composite signal 1.0Vp-p 75Ω	NTSC composite signal 1.0Vp-p 75Ω
	Connector	RCA pin jack	RCA pin jack
Rating	Power supply voltage	DC24V±10%	DC24V±10%
	Power consumption	1 A or less	700 mA or less
	Ambient operating temperature	0 to +40°C	0 to +40°C
	Ambient operating humidity	35 to 85% RH (no dew condensation)	35 to 85% RH (no dew condensation)
Mass		About 1200g	About 570g

Ring Light (CV-R10)

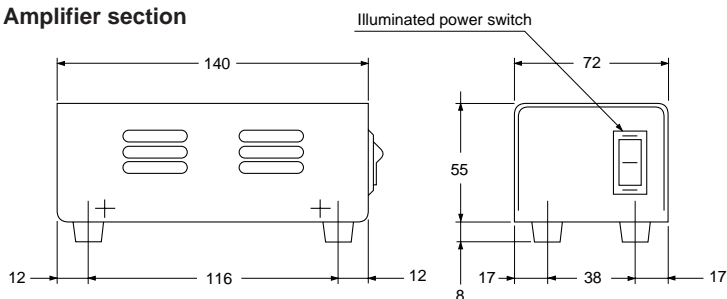
Outside Dimensions

Light section

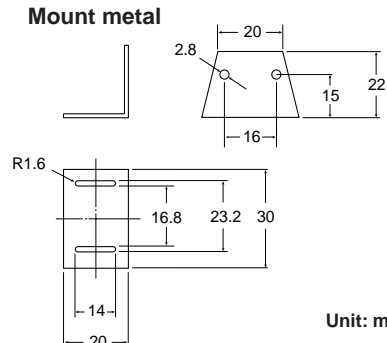


Unit: mm

Amplifier section



Mount metal



Unit: mm

Specifications

Lighting method	Inverter high-frequency lighting (25 to 35 kHz)
Lamp model	N-EX (daylight type)
Lamp contour	External diameter $\phi 80$ mm, internal diameter $\phi 56$ mm
Lamp lifetime ¹⁾	Approximately 2000 hours in average (Luminance is lowered to 70%)
Initial average luminance ²⁾	800 lx $\pm 10\%$ (luminance at 250 mm below the lamp center)
Luminance stability	$\pm 1.5\%$ relative to the fluctuation of AC 100V $\pm 10\%$
Rating	Power supply voltage: AC 100V $\pm 10\%$ (for both 50 and 60 Hz) Power consumption: 20 VA
Environmental resistance characteristics	Ambient operating temperature: +5 to +50°C Ambient operating humidity: 35 to 90% RH (no dew condensation)
Mass	Light section: about 150 g (including a diffusing plate and mount metal) Amplifier section: about 600 g (including a cable)

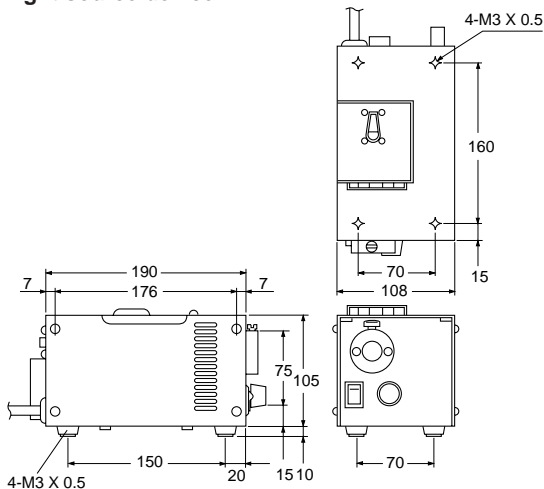
1) The lamp lifetime means the average time it takes to drop to 70% of its initial luminance when it is illuminated under the environment with the ambient temperature of about 25°C without vibration. Depending on the usage conditions, the lamp lifetime may be shorter.

2) The initial luminance indicates the luminance when an unused lamp is illuminated for the first time.

Fiber-optic Light (CV-F10)

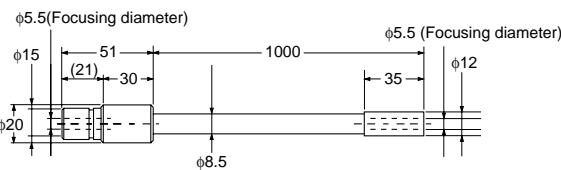
Outside Dimensions

Light source device



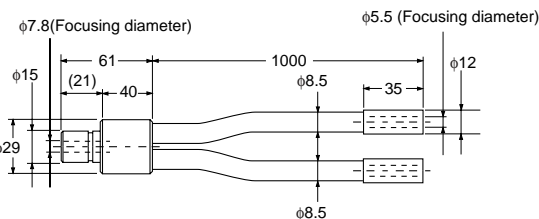
Unit: mm

Lightguide single type (CV-F01)



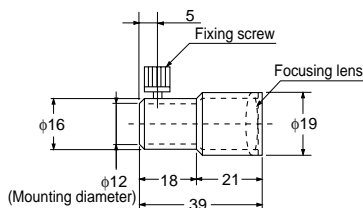
Unit: mm

Lightguide twin type (CV-F02)



Unit: mm

Condenser (CV-F03)



Unit: mm

Specifications

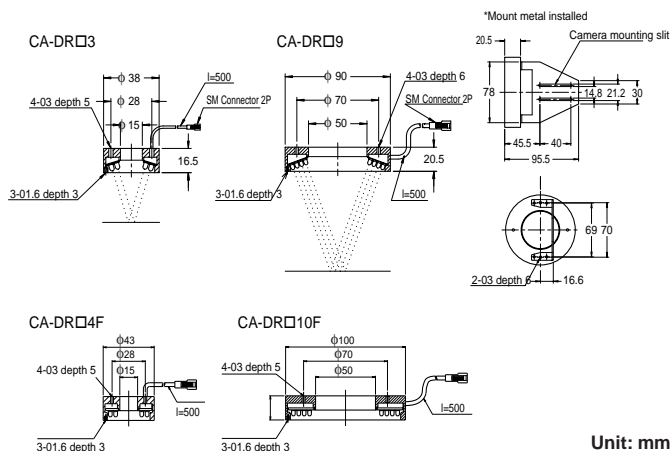
Lighting method	DC lighting in the forward converter method
Number of lamp	One piece (halogen lamp with dichroic mirror)
Light adjustment range	0 to 100%
Light adjustment method	Front panel volume or external control voltage DC 0 to 5 V (external control resistance 0 to 10 k Ω)
luminance ¹⁾	About 60000 lx
Lamp model	Halogen lamp manufactured by IWASAKI ELECTRIC Co., Ltd.
Lamp lifetime	About 1000 hours average
Color temperature	3100K
Fuse	$\phi 5.2$ mm \times L20mm, 5A
Rating	Power supply voltage: AC 100V \pm 10% (50 and 60 Hz) Power consumption: 135 W or less
Environmental resistance characteristics	Ambient operating temperature: 0 to +40°C Ambient operating humidity: 20 to 80% RH (no dew condensation)
Mass	About 2.2 kg

1) This is the value when the illuminance of the CV-F10 light source device with the CV-F01 lightguide installed is measured at the location of 50 mm apart from its end.

LED Light

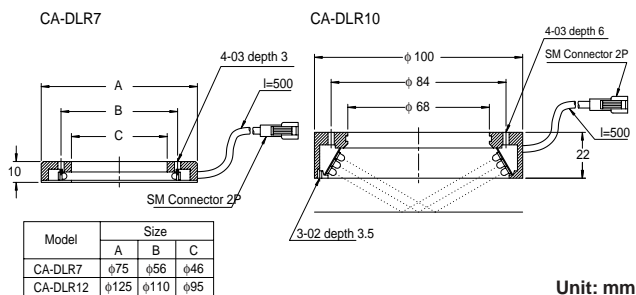
Direct ring type (CA-DR)

Model name	LED color	Mass	Power consumption
CA-DRR3	Red	about 20g	1.5W
CA-DRW3	White	about 20g	2.9W
CA-DRR9	Red	about 90g	8.3W
CA-DRW9	White	about 80g	7.9W
CA-DRR4F	Red	about 20g	1.5W
CA-DRW4F	White	about 20g	2.9W
CA-DRR10F	Red	about 90g	8.3W
CA-DRW10F	White	about 80g	7.9W



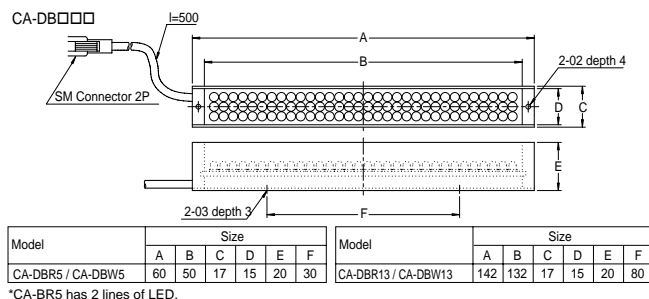
Low angle type (CA-DL)

Model name	LED color	Mass	Power consumption
CA-DLR7	Red	about 40g	2W
CA-DLR10	Red	about 80g	7.7W
CA-DLR12	Red	about 85g	3.3W



Bar type (CA-DB)

Model name	LED color	Mass	Power consumption
CA-DBR5	Red	about 35g	1.7W
CA-DBW5	White	about 40g	2.9W
CA-DBR13	Red	about 80g	4.2W
CA-DBW13	White	about 90g	7.3W

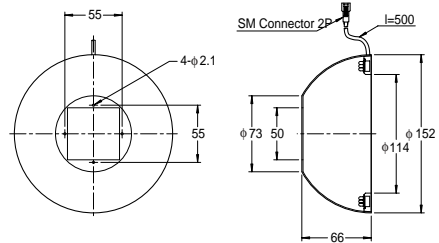


Option

Dome type (CA-DD)

Model name	LED color	Mass	Power consumption
CA-DDR15	Red	about 130g	11W
CA-DDW15	White	about 170g	18.8W

CA-DDR15

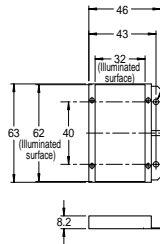


Unit: mm

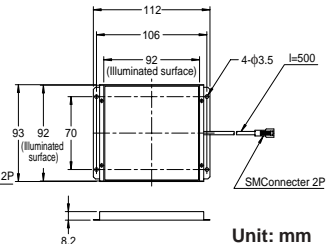
Back light type (CA-DS)

Model name	LED color	Mass	Power consumption
CA-DSR3	Red	about 40g	3.6W
CA-DSR9	Red	about 110g	14W

CA-DSR3



CA-DSR9



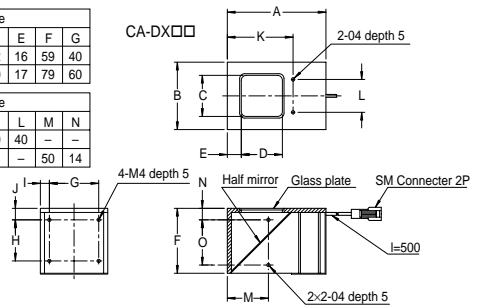
Unit: mm

Coaxial incident light type (CA-DX)

Model name	LED color	Mass	Power consumption
CA-DXR5	Red	about 230g	5W
CA-DXW5	White	about 230g	4.9W
CA-DXR7	Red	about 380g	6.7W
CA-DXW7	White	about 380g	10.1W

Model	Size						
	A	B	C	D	E	F	G
CA-DXR5	97	60	36	32	16	59	40
CA-DXR7	120	82	50	50	17	79	60

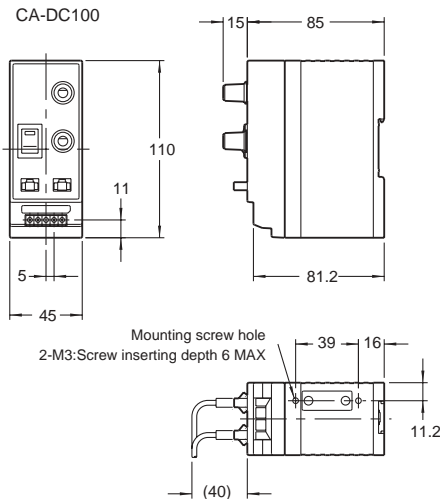
Model	Size						
	H	I	J	K	L	M	N
CA-DXR5	32	10	15	80	40	-	-
CA-DXR7	50	11	14	-	-	50	14



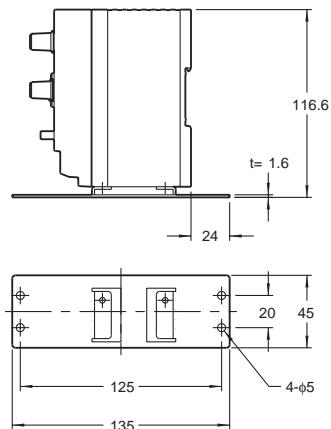
Unit: mm

LED Light Controller (CA-DC100)

Outside Dimensions

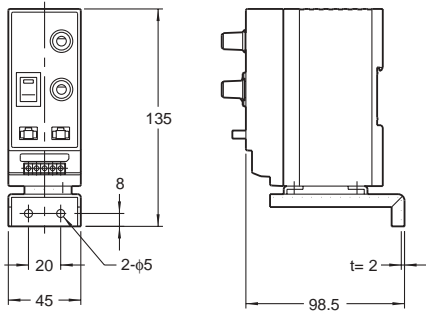


Mounting on the bottom (using OP-42169)



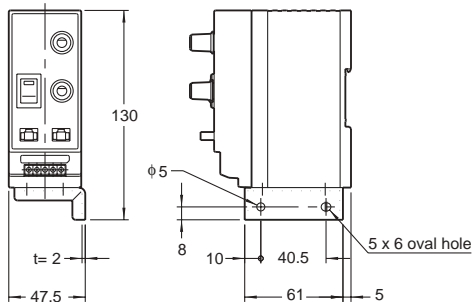
Unit: mm

Mounting on the front (using OP-42168)



Unit: mm

Mounting on the side (using OP-42170)



Unit: mm

Specifications

Output	Dimmer method: emission frequency 100 kHz, pulse-duration modulation method
	Number of connection point: 2 CH
	Voltage: 12 V
	Capacity: Maximum 30 W (but 20 W/1 CH)
Input	2 points of external control input (EXT), non-volt contact input
Rating	Power supply voltage: DC 24V \pm 10%
	Power consumption: 1.8 A (in maximum load)
Environmental resistance	Ambient operating temperature: 0 to +45°C
characteristics ¹⁾	Ambient operating humidity: 35 to 85% RH (no condensation)
Mass	About 220g

1) The environmental resistance characteristics of the LED light section include the ambient operating temperature of 0 to +40°C, and the ambient operating humidity of 35 to 65% RH (no dew condensation).

Chapter 15

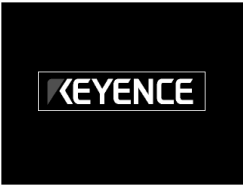
Appendices

Filter List

The types and functions of the image enhancements are listed below.

1. OFF

Pre-processing will not be executed.



2. Expand

The white pixels are expanded and the black pixel noise is removed.



3. Shrink

The white pixels are shrunk and the white pixel noise is removed.



4. Averaging

Intensity is averaged to remove noise.



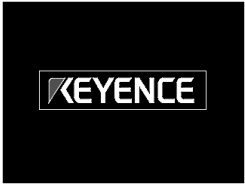
5. Median

Noise is removed while the outline is maintained.



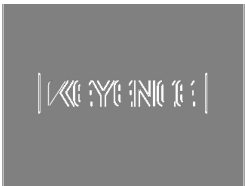
6. Edge sharpening

Region where there is a change in intensity is enhanced.



7. Edge extraction in X direction

Region where there is a change in intensity in the horizontal (X) direction is extracted.



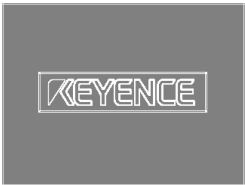
8. Edge extraction in Y direction

Region where there is a change in intensity in the vertical (Y) direction is extracted.



9. Edge extraction

Region where there is a change in intensity is extracted.

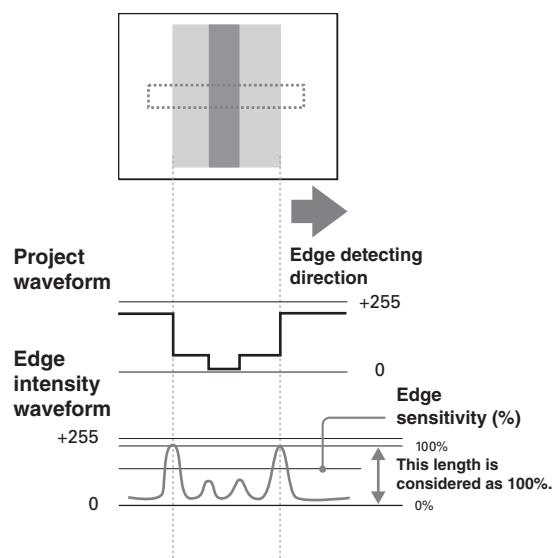


What is an Edge?

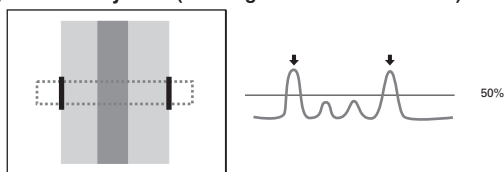
The edge process of the CV-2100 is used to detect edges within the desired measurement area. Edge tolerances such as sensitivity, intensity, and agp are discussed below.

Edge sensitivity

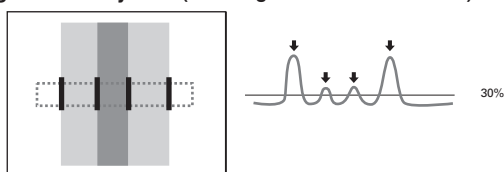
Edge sensitivity specifies the amount of edges that the CV-2100 will detect. A higher sensitivity will only detect the largest changes in intensity, while a lower sensitivity will pick up the smaller changes as well.



Edge sensitivity 50% (Two edges should be detected.)

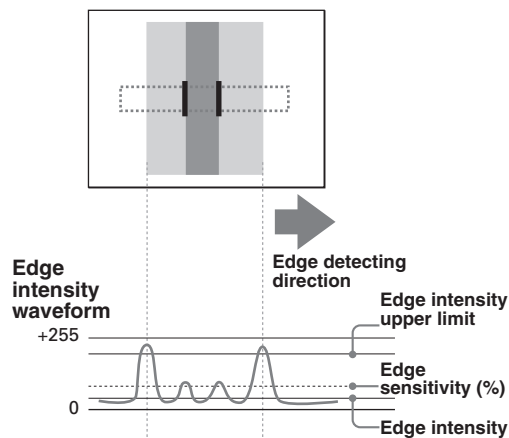


Edge sensitivity 30% (Four edges should be detected.)



Edge intensity upper and lower limit

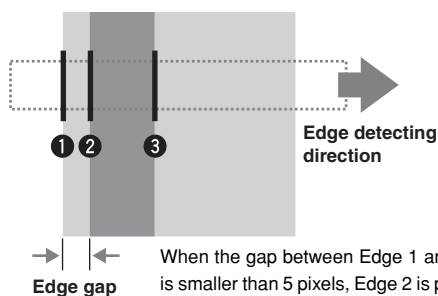
Sets the upper and lower limits for detecting edges. Only the edges that lie between the upper and lower limit will be detected. Any edge outside this range will not be processed.



Edge gap lower limit

If another edges exists within a certain number of pixels relative to the edge detection direction, it can be processed as noise by using this function.

Example of setting the edge gap lower limit to “5”



When the gap between Edge 1 and Edge 2 is smaller than 5 pixels, Edge 2 is processed as noise. In this case, the edges that are detected in the entire measurement range are Edge 1 and Edge 3.

Troubleshooting

Troubleshooting

Symptom	Cause	Remedy
The power cannot be turned on.	The power cable is not connected properly.	Connect the power cable properly (page 2-8).
Nothing is on the monitor.	The power used is outside of the specified range.	Use power that is within the specified range (page 2-8).
	The monitor cable is not connected.	Connect the monitor cable properly (page 2-7).
	The lens cap is on.	Remove the lens cap.
	The lens aperture is closed too narrowly.	Adjust the aperture to the appropriate width (page 2-11).
	The power is not on.	Turn on the power. Use power that is within the specified range (page 2-8).
	The camera cable is not connected properly.	Turn off the power, and then connect the camera cable (page 2-7).
	The monitor is not adjusted properly.	Adjust the brightness and the color of the monitor.
Camera image is not on screen while the Menu is on, or the image is abnormal.	The lens focus or aperture is not adjusted.	Adjust the focus or the aperture (page 2-11).
	The shutter speed is not appropriate.	Set the shutter speed properly (page 4-6).
	The lens or part of the CCD sensor is dirty.	Clean with an air duster.
Cannot operate on the console.	The console is not connected properly.	Turn off the power, and then connect the console (page 2-7).

Symptom	Cause	Remedy
Cannot communicate with the RS-232C.	The communication cable is not connected properly.	Turn off the power, and then connect the communication cable (pages 10-2, 11-6).
	An appropriate communication cable is not used.	Check the wiring and connect the communication cable properly (pages 10-2, 11-6).
	The communication condition of the personal computer is not set properly	Change the communication settings of the personal computer.
The judgement value and the measured value are not output.	The output circuit is not connected properly.	Connect the output circuit properly referring to the output circuit diagram (page 13-5).
	The output setting has not been implemented.	Implement the output setting to output the evaluation value and the measured value (page 4-119).
	Operating in program mode.	Use the switch on the console to switch to the run mode (page 5-2).
	The tolerance is not set properly.	Set the tolerance properly.
	The position of the window is deviated.	Perform the Screen Registration setting (page 4-16) again. If the position of the target is deviating, use the Position Correction function (page 4-104).
	The intensity of the light is not stable.	Use a stable light designed for image processing (page 2-12).

Error messages

Message	Cause	Remedy
Set data invalid. Initialize.	The internal memory data has an error.	Press the [ENTER] button and initialize.
Registered screen invalid. Initialize.	The internal memory data has an error.	Press the [ENTER] button and initialize.
Error. Turn OFF power.	The internal temperature is rising, or the internal memory data has an error.	Turn off the power of the CV-2100 and turn on again. If it is not activated correctly upon turning on the power, contact your nearest Sales Office.
Failed to access Memory card.	Access to the flash memory card has an error, or the format of the flash memory is different.	Replace the flash memory card, or reformat in FAT16.
Memory card free space insufficient.	Inadequate capacity of the flash memory card.	Make space available by replacing the flash memory card, or by deleting files.
Insert memory card.	The flash memory card is not inserted, or the cover of the slot is open.	Install the flash memory properly, and close the cover of the slot.
Camera not connected. Turn OFF power.	Camera connection has an error.	Check if the camera is properly connected, and turn on the power of the CV-2100 again.
Screen reg. memory full.	No more space in the internal memory of the registered screen.	Up to 64 registered pictures can be saved. If you use three or four pictures for a single program as in split scanning, you cannot keep registered images for all 32 program. Change the settings.
Memory full.	No more space in the internal memory used to save the setting.	When the memory capacity for a program is large such as when the Blob tool is set to 64 windows, you cannot implement all of the 32 programs. Change the settings.

A

Adjusting the Contrast for Captured Images ..	4-9
Adjusting the Gain of an Image	4-10
Adjusting the Illumination	6-2
Adjusting the Overall Brightness of an Image	4-9
Adjustment	2-10
Analysis	7-1
Analyzing the Run Result	7-1
Area	4-22

B

Basic Operation	3-1
Blob	4-78

C

Calculating the Evaluation Results	4-112
Calculation	4-109
Calibration	6-3
Camera 1/Camera 2 connector	1-2
Camera Sensitivity	4-9
Capture method	4-6
Capturing Images by Inputting Triggers Using Internal Timer	4-8
Capturing Multiple Image	4-11
Caution	4
Caution on Direction of	
Change language	8-7
Caution on Direction of	
Installing the Controller Unit	2-2
Changing Network Settings	8-4
Changing the Environment Settings (Environment Settings)	8-1
Changing the Save Screen Settings	6-15
Changing the Settings (Options)	6-1
Changing the Startup Display Setting	8-6
Changing the Transparency of Display Images	8-6
Checking How Much	

Internal Memory is Available	8-11
Checking the NG History in a List	7-2
Communication in Non-procedural Mode	10-1
Compact flash memory	
Compact flash memory slot	1-2
Checking the Available Space on	
Compact Flash Memory	9-11
Changing the Output Setting to the Compact Flash Memory	4-123
Inserting or Removing a Compact Flash Memory Card	9-2
Connecting Cables	2-7
Connection	2-1
Contrast Adjustment	4-10
Controller unit	1-2
Custom display setting	6-7
Selecting the Contents of the Custome Display	6-7
Specifying the Display Settings for Inspection Status	6-8
Specifying the Display Setting for Measurement Data	6-9
Displaying a Specified Text on the Custom Display	6-10
Displaying Graphics or Lines	6-12
CV-020	1-1
CV-2100	1-1

D

Date/time setting	8-11
Deleting Saved Screens	6-18
Details of Communication Commands	10-7
DIN rail	2-3
Displaying the Screen During Run mode	5-2
Displaying Two Camera Screens during Operation	6-19
Displaying Two Camera Screens in Horizontal Split	6-21

Displaying Two Camera Screens	
in Vertical Split	6-19
Drawing a Circle	3-6
Drawing a Measurement Window	3-5
Drawing a Polygon	3-9
Drawing a Rectangle	3-5
Drawing a Ring	3-7
Drawing an Edge Detect Range	3-10
Drawing an Oval	3-7

E

Edge angle	4-68
Edge gap	4-49
Edge Pitch	4-56
Edge position	4-42
Enabling Setting Changes during Operation	6-14
ENTER button	1-3
Environment Settings	
Environment Settings menu	8-1
Save Env. data	9-9
Saving Environment Setting Changes ..	8-12
ESCAPE button	1-3
Ethernet	
Ethernet connector	1-2
Changing the Output Setting	
for Ethernet	4-122, 8-4
Communication via Ethernet Port	12-1
External trigger	4-7

F

Filter List	15-2
FLASH output	13-7
FNC button	1-3

G

General Cautions	3
------------------------	---

I

Identifying Controls and Connectors	1-2
Illumination adjustment	6-2
Image Capture Range	4-14
Indiv. Position Adjustment	4-106
Input/Output Timing	13-6
Inputting Texts	3-4
Inputting Values	3-3
Installation and Connection	2-1
Installing Camera	2-4
Installing the Controller on a DIN Rail	2-3
Intensity Inspection	4-100
Internal trigger	4-8
Introduction	1-1
Introduction	2

L

Layout of the Screen	3-2, 5-2
List of Measurement Mode Functions	4-19
Loading Saved Data into your Computer	9-12

M

Making Position Adjustments for	
All Windows	4-105
Manual Convrnsn	6-3
Measured value	
Auto Convrnsn	6-4
Converting Measurement Values	
by Multiplying Them by	
Specified Coefficients	6-3
Calculating the Measurement Results	4-109
Displaying Measurement Values	
in Absolute Sizes	6-3
Displaying the Measured Value	7-3
Specifying the Desired Absolute	
Size Based on	
the Actual Measurement Value	6-4
Measured Value Calculation	4-110
Memory card	4-123, 9-1

MENU button	1-3	Password setting	8-10
Menu to create a Program No. (Specifying or Changing)	10	Pattern Search	4-27
Menu-tree contents	10	Performance during the Run Mode	5-4
Method specification	10-25	Position Adjustment	4-104
Modular connector	1-2		
Multiple Capturing of Images	4-11	R	
Multiple Pattern Search	4-34	Raw screen transmit	8-6
Multiple Reading of		Re-measuring	6-17
Multi-Measurement	4-11	Re-measuring Using the Displayed Screen ...	6-17
		Reading an Image Multiple Times and	
		Importing the Results	4-12
		Remote Control Console	1-3
		Registered Screen	
		Saving the Displayed Screen	
		as the Registered Screen	6-17
		Registering an Image Used	
		for Measurements	4-16
		RS-232C	
		RS-232C Interface	10-2
		RS-232C connector	1-2
		Checking the RS-232C Communication	
		Status	8-9
		Changing the Output Settings via	
		RS-232C	4-121
		Changing the RS-232C Communication	
		Method	8-3
		Communication via RS-232C Port	10-1
		Run	5-2
		RUN screen select	6-6
		S	
		Safety Precautions	3
		Save	
		Save (Option)	6-23
		Save (Environment Settings)	8-12
		Save (Settings)	4-125
		Save/Load Menu	11
		Save All Program	9-7
		Save Indiv. Program	9-5
N			
No. edges	4-63		
O			
Operation during Run Mode	5-4		
Option	14-7		
Option			
Option screen	6-1		
Saving the Optional Settings	6-23		
Option menu	12		
Output Data Format	10-21		
Output setting	4-119		
Output Settings Specification Format	10-29		
Overall Evaluation OR	4-120		
Overview of Camera Settings	4-5		
Overview of Commands	10-3		
Overview of Screen Registration	4-16		
Overview of Settings Inspection Windows ...	4-18		
P			
Parallel Port			
Standard I/O connector	1-2		
Changing the Output Settings of			
the Parallel I/O	4-120		
Parallel Interface	13-1		
Communication via Parallel Port	13-1		
Password Protecting the Settings	8-10		

Save screen	6-15
Save/Load Menu	9-1
Saving or Loading Data to/from an the compact Flash memory	9-1
Saving or Loading Screen Data	9-3
Saving the Displayed Screen as the Registered Screen	6-17
Saving the Settings	4-125
SCREEN button	1-3
Screen capture	1-4
Screen data	9-3
Screen update mode	8-5
Selecting a Program No.	4-3
Selecting a Shutter Speed	4-6
Selecting an Image Capture Mode	4-6
Selecting the Lens	2-5
Selecting the Screen	6-16
Selecting the Screen to Display	6-16
Selecting the Screen to View during Operation	6-6
Selection and Installation of the Lighting System	2-12
Selector switch	1-3
Setting the Internal Clock	8-11
Setting the Screen Update Timing	8-5
Setting the Startup-time Operating Mode	8-5
Specifications	14-2
Specifying the Image Caputure Range	4-14
Specifying the Image Caputuring Timing	4-7
Specifying the Timing for Saving Screens ...	6-15
Specifying the Units (Windows) for Inspections	4-1
Specifying the Units (Windows) for Measurements	4-1
Split screen setting	6-19
Stain	4-73
Standard System Configuration	2-1
Startup screen	8-6
Statistics	7-1

Checking the NG History in the List	7-2
Specifying the Window to be Recorded ..	7-2
Displaying the Statistics	7-3
Displaying the Measured Value	7-3
Displaying the Distribution of the Measured Value	7-5
Displaying the Measured Value along the Time-line	7-6
Statistics/Analysis Menu	11
Status calculation	4-112
Switching the User Interface Language	8-7

T

Terminal Output	
Terminal Output	4-120, 8-2
Changing the Terminal Output Settings ..	8-2
Checking wiring on the terminal block	8-8
Terminal block	
Terminal Block Interface	13-3
Communication via Terminal Block	13-1
Checking wiring on the terminal block	8-8
Test	6-17
Timing chart	13-6
Tolerance Specification Method	10-25
Trend edge gap	4-93
Trend Edge Position	4-86
Trial Run	5-1
Trial run menu	11
TRIGGER button	1-3
Trigger Setting	4-7
Troubleshooting	15-4

U

Update Saved screen	6-15
Using the CV-2100 Combined with PLC	11-1

V

Val out of image range	4-15
Video output terminal	1-2

VIEW button	1-3
Viewing the Connection Status of Input/Output Signals	8-7

W

Warning	3
What is a Program No.?	4-2
What is an Edge?	15-3

Revision History

Date of printing	Version number	Contents of revision
June, 2003	Official release	

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