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Calibration

The calibration unit enables the correction of captured images for linear and non-linear distortion caused by lens distortion and camera mounting.
Using the calibration function enables the generation of a corrected image and numerical conversion of measurement values from other units (Page 4-283) into a real world co-ordinate system. Actual dimensions can also be easily calculated from the scale factor values generated through calibration (Page 4-356).

► Note

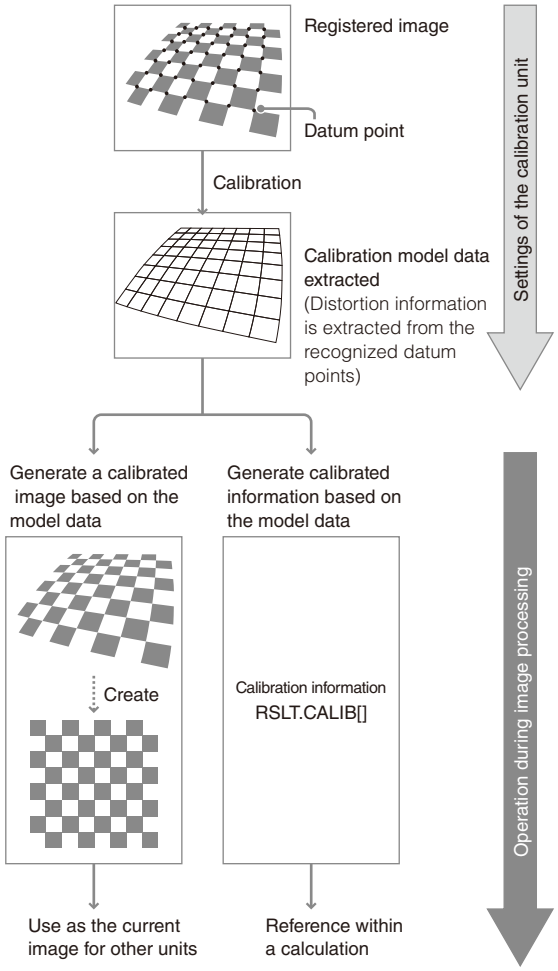
- For calibration to be performed correctly the calibration pattern needs to be registered under installation conditions. If the installation conditions change the calibration will need to be performed again.
- Errors in inspection / measurement may occur if the target is at a different height or angle to the calibration pattern plane.

Reference

To correct for trapezoid distortion by selecting four reference points on the image use the conversion option in the image operation unit (Page 4-286).

Calibration

In the initial unit setup a "calibration model" is built from registered coordinate datum points obtained via the captured image of a chess board or dot pattern calibration grid (which can be printed from XG VisionEditor).
During normal operation the "calibration model" can be used as a base to create a "calibrated image" or "calibrated data" for coordinate conversion.



Reference

- Calibration patterns can be printed by selecting [Print Calibration Pattern] from [Tools] menu of the XG VisionEditor. The pattern accuracy depends on the printer performance, and errors in calibration can occur from the how the pattern is presented when registered as an image. If sub-pixel order accuracy is required, it is recommended to use a calibration grid (such as a glass) with a known associated accuracy standard. See the XG VisionEditor Reference Manual (Programming Edition) for more details.
- To perform calibration the image of the calibration pattern needs to be saved as a registered image.

Processing results

The standard results and data returned by the calibration unit are as follows:

Src. Origin (X, Y)	The coordinates of the origin based on the calibration grid before image calibration in pixels.
Dst. Origin (X, Y)	The coordinates of the origin based on the calibration grid after image calibration in pixels (Valid only when a calibrated image is generated).
Pattern spacing after calibration	The spacing in-between calibration datum points after calibration in pixels (Valid only when a calibrated image with [Lens & Angled Camera] distortion correction is generated).
Corrected Angle (radians)	The correction angle from the calibration (Valid only when a calibrated image with [Lens & Angled Camera] distortion correction is generated).
X Scale Val.	The X scaling factor to be used for scaling (Page 4-356) of measurement values in other units (Valid only when a calibrated image with [Lens & Angled Camera] distortion correction is generated).
Y Scale Val.	The Y scaling factor to be used for scaling (Page 4-356) of measurement values in other units (Valid only when a calibrated image with [Lens & Angled Camera] distortion correction is generated).
Len. Scale Val.	The length scaling factor to be used for scaling (Page 4-356) of measurement values in other units (Valid only when a calibrated image with [Lens & Angled Camera] distortion correction is generated).
Model Param.	The internal parameters constructed from 28 elements to be used for conversion of measurement values into the real world co-ordinate system using the conversion function (ConvPixTo Wld) (Page 4-283). The information stored is the either the conversion information from the current image (when a calibration image is not generated) or the conversion image from a calibrated image (when a calibration image is generated)

► Note

The value of Model Param [ ] (RSLT.CALIB[ ]) is only to be used in the calculation unit. When this value changes the result of the calculation may fail.

Reference

For the lists of available measurement output values, refer to "List of Result Data" in the XG-7000 Series Communications Control Manual.

Main Menu

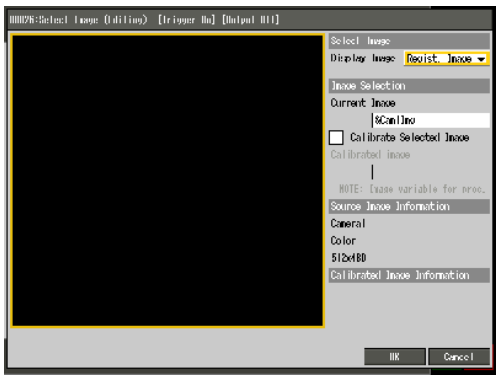
The main menu of the calibration tool consists of the following options. Configure settings under each option as required for the inspection.



Select Image (Page 4-301)	Specify the image to be used for unit processing.
Settings (Page 4-302)	Parameters for using a calibration pattern in order to create the calibration model.
Calibrated Img. (Page 4-306)	Parameters for generating a calibrated image from the calibration model (This menu is active only when [Generate calibrated image] is selected in the [Select Image] menu).
Origin & Axis (Page 4-308)	Define the relationship between the pixel and world coordinate systems (based on calibration image No.1).
Display Options (Page 4-309)	Unit processing display settings.
Save (Page 4-310)	Save unit settings.

Inspection Region

Outline the region on the captured image to be used for inspection.



Select Image

Display Image

Switch the image displayed on the screen.

- **Captured Image**: Displays the latest image from the specified camera (image variable).
- **Registered image**: Displays the registered image specified under [Image Selection].

Select Image

Captured image

Set an image variable to be used as the current image for the unit.

Generate corrected image

Check this option to generate a corrected image.

Image variable

If [Generate corrected image] is selected, input an image variable for storing the calibrated image.

► Note

- Only an image variable can be entered in [Image variable].
- An image variable for storing the calibrated image should be setup in advance in the [Variables] menu (Page 4-348). The camera specified in the image variable must be the same as the camera used for the current image of the calibration unit.
- If a line scan camera is used with the XG-7502A and the image size exceeds 25 MB (26214400 pixels), a calibrated image for cannot be displayed. (However the image can be displayed after the registered image is calibrated during unit editing.)

Source Image Information

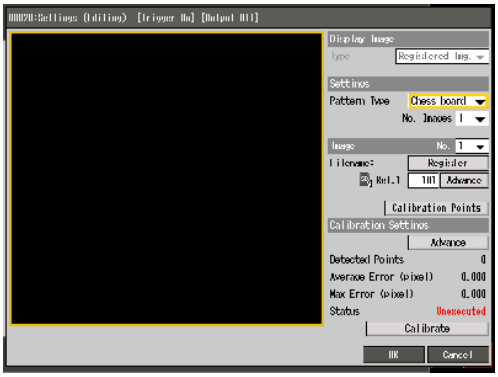
The camera No., type (color / monochrome), and resolution of the camera associated to the image variable specified is displayed.

Calibrated Image Information

The camera No., type (color / monochrome), and resolution of the camera associated to the calibrated image variable specified in the [Image variable] option are displayed.

Settings

Specify the options for using a calibration pattern in order to generate a calibration model, taking into account lens distortion and angled camera mounting.



Select Image

Display Image

Switch the image displayed on the screen.

- **Captured image**: Displays the latest image from the specified camera (image variable).
- **Registered image**: Displays the registered image specified under [Image Selection].

Settings

Pattern type

Select the type of pattern used for teaching.

- **Chess board** (default): Use a black-and-white chess board pattern.
- **Dot pattern**: Use a dot pattern.

► Note

- For calibration set the field of view and calibration grid size so that the pattern spacing is 15 pixels or more for the chess board pattern, and the dot size is 10 pixels or more for the dot pattern. If the number of pixels exceeds the 5 megapixel camera pixel count (4985600 pixels), or if the image width exceeds the 5 megapixel camera width (2432 pixels), set a size that is twice the above or larger for image capture.
- Calibration maybe unsuccessful if the angle of the camera is too shallow when using the dot pattern. When the angle is very shallow use the chess board calibration pattern for improved calibration performance.

Reference

Calibration patterns can be printed by selecting [Print Calibration Pattern] from [Tools] menu of the XG VisionEditor. The pattern accuracy depends on the printer performance, and errors in calibration can occur from the how the pattern is presented when registered as an image. If sub-pixel order accuracy is required, it is recommended to use a calibration grid (such as a glass) with a known associated accuracy standard. See the XG VisionEditor Reference Manual (Programming Edition) for more details.

No. Images

Use this option to create a calibration model from several images (1 to 16, default: 1) captured on the same plane but with different pattern layouts.
This ensures that the calibration model is as accurate as possible when a single calibration grid cannot cover the full image.

► Note

- Increasing the number of images for calibration may significantly increase the calibration time.
- The position and angle of the calibration grid can be changed for each image as long as all images are captured on the same plane.

Calibration Settings

Set the options for each of the images determined in [No. Images].

Image No.

Select the image.

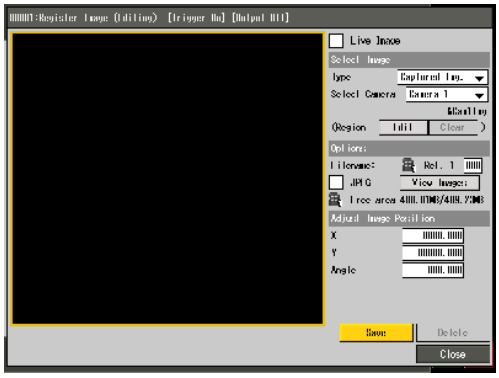
Registered image

Specify the registered image No. to be used for calibration.

- Registered images are managed as "Image (Camera No.) - (Registered image No.0 to 999)".
- The camera No. is fixed to camera of the image variable specified in the [Current Image].

Register Image

An image can be saved to the controller to be used as a template for measurements and settings. It is recommended to adjust and fix lighting and other external influences before registering an image.



Live Image

Check this box to display live images through a continuous feed.

► Note

- A live feed is only available while the unit is being edited.
- This setting cannot be changed when the screen update mode is set to [Continuous] in the trigger settings (Page 4-25).
- If the capture on trigger input is disabled in the trigger settings (Page 4-25), this check box is always unchecked and the setting cannot be changed.
- When Live image is selected for a moving object, take care when registering as there will be a time lag between the external trigger input and the actual image capture.
- In principle, Live-image is only used when the capture unit being edited is being executed (waiting for a trigger input). When the image capture buffer is set to custom and the capture unit which was most recently executed is being edited, the images collected in the buffer will still be displayed even if the capture unit is not presently capturing images.
- Continuous update cannot be used when HDR capture (Page 4-21) is enabled or when a line scan camera is being used.
- When the HDR capture (Page 4-21) is enabled, the Multi-image cannot be used.

Select Image

Type

Select an image to register.

- **Captured Img.**: Displays the latest image from the specified camera (image variable).
- **Registered Img.**: The registered image specified in [Options] is displayed.

Select Camera

Select the number of the camera used for registration. Choose from Camera1 - Camera4, and select only the camera number used for the capture unit being edited.

Specifying a region

To register only part of an image, select [Edit] then specify the region to register. To cancel the selected region, select [Clear].

Save Image

Filename

Specify the registered image number used for image registration in the form "(Camera No.)-(User-specified No.)".

Reference

The name of the saved file is "ref (Camera No.)_(Specified No.)" (for full screen image registration) or "ref (Camera No.)_(Specified No.)_XXX_YYY" (for partial image registration).

JPEG

Check this box to save the image in JPEG format. When this box is not checked, the image will be saved in BMP format as either a 24-bit color bitmap image (when a color camera is used) or an 8-bit grayscale bitmap image (when a monochrome camera is used).

► Note

Using image compression may result in some image deterioration, thus results from a compressed image may differ to those when using non compressed images.

View All

View all registered images in a list.

Adjust Image Position

Adjust the position of the image being captured.

X

-Adjust the movement in the X (horizontal) direction between -8191.000 and 8191.000 pixels.

Y

-Adjust the movement in the Y (vertical) direction between -16383.000 and 16383.000 pixels.

Angle

Adjust the position angle (rotation) around the center of the image between -999.999° and 999.999°.

► Note

Position adjustment may cause missing peripheries (black areas) due to image movement or jagged edges (jaggies) due to rotation in the registered image.

Save

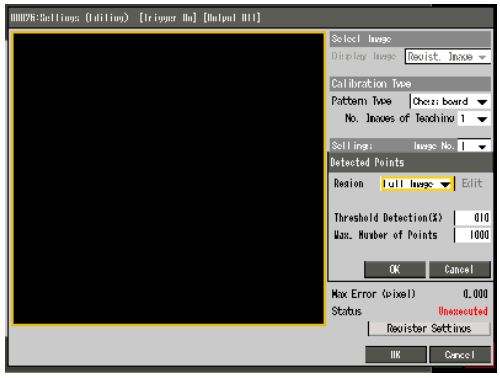
Save the displayed image as a registered image under the conditions specified in the [Register Image] menu.

Delete

When [Registered Img.] is selected for [Type], you can delete the registered image specified in [Options].

Calibration Points

Use the [Calibration Points] menu to change settings relating to the datum point detection during calibration.



- **Region**: Specify a region for detecting calibration points. If detection is unstable due to background data refine the region for stable detection.
  - **Full Image** (default): Use the entire image for detecting calibration points.
  - **User Set**: Define a user-specified rectangle for detecting calibration points.
- **Threshold Detection (%)**: Specify a threshold for detecting calibration points (1 to 100, default: 10).
- **Max. Number of Points**: Set the maximum number of points to be detected (100 to 4000, default: 1000).

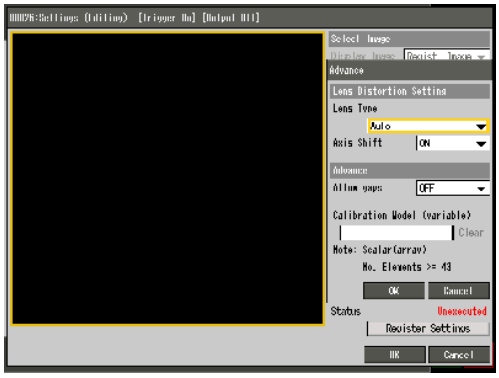
► Note

- Setting a low detection threshold value to detect more points may result in improper calibration due to noise being detected.
- Increasing the number of points to be detected may greatly increase the time required for detection and calibration.

Calibration settings

Advance

Use the [Advance] menu for changing other parameters relating to calibration.



- **Lens Type**:
  - **None**: Do not take into account lens distortion and calibrate for camera angle (linear distortion) only.
  - **Low order**: Correct using a single parameter. Calibrate using one set of parameters, the information used is minimal, but processing is fast.
  - **High order**: Correct using 2 parameters. Calibrate using two sets of parameters, accuracy is higher than low order, but the processing time is also increased.
  - **Asymmetry**: Use 4 sets of parameters to correct asymmetrical distortion. Accuracy is improved for asymmetrical distortion in the XY directions, but the processing time is also increased.
  - **Auto** (default): Use a range of parameters to minimize errors and result in stable calibration.
- **Axis Shift**: Select whether to include axis shifting in the calibration parameters.
  - **ON** (Default): Correct for axis shift in calibration.
  - **OFF**: Do not correct for axis shift in calibration.
- **Allow gaps**: When using two or more images choose whether to allow calibration to support different size calibration grids in each image.
  - **ON**: Allow different sizes between calibration grids across multiple images.
  - **OFF** (default): Do not allow different calibration grid sizes.

Reference

Small calibration grid spacing allows for high accuracy calibration; however the range across which points can be taken is limited. A large calibration grid spacing though allows for a large range to be calibrated across, but with an associated decrease in accuracy. "Allow Gaps" enables the use of the multi size calibration grids at different locations so the calibration accuracy can be maintained across the range of the image needing to be calibrated.

Calibration Model (variable)

Reference a numerical variable which contains previous model data from another calibration unit or use this option to share the model data with other calibration units. This function helps ensure that the same calibration model data can be used across numerous programs with calibration only needing to be performed once.

► Note

- The variable referenced has to be a numerical variable with 43 or more elements.
- If the variable is setup without the [Copy current value to initial value at save] checkbox checked, saving the program will not save the calibration data.

Calibrate

Perform calibration based on the specified registered image and settings. The result of the calibration is shown below and stored as part of the unit result settings.

Detected Points

The number of detected calibration points is displayed.

Average Error (pixel)

The average pixel value error from the calibration is displayed.

Max Error (pixel)

The maximum pixel value error from the calibration is displayed.

Status

The current status of the calibration is displayed.

- **Unexecuted**: No calibration has been performed yet.
- **Success**: Calibration was successful.
- **Fail**: Calibration failed due to improper extraction of datum points or unexpected distortion.
- **Illegal**: The size of the current image is different from the size from the previous image when performing multi image calibration.

Reference

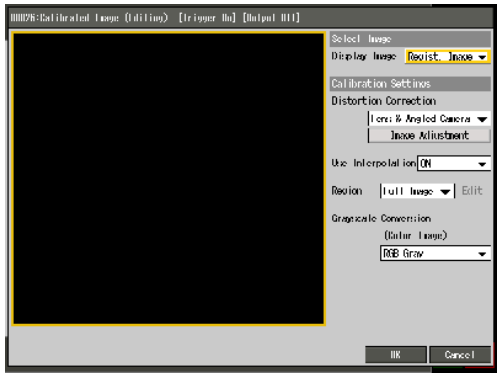
Calibration can also be performed by using the TG command. For more details, see the XG-7000 Series Communication Control Manual.

► Note

- The error shown relates to the accuracy of the calibration grid used. The error is intended to be used as a guide, and does not guarantee accuracy of the actual calibration result.
- The error display indicates the error around the calibration point. Areas other than the detected points are not considered. As a result, the image may not be calibrated properly around undetected points or the teaching may fail if, for example, points are concentrated in a certain area in all teaching images.
- If no calibration points are found in the image for image No.1, the calibration fails.
- If two or more images are used and no calibration points are found in the image, those images are ignored in the calibration.
- Changes in the [Settings] menu are not applied to the calibration model data until [Calibrate] is selected.
- When lots of calibration points and images are specified for calibration, calibration may require several minutes to execute following the 50% mark of the progress bar

Calibrated Image

Specify options for generating a calibrated image from the calibration model (This menu is active only when [Generate Calibrated Image] is selected in the [Image] menu).



► Note

This menu is only available when [Calibrate Selected Image] is checked in the [Select Image] menu.

Select Image

Display Image

Switch the image displayed on the screen.

- **Captured image**: Displays the latest image from the specified camera (image variable).
- **Registered image**: Displays the registered image specified under [Image Selection].

Calibration Settings

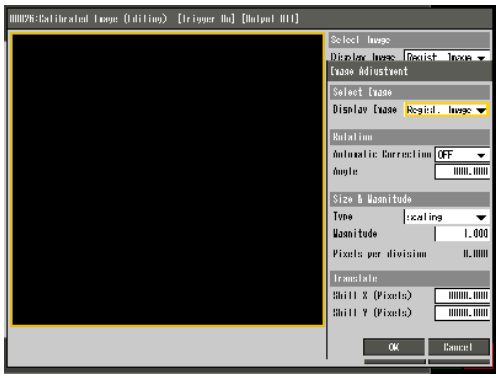
Distortion correction

Select the type of distortion to correct.

- **Lens Only**: Correct lens distortion only.
- **Lens & Angled Camera** (Default): Correct both lens distortion and angled camera distortion.

Image Adjustment

Use the [Image Adjustment] menu for adjusting the calibrated image.



Rotation

- **Automatic Correction**: Parameters for rotation of the calibrated image.
  - **ON**: Rotation based on the calibration grid used in image No.1.
  - **OFF** (default): Do not correct rotation.
- **Angle**: Specify the angle to adjust the calibrated image by. When [Automatic Correction] is [ON], this angle is applied to the image after rotation correction.

Size:

- **Scaling**: Specify the scale factor to be applied to the calibrated image (0.200 to 5.000, default: 1.000).
- **Division**: Specify the calibration grid spacing (pixels) to be applied to the calibrated image (5.000 to 1000.000, default: 50,000).
- **Pixels per division**: The current calibration grid spacing is displayed in pixels.

Translate:

- **Shift X (pixels)**: Specify the X translation of the calibrated image in pixels (-9999.999 to 9999.999, default: 0.000)
- **Shift Y (pixels)**: Specify the Y translation of the calibrated image in pixels (-9999.999 to 9999.999, default: 0.000)

Use interpolation

Select whether to interpolate the calibrated image. Although interpolation requires additional processing time, it can reduce the generation of jaggies in the calibrated image.

- **ON** (default): Use interpolation.
- **OFF**: Do not use interpolation.

Region

Use this option to select the region for the generated calibrated image.
Limiting the region can reduce processing time for the image calibration.

- **Full Image** (default): Calibrate across the full image.
- **Rectangle**: Calibrate inside the specified rectangle region only.

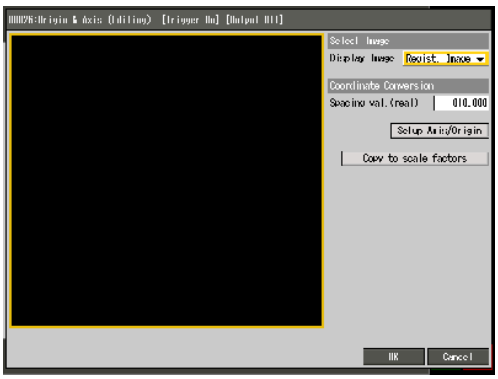
Grayscale conversion

When the current image is a color image, select the grayscale conversion method for the calibrated image.

- **Gray**: Take the maximum R, G and B intensity values for each pixel and convert them into grayscale information (producing a relatively bright grayscale image).
- **RGB Gray** (Default): Take the average R, G and B intensity values for each pixel and convert them into grayscale information (producing a gray image that similar to one from a monochrome camera).

Origin & Axis

Set the relationship between the pixel and world coordinate systems (based on calibration image No.1).



Select Image

Display Image

Switch the image displayed on the screen.

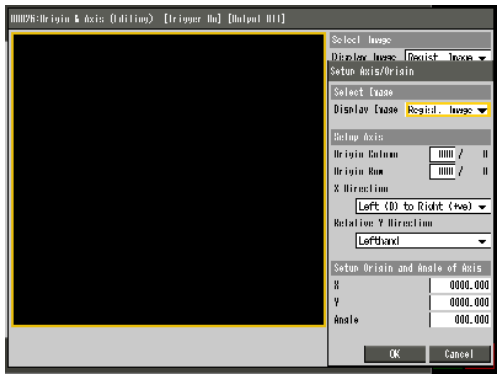
- **Captured image**: Displays the latest image from the specified camera (image variable).
- **Registered image**: Displays the registered image specified under [Image Selection].

Calibration scale

Specify the spacing of the calibration grid as an actual dimension in order to convert measurement results in pixels into actual dimension values (0.001 to 999.999, default: 10.000).

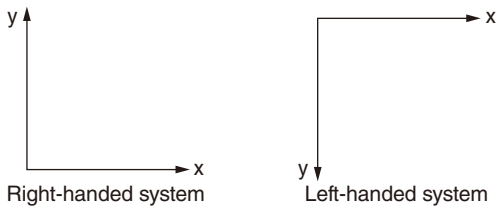
Setup Axis/Origin

Use the [Setup Axis/Origin] menu to change the origin and axis used as references for calibration (coordinate conversion) of the measurement value with a calculation unit.



Setup Axis

- **Origin Column**: Specify the column No. based on the calibration points of image No.1 and set the origin point of the axis (0 to 255, default: 0).
- **Origin Row**: Specify the row No. based on the calibration points of image No.1 and set the origin point of the axis (0 to 255, default: 0).
- **X Direction**: Select the direction of the X axis with respect to the origin point
  - **Right (0) to Left (+ve)**: Set the X axis to increase when moving to the left of the origin point.
  - **Bottom (0) to Top (+ve)**: Set the X axis to increase when moving upwards from the origin point.
  - **Left (0) to Right (+ve)**: Set the X axis to increase when moving to the right of the origin point.
  - **Top (0) to Bottom (+ve)**: Set the X axis to increase when moving downwards from the origin point.
- **Relative Y Direction**: Select the coordinate system of the Y axis with respect to the origin of the axis.
  - **Righthand**: Use the right-handed system.
  - **Lefthand** (default): Use the left-handed system.



Origin and Angle of Axis

Specify adjustments in the world coordinate system based on the [Setup Axis/Origin] settings for changing the origin position with numerical values.

- **X**: X origin coordinate adjustment (-9999.999 to 9999.999, default:
- **Y**: Y origin coordinate adjustment (-9999.999 to 9999.999, default: 0.000).
- **Angle**: Angle adjustment (0 to 359.999, default: 0.000).
- **Use Axis Settings**: Check this box to use the axis settings when specifying an adjustment value (default: ON).

► Note

- If the origin deviates significantly from the detected datum points, the error between the world and pixel coordinate systems may increase.
- Depending on the calibration pattern layout and or camera settings, the initial origin may greatly deviate from the screen during calibration. In this instance, adjust the values of [Origin Column] and [Origin Row] to move the origin to an appropriate position.

Copy to scale factors

Copy the calculated calibration scale factor to the scale factor setting (Page 4-356). This setting effects units which use the calibrated image as the current image and when the scaling is set to convert measured values into actual dimensions.

Reference

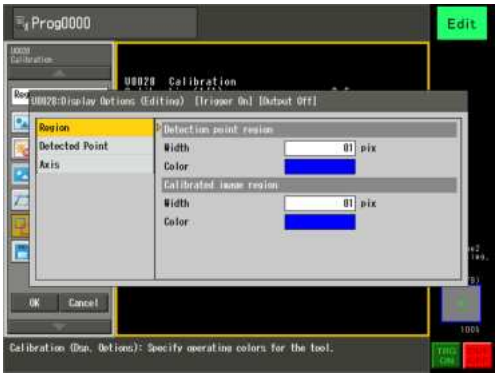
As the calibration scale factor changes with each calibration, the new coefficient will need to be applied to the scale factor setting after each calibration. If a variable is referenced in the scale factor settings this process can be eliminated by a calculation populating the variable with the scale factors.

► Note

Before using this option, a calibrated image needs to be generated via the [Distortion Correction] option in the [Calibrated Image] menu. To perform calibration (coordinate conversion) of the measurement value using a calculation instead of an image, use the coordinate conversion function (ConvPixToWld) in a calculation unit.

Display Options

Calibration display settings.



Region

Detection point region

Specify the line width and display color of the region specified in [Calibration Points] (Page 4-304) in the [Settings] menu.

Calibrated image region

Specify the line width and display color of the region specified in the [Calibrated Image] menu.

Detected point

Specify the width and display color of the detected points for used for calibration.

Axis

Horizontal

Specify the line width and display color of the horizontal (default X) axis displayed at the origin.

Vertical axis

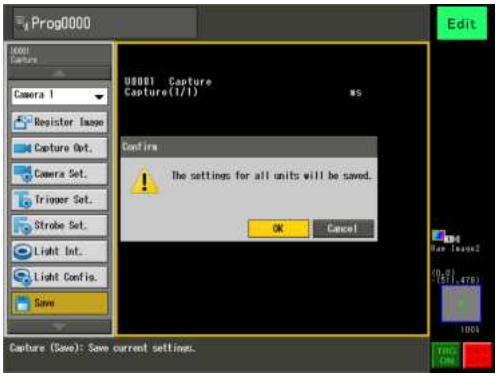
Specify the line width and display color of the vertical (default Y) axis displayed at the origin.

Save

Save the current unit changes the program file.

► Note

- If the device is turned off before any settings are saved, all of those changes will be deleted.
- Do not turn off the system power while you are saving the settings. Doing so may cause errors in the internal data



Save

The settings for the unit are saved in the current program file in SD Card 1 or SD Card 2.

► Note

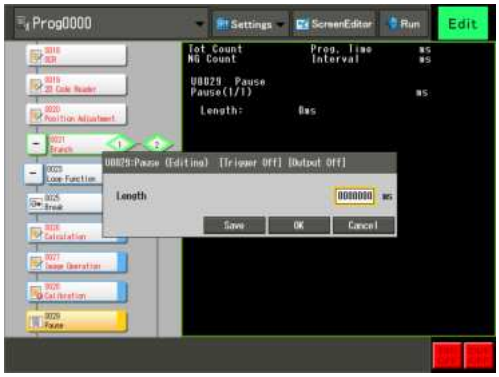
Items specified not to be saved in XG VisionEditor are excluded from the saving operation.
For example, variable values changed in the current program or the default display, and display parts, can be excluded when saving.

Pause

The pause unit stops the flowchart operation for a specified period of time.

Pause

Specify the condition for the pause.



Length

Processing of the flowchart is stopped for a specified period of time.
Enter a pause time (0 to 3600000) ms (default: 0)

Save

The settings for the unit are saved in the current program file in SD Card 1 or SD Card 2.

► Note

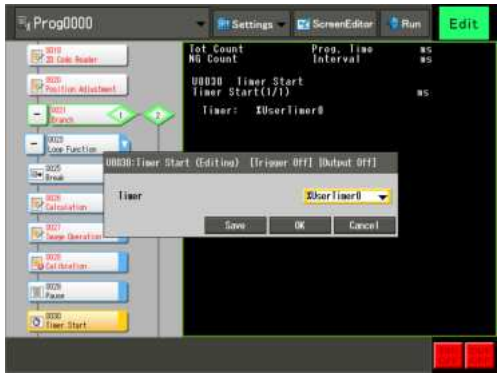
Items specified not to be saved in XG VisionEditor are excluded from the saving operation.
For example, variable values changed in the current program or the default display, and display parts, can be excluded when saving.

Timer Start

The timer unit starts off a specified timer (%UserTimer0 to 7) and is used with the timer end unit (Page 2-331) to control processing based on elapsed time.

Timer

Specify the timer.



Timer

Specify the timer (system variable) to be used: %UserTimer0 to 7.
The timer activates with execution of the timer unit. The elapsed time (in ms) of the timer once activated can be checked by referencing a specified variable.

► Note

- The timer is reset by the following operations:
  - Turning off the controller
  - Changing the program No.
  - Reset
  - Executing another timer unit in which the same timer is specified
- When the timer reaches 1073741824 ms after activation, its value returns to 0 and the time monitoring continues.

Save

The settings for the unit are saved in the current program file in SD Card 1 or SD Card 2.

► Note

Items specified not to be saved in XG VisionEditor are excluded from the saving operation.
For example, variable values changed in the current program or the default display, and display parts, can be excluded when saving.

Timer End

The timer setup unit stops the flowchart operation until the value of the activated timer (setup in the timer unit (Page 4-311)) reaches a set duration. These two units combined can be used to keep the processing time of sections of the flowchart to a constant.

Processing results

The standard results and data returned by the timer setup unit are as follows:

Status	The status of the specified timer can be referenced, 1 being output when the timer has been activated and the expiration passed, 0 at all other times.

Timer setup

Specify the conditions for timer expiration.



Timer

Specify the timer (system variable) used in the timer unit to be associated with this timer setup unit: %UserTimer0 to 7.

Length

Processing of the flowchart units is stopped until the value of the specified timer is reached.
Enter a duration for the timer (0 to 3600000) ms (default: 0)

Reference

If the timer value is greater than the length specified when the timer setup unit is processed, processing of the rest of the flowchart continues.

Save

The settings for the unit are saved in the current program file in SD Card 1 or SD Card 2.

► Note

Items specified not to be saved in XG VisionEditor are excluded from the saving operation.
For example, variable values changed in the current program or the default display, and display parts, can be excluded when saving.

Terminal I/O Delay

The terminal I/O delay unit pauses the flowchart operation until the status of the input terminal(s) matches the set conditions. This unit can be used to synchronize the processing with external devices and inputs.

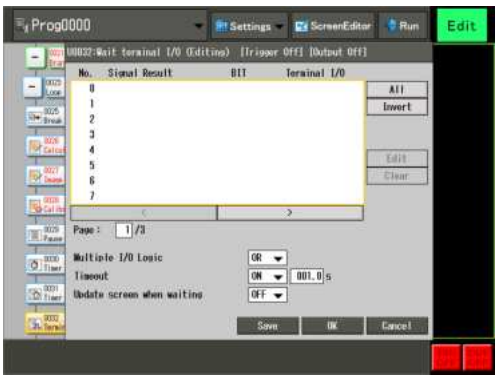
Processing results

The standard results and data returned by the wait terminal I/O unit are as follows:

Status	The status of the unit based on the time-out condition can be referenced, 1 being output when the time-out has occurred and the delay function cancelled, 0 at all other times.
Judge No.	Outputs the matched condition number. When [AND] is selected, the first matched condition number in the list is output.
Logical OR of satisfied conditions	The decimal equivalent of the logical bit sum (OR function) of the conditions can be referenced with a matched condition turning a bit 0 through 19 on. Bits 0 through 19 are assigned to in order with condition No.0 set to the LSB and condition No.19 the MSB.

Wait terminal I/O

Specify conditions for the status matching of specified terminals.



Terminal setting

Setup conditions 0 through 19 for pausing the process unless the terminal settings are satisfied.

Edit

Specify the terminal settings for the condition No.

Signal result

Select the system variable (I/O terminal) to be referenced.

Reference

Selectable system variables are those assigned to input (IN) terminals, to CC-Link bit devices (RY), or to EtherNet/IP output bit areas. For more details, see the XG-7000 Series Communication Control Manual.

Bit

Select the bit of the system variable to be used in evaluation.

Terminal name

If the system variable specified in [Signal Result] is assigned to a bit device (RY) in the [CC-Link] settings (Page 7-34), to the Ethernet/IP output bit area, or to a terminal in the [Terminal Block and Parallel Port] settings (Page 7-23), the name of the assigned terminal is displayed.

► Note

If a system variable which is not assigned to an input (IN) terminal a CC-Link bit device (RY), or to the EtherNet/IP output bit area is selected, the display is blank and a settings error will occur.

Signal Type/Direction

Select the type of signal to be evaluated in [Signal Type], and then specify the state in [Direction].

- **Rising/Falling Edge**: Select the signal transition type as the condition:
  - **OFF→ON**: Use the rising edge of the signal.
  - **ON→OFF**: Use the falling edge of the signal.
  - **Both**: Use both rising and falling edges of the signal.
- **Level**: Select the current signal state as the condition.
  - **ON**: Use the ON state of the signal.
  - **OFF**: Use the OFF state of the signal.

Multiple BIT, Single Result Logic

If several terminals are specified in the conditions to delay the processing, select a compound condition for final judgment.

- **OR** (default): Use the logical (OR) sum of the specified conditions. If at least one condition is satisfied, the flowchart processing continues.
- **AND**: Obtain the logical (AND) product of the specified conditions. If all conditions are satisfied, the flowchart processing continues. (If one or more conditions is not satisfied, the delay remains in effect.)

► Note

The multiple BIT, single result logic setting is fixed to [OR] if there are two or more conditions using [Rising / Falling Edge] in [Signal Type].

Timeout

For time sensitive processing, a time-out can be used to specify a time (0.1 to 600.0 s) to wait for the conditions to be satisfied (default: 60.0).

- **ON**: Wait for conditions to be satisfied in the specified period of time. If the time-out time is reached continue to process the rest of the flowchart regardless of the state of the monitored terminals.
- **OFF** (Default): No time-out function, continued processing of the flowchart will only occur when the conditions are satisfied.

► Note

Depending on the processing load of the controller the timeout value maybe longer than specified.

Update screen when waiting

Choose to update the screen display while the process is paused based on the status of this unit.

- **ON**: Update the display. (Results for units processed up to this point are updated on the display)
- **OFF** (default): The display is not updated and displays results from the previous processing of the flowchart.

Save

The settings for the unit are saved in the current program file in SD Card 1 or SD Card 2.

► Note

Items specified not to be saved in XG VisionEditor are excluded from the saving operation.
For example, variable values changed in the current program or the default display, and display parts, can be excluded when saving.

Variable delay

The variable delay unit pauses the flowchart operation until the value of the specified variable(s) matches the set conditions. This unit can be used to synchronize processing with the external changing of variable values.

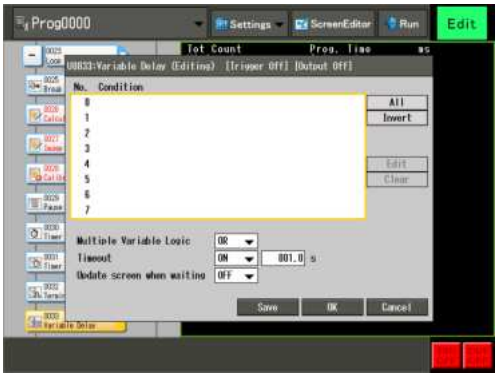
Processing results

The standard results and data returned by the variable delay unit are as follows:

Status	The status of the unit based on the time-out condition can be referenced, 1 being output when the time-out has occurred and the delay function cancelled, 0 at all other times.
Judge No.	Outputs the No. of the matched condition number. When [AND] is selected, the first matched condition number in the list is output.
Logical OR of satisfied conditions	The decimal equivalent of the logical bit sum (OR function) of the conditions can be referenced with a matched condition turning a bit 0 through 7 on. Bits 0 through 7 are assigned to in order with condition No.0 set to the LSB and condition No.7 the MSB.

Variable delay

Specify conditions for the matching of specified variables.



Edit

Specify the parameters for the condition No..

Condition

Select from the one of the 14 different compare functions for the variable to match:

- Variable = Cond.1
- Variable <> Condition value 1
- Variable > Condition value 1
- Variable < Condition value 1
- Variable >= Cond.1
- Variable <= Cond.1
- Cond.1 < Variable < Cond.2
- Cond.1 <= Variable < Cond.2
- Cond.1 < Variable <= Cond.2
- Cond.1 <= Variable <= Cond.2
- Variable < Cond.1 OR Cond.2 < Variable
- Variable <= Cond.1 OR Cond.2 < Variable
- Variable < Cond.1 OR Cond.2 <= Variable
- Variable <= Cond.1 OR Cond.2 <= Variable

Variable

Select a variable to be referenced against the conditions.

► Note

A numerical value can not be entered directly in the variable setting.

Cond.1/Cond.2

Select a variable or input a numerical value to be used for [Cond.1] and or [Cond.2] as specified in [Condition].

Multiple Variable Logic

If several variables are specified in the conditions to delay the processing, select a compound condition for final judgment.

- **OR**: Use the logical (OR) sum of the specified conditions. If at least one condition is satisfied, the flowchart processing continues.
- **AND**: Obtain the logical (AND) product of the specified conditions. If all conditions are satisfied, the flowchart processing continues. (If one or more conditions is not satisfied, the variable delay remains in effect.)

Timeout

For time sensitive processing, a time-out can be used to specify a time (0.1 to 600.0 s) to wait for the conditions to be satisfied (default: 60.0).

- **ON**: Wait for conditions to be satisfied in the specified period of time. If the time-out time is reached continue to process the rest of the flowchart regardless of the state of the monitored terminals.
- **OFF** (Default): No time-out function, continued processing of the flowchart will only occur when the conditions are satisfied.

► Note

Depending on the processing load of the controller the timeout value maybe longer than specified.

Update screen when waiting

Choose to update the screen display while the process is paused based on the status of this unit.

- **ON**: Update the display. (Results for units processed up to this point are updated on the display).
- **OFF** (default): The display is not updated and displays results from the previous processing of the flowchart.

Save

The settings for the unit are saved in the current program file in SD Card 1 or SD Card 2.

► Note

Items specified not to be saved in XG VisionEditor are excluded from the saving operation.
For example, variable values changed in the current program or the default display, and display parts, can be excluded when saving.

User menu

The user menu unit delays the flowchart operation until the specified menu is closed. This unit can be used to synchronize the processing of the flowchart with user interaction for such operations like re-writing setting values.

Reference

When the menu specified is opened, the result of flowchart processing so far is applied to the screen display. After that, the screen display is updated every time a value is changed in the menu.

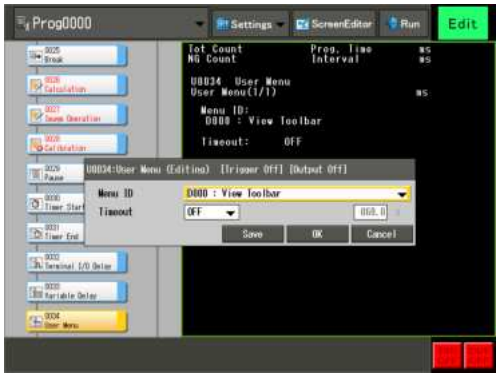
Processing

The standard results and data returned by the user menu unit are as follows:

Status	The status of the unit based on the time-out condition can be referenced, 1 being output when the time-out has occurred and the delay function cancelled, 0 at all other times.

User menu

Specify conditions for the menu.



Menu ID

Select the ID of the menu to be referenced.

► Note

If a menu is selected that cannot be closed with the handheld controller, the menu needs to be closed with a command or via the time-out setting. For more details on the menu setting, refer to the XG VisionEditor Reference Manual (Programming Edition).

Timeout

For time sensitive processing, a time-out can be used to specify a time (0.1 to 600.0 s) to wait for the conditions to be satisfied (default: 60.0).

- **ON**: Wait for conditions to be satisfied in the specified period of time. If the time-out time is reached continue to process the rest of the flowchart regardless of the state of the monitored terminals.
- **OFF** (Default): No time-out function, continued processing of the flowchart will only occur when the conditions are satisfied.

► Note

Depending on the processing load of the controller the timeout value maybe longer than specified.

Save

The settings for the unit are saved in the current program file in SD Card 1 or SD Card 2.

► Note

Items specified not to be saved in XG VisionEditor are excluded from the saving operation.
For example, variable values changed in the current program or the default display, and display parts, can be excluded when saving.

On-screen graphics

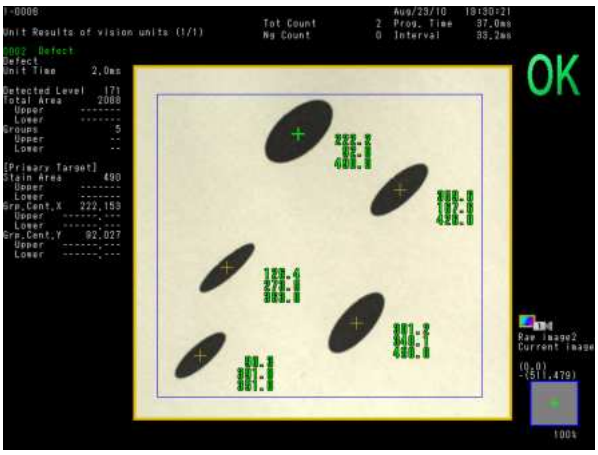
On-screen Graphics Tool

The on-screen graphics unit allows up to 32 graphics / text to be displayed on screen based on the 8 different types of graphic and 4 types of text available.
As this unit supports the referencing of result data and or variables (including arrays) it can be used to display results of other units or numerical data contained in a variable or an array at a specified position on the screen.

Reference

For details on the graphics display using an array variable, refer to "Using arrays to display multiple graphics" (Page 4-330).

Sample display



Example of result data being displayed for several defects detected by the defect unit (Page 4-115) at various positions in accordance with the detected defect position using the [Value] style (Page 4-328).

Main Menu

The main menu of the on-screen graphics tool consists of the following options. Configure settings under each option as required for the inspection.



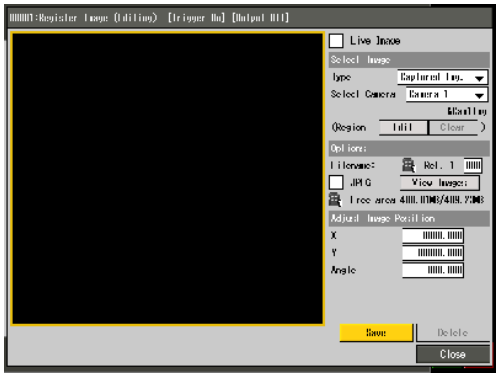
Register Image (Page 4-319)	Register an image to be used as a template for settings.
Select Image (Page 4-320)	Specify the image to be used for unit processing.
Setup Graphics (Page 4-321)	Define graphics and text to be displayed.
Display Options (Page 4-322)	Unit processing display settings.
Save (Page 4-332)	Save unit settings.

Reference

(The on-screen graphics unit displays [Current Image] as the initial image.)

Register Image

An image can be saved to the controller to be used as a template for measurements and settings. It is recommended to adjust and fix lighting and other external influences before registering an image.



Live Image

Check this box to display live images through a continuous feed.

► Note

- A live feed is only available while the unit is being edited.
- This setting cannot be changed when the screen update mode is set to [Continuous] in the trigger settings (Page 4-25).
- If the capture on trigger input is disabled in the trigger settings (Page 4-25), this check box is always unchecked and the setting cannot be changed.
- When Live image is selected for a moving object, take care when registering as there will be a time lag between the external trigger input and the actual image capture.
- In principle, Live-image is only used when the capture unit being edited is being executed (waiting for a trigger input). When the image capture buffer is set to custom and the capture unit which was most recently executed is being edited, the images collected in the buffer will still be displayed even if the capture unit is not presently capturing images.
- Continuous update cannot be used when HDR capture (Page 4-21) is enabled or when a line scan camera is being used.
- When the HDR capture (Page 4-21) is enabled, the Multi-image cannot be used.

Select Image

Type

Select an image to register.

- **Captured Img.**: Displays the latest image from the specified camera (image variable).
- **Registered Img.**: The registered image specified in [Options] is displayed.

Select Camera

Select the number of the camera used for registration. Choose from Camera1 - Camera4, and select only the camera number used for the capture unit being edited.

Specifying a region

To register only part of an image, select [Edit] then specify the region to register. To cancel the selected region, select [Clear].

Save Image

Filename

Specify the registered image number used for image registration in the form "(Camera No.)-(User-specified No.)".

Reference

The name of the saved file is "ref (Camera No.)_(Specified No.)" (for full screen image registration) or "ref (Camera No.)_(Specified No.)_XXX_YYY" (for partial image registration).

JPEG

Check this box to save the image in JPEG format. When this box is not checked, the image will be saved in BMP format as either a 24-bit color bitmap image (when a color camera is used) or an 8-bit grayscale bitmap image (when a monochrome camera is used).

► Note

Using image compression may result in some image deterioration, thus results from a compressed image may differ to those when using non compressed images.

View All

View all registered images in a list.

Adjust Image Position

Adjust the position of the image being captured.

X

-Adjust the movement in the X (horizontal) direction between -8191.000 and 8191.000 pixels.

Y

-Adjust the movement in the Y (vertical) direction between -16383.000 and 16383.000 pixels.

Angle

Adjust the position angle (rotation) around the center of the image between -999.999° and 999.999°.

► Note

Position adjustment may cause missing peripheries (black areas) due to image movement or jagged edges (jaggies) due to rotation in the registered image.

Save

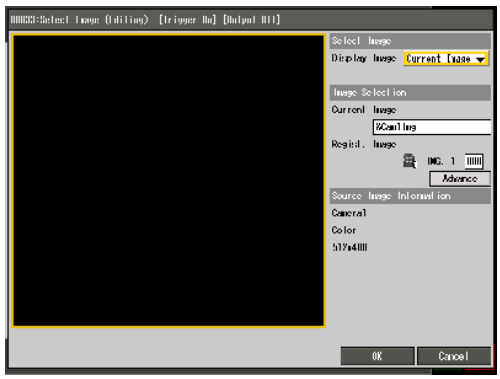
Save the displayed image as a registered image under the conditions specified in the [Register Image] menu.

Delete

When [Registered Img.] is selected for [Type], you can delete the registered image specified in [Options].

Select Image

Specify the image variable and associated registered image to be used for configuring the vision tool.



Select Image

Display Image

Switch the image displayed on the screen.

- **Captured Image**: Displays the latest image from the specified camera (image variable).
- **Registered Image**: The registered image specified under [Image Selection] is displayed.

Select image

Captured Img.

Set an image variable to be used as a current image for the unit.

Registered Img.

Specify the registered image No. for the registered image to be used.

- The registered images are managed as "Image (Camera No.) - (Registered image No.0 to 999)".
- The "Camera No" is fixed to the number of the camera associated to the image variable specified for the current image.

Advance

Set advance options for the switching of registered images as necessary.

- **Use numerical variable for registered image number**: To use a variable for the registered image No., check this box and assign a numerical or numerical array variable reference. By using a variable for the registered image No. and then issuing a variable reference value apply command (NU), the image is switched to the specified registered image in the variable and the reference image information is updated. For more details, see the XG-7000 Series Communication Control Manual.
- **Process variable when changing programs**: Use this option to switch to the registered image based on the initial value of the variable referenced when the program is changed or the controller is next turned on.

► Note

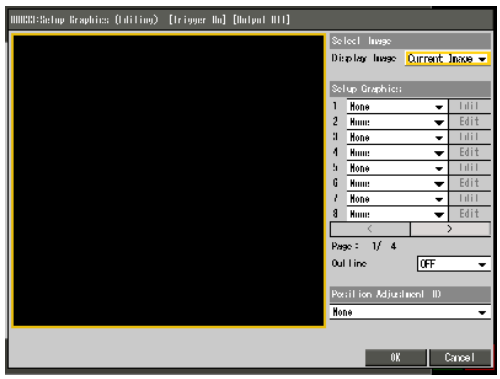
Note that the registered image No. does not switch in accordance with a change in the variable.

Source Image Information

The camera No., type (color / monochrome), and resolution of the camera associated to the image variable specified is displayed.

Graphics setting

Set the graphics and text to be displayed.



Select Image

Display Image

Switch the image displayed on the screen.

- **Captured Image**: Displays the latest image from the specified camera (image variable).
- **Registered image**: Displays the registered image specified under [Image Selection].

Setup Graphics

Specify up to 32 graphics or text blocks to be displayed from the following.

- **None**: No on-screen graphics.
- **Rectangle**: Display a rectangle, select [Edit] to specify parameters such as position and size (Page 4-323).
- **Rotated Rectangle**: Display a rotated rectangle select [Edit] to specify parameters such as position, size, and angle (Page 4-324).
- **Circle**: Display a circle, select [Edit] to specify parameters such as position and size (Page 4-324).
- **Oval**: Display an oval, select [Edit] to specify parameters such as position, size, and angle (Page 4-325).
- **Ring**: Display a ring, select [Edit] to specify parameters such as position and size (Page 4-325).
- **Arc**: Display an arc, select [Edit] to specify parameters such as position, size, and start/end angles (Page 4-326).

- **Point**: Display a point / crosshair, select [Edit] to specify parameters such as display, size, and angle (Page 4-326).
- **Line**: Display a line, select [Edit] to specify parameters such as position and tilt angle (Page 4-327).
- **Text**: Display specified text, select [Edit] to specify parameters such as position and contents (Page 4-271).
- **Value**: Display a numerical value, select [Edit] to specify parameters such as position and contents (Page 4-271).
- **Active Text**: Display text from a predefined table based on matching conditions, select [Edit] to specify parameters such as position and contents (Page 4-272).
- **Decimal/ to ASCII**: Display a character string converted from ASCII codes (decimal), select [Edit] to specify parameters such as position and contents (Page 4-273).

Reference

You can change the line of the currently selected graphic or text one line upward or downward by holding down the No.1 (FUNCTION) button on the handheld controller and moving up or down.

Edit

Set the display parameters for the selected graphic or text. See "Individual Graphic Settings" (Page 4-323) for more details.

Reference

Due to display processing being performed in order beginning from the lowest number, the graphic / text on top is the graphic or text with the highest number.

Outline

Specify whether to show the outline of the area of the graphic. This option is useful for the alignment of graphics as the display range of a text or value is shown based on the maximum number of characters / digits.

► Note

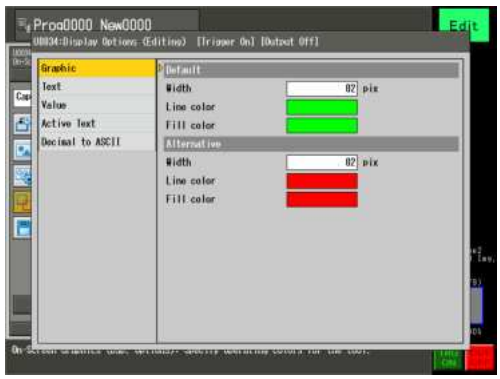
The outline is only shown when changing settings in the [Setup Graphics] menu.

Position Adjustment ID

To use position adjustment, specify the unit to be referenced.

Display Options

Graphics and text display settings.



Reference

The enlarging / reducing (zooming) of the image affects the displaying of the graphics and text as follows:

- Text: The size remains fixed regardless of the level of magnification.
- Point / Crosshair: The size of the point can be associated to enlarge / reduce with the level of magnification or remain fixed.
- Other graphics: The size of the graphic is associated to enlarge / reduce with the level of magnification.

For more details on the zoom function, refer to the XG VisionEditor Reference Manual (Programming Edition).

Graphic

Specify the line width, display, and fill color of the on-screen graphics.

Text

Specify the size, normal and alternative display color, and character edge color for the text displayed (Page 4-328).

Use these settings for other on-screen text graphics.
With this option checked, the settings for the text will also be applied to Value, Active Text, and Decimal to ASCII on-screen graphics (default: ON).

Value

Specify the size, normal and alternative display color, and character edge color for the value displayed (Page 4-328).

Active Text

Specify the size, normal and alternative display color, and character edge color for the text displayed (Page 4-329).

► Note

Style settings made in the [Display Options] menu override the style settings (normal, alternative and outline color) in the active text display table.

Decimal to ASCII

Specify the size, normal and alternative display color, and character edge color for the text displayed (Page 4-329).

Individual Graphic Settings

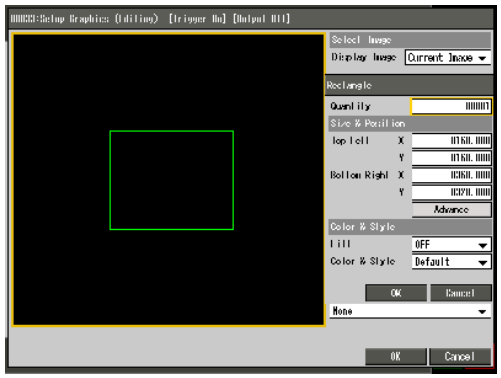
To change the display settings of each graphic or text, select [Edit] on the [Setup Graphics] tab (Page 4-321). The setting menu that is displayed after [Edit] is clicked varies depending on the type of graphic or text.

Reference

[Advance] allows the setting of position offsets and rotation for each graphic or text individually (Page 4-331).

Rectangle

Rectangle display settings.



Quantity

Specify the number of rectangles to display at the same time (0 to 10000).

Top Left

Specify the X, Y position coordinates of the top left corner of the rectangle.

Bottom Right

Specify the X, Y position coordinates of the bottom right corner of the rectangle.

Fill

Choose whether to fill the inside of the rectangle and make it solid.

- **ON**: Fill the rectangle. The fill color can be specified in the [Display Options] menu (Page 4-322).
- **OFF** (default): Display outline only.

Color and style

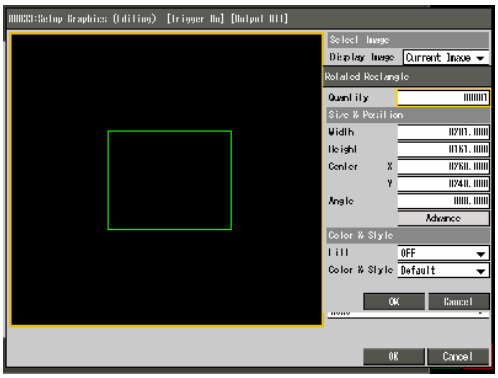
Choose the display style specified in the [Display Options] menu (Page 4-322) from [Default] or [Alternative].

Reference

If the unit is assigned to the system variable %JgAll, the display style will be switched according to the total judgment status: [Default] for OK (Pass) and [Alternative] for NG (Fail).

Rotated rectangle

Rotated rectangle display settings.



Quantity

Specify the number of rotated rectangles to display at the same time (0 to 10000).

Width

Set the width of the rotated rectangle.

Height

Set the height of the rotated rectangle.

Center

Specify the center X, Y position coordinates of the rotated rectangle.

Rotation angle

Specify the rotation angle of the rotated rectangle.

Fill

Choose whether to fill the inside of the rotated rectangle and make it a solid.

- **ON**: Fill the rotated rectangle. The fill color can be specified in the [Display Options] menu (Page 4-322).
- **OFF** (default): Display outline only.

Color and style

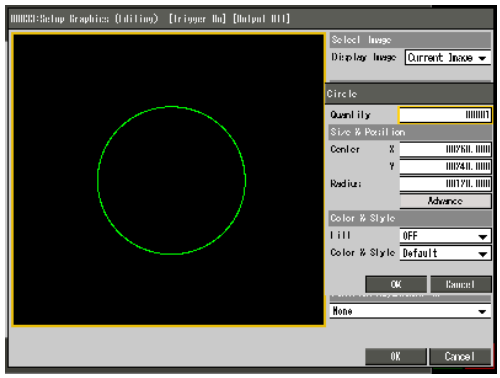
Choose the display style specified in the [Display Options] menu (Page 4-322) from [Default] or [Alternative].

Reference

If the unit is assigned to the system variable %JgAll, the display style will be switched according to the total judgment status: [Default] for OK (Pass) and [Alternative] for NG (Fail).

Circle

Circle display settings.



Quantity

Specify the number of circles to display at the same time (0 to 10000).

Center

Specify the center X, Y position coordinates of the circle.

Radius

Specify the radius of the circle.

Fill

Choose whether to fill the inside of the circle and make it a solid.

- **ON**: Fill the circle. The fill color can be specified in the [Display Options] menu (Page 4-322).
- **OFF** (default): Display outline only.

Color and style

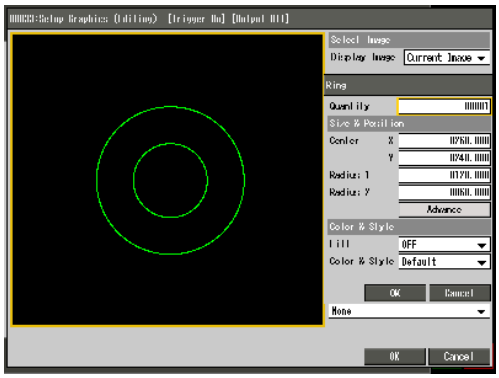
Choose the display style specified in the [Display Options] menu (Page 4-322) from [Default] or [Alternative].

Reference

If the unit is assigned to the system variable %JgAll, the display style will be switched according to the total judgment status: [Default] for OK (Pass) and [Alternative] for NG (Fail).

Ring

Ring display settings.



Quantity

Specify the number of rings to display at the same time (0 to 10000).

Center

Specify the center X, Y position coordinates of the ring.

Radius 1

Specify the radius of the outer ring.

Radius 2

Specify the radius of the inner ring.

Reference

Radius 1 and Radius 2 are interchangeable and can be used for either the inner or outer ring.

Fill

Choose whether to fill the inside of the ring and make it a solid.

- **ON**: Fill the ring. The fill color can be specified in the [Display Options] menu (Page 4-322).
- **OFF** (default): Display outline only.

Color and style

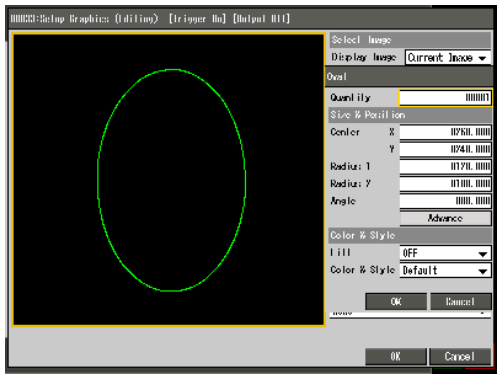
Choose the display style specified in the [Display Options] menu (Page 4-322) from [Default] or [Alternative].

Reference

If the unit is assigned to the system variable %JgAll, the display style will be switched according to the total judgment status: [Default] for OK (Pass) and [Alternative] for NG (Fail).

Oval

Oval display settings.



Quantity

Specify the number of ovals to display at the same time (0 to 10000).

Center

Specify the center X, Y position coordinates of the oval.

Radius 1

Specify either the major radius or minor radius of the oval.

Radius 2

Specify either the major radius or minor radius of the oval.

Angle

Specify the rotation angle of the oval.

Fill

Choose whether to fill the inside of the oval and make it a solid.

- **ON**: Fill the oval. The fill color can be specified in the [Display Options] menu (Page 4-322).
- **OFF** (default): Display outline only.

Color and style

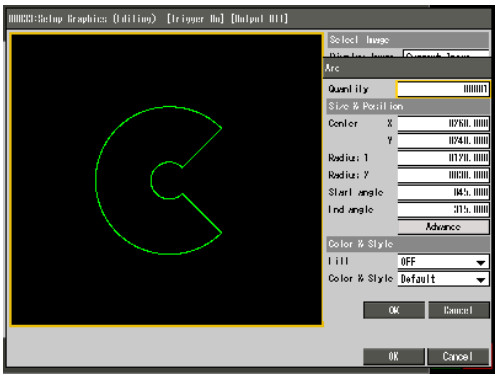
Choose the display style specified in the [Display Options] menu (Page 4-322) from [Default] or [Alternative].

Reference

If the unit is assigned to the system variable %JgAll, the display style will be switched according to the total judgment status: [Default] for OK (Pass) and [Alternative] for NG (Fail).

Arc

Arc display settings.



Quantity

Specify the number of arcs to display at the same time (0 to 10000).

Center

Specify the center X, Y position coordinates of the arc.

Radius 1

Specify the radius of the outer arc.

Radius 2

Specify the radius of the inner arc.

Reference

Radius 1 and Radius 2 are interchangeable and can be used for either the inner or outer arc.

Start angle

Specify the start angle of the arc.

End angle

Specify the end angle of the arc.

Fill

Choose whether to fill the inside of the arc and make it a solid.

- **ON**: Fill the arc. The fill color can be specified in the [Display Options] menu (Page 4-322).
- **OFF** (default): Display outline only.

Color and style

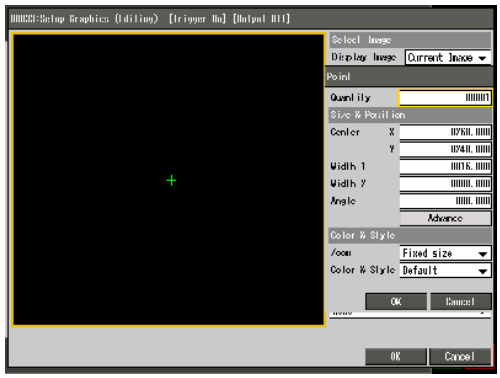
Choose the display style specified in the [Display Options] menu (Page 4-322) from [Default] or [Alternative].

Reference

If the unit is assigned to the system variable %JgAll, the display style will be switched according to the total judgment status: [Default] for OK (Pass) and [Alternative] for NG (Fail).

Point

Point / Crosshair display settings.



Quantity

Specify the number of points to display at the same time (0 to 10000).

Center

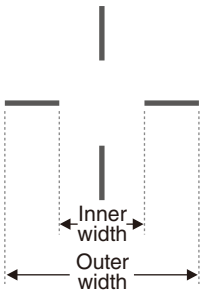
Specify the center X, Y position coordinates of the point / crosshair.

Width 1

Specify the outer width of the point / crosshair.

Width 2

Specify the inner width of the point / crosshair.



Reference

Width 1 and Width 2 are interchangeable and can be used for either the inner or outer width.

Angle

Specify the rotation angle of the point / crosshair.

Zoom

Choose whether to change the size of the point / crosshair to the image magnification.

- **ON**: Correlate with image magnification.
- **Fixed size** (Default): Fixed size.

Color and style

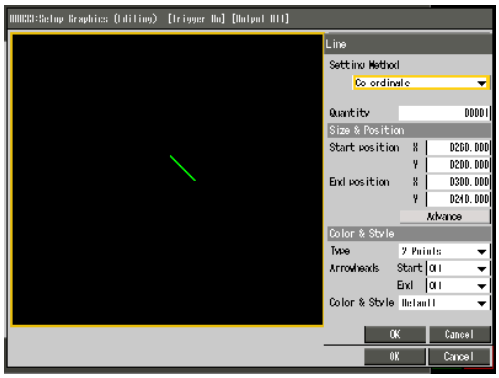
Choose the display style specified in the [Display Options] menu (Page 4-322) from [Default] or [Alternative].

Reference

If the unit is assigned to the system variable %JgAll, the display style will be switched according to the total judgment status: [Default] for OK (Pass) and [Alternative] for NG (Fail).

Line

Line display settings.



Size setting method

Choose the method for making a line.

- **Co-ordinate** (default): Specify the line from two X, Y coordinates.
- **Rotation about origin**: Specify the line using the distance and angle with respect to the origin.

Quantity

Specify the number of lines to display at the same time (0 to 10000).

Start position

Specify X, Y position coordinates for the start position of the line (when [Co-ordinate] is used for the [Setting Method]).

End position

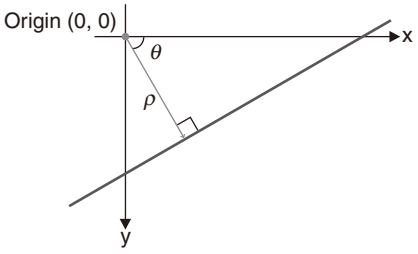
Specify X, Y position coordinates for the end position of the line (when [Co-ordinate] is used for [Setting Method]).

Origin Offset, Angle / Rotation

Specify the origin offset and rotation angle of the line (when [Rotation about origin] is used for the [Setting Method]).

Reference

- **Origin Offset**: The length of a perpendicular line connecting the line to the origin (0, 0)
- **Angle / Rotation**: The clockwise angle of the perpendicular line between the origin and the line (origin offset parameter) (0 to 359.999°, 3 o'clock being 0°).



Line type

Select the type of line (when [Co-ordinate] is used for the [Setting Method]).

- **2 Points** (Default): The line goes between the start and end position.
- **Continuous**: The line passes through the start and end position.

Arrowheads

Select ON to add an arrowhead to the start point, end point, or both (when [Co-ordinate] is used for the [Setting Method]).

Color and style

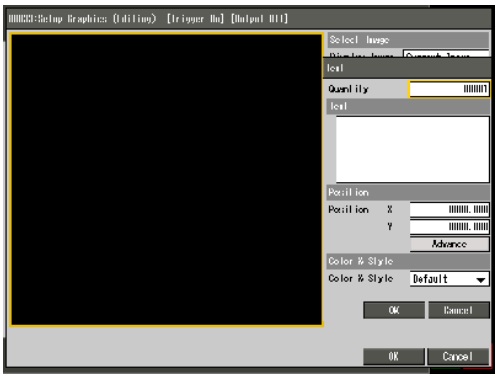
Choose the display style specified in the [Display Options] menu (Page 4-322) from [Default] or [Alternative].

Reference

If the unit is assigned to the system variable %JgAll, the display style will be switched according to the total judgment status: [Default] for OK (Pass) and [Alternative] for NG (Fail).

Text

Text display settings.



Quantity

Specify the number of text strings to display at the same time (0 to 10000).

Text

Input the characters (up to 100 single byte characters, 50 2-byte characters) to be displayed.

Reference

- Tab and line feed cannot be used.
- Spaces can be used and count as one character.

Position

Specify the X, Y position coordinates of the top left corner of the text display area.

Color and style

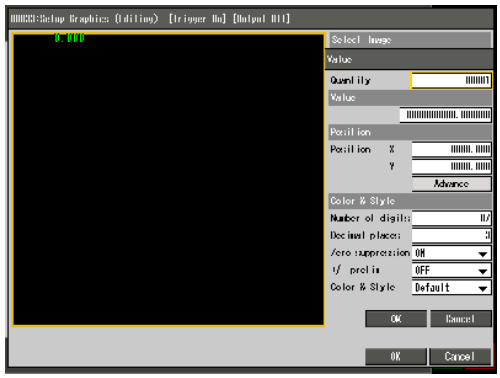
Choose the display style specified in the [Display Options] menu (Page 4-322) from [Default] or [Alternative].

Reference

If the unit is assigned to the system variable %JgAll, the display style will be switched according to the total judgment status: [Default] for OK (Pass) and [Alternative] for NG (Fail).

Value

Value display settings.



Quantity

Specify the number of values to display at the same time (0 to 10000).

Value

Specify the numerical value to display as a graphic.

Position

Specify the X, Y position coordinates of the top left corner of the value display area.

Number of digits

Specify the number of digits (10 digits max.).

Decimal places

Specify the number of decimal places (6 digits max.).

► Note

Due to other processes running, displaying all 16 digits (10 digits and 6 decimal places) may cause an error in the displayed value.

Zero suppression

Choose whether to remove preceding zeros from the number.

- **ON** (default): Remove the preceding zeros.
- **OFF**: Include preceding zeros.

Example, when the number of digits is set to 5 and the value is 500, "00500" will be displayed when zero suppression is [OFF], and "500" will be displayed when zero suppression is [ON].

+/- prefix

Choose whether to show a "+" symbol before a positive value.

- **ON**: Show the "+" symbol.
- **OFF** (default): Hide the "+" symbol.

Color and style

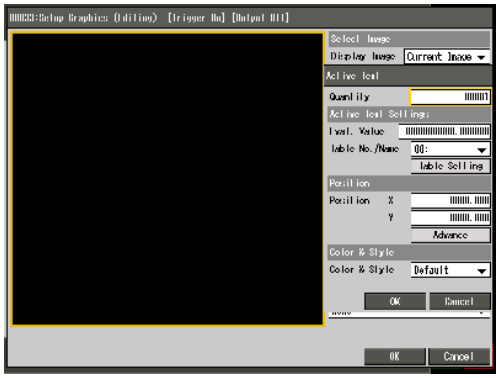
Choose the display style specified in the [Display Options] menu (Page 4-322) from [Default] or [Alternative].

Reference

If the unit is assigned to the system variable %JgAll, the display style will be switched according to the total judgment status: [Default] for OK (Pass) and [Alternative] for NG (Fail).

Active Text

Text display settings for text based on a lookup table.



Quantity

Specify the number of active text strings to display at the same time (0 to 10000).

Decimal Value

Specify a value to be referenced against the table settings.

Table No./name

Choose a table to be used from the user defined tables.

Table Setting

Show the [Table List] menu for editing a table which stores the different strings of text and associated displaying conditions. See "Creating the active text table" (Page 4-331) for more details.

Position

Specify the X, Y position coordinates of the top left corner of the text display area.

Color and style

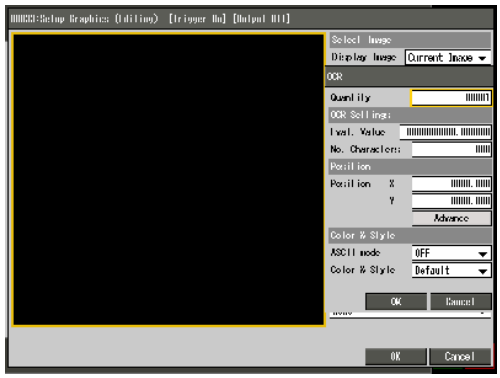
Choose the display style specified in the [Display Options] menu (Page 4-322) from [Default] or [Alternative].

Reference

If the unit is assigned to the system variable %JgAll, the display style will be switched according to the total judgment status: [Default] for OK (Pass) and [Alternative] for NG (Fail).

Decimal to ASCII

Convert decimal to ASCII characters based on the OCR (page 2-248) or 2D Code Reader (Page 2-273) units conversion or standard conversion.



Quantity

Specify the number of text strings to display at the same time (0 to 10000).

Decimal Value

Specify a decimal number or variable to be converted.

Reference

To display two or more characters, assign a scalar array variable containing the ASCII code (decimal) of each character.

No. of characters

Specify the number of characters to be displayed in the text.

Position

Specify the X, Y position coordinates of the top left corner of the text display area.

Mode

Choose whether to convert decimal numbers to ASCII characters based on the OCR tool conversion which supports user specified characters (1-20) or by using the conventional decimal to ASCII conversion.

- **OCR** (default): Use the conversion rules of the OCR unit.
- **ASCII:** Use the conventional ASCII code conversion rules.

Reference

- For details of the OCR unit conversion rules that are used when [OFF] is selected, see the XG-7000 Series Communication Control Manual. When 32 is specified and the OCR vision tool conversion rules are used "_" (underscore) is displayed rather than the standard " " (space).
- When set to [OCR], a 1-byte space is added in front of all numbers other than user-defined characters, and each 1-byte character is displayed in 2-byte fashion. When set to [ASCII], no space is inserted. Thus the displayed area is smaller when [ASCII] is selected even when the same text is displayed.
- When the data read by a 2D code reader is stored in a numerical array variable, set to [OCR] in order to display kanji, kana, and other 2-byte characters correctly.

Color and style

Choose the display style specified in the [Display Options] menu (Page 4-322) from [Default] or [Alternative].

Reference

If the unit is assigned to the system variable %JgAll, the display style will be switched according to the total judgment status: [Default] for OK (Pass) and [Alternative] for NG (Fail).

Using arrays to display multiple graphics

Multiple graphics can be displayed by using data from an array. This is useful when displaying multiple detection results or OCR text consisting of 2 characters or more as it is not necessary to make multiple individual settings.

1 In the [Quantity] field, set the number of graphics to display.

Reference

If the number of graphics fluctuates, assign a local or global variable which contains the quantity from a unit or calculation.

2 In the [Position] field, assign array result data or an array variable which contains the position coordinates to display the graphics.

► Note

- When using an array the index should be empty (Example: #A[]). To make an index empty, select [Variable] or [Unit Results] in the [Data Reference] menu (Page 4-354) and specify [*] for the index.
- If the [Quantity] specified is more than one, but no array result data or array variable has been set for the position, all graphics will be displayed at the same position.

3 If necessary, assign array result data or an array variable which contains any data to be referenced to [Eval. Value] or other fields in the same way as in step 2.

Reference

- If an array is assigned, the number of displayed graphics will either be the number of elements of the assigned array or the number specified in [Quantity] whichever is the smaller.
- To display all results of a vision unit even if the detection count fluctuates, assign the result data of the detection count (number of targets detected) in the [Quantity] field.

Applying an offset or rotation to the display position

An offset or rotation can be applied to the specified display position. As the on-screen graphics supports the displaying of multiple graphics, so it is useful to apply the same level of offset to each.

Reference

- The assignment of an array variable for the offset function is also supported. When using an array the index should be empty (Example: #A[ ]). To make an index empty, select [Variable] or [Unit Results] in the [Data Reference] menu (Page 4-354) and specify [*] for the index.
- If an array is assigned the number of displayed graphics will either be the number of elements of the assigned array or the number specified in [Quantity] which is the smaller.

Offset

Specify the offset from the display position in pixels.

Rotation Center

Set the X, Y absolute position coordinates of the rotation center to apply [Rotation] to before the offset or any position adjustment is applied.

Rotation

Specify the rotation angle around the [Rotation Center].

Reference

Text, Value, Active Text and OCR do not support rotated display and will remain horizontal regardless of the rotation setting.

Creating the active text table

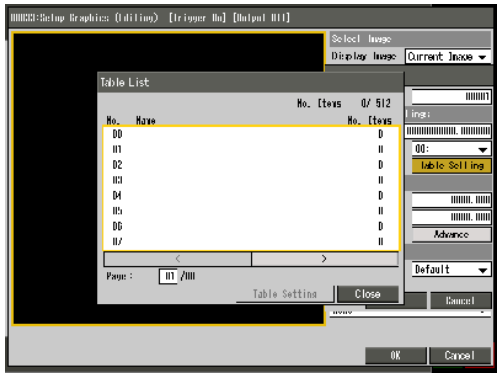
In the [Table List] menu, you can edit tables which store the different strings of text and associated displaying conditions.

► Note

- The active text table is the same active text table under display pattern parts (Page 4-31) used in creating custom screens.
- Settings in [Display] override the style settings (color inversion or outline) in the active text table.

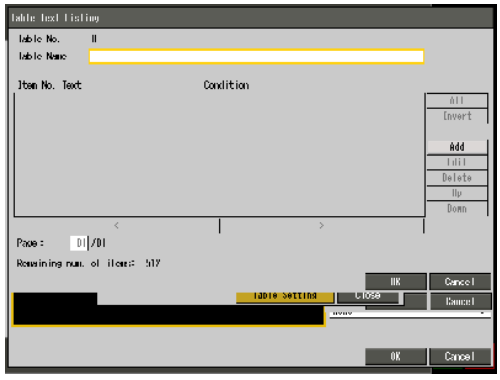
1 In the active text edit menu, select [Table Setting].

The [Table List] menu appears.



2 Select the line of the table No. to edit and then select [Table Setting].

The [Table Text Listing] menu of the selected table appears.



3 Select [Add].

The [Display Condition] menu appears.

4 Edit the conditions for text display.

Text

Enter the text (up to 64 1-byte characters or 32 2-byte characters) that you want to display when the conditions are met.

Lower limit

Choose either [Enable] or [Disable] and then set the lower limit for the reference value to be greater than or equal to for the text to be displayed.

Upper limit

Choose either [Enable] or [Disable] and then set the upper limit for the reference value to be less than or equal to for the text to be displayed.

Reference

When a value meets several conditions, such as "Display text "A" when the result is between lower limit 2 and upper limit 2 is set for condition 1" and "Display text "B" when the result is between lower limit 1 and upper limit 10 is set for condition 2" and the measurement value is "2", the smaller condition No. is used. In this example, "Display text "A" when the result is between lower limit 2 and upper limit 2" has higher priority therefore "A" is displayed. However, if the measurement value was not "2" but a value within the range 1 to 10, "B" would be displayed.

5 **Click [OK].**

The condition specified in step 4 is added.

6 **Edit the table details as required.**

- **Table Name**: Enter a table name (up to 64 1-byte characters or 32 2-byte characters).
- **All**: Select all conditions.
- **Invert**: Invert the current selection.
- **Edit**: Edit the selected condition.
- **Delete**: Delete the selected condition.
- **Move Up**: Move the selected condition up one line.
- **Move Down**: Move the selected condition down one line.

Reference

You can change the order of conditions by selecting one condition, holding down the No.1 (FUNCTION) button or No.7 Back button and then moving up or down.

► Note

Two or more conditions cannot be moved simultaneously.

7 **When editing is complete, select [OK].**

The changed made to the [Table Text Listing] are reflected and the display returns to the [Table List] menu

8 **To edit other tables, repeat steps 2 to 7.**

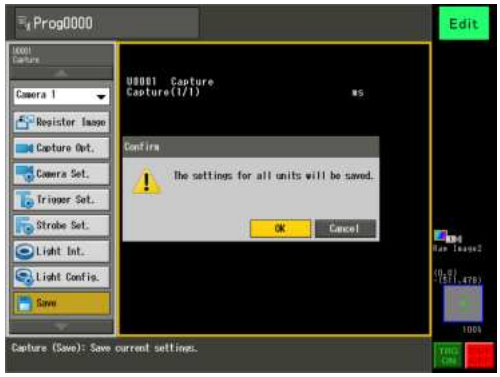
9 **When the editing of all tables is complete, select [Close].**

Save

Save the current unit changes the program file.

► Note

- If the device is turned off before any settings are saved, all of those changes will be deleted.
- Do not turn off the system power while you are saving the settings. Doing so may cause errors in the internal data



Save

The settings for the unit are saved in the current program file in SD Card 1 or SD Card 2.

► Note

Items specified not to be saved in XG VisionEditor are excluded from the saving operation.
For example, variable values changed in the current program or the default display, and display parts, can be excluded when saving.

Parallel terminal output

Parameters and settings for outputting data on the parallel I/O connector and terminal block.

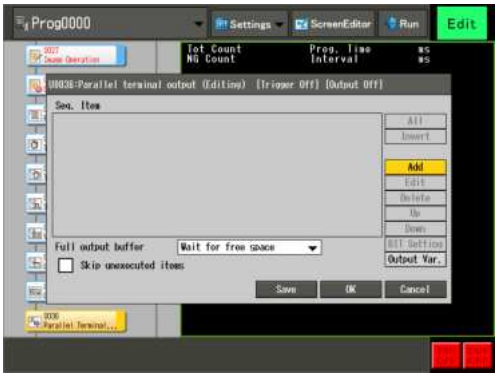
Processing results

The standard results and data returned by the parallel terminal output unit are as follows:

Out Buf. Space	The remaining space (0 to 100%) of the output buffer after unit execution ► Note If the remaining buffer decreases every time a flowchart unit is executed, the buffer may eventually overflow.
Output buffer overflow	The overflow status of the output buffer can be referenced, 1 being output when the buffer is full during execution of the unit. The behavior of the unit when the buffer overflows is dependent on the unit settings.
Data Transferred	The status of the transfer of data by the Parallel Terminal Output unit to the output buffer can be referenced, 1 being output when the transfer has been completed and 0 if the transfer fails.

Parallel terminal output

Specify the settings for outputting data on the parallel and or terminal I/O. Terminal assignment and settings are linked to the [Parallel Port] settings (Page 5-22).



Output List

Displays a list (8 lines maximum) of the current output data setup in the unit.

Add

Add an item to be output.
When the [Output Item] menu is displayed, choose the type of data or variable to be output and then select the output item or variable.

Reference

If two or more output system variables (%OutDataA to H) are assigned in the [Parallel Port] settings (Page 7-23), the [Output Item Setting] menu is displayed before the [Output Item] menu. Select the output system variable to be used in the [Output Item Setting] menu and then set the appropriate settings in the [Output Item] menu.

Edit

Edit the settings of the selected output item.
When the [Output Item] menu is displayed, choose the type of data or variable to be output and then select the output item or variable.

Delete

Delete the selected output item.
Select [OK] on the confirmation message.

Up/Down

Move the selected output item up/down to change the order of items being output.

Reference

You can change the order of the output data by holding down the No.1 (FUNCTION) button or No.7 Back button and then moving up or down.

Note

Two or more output items can not be moved simultaneously.

BIT Setting

Use the [Output BIT Setting] menu to set the combination of output system variables (%OutDataA to H) and output data.



- **(System variable name) BIT**: The output system variable assigned to the terminal and its bit position.
- **Item**: Specify the result data, variable, or numerical value to be output with reference to the bit of the output system variable.
- **BIT**: Specify the data bit of the item to be output with reference to the bit of the output system variable.
- **Terminal**: The physical names of the terminals assigned to the specified output variable and bits from the [Global Setting]. For more details on the terminal names and assignment, refer to "Terminal Block & Parallel Port" (Page 7-23).

Reference

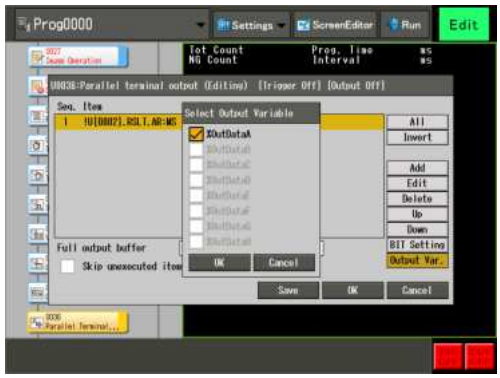
When two or more output system variables (%OutDataA to H) are assigned in the [Parallel Port] settings (Page 7-23), the [BIT Setting] menu is displayed before the [Output BIT Setting] menu. Select the output system variable to be used in the [BIT Setting] menu and then set the appropriate settings in the [Output BIT Setting] menu.

Note

- An output that hasn't been assigned to a terminal cannot be specified.
- Two or more combinations of the same output variable or bit assignment cannot be specified in the same unit.
- If referencing arrays in the [item] field, specify the element of the array to be output (Example: #a[1] for numerical variable data and #b.X for non-numerical variable data).
- Floating point values referenced in the [Item] field will be converted into an integer.
- If the [Item] field is empty, 0 is used.
- An execution error will occur if invalid result data is specified in the [Item] field, and the value of the output with the invalid result data is set to 0.

Output Var.

Use the [Select Output Variable] menu to specify the system variable to be output.



Check the system variable to be output.

Full output buffer

Specify which should have priority when the output buffer becomes full: Image processing or data output.

- **Skip output item**: Give priority to image processing and skip the current data waiting to be output.
- **Wait for free space**: Give priority to the waiting data and resume image processing after data output is complete.

Reference

The skipping of data can be by checked with the [Data Transferred] if the result remains 0 after the output unit execution data was skipped.

Skip unexecuted items

Skip outputting data for items referencing units which were not executed. Refer to "Unit Execution" (Page 7-6) for more details on the [Never Execute] setting of a unit.

Save

The settings for the unit are saved in the current program file in SD Card 1 or SD Card 2.

► Note

Items specified not to be saved in XG VisionEditor are excluded from the saving operation.
For example, variable values changed in the current program or the default display, and display parts, can be excluded when saving.

Data output

Parameters and settings for outputting data through the following means:

- **SD card**: Specify data to be saved to an SD card.
- **RS-232C:** Specify data to be output via RS-232C no-protocol communication.
- **Ethernet**: Specify data to be output via Ethernet no-protocol communication.
- **PLC link**: Specify data to be output via PLC link.
- **CC-Link**: Specify data to be output via CC-Link.
- **EtherNet/IP**: Specify data to be output via EtherNet/IP.
- **PC program**: Specify data to be output to XG VisionTerminal software or for ActiveX control.

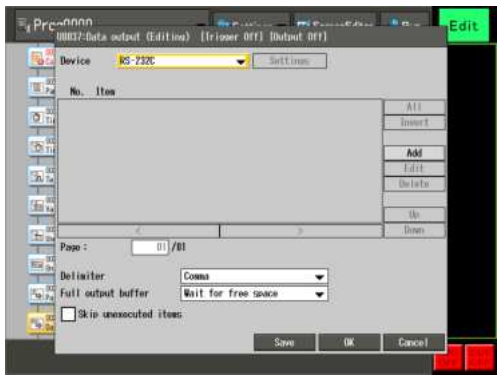
Major Processing results

The standard results and data returned by the data output unit are as follows:

Out Buf. Space	The remaining space (0 to 100%) of the output buffer after unit execution ► Note If the remaining buffer decreases every time a flowchart unit is executed, the buffer may eventually overflow.
Output buffer overflow	Outputs 1 when the output buffer of the destination becomes full during execution of the data output unit. Behavior of the data output unit when the output buffer becomes full depends on the unit settings.
Data Transferred	The status of the transfer of data by the Data Output unit to the output buffer can be referenced, 1 being output when the transfer has been completed and 0 if the transfer fails.

Data output

Specify the settings for outputting data.



► Note

- An execution error will occur if invalid result data is specified in the [Item] field, and the value of the output with the invalid result data is set to 0.
- When [PLC link], [CC-Link] or [EtherNet/IP] is selected for [Device], and when [Line String] or [Line Registered String] is selected for the OCR unit (Page 4-231) results data changing the [Number of Char.] setting may change the destination address of the text data and subsequent output items.
- When [Readout], [Split Data Readout], or [Multi Reference] is selected for the 2D code reader results data, changing [Fixed Length] to [OFF] may change the destination address of the text data and subsequent output items.

Device

Specify the destination of the data output.

- **SD Card**: Output data to an SD card.
- **RS-232C**: Output data to RS-232C.
- **Ethernet (TCP/IP)**: Output data to Ethernet.
- **PLC-Link**: Output data via PLC-Link.
- **CC-Link**: Output data via CC-Link.
- **EtherNet/IP**: Output data via EtherNet/IP
- **PC Program**: Output the image to the XG VisionTerminal or for use with ActiveX Control.

► Note

- The available destination varies depending on the System Configuration setting (Page 7-1).
- To use the CC-Link, you need to attach the CA-NCL10E CC-Link module to the controller. For more details, see the XG-7000 Series Communication Control Manual.

Reference

Some setting items in the [Data output] menu change depending on the specified destination.

Settings

Display the detailed settings menu for the selected data destination.

Output List

Displays a list (256 lines maximum) of the current output data setup in the unit.

Add

Add an item to be output.
When the [Output Item] menu is displayed, choose the type of data or variable to be output and then select the output item or variable.

Edit

Edit the settings of the selected output item.
When the [Output Item] menu is displayed, choose the type of data or variable to be output and then select the output item or variable.

Item
Specify the data to be output such as a variable, unit result data, a string or special characters. To assign a variable or unit result data from an array, specify the index number of the item.

Syntax
Choose the format for data to be output.
- **Auto**: Output data using the format of the referenced result data.
- **Format 1 to 16**: Output data using the format setting defined in the [Data output format setting] dialog.
- **Character**: Output a fixed string.
- **Non ASCII**: Output special characters.

► Note

If [PLC-Link], [CC-Link], or [EtherNet/IP] is selected for [Device], settings are limited as follows.
- If [Character] or [Non ASCII] are selected as the format, the item line is grayed out and the data excluded from the output.
- If [Format 1 to 16] is selected as the format, data is output but not using the pre-determined format setting.

Reference

- If [Auto] is selected, variables are set to "use +/- prefix", "zero suppression: OFF", and "7 integer digits, 3 decimal places".
- For a list of system variables, setting parameters, and result data, refer to the XG-7000 Series Communications Control Manual.

Format Setting
Define the format of the data to be output.
When the Format Setting menu is displayed, combine the following setting items to define formats 1 to 16.
- **+/- prefix**: Use this option to add a + sign to a positive value when output.
- **Zero suppress**: Use this option to suppress leading zeros.
- **Number of digits**: Specify the number of digits (1 to 10) to use.
- **Decimal places**: Specify the number of decimal places (0 to 6) to use.

Quantity
If array data is specified, specify the number of items to be output.

Preview (only available when the [Device] selection is not [PLC-Link], [CC-Link], or [EtherNet/IP])
Check the data that will be output based on the quantity and format settings.

DM Address ([PLC-Link] only)
Displays the data memory address of the output device.

RWr Address ([CC-Link] only)
Displays the register address of the destination.

Address ([EtherNet/IP] only)
Displays the address of the output device.

Item Name ([SD Card] or [PC Program] only)
Add a identification header to the output data as desired (40 bytes maximum).

Auto ([SD Card] or [PC Program] only)
Use the definition in [Item] as the [Item Name].

Clear ([SD Card] or [PC Program] only)
Clear settings in [Item Name].

Delete

Delete the selected output item.
Select [OK] on the confirmation message.

Up/Down

Move the selected output item up/down to change the order of items being output.

Reference

You can change the order of the output data by holding down the No.1 (FUNCTION) button or No.7 Back button and then moving up or down.

► Note

Two or more output items can not be moved simultaneously.

Delimiter

Select the character to separate the output data and header from either a comma, tab, space, or none (no delimiter).

Reference

- A delimiter is not used when [Character] or [Non ASCII] is selected for [Format] (Page 4-337).
- If it is necessary to use a delimiter for [Character] or [Non ASCII], specify a delimiter (TAB, CR, LF, or CR+LF) as a separate item in the output data

Full output buffer

Specify which should have priority when the output buffer becomes full: Image processing or data output.

- **Skip output item**: Give priority to image processing and skip the current data waiting to be output.
- **Wait for free space**: Give priority to the waiting data and resume image processing after data output is complete.

Skip unexecuted items

Skip outputting data for items referencing units which were not executed. Refer to "Unit Execution" (Page 7-6) for more details on the [Never Execute] setting of a unit.

► Note

Skip unexecuted items is disabled when [PC Program] is chosen for [Device].

Save

The settings for the unit are saved in the current program file in SD Card 1 or SD Card 2.

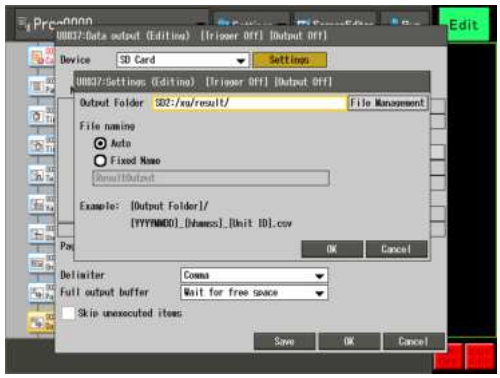
► Note

Items specified not to be saved in XG VisionEditor are excluded from the saving operation.
For example, variable values changed in the current program or the default display, and display parts, can be excluded when saving.

Settings

SD Card

If [SD Card] is chosen for [Device] in the [Data output] menu (Page 4-336), additional settings can be set for controlling the data.



Output folder

Specify the folder path to save the data to.

Reference

It is possible to change the destination folder via a command from an external device. For more details, see the explanation of OPW commands in the XG-7000 Series Communication Control Manual.

File naming rule

Choose the file naming rule for the file saved.

- **Auto** (default): Name the file as "Data output day (YYMMDD)_Time (hhmmss)_Unit ID.csv".
- **Fixed Name**: Name the file with a user-specified file name. If this option is selected, the most recent data is added to the file every time data output is repeated. If [Fixed Name] is selected, input the filename (up to 64 characters).

► Note

Illegal filename characters (such as space or period) can not be specified at the beginning of the filename.

Reference

If [Fixed Name] is selected, the file naming rule can be changed via a command. For more details, see the explanation of OW commands in the XG-7000 Series Communication Control Manual.

When [Auto] is selected, the output file is created at the time of the first trigger input after:

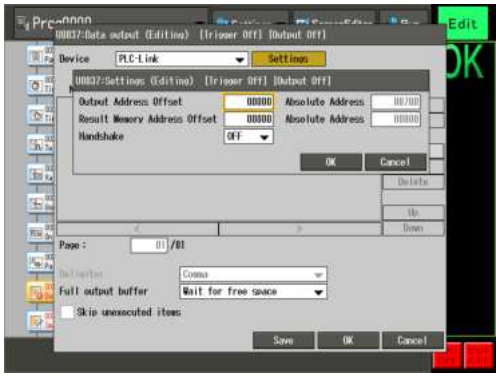
- The controller is tuned on.
- The controller is reset.
- The program No. is changed.
- The destination folder is not available at the destination.

PLC-Link

If [PLC-Link] is chosen for [Device] in the [Data output] menu (Page 4-336), additional settings can be set for controlling the data.

Reference

For more details on the PLC link, refer to "Changing the PLC-Link Settings" (Page 7-29) and "Control/Data Output via PLC-Link" in the XG-7000 Series Communication Control Manual.



Output Address Offset

Specify the offset from "Data Memory Address" (Page 7-32) for the address to output the result data to. The address to which the result data is output is displayed in the [Absolute Address] field.

► Note

If this address is the same as the output address of other data output units, the data will be overwritten.

Result Memory Address Offset

Specify the offset from "Result Memory Address (bit)" (Page 7-32) for the address to output the completion data to. The address to which the output completion data is output is displayed in the [Absolute Address] field.

► Note

If this address is the same as the output address of other data output units, the data will be overwritten.

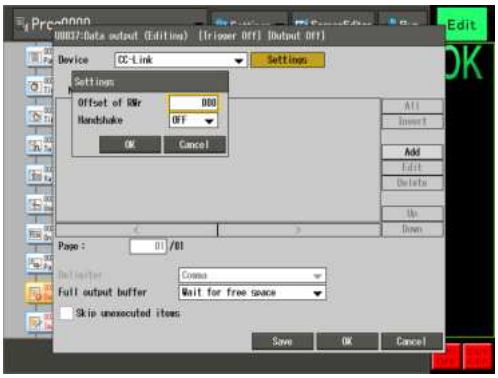
Handshake

Choose whether to use handshaking between devices before outputting result data.

- **ON**: Output result data after the handshaking process has been confirmed.
- **OFF** (Default): Output result data without using the handshaking process.

CC-Link

If [CC-Link] is chosen for [Device] in the [Data output] menu (Page 4-336), additional settings can be set for controlling the data.



Offset of RWr

Specify the offset from RWr address (RWr000) to output the result data to.

► Note

If this address is the same as the address used by the other data output units or commands used, the operation may be affected. For details, see "Control/Data Output via CC-Link" in the XG-7000 Series Communication Control Manual.

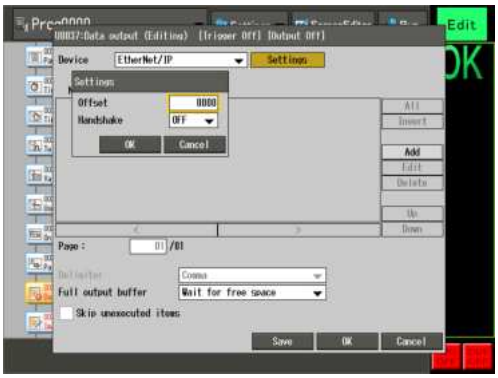
Handshake

Choose whether to use handshaking between devices before outputting result data.

- **ON**: Output result data after the handshaking process has been confirmed.
- **OFF** (Default): Output result data without using the handshaking process.

EtherNet/IP

If [EtherNet/IP] is chosen for [Device] in the Data Output menu (Page 4-336), additional settings can be set for controlling the data.



Output offset

Specify the offset value of the address to output the result data from the [Result Region Start] (Page 7-41) set in the Offline menu.

► Note

If this address is the same as the output address of another data output unit, the data will be overwritten. For details, see "Control/Data Output via EtherNet/IP" in the XG-7000 Series Communication Control Manual.

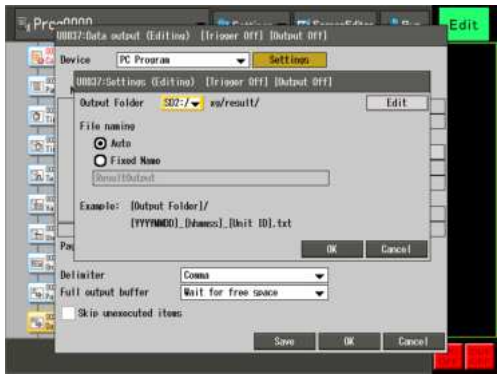
Handshake

Select whether to output result data after the output completion data is confirmed.

- **ON**: Output result data after the handshaking process has been confirmed.
- **OFF** (Default): Output result data without using the handshaking process.

PC Program

If [PC Program] is chosen for [Device] in the [Data output] menu (Page 4-336), additional settings can be set for controlling the data.



Output Folder

Specify the folder path to save the data to.

Reference

It is possible to change the destination folder via a command from an external device. For more details, see the explanation of OPW commands in the XG-7000 Series Communication Control Manual.

File naming rule

Choose the file naming rule for the file saved.

- **Auto** (default): Name the file as "Data output day (YYMMDD)_Time (hhmmss)_Unit ID.txt".
- **Fixed Name**: Name the file with a user-specified file name. If this option is selected, the most recent data is added to the file every time data output is repeated. If [Fixed Name] is selected, input the filename (up to 64 characters).

► Note

Illegal filename characters (such as space or period) can not be specified at the beginning of the filename.

Reference

If [Fixed Name] is selected, the file naming rule can be changed via a command OW command. For more details, see the explanation of OW commands in the XG-7000 Series Communication Control Manual.

Reference

When [Auto] is selected, the output file is created at the time of the first trigger input after:

- The controller is tuned on.
- The controller is reset.
- The program No. is changed.
- The destination folder is not available at the destination.

Image Output

Parameters and settings for outputting images.

Processing results

The standard results and data returned by the image output unit are as follows:

Out Buf. Space	The remaining space (0 to 100%) of the output buffer after unit execution ► Note Since the image output unit always occupies the output buffer for each unit, this value is always 0%.
Output buffer overflow	Outputs 1 when the image output unit is executed while another image from the image output unit with the same unit ID is being output through the output port. Behavior of the image output unit outputting an image, depends on the unit settings.
Data Transferred	The status of the transfer of data by the Image Output unit to the output destination can be referenced, 1 being output when the transfer has been completed and 0 if the transfer fails.

Image Output

Specify the settings for outputting images.



Image setting

Image variable

Specify the image variable to be output.

To specify an image from an array specify the index of the image.

No. Images (array)

If an image array is selected, specify the number of images to be output sequentially from the index number specified.

► Note

- If this number exceeds the number of elements of the array an error will occur.
- If the memory is insufficient specifying a number exceeding the capacity will result in an error.

File format

Choose the file format of the image to be output.

- **BMP** (default): Output the image in Windows bitmap format (24-bit color for a color camera, 8-bit grayscale for a monochrome camera).
- **BMP (1/2 Resolution)**: Shrink the image to 50% (reducing the number of pixels in the vertical and horizontal directions to half), and then output the image in Windows bitmap format (24-bit color for a color camera, 8-bit grayscale for a monochrome camera).
- **BMP (1/4 Resolution)**: Shrink the image to 25% (reducing the number of pixels to one quarter), and then output the image in Windows bitmap format (24-bit color for a color camera, 8-bit grayscale for a monochrome camera).
- **BMP (1/8 Resolution)**: Shrink the image to 12.5% (reducing the number of pixels to one eighth), and then output the image in Windows bitmap format (24-bit color for a color camera, 8-bit grayscale for a monochrome camera).
- **JPEG**: Compress and output the image in JPEG format.

Output Device Setting

Device

Choose the destination of the image output.

- **SD Card** (default): Output data to an SD card.
- **PC Program**: Output the image to the XG VisionTerminal or for use with ActiveX Control.

► Note

An output device has to be selected.

Settings

Displays detailed settings in the [Settings] menu for configuring the image output destination. See "Parameters" (Page 4-342) for more details.

Output Buffer & Memory

Full output buffer

Specify which should have priority when the output buffer becomes full: Image processing or image output.

- **Skip output item**: Give priority to image processing and skip the current image waiting to be output.
- **Wait for free space**: Give priority to image output and resume image processing after the image output is complete.

Image memory

The current image memory usage is displayed.

Save

The settings for the unit are saved in the current program file in SD Card 1 or SD Card 2.

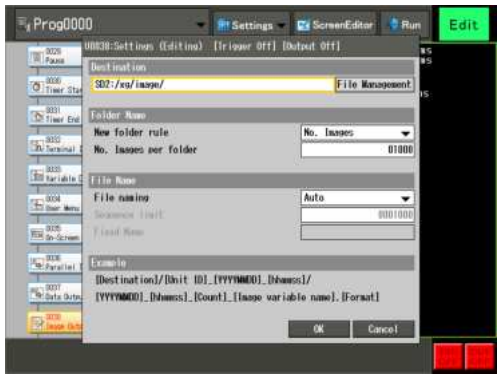
► Note

Items specified not to be saved in XG VisionEditor are excluded from the saving operation.
For example, variable values changed in the current program or the default display, and display parts, can be excluded when saving.

Parameters

SD Card

If [SD Card] is chosen for [Device] in the Image Output menu (Page 4-341), additional settings can be set for controlling the image output.



Destination

Specify the folder path to save the image to.

Reference

It is possible to change the destination folder via a command from an external device. For more details, see the explanation of OPW commands in the XG-7000 Series Communication Control Manual.

New folder rule

Specify the method and settings for creating folders to store images into.

- **None**: Save all images to the specified destination folder.
- **No. Images** (default): When image output starts, a new folder is created and named as "Unit ID_YYYYMMDD_hhmmss" in the folder specified in [Destination]. When the number of files stored in the folder exceeds the value specified in [No. Images per folder], a new folder is created and the destination of the image output changes accordingly.
- **Date**: When image output starts a new folder is created and named "Unit ID_YYYYMMDD" in the folder specified in [Destination]. Images are saved here until the data changes. When the date changes, a new folder is created and the destination of the image output changes accordingly.

Reference

When [No. Images] is selected, the output file is created at the time of the first trigger input after:

- The controller is tuned on.
- The controller is reset.
- The program No. is changed.
- The destination folder is not available at the destination.

File naming rule

Specify the file naming rules for images being output.

- **Auto** (default): Sets the filename as "Image output date (YYYYMMDD)_Time (hhmmss)_Measurement count_Image variable.Format".
- **Sequential**: Sets the filename as "Sequential number_Fixed name_Image variable.Format". Specify the maximum sequential number in the [Sequence limit] field and the name in [Fixed Name] (up to 64 characters) respectively. When the sequential number exceeds the maximum value, the number returns to 0. If [New folder rule] is set to [None] or [Date], and the value set for [No. Images] is larger than the maximum sequential number, images maybe overwritten.

► Note

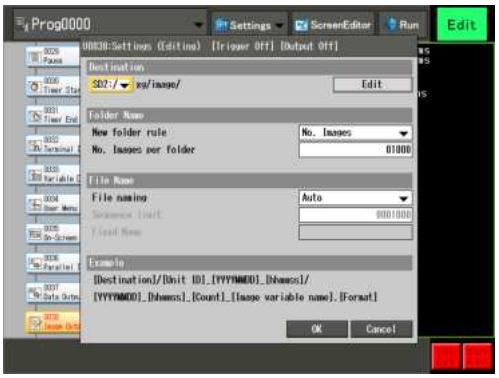
- If [Auto] is selected and the image output is repeated within 1 s, the output file is overwritten.
- If the [Sequence limit] is smaller than the value set for [No. Images] of [New folder rule], a new folder will not be created regardless of the [New folder rule] setting.

Reference

If [Sequential] is selected, the fixed name for the file naming rule can be changed via a command. For more details, see the explanation of OW commands in the XG-7000 Series Communication Control Manual.

PC Program

If [PC Program] is chosen for [Device] in the [Image output] menu (Page 4-341), additional settings can be set for controlling the image output.



Reference

Settings in the Settings menu are applied to the virtual SD drive, controlled by the PC programs XG VisionTerminal and ActiveX Control.

Destination

Specify the folder path to save the image to.

Reference

It is possible to change the destination folder via a command from an external device. For more details, see the explanation of OPW commands in the XG-7000 Series Communication Control Manual.

New folder rule

Specify the method and settings for creating folders to store images into.

- **None**: Save all images to the specified destination folder.
- **No. Images** (default): When image output starts, a new folder is created and named as "Unit ID_Date (YYYYMMDD)_Time (hhmmss)" in the folder specified in [Destination]. When the number of files stored in the folder exceeds the value specified in [No. Images per folder], a new folder is created and the destination of the image output changes accordingly.
- **Date**: When image output starts a new folder is created and named "Unit ID_Date (YYYYMMDD)" in the folder specified in [Destination]. Images are saved here until the data changes. When the date changes, a new folder is created and the destination of the image output changes accordingly.

Reference

When [No. Images] is selected, the output file is created at the time of the first trigger input after:

- The controller is tuned on.
- The controller is reset.
- The program No. is changed.
- The destination folder is not available at the destination.

File naming rule

Specify the file naming rules for images being output.

- **Auto** (default): Sets the filename as "Image output date (YYYYMMDD)_Time (hhmmss)_Measurement count_Image variable.Format".
- **Sequential**: Sets the filename as "Sequential number_Fixed name_Image variable.Format". Specify the maximum sequential number in the [Sequence limit] field and the name in [Fixed Name] (up to 64 characters) respectively. When the sequential number exceeds the maximum value, the number returns to 0. If [New folder rule] is set to [None] or [Date], and the value set for [No. Images] is larger than the maximum sequential number, images maybe overwritten.

► Note

- If [Auto] is selected and the image output is repeated within 1 s, the output file is overwritten.
- If the [Sequence limit] is smaller than the value set for [No. Images] of [New folder rule], a new folder will not be created regardless of the [New folder rule] setting.

Reference

If [Sequential] is selected, the fixed name for the file naming rule can be changed via a command. For more details, see the explanation of OW commands in the XG-7000 Series Communication Control Manual.

Command Execution

The command execution unit is used to issue commands from the flowchart to cause a controller based operation.

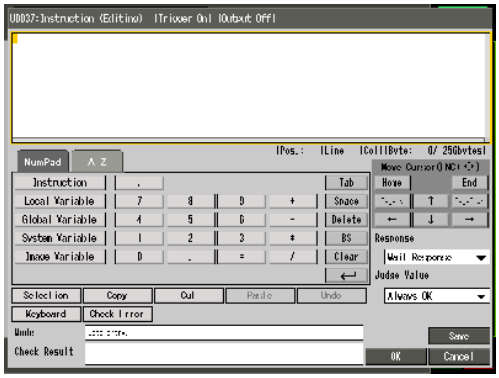
Processing results

The standard results and data returned by the command unit are as follows:

Command response	If an error occurs during processing a command, 1 is generated, all other times 0 is generated. ► Note The output is only available when [Response] is set to [Wait Response] and [Judge Value] is set to [Command Result]. When other settings are used the output is always 0.

Command

Specify the command and condition for the response.



Command

Select a command.

- A standard instruction or a user-defined custom instruction can be used. For more details, see the XG-7000 Series Communication Control Manual.
- Numerical values or variables can be specified as arguments for instructions.
- To use two or more standard instructions, separate them with a line feed.
- In a single command unit, up to 16 standard instructions or one custom instruction can be issued.
- The overall command can be a maximum of 256 characters. A line feed is counted as 2 characters.

Reference

- For details about the commands which can be used with the Command unit, see the XG-7000 Series Communications Control Manual.
- For details on custom instructions, see "List of Custom Instructions" (Page 7-48).

Instruction

Select this option to enter a standard or custom instruction. When the [Instruction] menu is displayed, select the type of instruction required. For details about the parameters that are associated with these commands, refer to the XG-7000 Series Communications Control Manual.

Local variable

Select this option to use a local variable in the command. When the [Local Variable] menu is displayed, select the local variable to be used.

Global variable

Select this option to use a global variable in the command. When the [Global Variable] menu is displayed, select the global variable to be used.

System variable

Select this option to use a system variable in the command. When the [System Variable] menu is displayed, select the system variable to be used.

Image variable

Select this option to use an image variable in the command.
When the [Image Variable] menu is displayed, select the image variable to be used.

Selection

Highlight characters to be edited by selecting the first and last characters.

Copy

Copy selected characters.

Cut

Cut selected characters.

Paste

Paste selected characters.

Undo

Undo the last operation.

Text Input

[Hiragana], [Katakana], [Alphanumeric Characters], and [Kanji] can be entered.

Check Error

Check and locate any errors. If several errors are found, the cursor moves to the first character of the error closest to the start of the command.

Wait for response

Specify whether to wait or not for the completed processing of the command unit before moving on and processing the next unit in the flowchart.

- **On** (Default): Wait for a completed response from commands in the unit before continuing to process the flowchart. Use [On] for conditional based processing and branching of the operation.
- **Off**: Continue to process units in the flowchart without waiting for a response from the command being processed.

Judge value

When [On] is set for [Wait for response] set the judgment value to be output from the command unit.

- **OK (Command Executed)** (default): Sets the judgment value of the command unit to be [OK] regardless of the result of the instruction processed.
- **Command Response**: Sets the judgment value of the command unit according to results of the actual instructions processed. Use [Command Result] for conditional processing and branching of the flowchart.

Reference

If two or more instructions are set in the command unit, they are executed in the order in which they are specified. If a command execution error occurs midstream, subsequent instructions are cancelled and the process moves to the next unit.
If the result of the command execution affects subsequent image processing, it is recommended to set [Wait for response] to [On] and [Judge Value] to [Command Response].

Save

The settings for the unit are saved in the current program file in SD Card 1 or SD Card 2.

► Note

Items specified not to be saved in XG VisionEditor are excluded from the saving operation.
For example, variable values changed in the current program or the default display, and display parts, can be excluded when saving.

Program Settings

The following settings can be changed via the [Settings] menu at the top of the program edit screen.



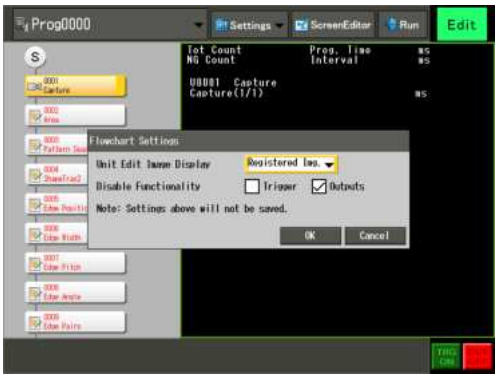
- Flowchart Settings (Page 4-347)
- Variable settings (Page 4-348)
- Total Status Output (OR and %JA_Hold) (Page 4-355)
- Total Error Output (Page 4-356)
- Scaling (Page 4-356)
- Camera Selection (Page 4-357)
- Image Capture Buffer Settings (Page 4-358)
- Statistics (Page 5-11)
- Image Archive (Page 5-20)
- FTP Settings (Page 4-359)
- Variable Update Settings (Page 5-8).
- Target Classification Settings.
- Update Registered Image Information (Page 4-359)
- Update Reference Position Information(Page 4-360)
- Lock / Unlock Groups (Page 4-360)

Controller Operation During Edit Mode (Flowchart Settings)

Set the default image used when setting up units and the trigger input / output operation.

1 from the [Settings] menu select [Flowchart Settings].

The [Flowchart Settings] menu appears.



2 Change the settings as required.

Unit Edit Image Display

In the [Unit Edit Image Display] field, switch the image to be displayed on the screen.

- **Captured Img.**: Displays the latest image from the specified camera (image variable).
- **Registered Img.**: Displays the registered image specified under [Image Selection].

Disable Functionality

- Disabling Trigger Inputs: Check [Trigger] to disable trigger inputs.
- Disabling Outputs: Check [Outputs] to disable outputs.

Reference

The I/O disable functionality is enabled when the flowchart is edited and disabled when the flowchart is closed. The setting is also disabled when [Show Flowchart] or [Hide Flowchart] is selected during the [Run] operation.

3 Click [OK].

Variable Settings (Variables)

Variables are used for referencing result data from units results or for setting parameters and controlling a units operation.

- Variables can also be used to process data between units, programs and to store calculation results.
- Variables also cover system inputs, outputs and image control in the system.

XG-7000 Series Variable Types

The following are the categories and types of variables supported by the controller along with their naming convention and processing rules.

System variable

These are pre-defined, read only variables managed by the system.

These variables include I/O and some values can be controlled through the command functions. Refer to the XG-7000 Communication Control Manual for the list of system variables provided in the controller.

User variable

These are user definable variables, divided into two categories depending on the scope of use.

- **Local Variables**: Variables that are only defined and available in the program. Up to 10000 can be defined and used.
- **Global Variables**: Variables that are defined and usable across multiple programs on a single controller. Up to 1024 can be defined and used.

Image variable

These are user definable variables for storing image data. Up to 512 image variables can be defined and used per program.

- **System image variables** (&Cam1Img to &Cam4Img): These are image variables managed by the system. A variable is pre-assigned to each camera and used in the capture unit (Page 4-17) and cleared at the start of the flowchart .
- **User image variables**: These are user managed image variables and the stored image is kept until it is overwritten or the system is reset.
  By using a user defined image variable as a result image in an image operation unit (Page 4-286) the process performed in the unit can be checked. A user defined image variable can also be used for displaying a processed image for large pixel processing inspections.

Temporary variables

A temporary variable can only be used in a calculation unit (Page 4-283), and does not require definition in the [Variables] menu. See "Operator and Function List" (Page 10-28) for more details.

► Note

- The number of variables available varies depending on the amount of resources currently used.
- The maximum number of image variables depends on the type of connected cameras set in the capture unit and the amount of free image memory. As the amount of image memory varies depending on the type of camera (color and resolution, capture range, and scanning method), changes to the type of connected camera set with the capture unit may result in an error due to insufficient image memory.
- The number of user defined image variables maybe changed through unit properties, image archive criteria, or other settings.

Types of variables

User variable

The type of user variables are as follows. All types also have the functionality to be set as an array.

Type	Naming Convention	Internal storage type
Numerical	Variable name	64-bit floating point number
Position	Variable name.X (X coordinate)	64-bit floating point number
	Variable name.Y (Y coordinate)	64-bit floating point number
Line*	Variable name.T (q)	64-bit floating point number
	Variable name.RH (r)	64-bit floating point number
Circle	Variable name.CX (center of circle X coordinate)	64-bit floating point number
	Variable name.CY (center of circle Y coordinate)	64-bit floating point number
	Variable name.CR (circle radius)	64-bit floating point number

* Line variable notation
- T(θ): The clockwise angle from the 3 o'clock direction of the line perpendicular to RH (ρ) as 0°
- RH(ρ): The length of the perpendicular line that connects the straight line from the origin (0,0).

Image Variables

Image variables are associated by camera type and image area along with connected camera number. Image variables also have the functionality to be set as an array.

Reference

The camera type information is automatically determined by the camera settings (Page 7-8).

Initial Value

- The initial value of a variables can be defined when the variable is setup.
- The initial values are stored together with all variable settings in the following files.

Type	Save location
Local variables	Program files (inspect.dat) under each program folder Saved for each program.
Global variables	Global variable files (gvar.dat) on SD1

- An initialization is performed whenever the controller is turned on, reset, or a program is switched. The initialization of a variable on a reset or program switch can be set when defining the variable.

Reference

When a program is saved, the current variable value can be copied over the initial value so when the program is used again the previous current value is used.

Variable naming rules

- A variable name can contain up to 32 alphanumeric characters (including the variable prefix).
- Variable prefixes are shown in the table below.

Variable type		Naming rule prefix
System variable		%
User variable	Local variables	#
	Global variables	$
Image variable		&
Temporary variables (used in calculation units (Page 4-283) only)		@

- Variable names are case sensitive.
- Each variable name must be unique within its scope of use.
- Symbols other than the prefix symbols and underscore (_) cannot be used.

Save location of variables

Defined variables are saved in the program file.
The save location differs for local and global variables.

Type	Save location
Local variables	Program files (inspect.dat) under each program folder Saved for each program.
Global variables	Global variable files (gvar.dat) on SD1

► Note

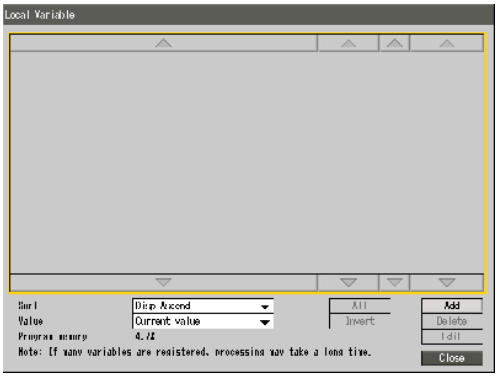
The program file name is fixed, if a inspect.dat file is renamed, the system cannot reference the file.

Defining and editing local variables

1 **From the [Settings] menu select [Variables].**
The [Variables] menu appears.



2 **Select [Local Variable] and then select [OK].**
The [Select Local Variable] menu appears.

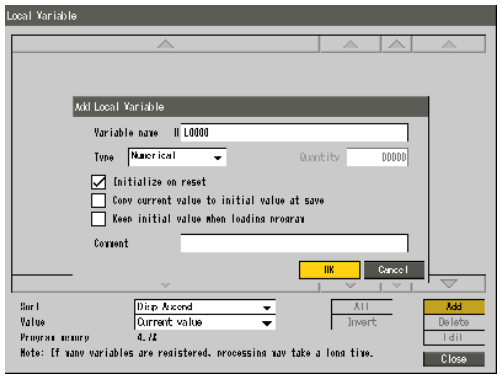


- **Sort**: Choose the order to display the local variables.
- **Value:** Choose the variable value to be displayed.
- **Program memory**: Shows the current program memory usage.

► Note

If the program memory usage exceeds 100% after defining a variable the definition is cancelled.

3 **Select [Add].**
The [Add Local Variable] menu appears.



4 **Defining a local variable.**

- **Variable name**: Specify the name of the local variable.
- **Type**: Choose the local variable type (Page 4-348).
- **Quantity**: Specify the number of elements in an array based variable.
- **Initialize on reset**: Choose whether to reset the variable value on reset. When this is checked, an initialization is performed on reset.
- **Copy current value to initial value at save**: Choose whether to copy the current value to the initial value when the program is saved. When this is checked, the initial value on the controller can be kept without being overwritten depending on the setting at the time of uploading.
- **Keep initial value when loading program**: Choose whether to keep the initial value of the variable on the controller when uploading a program from XG VisionEditor. When this is checked, the current value is copied to the initial value at save.
- **Comment**: Enter any comments (up to 64 characters) to associate with the variable. To aid developments comments are shown when variables are referenced in unit parameters and calculations (Page 4-283).

► Note

If the variable is edited and [Copy current value to initial value at save] is selected, the current value is set as the initial value.

5 **Click [OK].**

Editing a local variable

Select the local variable to edit and select [Edit].
To edit the current value or initial value, change the item shown in the [Value] field and then change the value in the right column.

► Note

Two or more variables can not be selected simultaneously.

Deleting a local variable

Select the local variable to delete and select [Delete].
Select [OK] on the confirmation message.

Reference

Two or more variables can be selected for mass deletion.

Defining and editing global variables

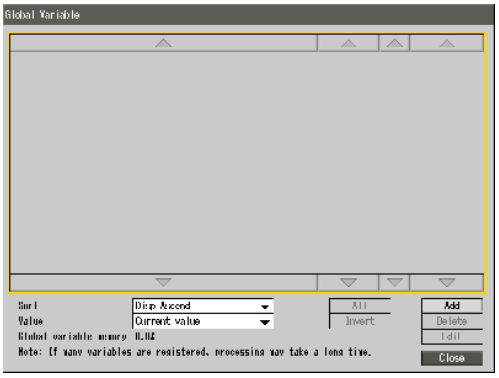
1 **From the [Settings] menu select [Variables].**

The [Variables] menu appears.



2 **Select [Global Variable] and then select [OK].**

The [Select Global Variable] menu appears.



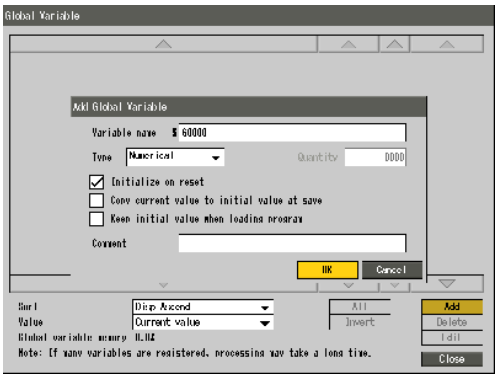
- **Sort**: Choose the order to display the global variables.
- **Value**: Choose the variable value to be displayed.
- **Global variable memory**: Shows the current global variable memory usage.

► Note

If the global variable memory usage exceeds 100% defining a variable the definition is cancelled.

3 **Select [Add].**

The [Add Global Variable] menu appears.



4 **Defining a global variable.**

- **Variable name**: Specify the name of the global variable.
- **Type**: Choose the global variable type (Page 4-348).
- **Quantity**: Specify the number of elements in an array based variable.
- **Initialize on reset**: Choose whether to reset the variable value on reset. When this is checked, an initialization is performed on reset.
- **Copy current value to initial value at save**: Choose whether to copy the current value to the initial value when the program is saved. When this is checked, the initial value on the controller can be kept without being overwritten depending on the setting at the time of uploading.
- **Keep initial value when loading program**: Choose whether to keep the initial value of the variable on the controller when uploading a program from XG VisionEditor. When this is checked, the current value is copied to the initial value at save.
- **Comment**: Enter any comments (up to 64 characters) to associate with the variable. To aid developments comments are shown when variables are referenced in unit parameters and calculations (Page 4-283).

► Note

If the variable is edited and [Copy current value to initial value at save] is selected, the current value is set as the initial value.

5 **Click [OK].**

Editing a global variable

Select the global variable to edit and select [Edit].
To edit the current value or initial value, change the item shown in the [Value] field and then change the value in the right column.

► Note

Two or more variables can not be selected simultaneously.

Deleting a global variable

Select the global variable to delete and select [Delete].
Select [OK] on the confirmation message.

Reference

Two or more variables can be selected for mass deletion.

Defining and editing image variables

► Note

In image variables, &Cam1Img to &Cam4Img are defined as system image variables by default and cannot be edited.

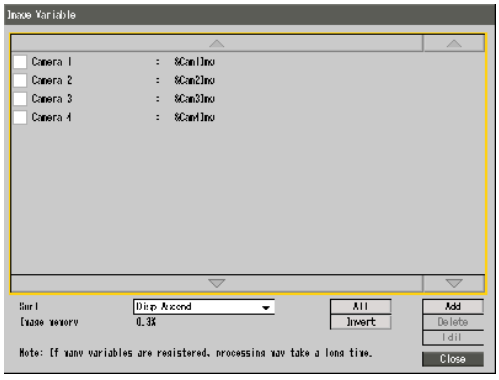
1 **From the [Settings] menu select [Variables].**

The [Variables] menu appears.



2 **Select [Image Variable] and then select [OK].**

The [Select Image Variable] menu appears.



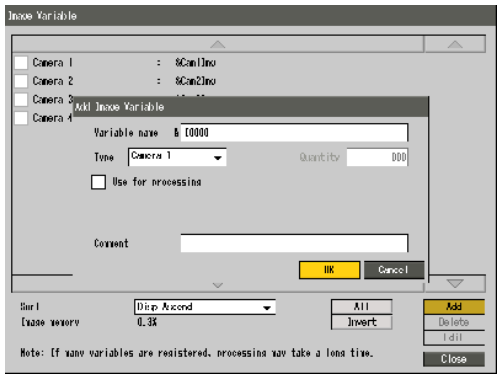
- **Sort**: Choose the order to display the image variables.
- **Image memory**: Shows the current image memory usage.

► Note

If the image memory usage exceeds 100%, after defining a variable the definition is cancelled.

3 **Select [Add].**

The [Add Image Variable] menu appears.



4 **Define an image variable as required.**

- **Variable name**: Specify the name of the image variable.
- **Type**: Choose the camera No. associated with the image variable.
- **Quantity**: Specify the number of elements in an array based variable.
- **Use for processing**: Choose whether to make this image variable available for unit processing (Image Operation, Calibration, C Plug In) or as a display image variable. Image variables can also be used for defining regions based on image data. Refer to "Generating a Region from an Image" (Page 1-30) for more details.
- **Comment**: Enter any comments (up to 64 characters) to associate with the variable. To aid development comments are shown when image variables are referenced in image operation (Page 4-286).

5 **Click [OK].**

Editing a image variable

Select the image variable to edit and select [Edit].

Deleting a image variable

Select the image variable to delete and select [Delete]. Select [OK] on the confirmation message.

Assigning variables to Parameters

If a unit has parameters which support variable referencing, a variable can be assigned to control or change the parameters externally, or to tie multiple settings to one central point.

Reference

Refer to "List of Setting Parameters" in the XG-7000 Series Communication Control Manual for more details about the parameters that can be assigned and the supported variables.

1 Select the value input field of the setting parameter to assign a variable.

2 Press the No.1 (FUNCTION) button on the handheld controller.

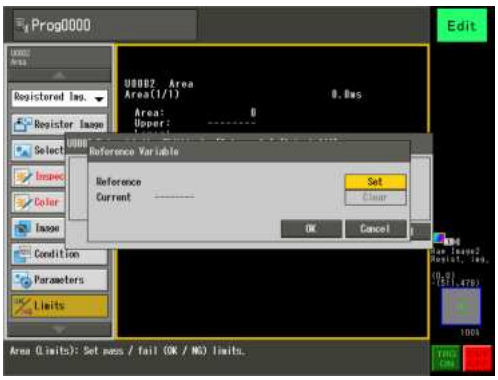
The [Edit Menu] is displayed.

Example: Using a variable for the [Upper] limit of an area inspection



3 Select [Data Reference].

The [Data Reference] menu appears.



Reference

The Data Reference menu can be also be displayed by pressing the No.7 button or No.1 + No.0 buttons.

4 Select [Set].

5 Choose the type of variable to assign and then select [OK].

6 Select the variable to assign.

Notes on assigning variables to setting parameters

Each parameter has a set input range, if the value of the variable is invalid, an error will occur in the processing of that unit.

Reference

For the lists of parameters, input ranges, and other details, refer to "List of Parameters" in the XG-7000 Series Communications Control Manual.

Canceling the variable assignment

Select [Clear] in the [Data Reference] menu.

Reference

If the assignment is canceled, the definition of the variable is not deleted.

Assigning an image variable

An image variable can be assigned to the current image of a unit and used as a reference for image processing or image display.

Reference

The image variable can only be used to store image data from the capture, image operation and calibration units. To set an image variable to store a captured image from the capture unit, refer to the capture unit section (Page 4-17). To set an image variable as a result image from the image operation unit, refer to the image operation unit section (Page 4-286).

Assigning image variables

To reference an image variable, assign it to the [Current Image] field in the [Select Image] menu of the unit.

► Note

A blank image variable assignment will result in a setting error.

Reference

Units which support the assignment of image variables are limited to the vision tools, on-screen graphics, image operation, and position adjustment units.

1 **Open the [Select Image] menu for the unit.**
[&Cam1Img] (the system image variable used for captured images from Camera1) is assigned to the current image by default.

2 **To change the image variable, choose the image variable which contains the desired image.**
The image display, camera No., number of colors, and number of pixels for [Source Image Information] are updated based on information of the image variable.

Notes on changing the image variable assignment

Changing the image variable may reset some settings of the unit and result in errors. After changing the image variable, confirm that there are no errors.

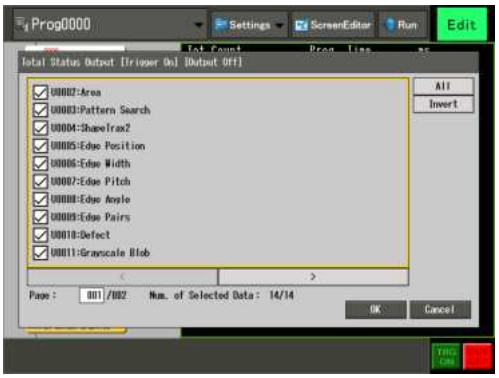
Reference

If no capture units in the flowchart are used to assign an image to an image variable, processing is performed using a black image.

Total Status Output (OR and %JA_Hold)

Choose the units to be associated with the total status output (%JgAll and %JAHold).

1 **From the [Settings] menu select [Total Status Output (OR and %JA_Hold)].**
The [Total Status Output] menu appears.



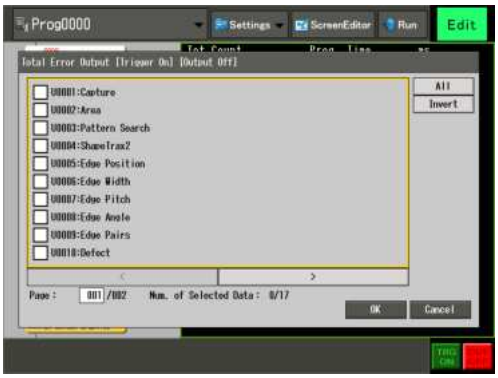
2 **Select the unit or units to be used by checking the box of each unit.**
The logical sum (OR function) of the judgment values of the selected units are used as the result for %JgAll and %JAHold.

3 **Click [OK].**

Total Error Output Unit

Choose the units to be associated with the total error output (%UnitError).

1 **From the [Settings] menu select [Total Error Output].**
The [Total Error Output] menu appears.



2 **Select the unit or units to be used by checking the box of each unit.**
The logical sum (OR function) of the errors of the selected units are used as the result for %UnitError.

3 **Click [OK].**

Scaling

Specify the scale factors to be used for each camera.

1 **From the [Settings] menu select [Scaling].**
The [Setup Scale Factor] menu appears.



2 **Specify the scale factor that can be used for measurement data from the vision tool units.**

X
Input the scale factor to be applied in the X direction.

Y
Input the scale factor to be applied in the Y direction.

Length
Input the scale factor to be applied for length measurements.

Reference
For more details on the result data for which scaling can be used refer to "List of Result Data" in the XG-7000 Series Communication Control Manual.

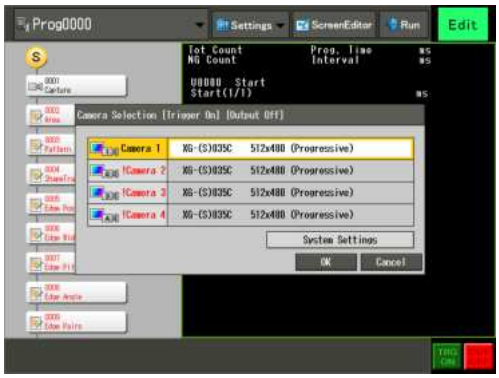
3 **Click [OK].**

Camera Selection

Choose the model and specifications for the camera connected to the controller.

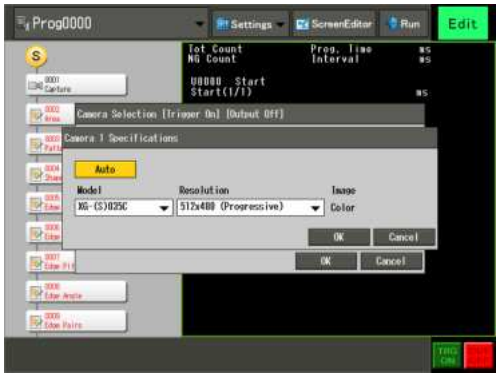
1 From the [Settings] menu select [Camera Selection].

The [Camera Selection] menu appears.



2 Select the camera No. ([Camera1] to [Camera4]) to be set.

The settings screen for the selected camera appears.



3 Choose the model of the connected camera.

- The camera connection will be configured according to the color/monochrome selection and resolution.
- If the connected camera is any of XG-200C/200M/S200C/S200M/H200C/H200M: the resolution can be set to [1600 × 1200] or [1024 × 960].
- If the connected camera is any of XG-035C/035M/S035C/S035M/H035C/H035M, the resolution can be set to [640 × 480] or [512 × 480].

For analog cameras

- If an analog camera is connected, select the manufacturer of the camera connected to the terminal in step 1.
- Depending on the camera the number of pixels in the imaging region and the scanning method can also be set.
- If the camera settings for an analog camera are modified, the controller needs to be restarted for changes to take effect. Note, some changes may also require you to change the DIPP switches on the camera. For more details, refer to "Changing the DIP switches on an analog camera" (Page 2-9), or contact Keyence directly.

Reference

- Selecting [Auto] with a digital camera connected will automatically detect and set the connected camera.
- For more details on analog camera models, refer to "Cameras (CA-CM20: for XG-7002A)" (Page 9-14).

4 Change the camera settings, then click [OK].

► Note

- Connect the camera before turning on the controller.
- When using analog cameras, the same model has to be set for all cameras 1 through 4.
- If the selected camera uses a non-square CCD, the aspect ratio of the captured image will be incorrect. Measurements and inspections will also potentially be incorrect due to this incorrect CCD ratio. For details on the CCD types used in your camera, refer to the instruction manual provided with the camera.
- For details on the CCD types used in your camera, refer to the instruction manual provided with the camera.
- When the model or resolution is changed, operation stops, and all image variables, archived data, and the image buffer are cleared.

Image Capture Buffer Settings

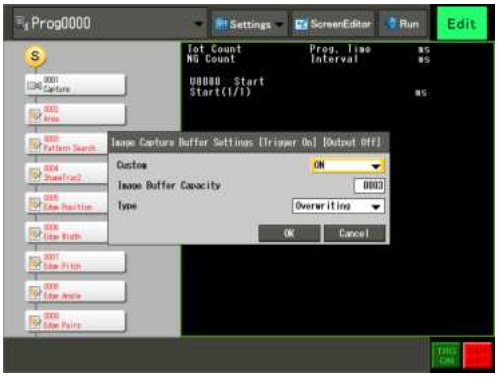
Set the image capture buffer according to the application speed and processing requirements.

Reference

- The image capture buffer settings are common for all capture units in the flowchart.
- For details about the image capture buffer, see the XG-7000 Series Communication Control Manual.

1 From the [Settings] menu select [Image Capture Buffer Settings].

The [Image Capture Buffer Settings] menu appears.



2 Set options for the image capture buffer operation.

Custom

- **ON** (default): Use the image capture buffer and allocate image memory for storing multiple images.
- **OFF**: Do not use the image capture buffer.

Note

- If there is insufficient image memory errors will occur.
- The image capture buffer cannot be used in combination with HDR capture (Page 4-21).

Image Buffer Capacity

Specify the number of images to be stored in the buffer between 1 to 1024 (Default: 1). The number of images that can be stored depends on the type and number of cameras used and the amount of free image memory.

Type

Choose how the buffer handles images when full.

- **Fixed** (Default): When the buffer is full with unprocessed images additional captured images are ignored.
- **Overwriting**: When the buffer is full with unprocessed images additional captured images overwrite existing images starting at the oldest unprocessed image.

3 Click [OK].

Note

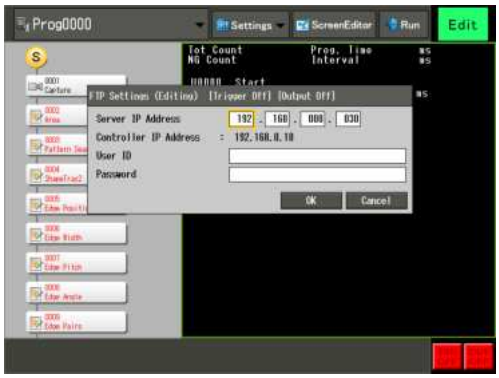
- The image capture buffer memory is reserved for each camera.
- The capture unit processes the oldest unprocessed image in the image capture buffer allocating it to the assigned image variable. If several capture units are used, multiple images can be captured with a variety of different settings.
- When the type is changed, operation stops, and all image variables, archived data, the output buffer, and target classification results are cleared.
- When continuous capture is set with a line scan camera, the buffer operation mode requires overwriting buffer and capacity of 3 or more is required.

FTP Settings

When using [FTP] for outputting archived information "Output Location" (Page 5-21) set the FTP server settings.

1 **From the [Settings] menu select [FTP Settings].**
A confirmation screen appears.

2 **Select [Edit].**
The FTP Server Settings menu appears.



3 **Input the FTP server details.**

Server IP Address
Specify the IP address of the FTP server to output the data to.

► Note
The IP address must be different from the controller's IP address.

Controller IP Address
The current IP address of the controller is displayed.

User ID
Input the user name for logging into the FTP server (up to 32 characters).

Password
Input the password for logging into the FTP server (up to 32 characters).

► Note
The folder for storing the archived data depends on the FTP server settings.

4 **Click [OK].**

Update Registered Image Information

Registered image information used by multiple pattern search and or image operation units can be registered/ updated simultaneously. If several units in a program use registered image information, this eliminates the need to change each individual set of settings.

1 **From the [Settings] menu select [Update Registered Image Information].**
A confirmation screen appears.



2 **Click [OK].**
The registered image information is registered to all relevant units simultaneously.

3 **Click [Close].**

Update Reference Position Information

Positioning information for position adjustment units in a program can be registered/updated simultaneously. If there are several position adjustment units in a program, this eliminates the need to change each individual set of settings.

1 **From the [Settings] menu select [Update Reference Position Information].**
A confirmation screen appears.



2 **Click [OK].**
Positioning information is updated for all position adjustment units simultaneously.

3 **Click [Close].**

► Note

- If there are no position adjustment units that allow the updating of the base position, a message "There are no units to be updated." appears and the settings are not updated.
- Using [Update Reference Position Information] under these circumstances may result in an inaccurate position adjustment when:
  - the inspection region for a unit that affects position adjustment uses the current image.
  - the unit that is referenced by a position adjustment has not been registered with an appropriate registered image. Make sure to save the settings before turning off the controller.

Lock / Unlock Group-Lock

If a group has been locked via XG VisionEditor the group can be unlocked edited and locked again.

► Note

If the "allow editing on the controller" option has not been set via XG Vision Editor [Lock Group Lock] and [Unlock Group Lock] are not displayed.

Unlocking a group

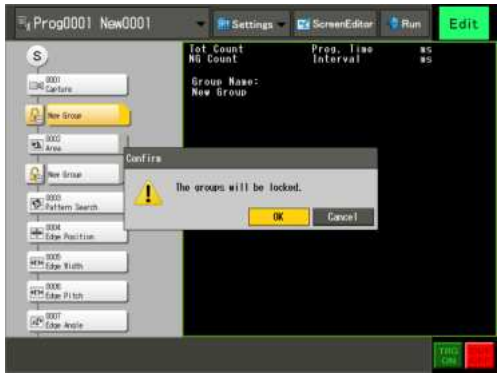
1 **From the [Settings] menu select [Unlock Group Lock].**
The [Unlock Group-Lock] menu appears.



2 **Input the password and then select [OK].**
If the password is correct, the group is unlocked.

Locking a group

1 **From the [Setting] menu select [Lock Group Lock].**
A confirmation screen appears.



2 **Click [OK].**
The group is locked.

Program File Management

Changing Programs

► Note

- Changing the program will stop the inspection in progress and clear all archive and statistics data in the controller's memory. Any unsaved variables being used in the current program will also be cleared and returned to their initial values.
- If data is being output (terminal I/O, data output, image output) when the request to change programs is made the program change is not completed until the data output is finished. Depending on the data being output the output, the program changeover could take up to a minute. During this time, the controller will be inoperable. For more details, refer to "Output Units" in the XG VisionEditor Reference Manual (Programming Edition).
- During the program change, the controller will read from and write to the SD card where the program data is stored. The flash memory used as in the SD card has a read/write life. Corruption and or loss of data may result if programs are frequently changed. It is strongly recommended that data stored on the SD card is backed up regularly to other storage media.

1 Select [Program No.]



Reference

- The icon to the left of the program indicates the program is stored on either SD Card 1 or SD Card 2.
- A maximum of 1000 programs (0000 to 0999) can be stored each on SD card 1 and SD card 2. The number of programs varies depending on the capacity of the SD card where the programs are stored.

2 Select [Change Programs].

The [Change Programs] menu appears.

3 Select the desired program No. from the menu and then select [OK].

The controller changes to the selected program.

Reference

Program changes can also be made via an external command.

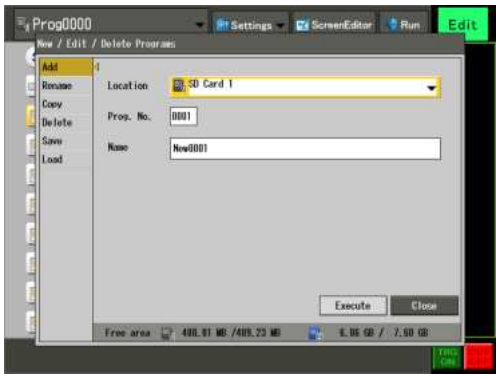
Adding a New Program

New programs for new inspections can be easily added as required.

1 From the [Program No.] menu select [New/Edit/Del Programs].

The [New/Edit/Delete Programs] menu appears.

2 Select [Add].



3 To add a program to SD Card 2, change the default selection in the [Location] field from [SD Card 1] to [SD Card 2].

Reference

[Location] cannot be set to SD Card 2 if no SD card exists. When adding a Program No. to SD Card 2, be sure to first insert the SD card into the SD2 slot.

4 Select [Prog. No.] and specify the program number for the program.

The name of the newly created program defaults to "New****", where **** represents the program number.

► Note

A Program No. that is already being used cannot be specified.

5 Select [Name].

The [Program Name] menu appears.

6 Input the program name and select [OK].

Refer to "Entering Characters" (Page 3-8) for more details on inputting characters.

7 **Click [Execute].**
The Program is added and the system is switched to that program.

Reference

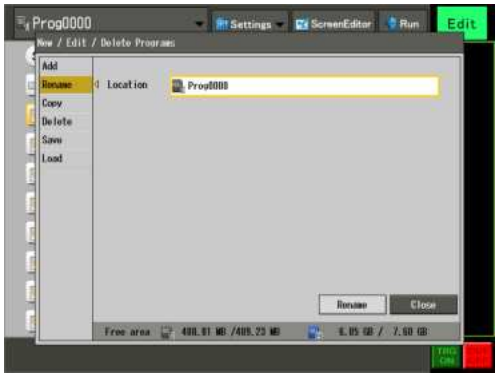
- Selecting [Close] will cancel the creation of a new program.
- The available free area on each SD card is displayed at the bottom of the [New/Edit/Delete Program] menu as "Free area/ total area in SD Card 1" and "Free area/total area in SD Card 2".

Renaming a Program

Programs can be renamed for easy identification.

1 **From the [Program No.] menu select [New/Edit/Del Programs].**
The [New/Edit/Delete Programs] menu appears.

2 **Select [Rename].**



3 **Select the program to change its name and select [Rename].**
The [Program Name] menu appears.

4 **Input a new name for the program and then select [OK].**
Refer to "Entering Characters" (Page 3-8) for more details on inputting characters.

5 **Click [Close].**
The program name is changed.

Copying/Deleting a Program

Copying a program

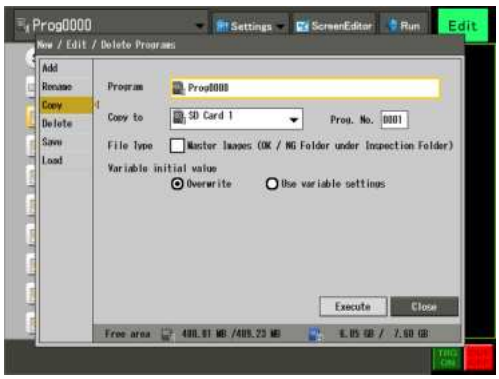
All the settings contained under one program can be copied across to another program.

► Note

- When a program is copied, the previous settings in the destination program will be overwritten with the settings of the source program.
- When using a program stored in SD Card 2 as the source or destination for copying, make sure an SD card is in slot 2 beforehand.
- Copies cannot be made if the copy destination has insufficient space to store the program.

1 **From the [Program No.] menu select [New/Edit/Del Programs].**
The [New/Edit/Delete Programs] menu appears.

2 **Click [Copy].**



3 **Select [Program] and choose the source program.**

4 **Select [Copy to] and choose the location and program number.**

5 **To include the master images (re-test mode), check the [Master (OK / NG Folder under Inspection Folder)] box.**

6 **If necessary, choose how the copying / overwriting of variables should be handled.**

- **Overwrite** (Default): Overwrite the initial value of the variables with the values in the source program.
- **Use variable settings**: Do not overwrite the initial value of the variables that have [Keep initial value when loading program] selected. The variable settings are also copied across to the destination program.

Reference

For more details on keeping initial values of the variables, refer to the XG VisionEditor Reference Manual (Programming Edition).

7 **Click [Execute].**
After copying is complete, "File(s) copied" is displayed.

Reference

If the selected program number already exists in the destination location, conformation is required to overwrite the program.

8 **Click [Close].**
To exit the copying menu, select [Close].

Deleting a program

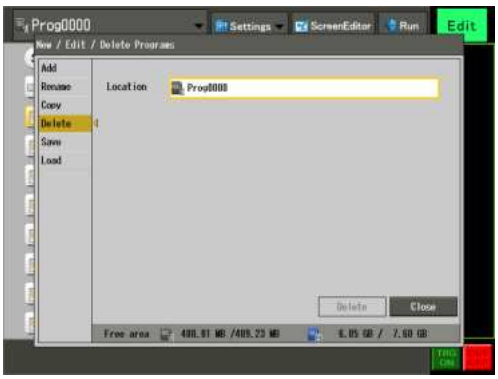
Existing programs can be deleted.

► Note

If a program is deleted, all related settings (such as units, local variables etc) are also deleted.

1 **From the [Program No.] menu select [New/Edit/Del Programs].**
The [New/Edit/Delete Programs] menu appears.

2 **Click [Delete].**



3 **Select [Location], and then select a program to delete.**

4 **Click [Delete].**
A confirmation screen appears.

5 **Click [OK].**
The program selected in step 3 is deleted.

6 **Click [Close].**

Saving/Loading Programs

Saving individual program settings

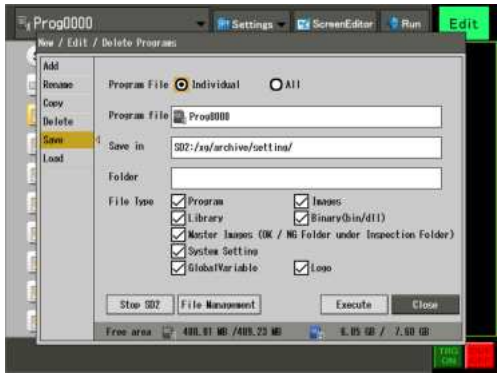
Choose what settings and image data for a specified program to be saved.

► Note

The following operations cannot be performed if an appropriate SD card is not inserted.

1 **From the [Program No.] menu select [New/Edit/Del Programs].**
The [New/Edit/Delete Programs] menu appears.

2 **Click [Save].**



3 **Choose [Individual] for [Program File].**

4 **Select [Program file] and choose the program to save.**

5 **Under [File Type], check the files / settings to be saved.**

- **Program**: Save the program data from the selected program.
- **Images**: Save the image data from the selected program.
- **Library**: Save the library data from the selected program.
- **Binary(bin/dll)**: Save the bin/dll files from the selected program.
- **Master Image**: Save the OK and NG master images that are contained in the selected program.
- **System Setting**: Save the system setting data.
- **Global Variable**: Save the global variable settings.
- **Logo**: Save the logo image files.

Reference

For more details on the global variable files and logo image files, refer to the XG VisionEditor Reference Manual (Programming Edition).

6 **Select [Save in] and specify where to save the data.**
Specify a folder, (if necessary), where the controller manages all program files.

► Note

Folders under "SD1:/xg/setting" and "SD2:/xg/setting" cannot be used as the [Save in] location.

7 **Select [Folder] and specify the folder to which the data will be saved.**

8 **Click [Execute].**
The controller starts saving the selected program files / settings.
When the settings have been saved, a confirmation screen appears.

9 **Click [Close].**

Reference

The available free area on each SD card is displayed at the bottom of the [New/Edit/Delete Program] menu as "Free area/total area in SD Card 1" and "Free area/total area in SD Card 2".

Saving all program settings

Choose what settings and image data to be saved for all programs.

► Note

The following operations cannot be performed if an appropriate SD card is not inserted.

1 **From the [Program No.] menu select [New/Edit/Del Programs].**
The [New/Edit/Delete Programs] menu appears.

2 **Click [Save].**



3 **Choose [All] for [Program File].**

4 **Select [Program file] and choose the location for all the programs.**
- **SD Card 1**: Save all program settings stored on SD Card 1.
- **SD Card 2**: Save all program settings stored on SD Card 2.

5 **Under [File Type], check the files / settings to be saved.**
- **Program**: Save the program data from the location specified in [Program file].
- **Image**: Save the image data from the location specified in [Program file].
- **Library**: Save the library data from the location specified in [Program file].
- **Binary(bin/dll)**: Save the bin/dll files from the location specified in [Program file].
- **System Setting**: Save the system setting data.
- **Global Variable**: Save the global variable settings.
- **Logo**: Save the logo image files.
- **Master Image**: Save the OK and NG master images from the location specified in [Program file].

Reference

For more details on the global variable files and logo image files, refer to the XG VisionEditor Reference Manual (Programming Edition).

6 **Select [Save in] and specify where to save the data.**
Specify a folder, (if necessary), where the controller manages all program files.

► Note
Folders under "SD1:/xg/setting" and "SD2:/xg/setting" cannot be used as the [Save in] location.

7 **Select [Folder] and specify the folder to which the data will be saved.**

8 **Click [Execute].**
When the settings have been saved, a confirmation screen appears.

9 **Click [Close].**

Reference
The available free area on each SD card is displayed at the bottom of the [New/Edit/Delete Program] menu as "Free area/total area in SD Card 1" and "Free area/total area in SD Card 2".

Loading individual programs

Load program settings and image data saved in a folder on an SD card into a specified program.

► Note
The following operations cannot be performed if an appropriate SD card is not inserted.

1 **From the [Program No.] menu select [New/Edit/Del Programs].**
The [New/Edit/Delete Programs] menu appears.

2 **Select [Load].**



3 **Choose [Individual] for [Program File].**

4 **Select [Load from] and specify the location of the desired files.**
Specify a folder, (if necessary), where the program is stored.

► Note
Folders under "SD1:/xg/setting" and "SD2:/xg/setting" cannot be used as the [Load from] location.

Reference
Folders which contain program files / settings are shown by the following icons: (when the folder is not selected) and (when the folder is selected).

5 **Under [File Type], check the files / settings to be loaded.**
- **Program**: Load the program data.
- **Image**: Load the image data.
- **Library**: Load the library data.
- **Binary(bin/dll)**: Load the bin/dll files.
- **Master Image**: Load the OK master images and NG master images.

6 **Select [Copy to] and choose where to load the data.**

- **SD Card 1**: Load the data to SD Card 1.
- **SD Card 2**: Load the data to SD Card 2.

7 **Select [Prog. No.] and then choose the program number to load the data to.**

8 **If necessary, choose how the copying / overwriting of variables should be handled.**

Choose how the copying and overwriting of variables with same name in both the [Load from] and [Save in] locations are handled.

- **Overwrite (Default):** Overwrite the initial value of the variables with the values in the source program. Use variable settings:
- **Use variable settings:** Do not overwrite the initial value of the variables that have [Keep initial value when loading program] selected. The variable settings are also copied across to the destination program.

Reference

For more details on initial values and settings of the variables, refer to the XG VisionEditor Reference Manual (Programming Edition).

9 **Click [Execute].**

The controller loads the selected files / settings. When loading operation is completed, a confirmation screen appears.

10 **Click [Close].**

Reference

The available free area on each SD card is displayed at the bottom of the [New/Edit/Delete Program] menu as "Free area/total area in SD Card 1" and "Free area/total area in SD Card 2".

Loading all program and system settings

Load program settings, image data, and system settings for all programs from an SD card.

► Note

- The following operations cannot be performed if an appropriate SD card is not inserted.
- This operation overwrites all the existing program settings and system settings. Save the current program settings and system settings to an SD card or other media before performing this operation.

1 **From the [Program No.] menu select [New/Edit/Del Programs].**

The [New/Edit/Delete Programs] menu appears.

2 **Select [Load].**



3 **Choose [All] for [Program File].**

4 **Select [Load from] and specify the location of the desired files.**

Specify a folder, (if necessary), where the files are stored.

► Note

- Folders under "SD1:/xg/setting" and "SD2:/xg/setting" cannot be used as the [Load from] location.
- The load operation cannot be performed if the folder above the folder with the program files / settings is not specified properly.

Reference

Folders which contain program files / settings are shown by the following icons: (when the folder is not selected) and (when the folder is selected).

5 **Under [File Type], check the files / settings to be loaded.**

- **Program**: Load the program data.
- **Image**: Load the image data.
- **Library**: Load the library data.
- **Binary(bin/dll)**: Load the bin/dll files.
- **System Setting**: Load the system setting data.
- **Global Variable**: Load the global variable setting data.
- **Logo**: Load the logo image files.
- **Master Image**: Load the OK master images and NG master images.

Reference

For more details on the global variable files and logo image files, refer to the XG VisionEditor Reference Manual (Programming Edition).

6 **Select [Copy to] and choose where to load the data.**

- **SD Card 1**: Load the data to SD Card 1.
- **SD Card 2**: Load the data to SD Card 2.

7 **If necessary, choose how the copying / overwriting of variables should be handled.**

Choose how the copying and overwriting of variables with same name in both the [Load from] and [Save in] locations are handled.

- **Overwrite (Default):** Overwrite the initial value of the variables with the values in the source program. Use variable settings:
- **Use variable settings:** Do not overwrite the initial value of the variables that have [Keep initial value when loading program] selected. The variable settings are also copied across to the destination program.

Reference

For more details on initial values and settings of the variables, refer to the XG VisionEditor Reference Manual (Programming Edition).

8 **Click [Execute].**

The controller loads the selected files / settings. When loading operation is completed, a confirmation screen appears.

Reference

If [Global Setting] or [Global Variable] is checked for [File Type], the system setting data and global variable settings are not applied until the controller is restarted. The controller can be restarted by selecting [Restart now] from the confirmation menu.

9 **Click [Close].**

Reference

The available free area on each SD card is displayed at the bottom of the [New/Edit/Delete Program] menu as "Free area/total area in SD Card 1" and "Free area/total area in SD Card 2".

Chapter 5

Using Functions During Operation

Features Available in Run Mode

This section explains the various functions available during Run mode.

- Starting/Ending Inspections: Performing inspection in Run Mode. (Page 5-2).
- Built-in Functions (Page 5-4)
- Changing Programs (Page 5-6)
- Changing a Variable Value (Variable Update) (Page 5-8)
- Statistics (Page 5-11)
- Image Archive (Page 5-19)
- Using Inspection Results for Retesting (Page 5-26)
- Classifying Detected Targets by Feature (Target Classification).
- Viewing a Graph of the Scan Camera Capture Conditions (Graph Viewer)
- SD Card File Management (Page 5-41)
- Verifying the Connection Status of Input and Output Terminals (Page 5-41)
- Verifying the Status of RS-232C Communication (Page 5-42)
- Changing the Login User (Page 5-43)
- Logging Handheld Controller Operations (Page 5-44)
- Setting the Clock (Date & Time) (Page 5-45)
- Saving settings (Page 5-46)

Reference

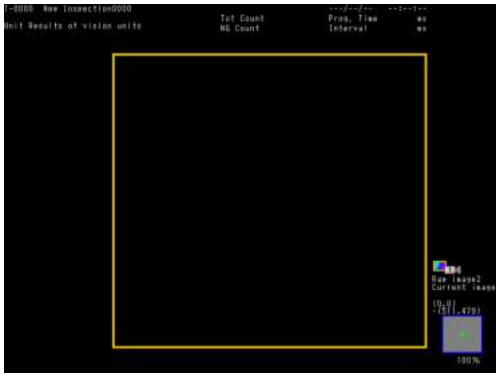
For details on how to select and use items or how to enter numerical values and characters, refer to "Basic System Operation" (Page 3-7).

Starting/Ending Inspections

Running Inspections

1 **Turn on the controller**

The controller displays the startup screen, and automatically loads the last saved program file (Page 5-46), ready to start performing inspections in Run mode.



Reference

The controller may be configured to display a modified startup screen or to startup in a different mode.

If the program cannot be loaded

If the specified program file cannot be loaded from the SD card, the controller will display an error message and default to Offline mode. Click [Close] on the error screen and choose an option from the following menu.

- **Create a new program**: To create a new program.
- **Go Offline**: Switch to offline mode and show the system configuration menu (Page 7-1).
- **Change Programs**: Change to a different program and go to Run mode.

► Note

Under default settings, the initial startup menu will appear if button No.1 (FUNCTION) is held down while the controller is started up. Refer to the setup manual for more details.

2 **If using an external trigger, input trigger signals.**

This starts capture and image processing.

Reference

Depending on settings, the controller may be configured to start capturing and processing images as soon as it is placed in Run mode without the need of an external trigger.

Loading a different program file immediately after turning power ON

The program file loaded when the system is turned on is either the last saved program, or the startup program number specified in XG VisionEditor. To load a different program, switch to that desired program (Page 5-6), save it and then cycle power.

Reference

The file does not need to be saved if the program is being changed by the handheld controller.

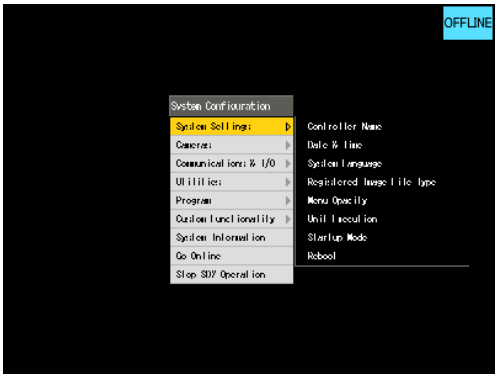
Stopping / Ending Inspections

Stopping Inspections

Switching to Offline mode stops the current inspection and displays the System Configuration menu (Page 7-1).

From the Function menu select [Go Offline] (Page 5-4).

The System Configuration menu appears.



When the controller goes offline

- Inspections in Run mode stop.
- Data for the last inspection cycle in progress when the controller is switched is processed and output before going to offline mode.

Resuming Inspections

From the System Configuration menu select [Go Online (run)] (Page 7-1).

The controller will resume inspections using the last program file when the controller was switched to offline.

► Note

If the controller cannot find this program file, it will display the Start menu for creating a new or choosing a different program.

Ending inspections

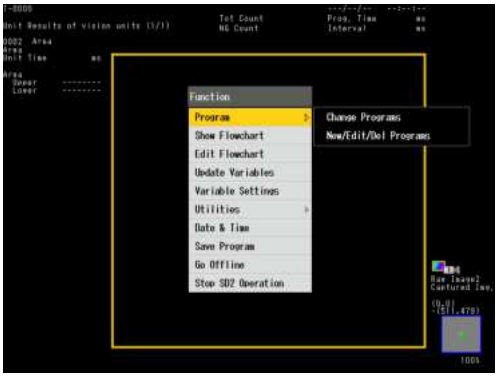
Turn off the controller.

► Note

Turning off the controller while it is accessing an SD card may damage and or corrupt the data of the SD card.

Built-in Functions

The function menu provides access to built in functions of the system. Press the No.1 (FUNCTION) button on the handheld controller to display the function menu.



Reference

- Some or all function menu operations may be limited by the logged in users account settings (Page 5-43).
- The function menu is not available in Offline or Remote capture mode (Page 3-4).

To close the function menu

Press the No.1 (FUNCTION) button or the No.2 (ESCAPE) button.

Function Menu Options

► Note

The function menu displays different items based on the operating mode of the controller and items currently selected. Some items may not be displayed based off the user account settings.

Program

- **Change Programs**: Provides the opportunity to change the program currently running to a user specified program stored on the controller's SD card (Page 5-6).
- **New/Edit/Del Programs:** Displays the [New/Edit/Del Programs] menu for creating, renaming, loading and saving programs. See "Program File Management" (Page 4-361) for more details.
- **Rename Program**: Change the name of a program. Refer to "Renaming a Program" (Page 4-362) for more details.
- **Copy/Delete Programs**: Copy or delete a program. Refer to "Copying/Deleting a Program" (Page 4-363) for more details.
- **Save/Load Programs**: Saves or loads a program. Refer to "Saving/Loading Programs" (Page 4-364) for more details.

Show/Hide Flowchart

Displays/hides the flowchart while in Run Mode.
Refer to "Showing/hiding a flowchart" (Page 4-2) for more details.

Edit Flowchart/Finish Editing

Enters/Exits the flow editor (Edit Mode). Refer to "Creating and Editing Flowcharts" (Page 4-1) for more details.

Edit Unit

This command opens the unit properties menu. Refer to "What is the Edit Unit menu?" (Page 4-8) for more details.

Update Variables
The variables selected in [Variable Update Settings] can be changed. Refer to "Changing a Variable Value (Variable Update)" (Page 5-8) for more details.

Reference

The displayed variable name can be changed using [Variable Update Settings] (Page 5-9).

Variables
Displays the [Variables] menu used to define and configure variables. See "Variable Settings (Variables)" (Page 4-348) for more details.

Utility
- **Statistics**: Displays the [Statistics] results menu, which shows measurement results as statistical data using trend graphs, histograms, and other display formats (Page 5-11).
- **Image Archive**: Displays the Image Archive menu, which can be used to check captured images from the inspection process (Page 5-19).
- **Retest**: Displays the Image Strip which shows thumbnails of the selected archived images that have been previously stored. Retest mode is initiated when an image is selected (Page 5-26).
- **File Management**: Displays the File Management menu, which can be used to view, verify and format files on the SD cards used in the controller (Page 5-35).
- **I/O Monitor & Diagnostics**: Displays the I/O Monitor & Diagnostics screen, which can be used to check the real time status of terminal inputs and outputs on the controller (Page 5-41).
- **RS-232C Monitor**: Displays the RS-232C Monitor screen, which can be used to check the real time status of the RS-232C port data on the controller (Page 5-42).
- **Change Login User**: Allows the logged in user to be changed (Page 5-43).
- **Modification Log (start/stop)**: Starts/stops logging of operations performed with the handheld controller (Page 5-44).
- **Resources**: Displays the amount of memory (program, image, and processing memory) used by the controller.

Date/Time
Reset the date and time of the controller's internal clock (Page 5-45).

Save program
Saves the current program (Page 5-46).

Go Offline
Switches to Offline mode (Page 7-1).

Stop SD Card 2 Operation
Stops all SD Card 2 operation so that it can be safely ejected.

Changing Programs

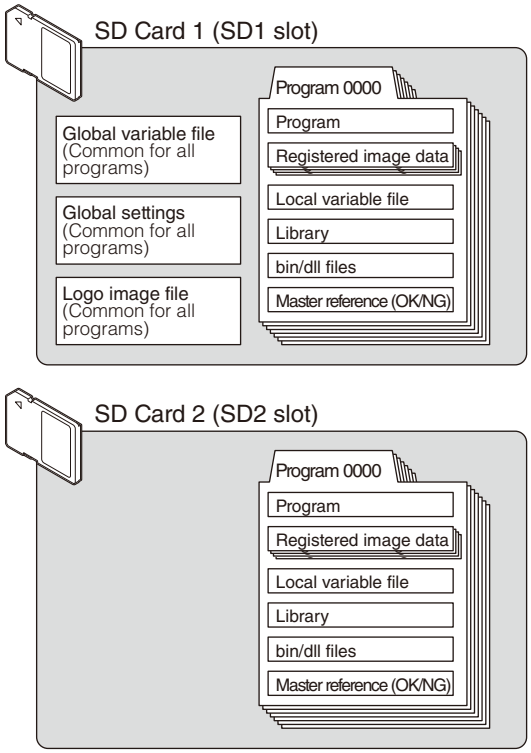
This function allows the change of the running program to a different user specified program stored on an SD card in the controller.

What is a Program?

All the settings required for an inspection including camera settings, inspection regions, limits etc. are grouped together in one entity in the controller called a program. This helps by making the organization of everything very easy so that switching programs or performing product changeovers is a simple process.

Data storage on the controller

Each program in the controller is managed and saved in a folder as a group files. This includes the individual program used for image processing, image data, library data, image data, variables and other files.



► Note

- SD Card 1 and 2 can individually manage up to 1000 programs from 0000 to 0999, where as the actual number of programs that can be stored depends on the available space of the SD card.
- Removing SD Card 1 will remove the system settings file and prevent the controller from operating properly.
- Make sure SD Card 1 is inserted when using the controller.

Reference

- The systems settings are referenced by all programs in the controller.
- The bin/dll files are used for C Plug In units.

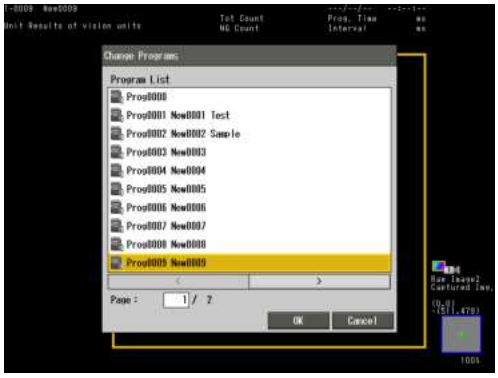
Changing Programs

► Note

- Changing the program will stop the inspection in progress and clear all archive and statistics data in the controller's memory. Any unsaved variables being used in the current program will also be cleared and returned to their initial values.
- If data is being output (terminal I/O, data output, image output) when the request to change programs is made the program change is not completed until the data output is finished. Depending on the data being output the output, the program changeover could take up to a minute. During this time, the controller will be inoperable. For more details, refer to "Output Units" in the XG VisionEditor Reference Manual (Programming Edition).
- During the program change, the controller will read from and write to the SD card where the program data is stored. The flash memory used as in the SD card has a read/write life. Corruption and or loss of data may result if programs are frequently changed. It is strongly recommended that data stored on the SD card is backed up regularly to other storage media.

1 From the Function menu (Page 5-4) select [Program] - [Change Programs].

The Change Programs menu appears with the current program selected.



Reference

- The icon to the left of the program indicates the program is stored on either SD Card 1 or SD Card 2.
- Both SD Card 1 and SD Card 2 can individually manage up to 1000 programs each (0000 to 0999). The actual number of programs that can be stored will depend on the available space on the SD card.

2 Select the program to change from the pull down menu.

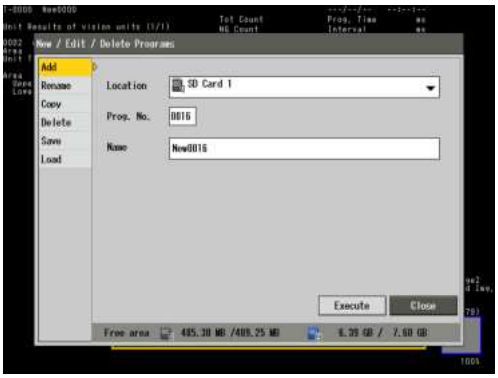
The controller changes to the selected program.

Reference

Program changes can also be made via an external command.

Additional Program Management Functions

The functions listed below are accessed by selecting [Program] - [New/Edit/Del Programs] from the function menu (Page 5-4).



- Adding a new program (Page 4-361)
- Renaming a program (Page 4-362)
- Copying and deleting programs (Page 4-363)
- Saving and loading programs (Page 4-364)

For further details refer to the noted pages.

Changing a Variable Value (Variable Update)

This function allows the easy changing of specified variables within the Update Variables menu.

Changing the Settings to Allow Changing Variables

In order to allow the variable to be changed from the

1 **From the function menu (Page 5-4), select [Edit Flowchart].**
A confirmation screen appears.

2 **Select [OK].**
This will open the flowchart edit mode.

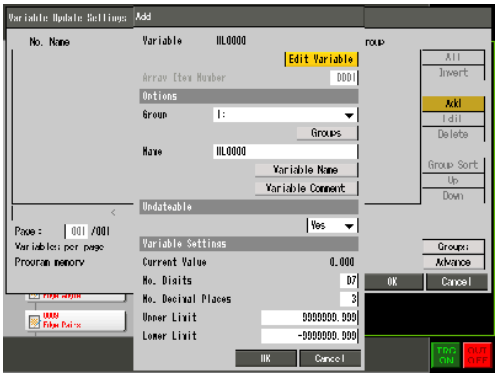
3 **Select [Variable Update Settings] from the [Settings] menu located at the top of the screen.**
The [Variable Update Settings] menu appears.



4 **Select [Add].**
The Variable menu appears.

5 **Select the variable type to add and then select [OK].**
A selection menu is displayed which lists the variables of the selected type.

6 **Select the variable to add to the update list and then click [OK].**
The Add menu appears.



7 **Change the variable update settings as necessary.**

Array Item Number
If an array type variable is selected, select the number of array items to be able to update.

Group
Select the group which the variable will belong to. When [Groups] is selected, the group name and group order can be changed.

Name
Enter the item name that will be displayed in the Variable Update Settings menu for the selected variable. It is also possible to click [Variable Name] to use the actual name of the variable as the item name or [Variable Comment] to use the comment of the variable as the item name.

Updateable
Select whether or not to permit the selected variable to be changed during operation (default: Yes).

▶ Note
If a system variable is added, this setting is fixed at [No].

Variable Settings
Set the number of digits and decimal places that can be set for the variable. Additionally, an upper and lower limit can be set so the value cannot be changed outside this set range.

8 **When setting is complete, Select [OK].**
The variable which was selected in step 6 is added to the displayed variables in the Update Variables menu.

9 Select [OK] to close the Variable Update Settings menu.

Reference

When a variable is assigned to a program parameter, it is possible to add it to the Variable Update list by selecting [Add to Update List] from the Edit menu of the flowchart.

Modifying the variable update settings

Select the desired variable to modify settings for on the Update Variables menu, then select [Edit].

Deleting the registration of a variable in the variable update settings

Select the desired variable to delete from the Update Variables menu, then select [Delete].

Changing the order of the displayed variables

The order for displaying the variables registered in the Update Variables menu can be changed as follows:

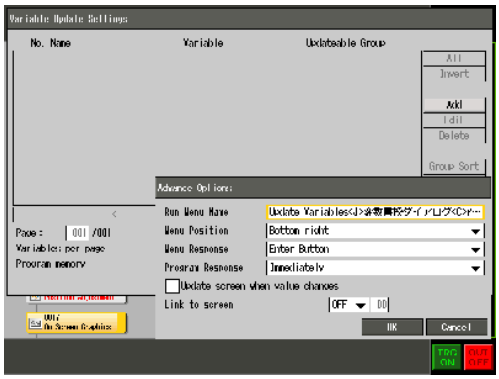
- Group Sort: Arrange in ascending order of the group Nos. set for the groups.
- Move Up: Move the selected variable up in the list.
- Move Down: Move the selected variable down in the list.

Changing the number of variables displayed per page on the Update Variables menu

The number of variables to display per page on the Update Variables menu can be set between 1 and 13 by changing [Variables per page] (default: 8).

Changing the Update Variables menu display method

Select [Advance] on the Variable Update Settings menu to change the settings for the way in which the Update Variable menu appears on the screen and the response when a value is changed.



- **Run Menu Name**: Specify the name of the Update Variables menu that is displayed on the controller. (default: Update Variables)
- **Menu Position**: Select the position where the Update Variables menu is displayed on the controller (default: Bottom right).
- **Menu Response**: Select the timing for when a variable update is confirmed (default: Enter Button).
- **Program Response**: Select the timing for when a variable update is applied to the program (default: Immediately).
- **Update screen when value changes**: Check this box to update the camera image and display template while a variable is updated.
- **Link to screen**: Select the display template that is displayed for the Update Variables menu.
  - **ON**: Specify the screen display.
  - **OFF** (default): Do not specify the screen display.

Reference

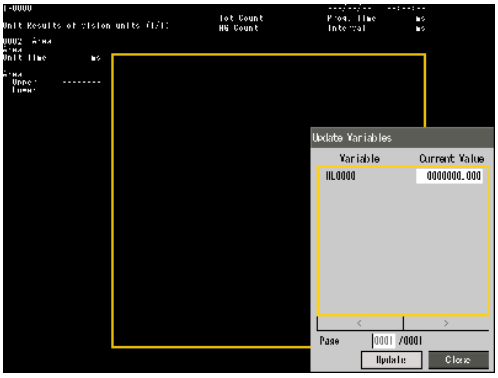
Refer to "Overview of the Creation of Display Templates" (Page 6-2) for more details on screen displays.

Note

Changes to the Update Variable menu name is not applied on the Menu ID drop-down menu of User Menu units.

Changing a Variable Value on the Update Variables menu

1 **From the Function menu select [Update Variables].**
The Update Variables menu appears.



► Note

If the name of the Update Variable menu has been changed, that name will appear in the Function menu.

2 **Select the [Current Value] field of the desired variable and change the value.**
To check the most current value of a variable while the Update Variables menu is displayed, select [Update].

3 **Select [Close].**
The value of the variable selected in step 2 is changed at the timing which was set for [Menu Response] and [Program Response].

Reference

If the current value of a variable is changed where [Copy current value to initial value at save] is enabled, then a confirmation screen appears asking whether or not to save the setting.

Statistics

Any of the data used or generated from the running of a program and inspection of parts can be recorded for later viewing and analysis through the [Statistics] option in the XG Vision Editor or Edit mode on the XG-7000 controller. In Run mode the items identified for collection can be viewed in real-time, while also allowing for changes to be made directly to upper and lower limits. At the same time any images stored in the image archive can also be directly referenced and viewed based on the statistical analysis.

Reference

Some displays and functions are different when the statistics functions are used in Retest mode. See "Checking the retesting results on the Statistics screen" (Page 5-30) for more details.

► Note

- Statistics provide useful information allowing the verification of optimal tolerance levels in a test run as well as the checking, configuring and fine tuning of settings during production.
- The maximum number of statistical data points that can be recorded per item is 100,000 (1024 per item for statistics in Retest Mode). If the data exceeds the preset limit the oldest data is overwritten.
- Up to 256 items can be recorded at one time. If the items being recorded contain multiple targets the primary target data is used.
- Only the results generated during the Run mode are recorded.
- Recorded statistical data is deleted in the following situations:
  - When the controller is turned off
  - When the controller is reset
  - When changing programs
  - When the current program is overwritten via an external command
  - When selecting [Clear] on the [Statistics] screen.
  - When the Statistics Data Clear command is executed.
  - When the operating mode is changed to Remote capture mode
  - When opening the camera settings or white balance settings in Offline mode
  - When editing the targets for statistical analysis or criteria for image archiving
  - When the controller is stopped after changes in Retest mode (Online) were confirmed.
  - When the setting to enable/disable the use of Retest Mode was changed
- The statistical data can be viewed during Run mode without affecting image processing, however the refresh rate for the [Statistics] screen maybe slower depending on runtime conditions.

Specifying Items to be Recorded

To store statistical results on the controller and during simulation, specify items to gather data from beforehand.

Reference

- Up to 256 items can be recorded at one time.
- The statistical analysis function records the results when the program execution reaches the end unit. Thus results for a unit processed multiple times in a loop will be the value from the last execution.

► Note

Specifying items for statistical analysis consumes program memory space.

1 **From the function menu (Page 5-4), select [Edit Flowchart].**

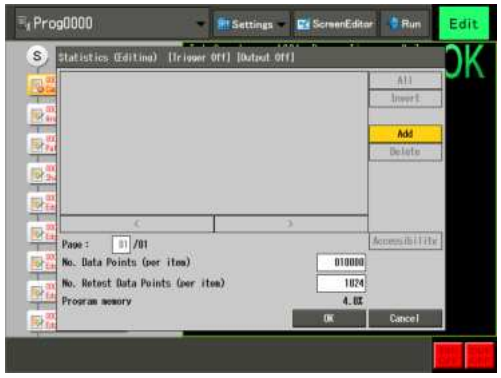
A confirmation screen appears.

2 **Click [OK].**

The options menu is now available for setting up the image archive function.

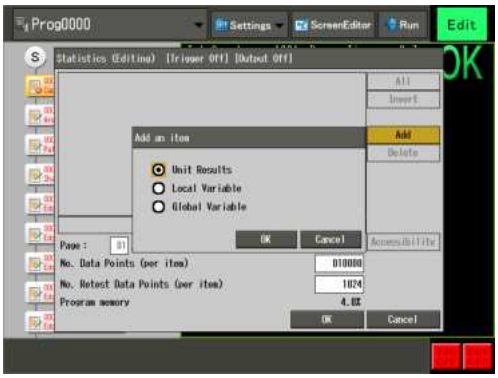
3 **From the [Option] menu, select [Statistics].**

The [Statistics] screen appears.



4 **Select [Add].**

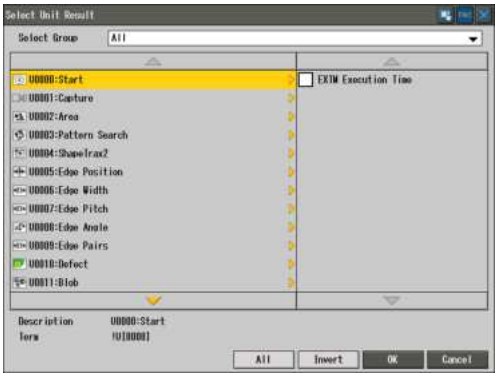
The [Add an item] menu appears.



5 **Choose the item type, then click [OK].**

A menu to select items and data from for the item type selected appears.

Example shown for [Unit Results]

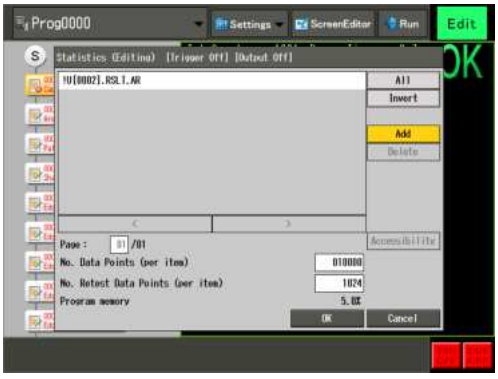


► Note

Groups can not be selected for statistical analysis.

6 **Select the desired item and data, then click [OK].**

The unit data or variable is added to the list of statistics, and the display returns to the [Statistics] screen.



Reference

An item in an array can also be specified by including the index number.

7 **Make changes to the controller's statistical processing [Statistics] screen (Page 5-13) as required.**

Accessibility

The accessibility to changing upper and lower limits on the controllers [Statistics] screen can be set for each user group (UG0 to UG4).

Highlight the item to set the accessibility for and click [Accessibility]. In the [Accessibility] menu, remove the checks for user groups that should not have access to the limit values.

No. Data Points (per item)

Specify the number of data points (from 10 to 100000) to be collected by the statistics function.

- The statistics will set aside as many data points as required to collect all the data.
- When the data exceeds the preset limit, the oldest data will start to be overwritten.

No. Retest Data Points (per item)

Specify the number of data points (from 0 to 1024) to be collected in Retest mode.

► Note

If the count is set to 0, statistical function for retesting results cannot be used.

8 **Click [OK].**

Deleting statistical items

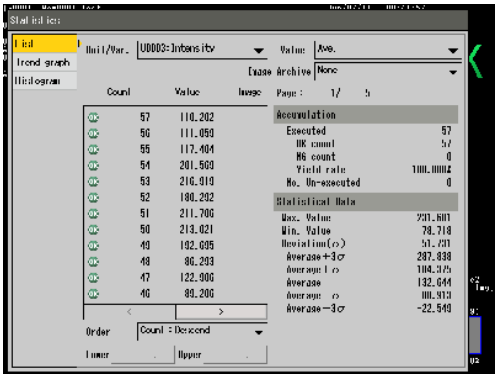
In the [Statistics] screen, select the measured values or variables to delete and click [Delete].

Displaying Statistics (List)

The list view displays the results of items that have been selected for statistical processing.

- Here statistical summary data such as OK/NG counts, standard deviation of each item can be seen and saved to an SD card.
- The cause of rejects can also be analyzed by checking the data against the image archive.
- Upper and lower limits can also be optimized based on the statistical data.

1 **From the Function menu select [Utility] - [Statistics].**
The [Statistics] result screen appears.



2 **Select [List].**
The list screen appears.

3 **From the drop down menu select the data to see the summary for.**
The selected measurement data values appear.

► Note

The list does not show data for items not specified for statistical analysis.

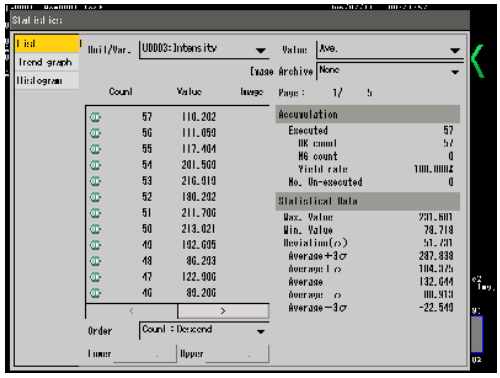
4 **To view the details for each recorded value move the cursor to the item in the list.**

- To change pages, use the 8-way key right and left with the list selected.
- If a NG has occurred, a NG icon appears to the left side of the [Count] column. If the item is OK or no limit is set, an OK icon appears.

Reference

- Data that cannot be processed is handled as follows.
  - 0 appears in the value column in the list (except for defect measurements which appear as "9999999").
  - Results in the [Counts] group reflect the judgment settings specified for data that cannot be measured.
  - Calculations in the [Statistical Value] group do not include items that cannot be measured.
- Unexecuted units are handled as follows.
  - The [Value] column in the list displays "------.---".
  - No OK or NG icon is displayed.
  - Calculations in the [Statistical Value] group do not include items that cannot be measured.

5 **To sort the displayed order by inspection number, value, or presence of an image, select [Order].**



- **Count: (Descend/Ascend):** Displays the list in order (ascending or descending) by inspection number.
- **Value: (Descend/Ascend):** Displays the list in order (ascending or descending) by the size of the value.
- **Image: (Available → None/None →Available):** Displays the list in order giving priority to items with a recorded image.

6 To display the associated image, select the appropriate image archive from [Image Archive]. Then use the data summary to choose which image based on the image flag type, "*" or "+". "*" indicates the image was recorded as it matched the image archive criteria, and "+" indicates the image was recorded as part of a multiple archive series (Page 5-23).

- Select an item that has an image flag and press the No.0 (ENTER) button to display the images.
- When the image is displayed, move the 8-way key left and right while holding down the No.1 (FUNCTION) button to scroll through additional images and data in the image archive.
- To exit replay mode, press the No.2 (ESCAPE) button.

► Note

- If the [Image] column does not contain any image flags, there are no images associated between the statistical and image archive data.
- When continuously recording images during Run mode, the image archive updates after the images have been recorded. Thus images may not yet be recorded even if the item shows an image flag.
- If no image archive criteria has been set, no image flags will appear during Run mode.

7 To adjust the tolerance limits, change the values in the [Upper] and [Lower] fields, then select [OK].

The summary data changes as the upper and lower limits are changed. Adjust the values while observing changes to the yield rate.

Reference

- When changing the limits, the summary data is displayed with simulation values for the program. After the [Statistics] screen is closed and reopened, selecting the items again from the list returns the summary data based on the result history.
- If the tolerance limit references a variable, changes in the values will take effect when execution reaches the initial capture/end unit. Otherwise, the changes take effect immediately.

► Note

- When no limits are set for the unit, "-----" is displayed and the value cannot be changed. Set an upper/lower limit in the desired unit to be able to change the values.
- Tolerance limits that reference a variable will be shown with a gray or blue background. Limits that reference a system variable (gray background) cannot be changed.
- The upper and lower limits cannot be changed if accessibility is turned off for the current user group.

8 After checking the statistics, click [OK].

Saving recorded results to an SD card

Clicking [Save] with an SD card inserted into the controller saves the recorded data, judgment results, and item name as text data.

Two csv text files are saved into the "/xg/stat" folder of the specified SD card.

- **YYMMDD_HHMMSS_SD No. in program_Program No._dat.csv:** Measurement results (count/total status/ statistic item/individual status)
- **YYMMDD_HHMMSS_SD No. in program_Program No._idx.csv**: Measurement item names

Reference

- The SD card can be specified in the System Settings in XG VisionEditor (default: SD2).
- The data in the saved files can be viewed or edited using a text or spreadsheet program.
- The controller keeps track of the inspection number until it is reset. This allows it to resume properly for the second run and onwards. The upper limit for the inspection count on the controller is 1,000,000,000.

► Note

- If the data exceeds the maximum amount of statistical data, the oldest results are overwritten so part of the results may not be saved.
- The [Save] button is disabled if [Save] has been disabled for the user group logged in.

Deleting recorded results (Clear)

Clicking [Clear] deletes the currently recorded statistical data.

► Note

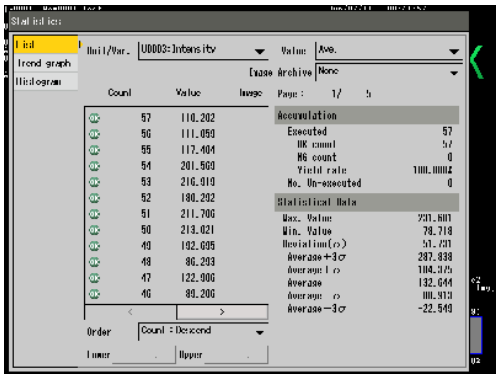
The [Clear] button is disabled if [Clear] has been disabled for the user group logged in.

Displaying Data as a Trend Graph

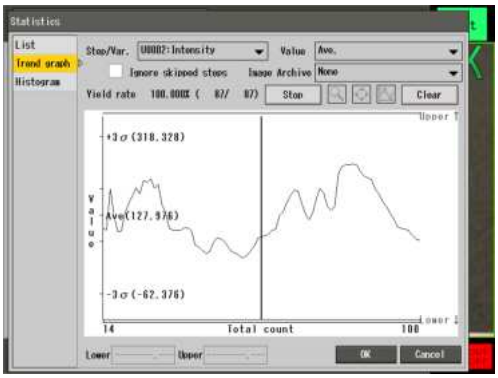
Data can be displayed as a trend graph against the inspection number. This function is useful for checking how data is changing over the course of time or several inspections during Run mode.

- Upper and lower limits can be changed during the Run mode while observing changes in the yield rate and the distribution of data.
- The graph also displays whether image data was recorded with the image archive and allows images to be viewed directly.

1 **From the Function menu select [Utility] - [Statistics].**
The [Statistics] result screen appears.



2 **Select [Trend graph].**
The [Trend graph] screen appears.



3 **From the drop down menu select the data to see the trend graph for.**
The histogram of the selected data appears.

► Note
The list does not show data for items not specified for statistical analysis.

Reference
If the [Ignore skipped units] option is checked, the graph will exclude the data for units that were not executed.

4 **To adjust the tolerance limits, change the values in the [Upper] and [Lower] fields, then select [OK].**
Select the bar for upper and lower limit, then move the 8-way key up and down to adjust the tolerance.
The judgment results and yield rate change when the upper and lower limits are changed. Adjust the values while observing changes to the yield rate.

Reference
- When changing the tolerance, the yield rate is displayed with simulation values for the program. After the [Statistics] screen is closed once and reopened, selecting items again from the list returns the yield rate to the actual result history.
- If the measurement references a variable, changed tolerance values will take effect when execution reaches the initial capture/end unit. Otherwise, the changes take effect immediately.

► Note
- When no limits are set for the unit, "-----" is displayed and the value cannot be changed. Set an upper/lower limit in the desired unit to be able to change the values.
- Tolerance limits that reference a variable will be shown with a gray or blue background. Limits that reference a system variable (gray background) cannot be changed.
- The upper and lower limits cannot be changed if accessibility is turned off for the current user group.

5 **After checking the statistics, select [OK].**

Enlarging / Reducing the trend graph size

The trend graph can be enlarged or reduced for easier viewing. During Run mode, click [Stop] to stop updating the graph and zoom in / out of the graph for an enlarged / reduced view.

- Use the Zoom icon (magnifying glass) and go to the desired center point for the zoom using the 8-way key up, down, left, and right. The display will zoom in or out centered on the position of the zoom cursor.
- Use the Move icon to scroll around the histogram.
- Use the Fit icon to fit the histogram to the Y axis range.

Reference

The initial display state for the trend graph is to automatically adjust according to the range of data based on the settings below:

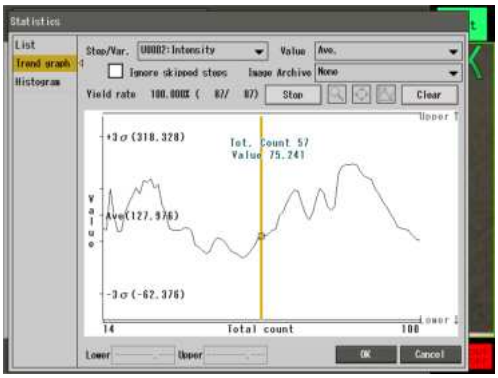
- X direction: Previous 515 inspections
- Y direction: Results ±3σ or range between the upper and lower limits, whichever is larger

► Note

- After closing the [Trend Graph] screen or updating the screen in Run mode, the zoom ratio in the Y direction returns to the initial state of automatically adjusting to the range of data.
- The zoom ratio in the X direction is maintained until the system is restarted.

Checking the values on the trend graph

Use the vertical data selection cursor on the screen and move the 8-way key left and right. The display will show the inspection number and item data at the position of the cursor.



Viewing images from the trend graph

To check the data against an image that is stored in the archive, move the data selection cursor to the desired point.

- At each data point a square will appear on the graph when an image is available. Place the cursor over a square and press the No.0 (ENTER) button to display the image from the image archive.
- When the image is displayed, moving the 8-way key left and right while holding down the No.1 (FUNCTION) button scrolls additional images and data in the image archive.
- To exit replay mode, press the No.2 (ESCAPE) button.

Reference

Dark blue squares indicates the image was recorded as it matched the image archive criteria, while the light blue squares indicate images recorded as part of a multiple archive series (Page 5-23).

► Note

- If the data point does not have a square next to it, there are no images associated between the statistical and image archive data.
- When continuously recording images during Run mode, the image archive updates after the images have been recorded. Thus images may not yet be recorded even if the data point a square.
- If no image archive criteria has been set, no squares will appear on the graph.

Reference

Moving the cursor bar left and right while holding down the No.1 (FUNCTION) button jumps between data points that have images.

Deleting recorded results (Clear)

Selecting [Clear] deletes the currently recorded statistical data.

► Note

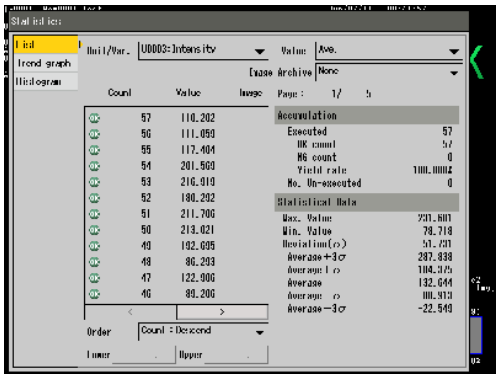
The [Clear] button is disabled if [Clear] has been disabled for the user group logged in.

Displaying Data as a Histogram

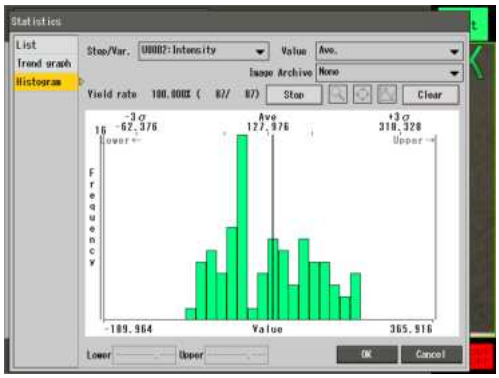
This can be used to display the distribution of values as a histogram. This function allows the user to grasp the overall dispersion of values, so it is useful when adjusting measurement limits.

- Upper and lower limits can be changed during the Run mode while observing changes in the yield rate and the distribution of data.
- The graph also displays whether image data was recorded with the image archive and allows images to be viewed directly.

1 **From the Function menu select [Utility] - [Statistics].**
The [Statistics] result screen appears.



2 **Select [Histogram].**
The [Histogram] screen appears.



3 **From the drop down menu select the data to see the trend graph for.**
The histogram of the selected data appears.

► Note

The list does not show data for items not specified for statistical analysis.

4 **To adjust the tolerance limits, change the values in the [Upper] and [Lower] fields, then select [OK].**
Select the bar for upper and lower limit, then move the 8-way key left and right to adjust the tolerance.
The judgment results and yield rate will update when the upper and lower limits are changed. Adjust the values while observing changes to the yield rate.

Reference

- When changing the tolerance, the yield rate is displayed with simulation values for the program. After the [Statistics] screen is closed once and reopened, selecting items again from the list returns the yield rate to the actual result history.
- If the measurement references a variable, changed tolerance values will take effect when execution reaches the initial capture/end unit. Otherwise, the changes take effect immediately.

► Note

- When no limits are set for the unit, "-----" is displayed and the value cannot be changed. Set an upper/lower limit in the desired unit to be able to change the values.
- Tolerance limits that reference a variable will be shown with a gray or blue background. Limits that reference a system variable (gray background) cannot be changed.
- The upper and lower limits cannot be changed if accessibility is turned off for the current user group.

5 **After checking the statistics, select [OK].**

Enlarging / Reducing the histogram size

The histogram can be enlarged or reduced for easier viewing. During Run mode, select [Stop] to temporarily halt updating the graph and zoom in / out of the graph for an enlarged / reduced view.

- Use the Zoom icon (magnifying glass) and go to the desired center point for the zoom using the 8-way key up, down, left, and right. The display will zoom in or out centered on the position of the zoom cursor.
- Use the Move icon to scroll around the histogram.
- Use the Fit icon to fit the histogram to the Y axis range.

Reference

The initial display state for the trend graph is to automatically adjust according to the range of data based on the settings below:

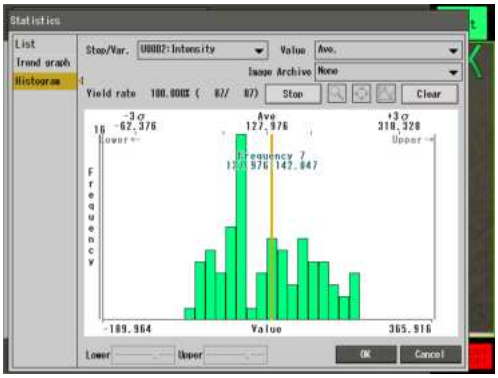
- X direction: Results ±3σ or the range between the upper and lower limits, whichever is larger
- Y direction: Maximum frequency

► Note

After closing the [Histogram] screen, or after updating the screen in Run mode, the zoom ratio returns to its initial state of automatically adjusting to the range of data.

Checking values on the histogram

Select the cursor bar on the screen and move the 8-way key left and right. This displays the recorded count and value range at the position of the cursor.



Viewing images from the histogram

To check the data against an image recorded by the image archive use the data selection cursor. At each data point a square will appear on the graph.

- Place the cursor over a square and press the No.0 (ENTER) button to display the image saved during measurement in archive mode.
- When the image is displayed, moving the 8-way key left and right while holding down the No.1 (FUNCTION) button scrolls additional images and data in the image archive.
- To exit archive mode, press the No.2 (ESCAPE) button.

Reference

Dark blue squares indicates the image was recorded as it matched the image archive criteria, while the light blue squares indicate images recorded as part of a multiple archive series (Page 5-23).

► Note

- If the data point does not have a square next to it, there are no images associated between the statistical and image archive data.
- When continuously recording images during Run mode, the image archive updates after the images have been recorded. Thus images may not yet be recorded even if the data point a square.
- If no image archive criteria has been set, no squares will appear on the graph.

Reference

Moving the cursor bar left and right while holding down the No.1 (FUNCTION) button jumps between data points that have images.

Deleting recorded results (Clear)

Clicking [Clear] deletes the currently recorded statistical data.

► Note

The [Clear] button is disabled if [Clear] has been disabled for the user group logged in.

Image Archive

The image archive is a useful troubleshooting tool for reviewing inspections that have failed during Run mode. The image archive allows for Images captured in Run mode to be archived in the controllers internal memory for review at a later time. Data can also be stored for the images archived allowing for full process to be understood when the image is reviewed.

► Note

- The display and functionality of the Image Archive may be limited due to settings in the XG VisionEditor. For more details, refer to "Controller System Settings" in the XG VisionEditor Reference Manual.
- The [Image Archive] screen cannot be displayed while the XG VisionEditor or any other program is accessing the image archive.
- Images can only be archived during online Run mode.
- The image archive data is recorded in the controller's memory and will be cleared in the following circumstances. If the information is required for later use, save the data to an SD card or another media (Page 5-24).
  - When the controller is turned off
  - When the controller is reset
  - When changing programs
  - When the current program is overwritten via an external command
  - When the Image Archive Clear command is executed
  - When the operating mode is changed to Remote capture mode
  - When opening the camera settings (Page 7-22) or white balance settings (Page 7-8) in Offline mode
  - When editing the image archive criteria
  - When adding, editing, or deleting image variables in the [Variables] menu
  - When the camera type setting is changed
  - When the using the [Area Settings] menu in a capture unit
  - When the image buffer setting is changed

Reference

- Using the image archive does not affect the processing time.
- Images can be recorded from multiple cameras at the same time.

Number of images that can be archived

The number of images that can be archived varies depending on the camera settings and the combination of connected cameras. The maximum number of images that can be archived into the system image memory is as follows.

Typical examples with the XG-7702

	When using a monochrome camera	When using a color camera
240,000 pixel images	Maximum 1013 images	Maximum 1008 images
310,000 pixel images	Maximum 501 images	Maximum 498 images
1000,000 pixel images	Maximum 245 images	Maximum 240 images
2000,000 pixel images	Maximum 117 images	Maximum 112 images
500 megapixel images	Maximum 40 images	Maximum 35 images

Typical data for the XG-7502

	When using a monochrome camera	When using a color camera
240,000 pixel images	Maximum 501 images	Maximum 496 images
310,000 pixel images	Maximum 245 images	Maximum 242 images
1000,000 pixel images	Maximum 117 images	Maximum 112 images
2000,000 pixel images	Maximum 53 images	Maximum 48 images

► Note

The figures above represent the maximum number of images that can be recorded in Run mode under the following conditions: one camera is connected, the default settings for the image capture buffer are used (image capture buffer enabled and the image capture buffer is reserved for 1 fixed image), Retest mode is not used, and [Archive all images] is selected for the archiving condition.

Setting the conditions to archive images used for inspection and result data (Specifying Criteria for Image Archiving)

The reference criteria needs to be set for the image archive in order to store images/data into the controller memory. Up to eight individual image archives can be set, each with their own unique reference criteria. Even if the same criteria is specified for multiple archives, the data is still handled separately.

► Note

Enabling an image archive consumes image and program memory.

1 **From the function menu (Page 5-4), select [Edit Flowchart].**

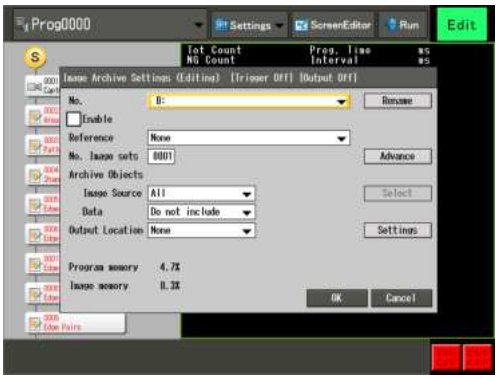
A confirmation screen appears.

2 **Click [OK].**

The options menu is now available for setting up the image archive function.

3 **From the [Options] menu, select [Image Archive Settings].**

The [Image Archive Settings] menu appears.



The Image Archive menu displays the current image archive No. and shows the amount of resources currently consumed by the current program.

► Note

If the program and image memory are close to 100%, it may not be possible to enable the image archive.

4 **Choose the image archive to set criteria for.**

5 **Change the settings as required.**

Enable

Check this box to enable archive setting.
When you check this box, the controller will allocate memory according to the selected criteria settings of archive condition.

Reference

Specify the reference to determine which images should be stored in the archive. Specify the unit reference condition and the result (OK / NG) to be used for archiving images.

Reference

- The result of the [Total Status] depends on the Total Status Settings (Page 4-355).
- In addition to the [Total Status] option, the reference includes all units that have a judgment value (UJG) available.

No. Archives

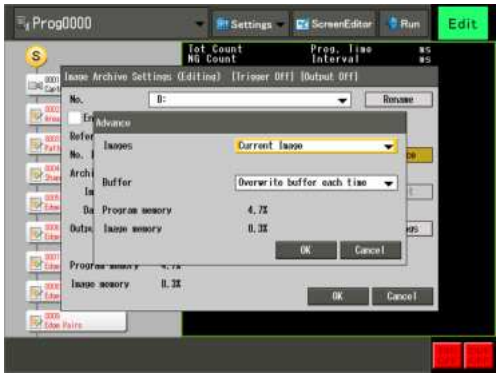
Specify the number of image sets (max. 1024).

- If [Images] is set to [Single]: images are stored one at a time.
- If [Images] is set to [Multiple]: multiple images (including preceding images as set under [Advance]) are stored one at a time.

► Note

Make sure there is enough memory when storing preceding inspection images as well as the current image. If the archive criteria is set to store a lot of images including preceding images this will can consume a large amount of memory.

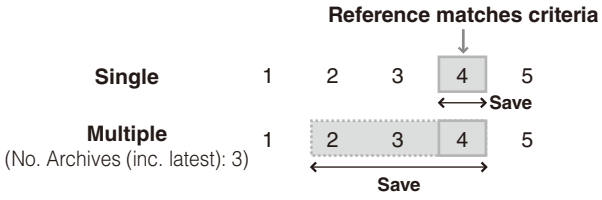
Parameters



- **Images**: Choose the images to be archived.
  - **Single**: Archives the single image that matches the criteria.
  - **Multiple**: Archives the current image when it matches the criteria and a number of preceding images as specified in [No. Archives (inc. latest)] (max. 512).This is useful when the images before the NG state need to be reviewed as well.
- **Buffer**: Choose how the image buffer works when the capacity is reached.
  - **Overwrite buffer each time**: Continues storage by overwriting images starting with the oldest first.
  - **Process until buffer full**: Stops archiving when the buffer is full. Pauses archiving until the controller is reset, or the image data in the archive criteria is cleared.

Reference

The following diagram explains how the [Images] setting affects storage range when the archive criteria is met.



Archive Objects

- **Image Source**: Choose the image variables to be archived.
  - **All**: All image variables that are used in the program are archived.
  - **Select**: Select which image variables to archive (up to 256 image variables can be select).
- **Data**: Choose whether to include unit and variable processing data with the image (default: OFF).

► Note

- If the data is not archived, the data will not be able to be checked when using the image archive replay mode in the XG VisionEditor software or on the XG Controller screen display.
- Even when [All] is selected, images for image variables that are not used by the measurement unit are not output. If the output of monochrome images for image variables that are not used is required, select [Select] and check the boxes of the individual image variables to output images for.
- If [Select] is used under [Image Source] and all the image variables are removed this will force the data to be not be included.

Output Location

Choose the output location where images and results data are output to when they meet the archive criteria.

- **None**: No archive data is output.
- **SD Card**: Output to the SD card in the controller.
- **PC Program**: Output the image to the XG VisionTerminal or for use with ActiveX Control.
- **FTP**: Output to an FTP server.

► Note

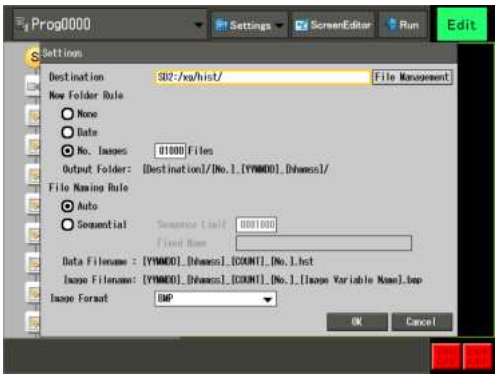
If [Archive Objects] is set to [Select] and the image variable with a check mark is not actually used, the data is output as a black back image.

Reference

Outputting archived images differs from using the image output unit (Page 4-341) as all images are stored in the image archive before they are output. This prevents the loss of images, even for a continuous stream, as long as there is enough memory to hold the images required.

Settings

This menu is used to set the destination for the image archive.



- **Destination**: Specify the destination for the image archive.

Reference

- If [PC Program] is selected as the [Output Location], the image archive data will be saved in the specified folder below the destination base path folder, or in a newly created folder.
- If [FTP] is selected as the [Output Location], the image archive data will be saved in the specified folder below the FTP server home directory, or in a newly created folder. Note, depending on the FTP server the server may require the full path including the home directory. For details on such settings consult with your network administrator.

- **New Folder Rule**: This rule is for creating new folders for saving archive data.
  - **None**: The archive data is saved in a specified destination folder without separating new folders.
  - **Date**: The archive data is saved in a folder created below the specified destination folder when each output begins. Folders are named [No.]_[YYMMDD]. When the date changes, a new folder is created and this becomes the new destination folder for archive data.
  - **No. Images**: The archive data is saved in a folder created below the specified destination folder. Folders are named as [No.]_[YYMMDD]_[HHMMSS]. (Folders can store up to 50,000 images.) When the number of images in the folder reaches the specified limit, a new folder is created and this becomes the new destination folder for archive data.

► Note

If you select [None] and continue to save a large number of files to the same folder, saving may be time-consuming.

Reference

When [No. Images] is selected, the output file is created at the time of the first trigger input after:

- The controller is tuned on.
- The controller is reset.
- The program No. is changed.
- The destination folder is not available at the destination.

- **File Naming Rule**: These are rules for naming files when saved.
  - **Auto**: Files are named automatically with the date and time when the data was stored, [YYMMDD]_[HHMMSS]_[Count]_[No.]_image variable.jpg/bmp (image file) and [YYMMDD]_[HHMMSS]_[Count]_[No.].hst (results file).
  - **Sequential**: The files are named as [Sequential_fixed name_image variable.jpg/bmp] (image file) and [Sequential_fixed name.hst] (results file). Specify the maximum number of images in the [Sequence Limit] field (max.1000000), and a fixed name to use in the [Fixed Name] field. Each field may contain no more than 32 characters.

► Note

When the sequential number exceeds the limit, the count rolls over to 0. This may result in old output data files being overwritten if the new folder rule is set to [None], or if the number of images is greater than the maximum serial number.

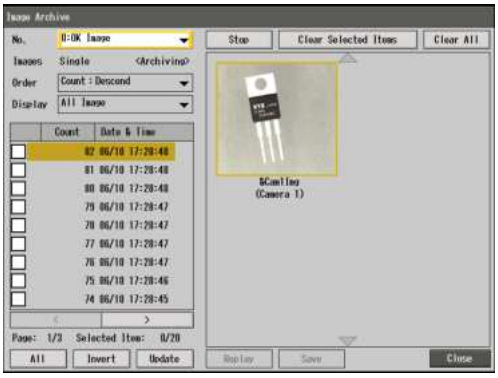
- **Image Format**: This specifies the file format for saving the image data.
  - **BMP**: Outputs the image as a bitmap file (24-bit color: color camera, 8-bit gray scale: monochrome camera).
  - **BMP (1/2 Resolution)**: Shrink the image to 50% (reducing the number of pixels in the vertical and horizontal directions to one-half), and then output the image in bitmap format (24-bit color for a color camera, 8-bit grayscale for a monochrome camera).
  - **BMP (1/4 Resolution)**: Shrink the image to 25% (reducing the number of pixels in the vertical and horizontal directions to one-quarter), and then output the image in bitmap format (24-bit color for a color camera, 8-bit grayscale for a monochrome camera).
  - **BMP (1/8 Resolution)**: Shrink the image to 12.5% (reducing the number of pixels in the vertical and horizontal directions to one-eighth), and then output the image in bitmap format (24-bit color for a color camera, 8-bit grayscale for a monochrome camera).
  - **JPG**: Outputs the full pixel image as a JPEG file.

6 Select [OK].

Viewing Images in the Image Archive

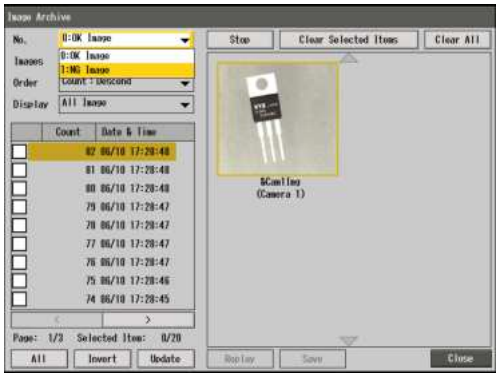
1 From the Function menu select [Utility] - [Image Archive].

The [Image Archive] screen appears.



2 Select the image archive to be viewed.

A summary list of the images recorded based on the set criteria are displayed along with the [Images] and [Status].



Images

- **Single**: Images are archived for each single measurement.
- **Multiple**: is shown when preceding images are being archived as well as the current image.

Status

- **<Archiving>**: Images are being archived.
- **<Hold>**: Archiving has stopped because the set archiving count has been reached. The images are retained in the archive, preventing them from being overwritten.
- **<Paused>**: Archiving has been temporarily stopped.

3 Use [Order] to change the display order of the image files.

4 Use [Display] to choose the image variables to show.

- **All Image** (default): Displays all the images from each measurement.
- **&<image variable>**: Displays only images for the user-specified image variable.

5 After reviewing the images, select [Close].

Clearing the image archive

Use the following procedure to clear the image archive.

Reference

To clear only the current image archive

Select [Clear Selected Items].

To clear all of the image archive

Select [All Clear].

Pausing the image archive

Pausing the image archive

Pausing the archive is useful when data is being archived at high speeds so the images do not get overwritten when reviewing.

To pause the image archive

Select [Stop].

While the image archive is paused, the button changes to [Start].

To resuming the image archive

Select [Start].

Reference

The image archive will remain paused even if the [Image Archive] screen is closed. The paused condition will remain in effect until either power is turned off and on again, or until it is canceled via an external command.

Replaying image archive results

Images and data archived in the memory can be replayed for analysis and review.This is useful for reviewing the conditions when a NG (fail) occurred without having to take the controller offline.

► Note

- If the image archive is not configured to archive data, only images are replayed.
- If the program is changed via the Edit Unit menu option (Page 4-8), the archived data recorded before the change may not match the changed parameters preventing proper replaying of the archived result.

1 Check the box for the images from the list in the [Image Archive] screen to replay.

2 Select [Replay].
The image and the data for the selected inspections is displayed.

3 If multiple images were selected, press and hold the No.1 or No.7 button while moving the 8-way key left and right to move through the inspections.
The image and the data for the selected inspection is displayed.

4 To finish the replaying of the image archive, press the No.2 (ESCAPE) button.

Reference

Results displayed during replay cannot be output to an external device.

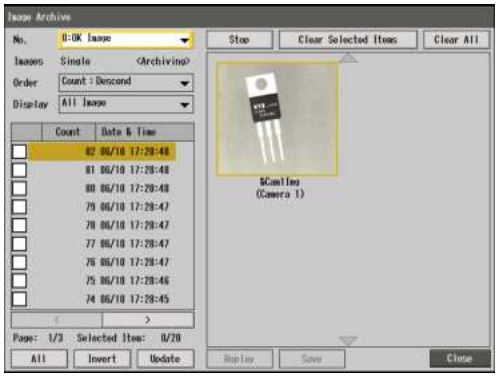
► Note

If program data is changed in the Edit Unit menu, the archived result data recorded before the change may not replay properly.

Saving the Image Archive

Follow this procedure to save the archived image and result data to an SD Card.

1 From the Function menu select [Utility] - [Image Archive].
The [Image Archive] screen appears.

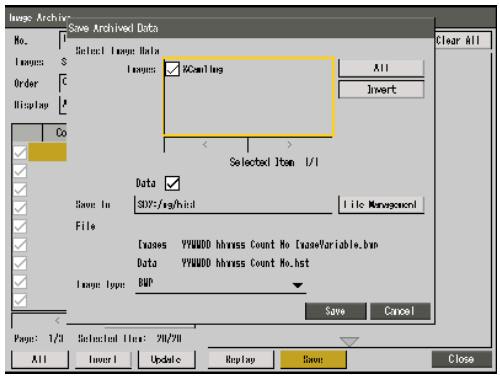


2 Check the box for the images from the list in the [Image Archive] screen to save the image and data for.

Reference

- Clicking [All] places check marks next to all the items in the image archive list.
- Clicking [Invert] reverses the checked / unchecked state.

3 Click [Save].
The [Save Archived Datas] menu appears.



4 Choose which image variables from the image archive to save the data for.
To save the data as well, check the [Data] box.

5 **Use the [Save To] field to specify where to save the image archive to.**

Reference

Use [View Files] to specify the folder path from the [View Files] screen (Page 5-35).

6 **Specify the file format in the [File Type] field.**

Specify the file format used when the image data is saved from the formats below.

- **BMP**: Outputs the image as a bitmap file (24-bit color: color camera, 8-bit gray scale: monochrome camera).
- **BMP (1/2 Resolution)**: Shrink the image to 50% (reducing the number of pixels in the vertical and horizontal directions to one-half), and then output the image in bitmap format (24-bit color for a color camera, 8-bit grayscale for a monochrome camera).
- **BMP (1/4 Resolution)**: Shrink the image to 25% (reducing the number of pixels in the vertical and horizontal directions to one-quarter), and then output the image in bitmap format (24-bit color for a color camera, 8-bit grayscale for a monochrome camera).
- **BMP (1/8 Resolution)**: Shrink the image to 12.5% (reducing the number of pixels in the vertical and horizontal directions to one-eighth), and then output the image in bitmap format (24-bit color for a color camera, 8-bit grayscale for a monochrome camera).
- **JPG**: Outputs the full pixel image as a JPEG file.

7 **Click [Execute].**

The image and results data from the image archive are saved.

The image and data files are named as follows when they are saved.

- **Image**: YYMMDD_HHMMSS_Count_No._ImageVariable..bmp (jpg)
- **Data**: YYMMDD_HHMMSS_Count_No.hst.

8 **After saving is complete, click [Close].**

► Note

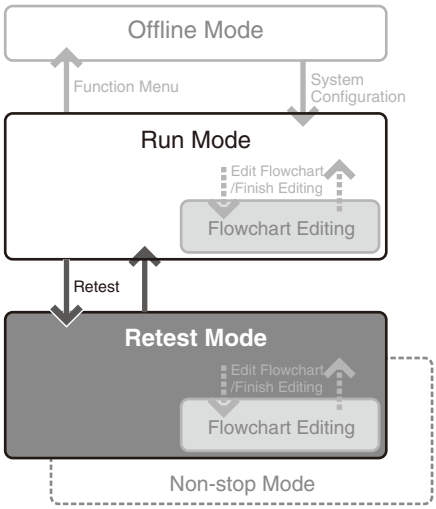
- Depending on the amount of data saving can take several minutes.
- The controller cannot be operated while saving is taking place.

Using Inspection Results for Retesting (Retest Mode)

It is possible to check and modify the image processing flowchart using stored archived images on the controller or images saved on the SD card/FTP. The Online setting (page 3-33) allows the retesting to be performed independently without interrupting the current image processing inspection.

Checking the Image Processing Results Again for Images Stored in the Controller (Retest Mode)

Select an image (archived image) stored in the controller and execute image processing. This mode is useful to check for the condition of a NG result at a later time.

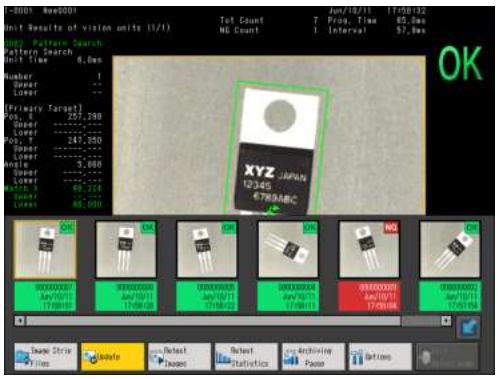


► Note

- In Retest mode, image processing based on the trigger input is disabled.
- The changes made during Retest mode are directly applied to the active program and are effective immediately after the retest finishes.
- The following options are disabled in Retest mode: [Change Programs], [Rename], [Copy/Delete Programs], [Save/Load Programs], [Image Archive], [Change Login User], and [Go Offline].
- The availability of some commands may be different from that in Run mode. Refer to the XG VisionEditor Reference Manual (Control/Data Edition) for more details.

1 **In Run mode, press the No.6 (MENU) button on the hand-held controller.**

The image strip is displayed which lists the archived or stored images as thumbnails.



Reference

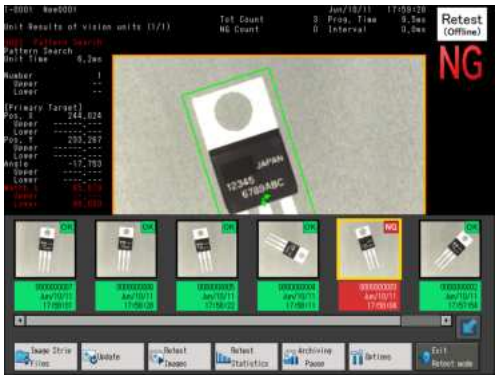
- If [Image Archive Memory] is selected for Image Strip Files, at least one image must be in the archive in order to show thumbnails.
- To apply the most recent archive results to the Image strip, select [Update] to update the Image Strip display.

2 **Select the image to retest.**

A confirmation screen appears.

3 **Select [OK].**

The controller changes to Retest mode and retesting is performed using the current inspection setting.



4 **To retest another image, select the thumbnail of the image to retest from the Image Strip.**

To retest the same image again, press the No.3 (TRIGGER) button on the hand-held controller to execute retesting for the currently selected image.

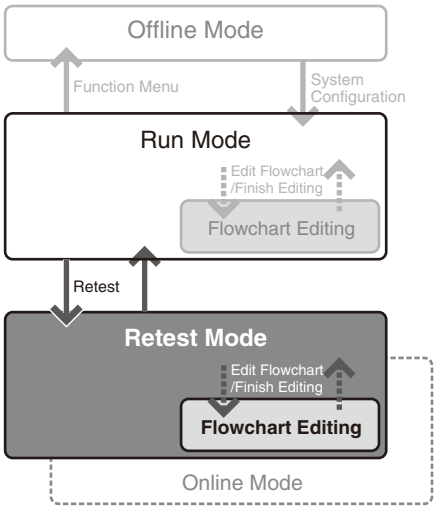
5 **To exit Retest mode and return to Run mode, select [Exit Retest Mode] on the Image Strip.**

Reference

The images shown on the Image Strip are the images specified by the image variable referenced by the unit which is being selected when the Image Strip is displayed.
To display the images specified by a different image variable, close the Image Strip, change the unit, and then display the Image Strip again.

Editing a Program Using the Stored Archive Images (Flow Editor in Retest Mode)

Select an archived image from the Image Strip, then edit the flowchart as normal. This can be useful when adjusting the inspection conditions as you can check the setting results using an image that was stored during the actual inspection operation.

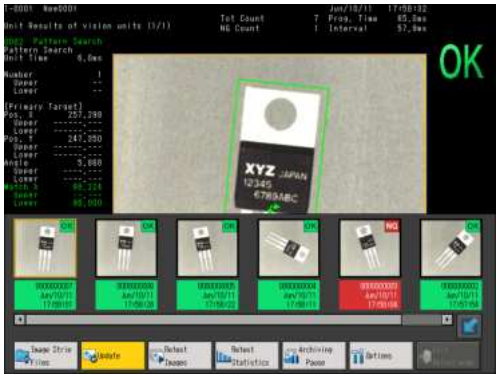


► Note

- During Retest mode, image processing based on the trigger input is disabled.
- The changes made during Retest mode are directly applied to the active program and are effective immediately after the retest finishes.

1 In Run mode, press the No.6 (MENU) button on the hand-held controller.

The Image Strip appears, displaying a thumbnail list of the archive images.



Reference

- If [Image Archive Memory] is selected for Image Strip Files, at least one image must be in the archive in order to show thumbnails.
- To apply the most recent archive results to the Image Strip, select [Update] to update the Image Strip display.
- If [Image Archive Memory] is selected for Image Strip Files, it is recommended that archiving be paused beforehand because the archive images can be overwritten while the controller is operating continuously.
- It is possible to display the Image Strip directly from the Edit mode Flow Editor. If this is done, step 4 below is not necessary.

2 **Select the thumbnail of the image to use for program editing.**
A confirmation screen appears.

3 **Select [OK].**
The controller changes to Retest mode and retesting is performed using the current program setting.

4 **Press the No.1 (FUNCTION) button on the handheld controller, then select [Start to Edit Program].**

5 **On the Flow Editor, change the flowchart and the unit settings as necessary.**

Reference

When [Captured Image] is selected in the Flow Editor, the image selected in step 2 is displayed.

6 **To retest a different image, select the new thumbnail to retest from the Image Strip.**

7 **To exit Retest mode and return to Run mode, exit the Flow Editor and select [Exit Retest Mode] on the Image Strip.**
The mode changes to Run mode and trigger input is enabled. If [Exit Retest Mode] is selected on the Image Strip without exiting the Flow Editor, the mode changes to Edit mode and the Flow Editor remains active.

Reference

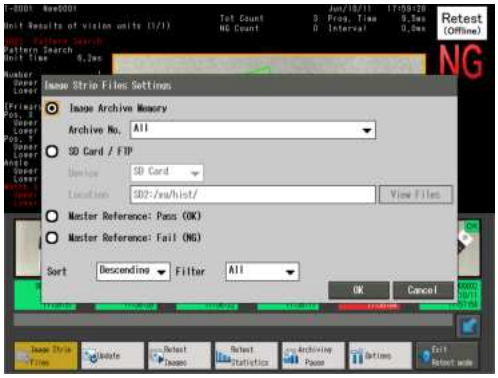
Select [Run] on the Flow Editor to directly return to Run mode.

Using Other Retesting Functions

Selecting the image for retesting

In addition to the images stored in the controller (archive images), images saves on an SD card or FTP server and images saved in the OK master image folder or NG master image folder can be displayed on the Image Toolbar and selected for retesting.

1 **Select [Image Strip Files] on the Image Strip.**
The Image Strip Files Settings menu appears.



2 **Select the image for retesting.**

- **Image Archive Memory** (default): Display the images stored in the controller (archive images) in the Image Strip. Also select the archive condition No.
- **SD Card / FTP**: Display the images saved on an SD card or FTP server in the Image Strip. Also select the device and folder.
- **Master Reference Pass (OK)**: Display the images saved as the OK master (Page 5-29) in the Image Strip.
- **Master Reference Fail (NG)**: Display the images saved as the NG master (Page 5-29) in the Image Strip.
- **Sort**
  - **Ascending**: Display the images on the Image Strip in ascending order of the measurement count.
  - **Descending**: Display the images on the Image Strip in descending order of the measurement count.

- **Filter**
  - **All**: Display all images in the Image Strip.
  - **OK Only**: Display only the images that are judged as OK or untested in the Image Strip.
  - **NG Only**: Display only the images that are judged as NG in the Image Strip.

Reference

The device and folder path selection for the OK master and NG master can be changed from the Options menu (Page 5-32) of the Image Strip.

► Note

- The sorting filter is applied when [Image Strip Files] is executed.
- When performing retesting, the format of the image file name must be one of the following.
  - YYMMDD_HHMMSS_Count_No._Image variable.bmp/jpg
  - Sequential No._Fixed name_Image variable.bmp/jpg
  - Sequential No._Image variable.bmp/jpg
- If the file name is changed, it may not be possible to perform retesting on the image.
- Files that include double-byte characters cannot be used in re-test.

3 **Select [OK].**

Retesting a Group of Archived Images Simultaneously (Retest Images)

It is possible to retest images on the Image Strip and OK/NG master images simultaneously instead of retesting them one by one. Several images can be batch retested together after editing measurement conditions. This is useful when to track the results from the previous measurement or judgment results.

Reference

- OK master images are known good images that were obtained from actual measurement, and OK images obtained in an ideal environment, that are saved in the designated folder. Use them to verify during retesting that images which must be judged OK (OK masters) are not judged NG. Conversely, use the NG master images to check during retesting that images which must be judged NG (NG masters) are not judged OK.
- The folder where the OK master / NG master images are saved can be specified on the Options menu (Page 5-32) of the Image Strip.
- It is also possible to add an image on the Image Strip as an OK master or NG master image. With the cursor positioned over the thumbnail in the Image Toolbar Strip, press the No.1 (FUNCTION) button and select either [Add to Master Ref.: OK Images] or [Add to Master Ref.: NG Images] from the Retest menu that appears.

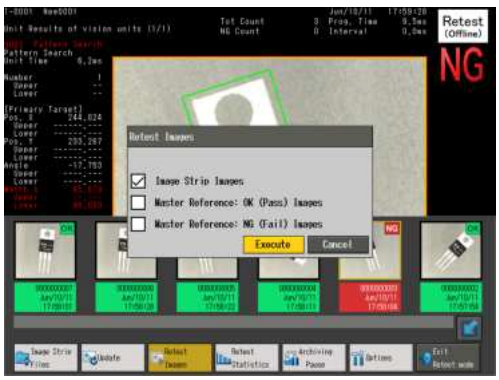
► Note

The batch testing results are cleared at the following times.

- When an FTP server image is set as an Image Strip image or OK/NG master image and the FTP server settings are changed
- When [Update] is executed
- When [Image Strip Files] is executed (except for cases when only the sorting or filter was changed)
- The settings on the Options menu (Page 5-32) are changed.

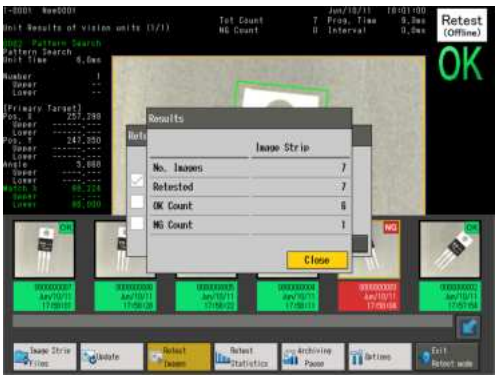
1 **Select [Retest Images] on the Image Strip.**

The Retest Images menu appears.



2 **Check the boxes of the images to use for the batch test, then select [Execute].**

Batch testing is executed and the [Results] menu appears.



3 **After checking the result, select [Close].**

Reference

It is also possible to interrupt batch testing before it is completed. In this case, the [Restart] button appears in the batch test results, and when [Restart] is selected, retesting is continued from the point it was interrupted.

Checking the retesting results on the Statistics screen

The results of retesting can be checked on the Statistics screen.

Select [Statistics] on the Image Strip.

The [Retest Statistics] screen appears.

The operations on the Retest Statistics screen are the same as for standard Statistics, however some functions are different.

Reference

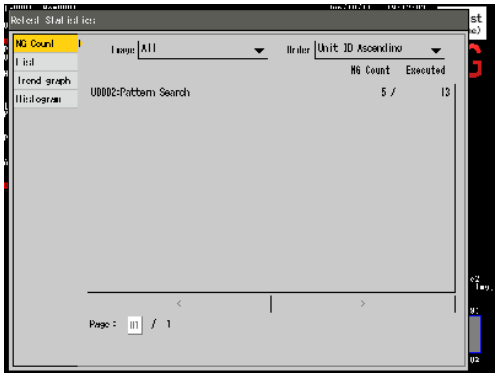
The only statistics displayed are for the batch test results.

The following Statistics screens are from when batch testing was performed with Image Strip images, OK master images, and NG master images.

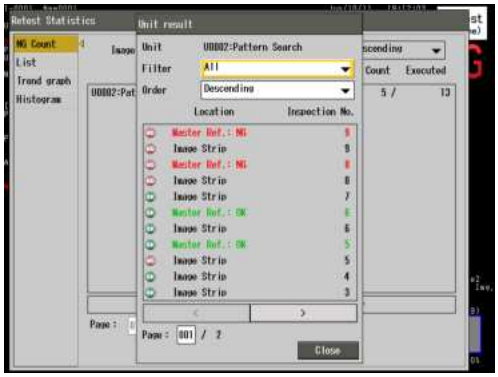
[NG Count] screen

The NG count for each unit can be checked.

For example, if a result was NG during a batch test of OK master images, then it is possible to select the images from the unit which resulted in the NG and directly adjust those settings on the images.



When a unit is selected for checking results or for adjusting parameters, the [OK/NG] inspection count for the selected unit is displayed on the Unit Result screen.



When an inspection count is selected on the Unit Result screen, the image for the selected inspection count is displayed as the current image in the Unit Properties menu, and the necessary program adjustments can be made.

Reference

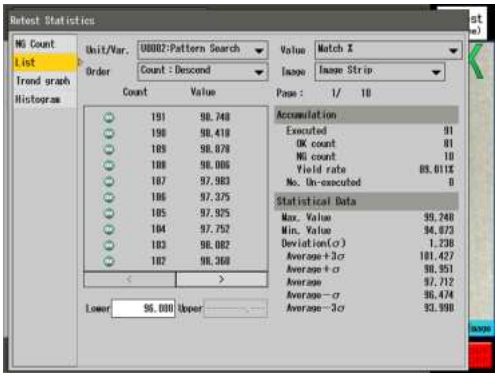
- On the [NG Count] screen, it is possible to change the displayed units and display order, and to display only the desired units.
  - **Image**:
    All: Display the count for all images.
    Image Strip: Displays the counts for images that are in the Image Strip.
    Master Ref.: OK: Displays only the counts for OK master images.
    Master Ref.: NG: Displays only the counts for NG master images.
  - **Order**
    Unit ID Ascending: Displays units in ascending order of the Unit IDs.
    Unit ID Descending: Displays units in descending order of the Unit IDs.
    NG Count Ascending: Displays units in ascending order of their NG counts.
    NG Count Descending: Display units in descending order of their NG counts.
- On the Unit Result screen, it is possible to change the filters and display order, and to display only the desired measurement counts.
  - **Filter**
    NG Only: Displays only the NG images.
    OK and non-processed: Display only the OK images and images which have not been retested.
    All: Display all images.
  - **Order**
    Ascending: Display images in ascending order of the measurement count.
    Descending: Displays images in descending order of the measurement count.

► Note

- Only the images selected for [Image Strip Files] are displayed in the Unit Result screen.
- Because the measurement count is associated with the file name, if the file name was changed, the image may not be displayed correctly.

List menu

Used to check a list of the measurement values from retesting.



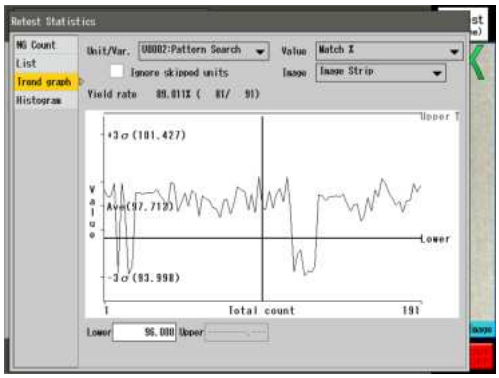
The primary differences with the standard Statistics List menu (Page 5-13) are as follows:

- The displayed images can be changed among all images, the Image Strip images, the OK master images, and the NG master images.
- If the [Master Ref.] box is checked, the measurement count results data can be added as a master image.
- When [Save] is executed, a file is created for each displayed image. The names are as shown below.
  - YYMMDD_HHMMSS_SD No. in program_Program No._image.csv: data (count/total status/statistic item/individual status)
  - YYMMDD_HHMMSS_SD No. in program_Program No._ok.csv: data (count/total status/statistic item/individual status)
  - YYMMDD_HHMMSS_SD No. in program_Program No._ng.csv: data (count/total status/statistic item/individual status)
  - YYMMDD_HHMMSS_SD No. in program_Program No._idx.csv: item name

Reference

When the measurement unit results data is displayed in the list, the desired measurement count can be selected and the Unit Properties menu for that measurement unit displayed.

Trend Graph screen



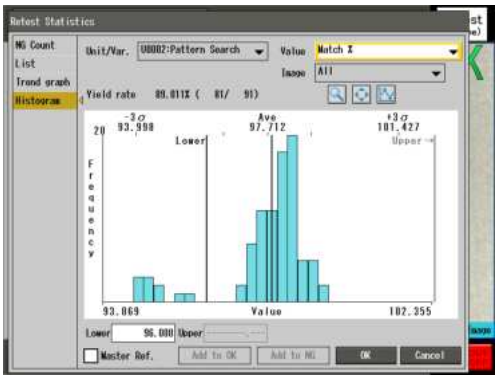
The primary differences with the standard Statistics Trend Graph screen (Page 5-15) are as follows:

- The displayed images can be changed among all images, the Image Strip images, the OK master images, and the NG master images.
- The results data for the measurement count selected in the trend graph can be added as a master image.

Reference

When the measurement unit results data is displayed in the trend graph, the desired measurement count can be selected and the Unit Properties menu for that measurement unit displayed.

Histogram screen



The primary differences with the standard Statistics Histogram screen (Page 5-17) are as follows:

- The displayed images can be changed among all images, the Image Toolbar images, the OK master images, and the NG master images.
- If the [Master Ref.] box is checked, the measurement count results data can be added as a master image.
- The results for OK master images are shown in green. The results for NG master images are shown in red.

Reference

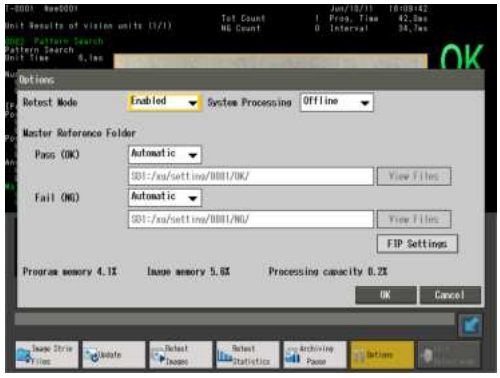
When the measurement unit results data is displayed in the histogram, the desired measurement value can be selected and the Unit Properties menu for that measurement unit displayed.

Changing the Retest Mode settings (options)

The settings for retesting can be changed.

1 Select [Options] on the Image Strip.

The [Options] menu appears.



2 Change the settings as necessary.

Retest mode

If Retest mode will not be used, select [Disabled] (default: Enabled).

System Processing

If online retest operation (Page 5-33) will be used, select [Online] (default: Offline).

► Note

- These settings cannot be changed while Retest mode is active.
- If there is not enough memory, then Retest mode and Retest mode (Online) cannot be used.

Master Reference Folder

Specify the folder where the master images are saved.

- **Pass (OK)**: Select the folder where the OK master images are saved.
- **Fail (NG)**: Select the folder where the NG master images are saved.
- **FTP Settings**: When the master images are saved on an FTP server, select the FTP server where the images are saved. Refer to "FTP Settings" (Page 4-359) for more details.

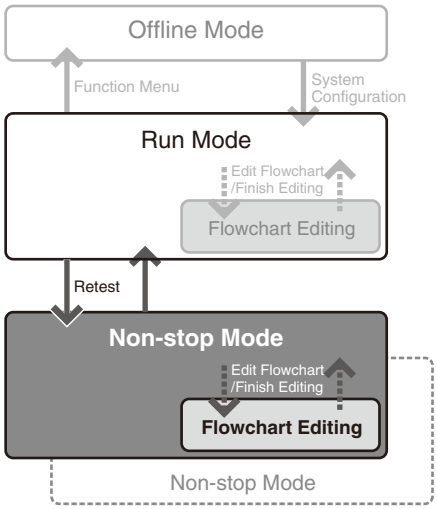
3 Select [OK].

► Note

If the System Processing setting is changed, it will be necessary to save and reload the program. This is done automatically with the confirmation screen, just select [Save & Reload].

Retesting While Normal Inspection Continues (Keep System Online)

Select an image (archived image) stored in the controller and execute image processing. When online operation is enabled, it is possible to perform retesting and program editing during normal operation, without interrupting actual image processing.

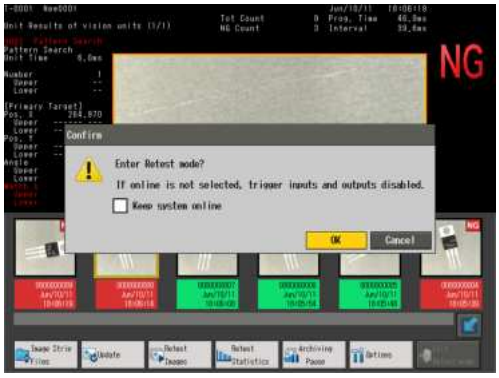


► Note

- When online operation is enabled, some flowchart editing functions are restricted. Refer to "Editing restrictions during Retest Mode (Online)" (Page 5-34) for more details.
- The following options are disabled in Retest mode: [Change Programs], [Rename], [Copy/Delete Programs], [Save/Load Programs], [Image Archive], [Change Login User], and [Go Offline].
- The availability of some commands may be different from that in Run mode. Refer to the XG VisionEditor Reference Manual (Control/Data Edition) for more details.

1 On the Image Strip, select the thumbnail of the image to retest.

A confirmation screen appears.

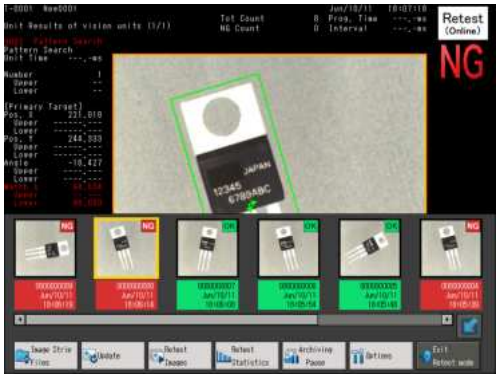


► Note

When the flow editor is open in Retest Mode, it is not possible to change the System Processing setting. However when [Run] on the Flow Editor is selected, the mode automatically changes from Retest mode (Online) to Run mode when the Flow Editor closes.

2 Check the [Keep system online] box and then select [OK].

The controller changes to online Retest mode and retesting is performed using the current program.



► Note

The checkbox is not displayed when [Offline] is selected for System Processing on the Options menu (Page 5-32).

3 **Execute retesting and edit the flowchart and unit settings as necessary.**

Reference

- During Retest mode, there is the possibility that a black image will be displayed if image processing inspection overwrites the archive image and the image displayed in the Image strip disappears when selected. In this case, either select [Update] on the Image Toolbar to update the display, or select [Archiving Pause] to stop overwriting of archive images.
- If the mode is Retest mode (Online), [Running count]  is displayed at the lower right of the Run screen. [Running count] displays the measurement count and total status (green if OK, red if NG).

4 **Resume inspections.**

If the inspection program contents have been changed at the time when inspections are resumed, a confirmation screen appears to confirm whether or not to apply the changes to the currently active inspection program. If [OK] is selected, image processing is performed using the changed program contents as soon as Run mode is restored.

Reference

If the inspection program has been changed, or if [OFF] or [User updated (fast)] is set for High Speed Mode in the flowchart, a confirmation screen will appear before inspections are restarted to check whether or not to save the program.

► Note

When the changes are applied, a several milli-second may occur in the process which is currently being executed.

Editing restrictions during Retest Mode (Online)

During Retest mode (Online), the restrictions on the program items which can be edited are as follows:

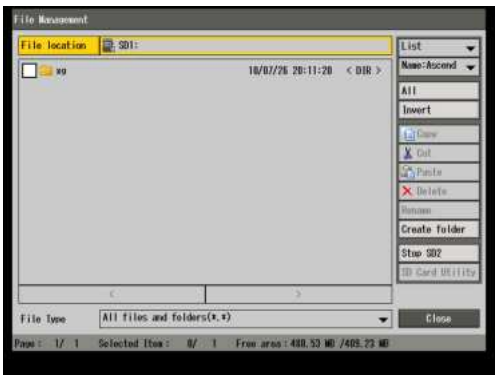
- Add, Delete, Edit (including unit execution and unit name changes), Cut, Paste, and Copy of Imaging units, Output units (Parallel Terminal Output, Data Output, Image Output), and Timing units (Pause, Timer Start/ End, Terminal I/O Delay, Variable Delay, User Menu) are not possible.
- Add, Delete, Copy, Cut, and Paste of Calibration units is not possible. (Editing is possible.)
- If there is an output unit where [PC Program] was selected as the [Device], Add, Delete, Copy, Cut, and Paste of all units is not possible.
- When an image variable (other than a resultant image variable) is not defined and the only Capture unit is located immediately after the Start unit, it is not possible to add or paste a unit between the Start unit and Capture unit. If the deletion or cut of a unit would result in the only Capture unit being located immediately after the Start unit, then unit delete/cut is not possible.
- Renumbering of unit IDs is not possible.
- [Register Image] and OCR [Library] (other than library index change, library name change, and library export) are not possible.
- Screen editing is not possible.
- It is not possible to change to Offline mode or Remote Capture mode.
- The only changes permitted on the Settings menu of the Flow Editor are [Variable Settings] (change current value only), [Total Status Output], [Total Error Output], [Statistics], and [Update Reference Position Information].
- If target classification [Enable] is set, Add, Delete, and Paste of Defect, Blob and Grayscale Blob Units is not possible.

SD Card File Management (File Management)

From the [File Management] screen, files and the SD cards used in slot 1 & 2 can be viewed, checked and managed.

Viewing Files

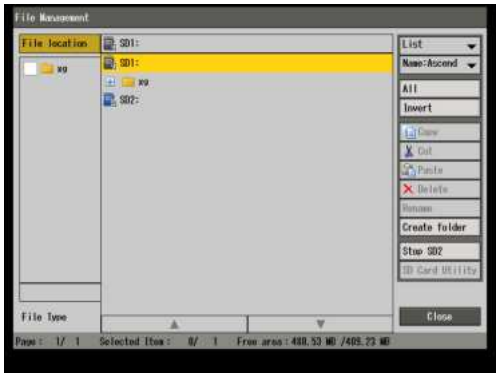
1 **From the Function menu select [Utilities] - [File Management].**
The [File Management] menu appears.



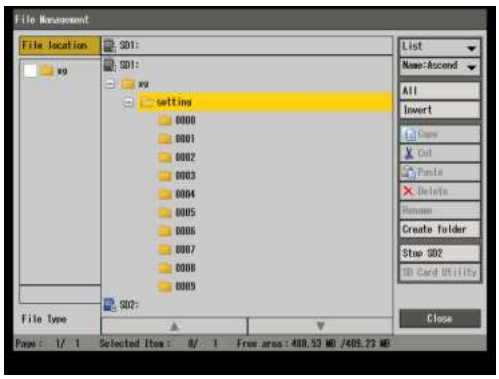
2 **Select [Close] to finish viewing files.**

Viewing Files Saved on the SD Card

1 **From the [File Management] menu, select the [File location].**
Two icons are displayed representing SD Card 1 (SD1) and SD Card 2 (SD2).



2 **Select the drive or folder containing the files to view move the 8-way key to the right.**
Moving the 8-way key to the right expands the folders in the drive or folder.



Reference

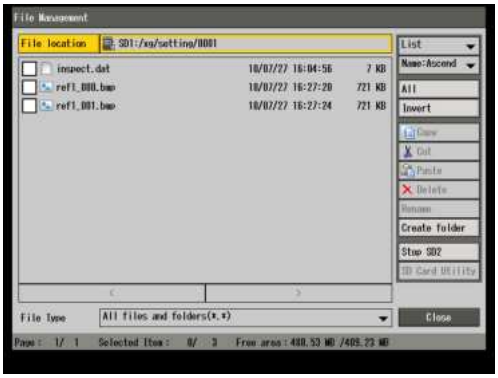
Continue moving the 8-way key to the right to open lower level folders one after another.

► Note

Up to 1,024 items can be displayed in the [View Files] screen.

3 To view files within folders or to check a list of files / folders, highlight the desired folder and press the No.0 (ENTER) button.

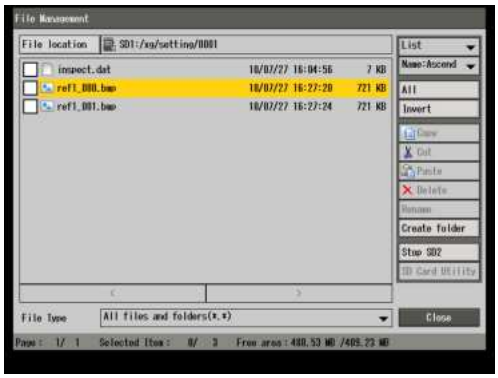
A list of files or folders inside the folder is displayed.



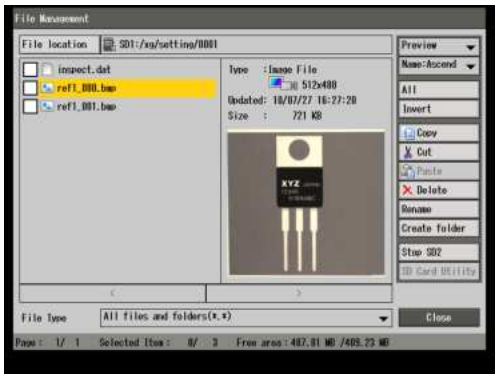
Switching display methods

The File Management menu display can be switched between a list and a preview display.
To switch the display method, select the desired method from the menu on the right side of the [File Management] menu.

List



Preview



Reference

- The preview display will only show 24-bit color or 8-bit grayscale BMP or JPEG images supported by the system.
- 5-megapixel (2432 x 2050 pixels) preview images can be displayed only when a 5-megapixel camera is assigned for the XG-7702 controller.
- Screen capture images can be displayed only when using a 1-megapixel camera.
- Progressive JPEG images cannot be displayed.

Display order

The order for displaying files and folders can be switched between ascending and descending based on file name, last saved, or file size.
To change the display order, select the desired display order from the menu on the right side of the [File Management] screen.

Managing Folders and Files

Folders and files in the SD card can be managed just the same as folders and files on a computer.

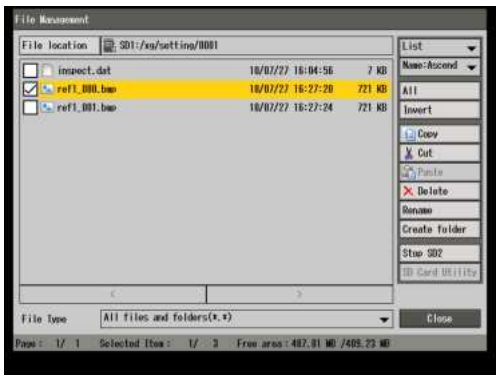
► Note

The controller may not be able to read saved data correctly if folders are moved or if the names of folders or files are changed.

Copying folders and files

To replicate folders and files follow this procedure.

1 Select the folders and files to be copied by using check marks.



Reference

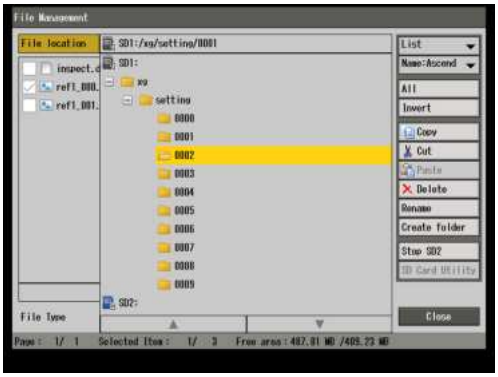
- Clicking [All] puts a check mark next to all the folders and files displayed in the list.
- Clicking [Invert] reverses the checked / unchecked state.

2 Select [Copy].

A confirmation screen appears.

3 Select [Close].

4 Select the folder location to move the files to.



5 Press the No.0 (ENTER) button to display the destination list.

6 Select [Paste].

A confirmation screen appears.

7 Select [OK].

The selected folders and files are copied.

► Note

- Copying may take up to several minutes, depending on the size of the information.
- The controller cannot be operated while copying files.
- Do not turn the controller off or eject the SD card while copying. Doing so may corrupt the data and or damage the SD card.

Moving folders and files

To move folders and files follow this procedure.

1 **Select the folders and files to be copied by using check marks.**

Reference

- Clicking [All] puts a check mark next to all the folders and files displayed in the list.
- Clicking [Invert] reverses the checked / unchecked state.

2 **Select [Cut].**
A confirmation screen appears.

3 **Select [Close].**

4 **Select the folder location to move the files to.**

5 **Press the No.0 (ENTER) button to display the destination list.**

6 **Select [Paste].**
A confirmation screen appears.

7 **Select [OK].**
The selected folders and files are moved.

Deleting folders and files

► Note

Once folders or files are deleted, they cannot be restored.

1 **Select the folders and files to be deleted by using check marks.**

Reference

- Clicking [All] puts a check mark next to all the folders and files displayed in the list.
- Clicking [Invert] reverses the checked / unchecked state.

2 **Select [Delete].**
A confirmation screen appears.

3 **Select [OK].**

4 **Select [Close].**

Renaming folders and files

1 **Select a single folder or file to be renamed and place a check mark next to it.**

2 **Select [Rename].**
The [Rename] menu appears.

3 **Change the name of the folder or file and click [OK].**
Refer to "Entering Characters" (Page 3-8) for more details on inputting characters.
A confirmation screen appears.

4 **Select [Close].**

Creating new folders

1 **From the [File Location] select the location to create the folder.**

2 **Press the No.0 (ENTER) button to display the destination list.**

3 **Select [Create folder].**
The [Create folder] menu appears.

4 **Input the name of the folder and Select [OK].**
Refer to "Entering Characters" (Page 3-8) for more details on inputting characters.
A confirmation screen appears.

5 **Select [Close].**

Removing SD Card 2

Choose [Stop SD2] operation, then press the SD card in the SD2 slot inward to release and remove the card.

► Note

- Take the following steps to protect the SD card and the data it contains.
- Turn off the controller when removing the SD card in the SD1 slot (SD Card 1).
- If you remove the SD card using a procedure other than that specified, or if power is turned off when the card is being accessed, any writing task will stop resulting in a possible loss of data or damage to the SD card.

1 **From the [View Files] menu, select [Stop SD2].**
A confirmation screen appears.

2 **Select [OK].**
The LED indicator turns off, indicating that SD Card 2 can now be removed.

3 **Press the SD card in the SD2 slot inward to release and remove the card.**

Checking and Formatting SD Cards

► Note

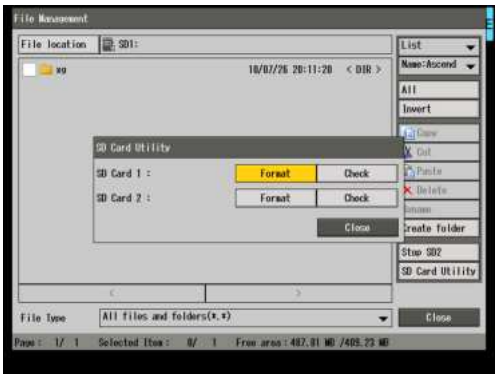
The SD Card Utility function can only be used during Offline mode.

Checking the SD Card

If an error occurs with an SD card it may cause additional problems such as the inability to load files or the loss of files. If these types of problems occur, the Check function can be used to resolve such errors.

1 **From the [File Management] menu select [SD Card Utility].**

The [SD Card Utility] menu appears.



2 **Choose [Check] for [SD Card 1] or [SD Card 2].**

A confirmation screen appears.

3 **Select [OK].**

After the check is complete, the "Check is complete" confirmation message appears.

4 **Select [Close].**

Reference

Refer to "Error Messages" (Page 10-74) when abnormal messages are displayed after the Check function has been performed.

Formatting the SD Card

► Note

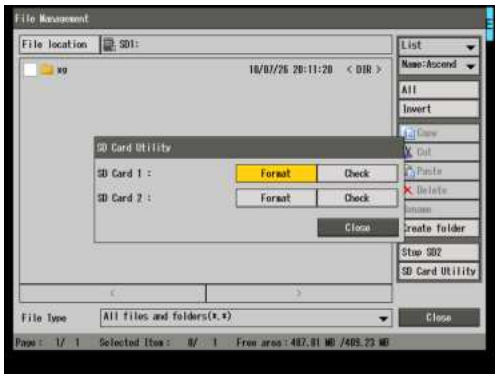
When the SC card is formatted, all data stored on the card will be lost. Formatting erases all of the data on the SD card, and data cannot be restored. Format the SD card after copying the data from the SD card onto a computer.

Reference

When formatting an SD card with a PC, it is recommended that a special SD/SDHC card formatter be used.
Visit the below URL to obtain the formatter (English site, as of March 2010).
http://www.sdcard.org/consumers/formatter_3/
Download from [Download the SD Formatter] at the bottom of the page.

1 **From the [File Management] menu select [SD Card Utility].**

The [SD Card Utility] menu appears.



2 **Choose [Format] for [SD Card 1] or [SD Card 2].**

A confirmation screen appears.

3 **Select [OK].**

After formatting the confirmation screen appears.

4 **Select [Close].**

Verifying the Connection Status of Input and Output Terminals (I/O Monitor & Diagnostics)

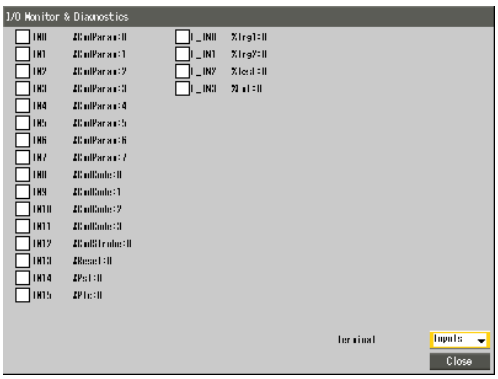
The I/O Diagnostic tool allows for the checking of the status of incoming and outgoing signals via the inputs and outputs of the terminal block and parallel port. This is very useful for verifying the connection status of external equipment wired to the terminals on the controller.

► Note

Not supported when system variables %Flash1 to 8 are assigned to outputs F_OUT0 to 7. For more details on system variables, refer to "Variables" in the XG VisionEditor Reference Manual.

1 From the Function menu select [Utilities] - [I/O Monitor & Diagnostics].

The [I/O Monitor & Diagnostic] menu appears.



2 Select the terminal type (Inputs or Outputs) indicating the connection status in the [Terminal] field in the lower right of the screen.

3 Verify the connections.

Each input and output is displayed with their respective assigned system variable.

- The status display for each terminal is updated in real time in response to the incoming and outgoing signals. A check mark next to the input / output indicates the terminal is ON (shorted).
- To forcibly turn on specific output terminals, set [Control] to [ON], and put check marks next to the terminals to be turned on (only available during Offline mode).

Reference

In Offline mode, no variables are output except certain system variables. To verify data output, switch to Run mode or use the [Manual Control] function in the I/O Diagnostic tool.

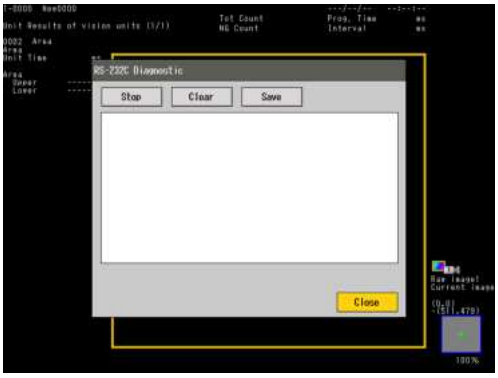
4 Select [Close].

Verifying the Status of RS-232C Communication

The RS-232C Diagnostic tool allows for the checking of the status of incoming and outgoing signals via the RS-232 port of the controller. This feature is very useful for verifying the communication status and content between the controller and external equipment. The most recent communication content (up to 10 KB) can also be saved for later review.

1 **From the Function menu select [Utilities] - [RS-232C Monitor].**

The [RS-232C Monitor] menu appears.



2 **Verify the communication status.**

The communication data is updated in response to incoming and outgoing RS-232C commands.

- A "<" appears at the beginning of the data when output from the controller, and a ">" appears at the beginning of received by the controller.
- Characters other than ASCII code are displayed as in ■hexadecimal.

Reference

In Offline mode, the only RS-232 communication output that occurs are responses to commands input from external devices. To check whether data output from the program is functioning correctly, switch to Run mode.

3 **Use the following operations as required.**

- **To stop data being displayed on screen:** Click [Stop].
- **To clear the log:** Click [Clear].
- **To save the log to the SD card:** Click [Save] to save the log as text data. The log is saved in the "\xg\rs_log\" folder on the specified SD card with the name "File creation date YYMMDD_HHMMSS_SD No._ProgramNo.log".

Reference

The SD card can be specified in the System Settings in XG VisionEditor (default: SD2).

4 **Click [Close].**

Changing the Login User

This function enables a different user to be able to log into the system and operate the controller.

What is a User Account?

A user account belongs to a user group which has a defined set of privileges for operating the controller. Depending on which account is logged in different items can be used or displayed based on the user group (UG0 through 4) that account belongs to.
Logging in with a different user account and password changes the user group and allows different control over the information displayed and available options. Handheld controller actions can also be recorded for different users using the system for traceability purposes. Refer to "Logging Handheld Controller Operations" (Page 5-44).

Reference

Only through the System Settings in XG VisionEditor or via external commands can user accounts and groups be added, edited or deleted. For more details on how to setup accounts, refer to "Controller Global Settings" in the XG VisionEditor Reference Manual.

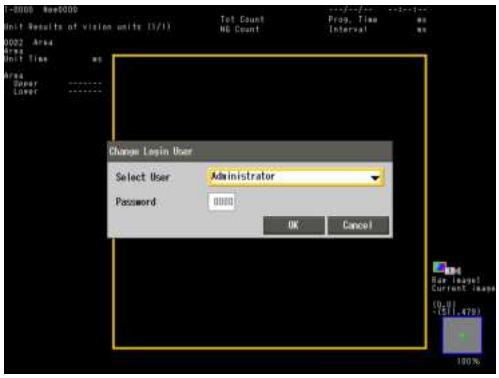
Changing the Login User

1 From the Function menu select [Utilities] - [Change Login User].

The [Change Login User] menu appears with the currently logged in user account displayed.

Reference

"Administrator", registered to user group UG0, is the default logged in account.



2 From the drop down menu choose the desired user account.

Reference

User accounts can be set without a password.

► Note

If the password is lost that account cannot be used until a new password is assigned via the XG VisionEditor software.

3 Click [OK].

This changes the logged in user.

Reference

If the controller is turned off and on again, the controller will log in to the start up user account setup through the XG VisionEditor software.

Logging Handheld Controller Operations (Modification Log (Start/Stop))

Use the following procedure to start/stop the logging of controller operations made with the handheld controller and touch panel.

What is Logging?

Logging is a function which automatically records all the handheld controller and touch panel operations of the controller that are made, along with the user name and a data time stamp, in a CSV text file.
With this function modifications made by the logged in user can be traced and reviewed for traceability purposes (Page 5-43).

Reference

- Log settings can only be changed in the System Settings in the XG VisionEditor software. For more details on logging, refer to "Controller Global Settings" in the XG VisionEditor Reference Manual.
- Log files are saved to the controller SD card in the"\xg\op_log\" folder under the name "file creation dateYYMMDD_HHMMSS.csv" or "User-defined text.csv".
- The log file cannot be viewed on the controller. To view the logs, use a spreadsheet or text editor to open the file.
- The modification log records operations performed with the handheld controller and touch panel, as well as some operations performed in Offline mode.

Starting / Stopping the Log

To start logging

1 **From the Function menu select [Utilities] - [Modification Log (start)]. (If controller modification log recording is stopped)**
A confirmation screen appears.

2 **Select [OK].**
Logging has started

Reference

If the menu shows [Modification Log (stopped)], logging will resume automatically when the controller is turned on if based on the settings set with the XG VisionEditor software.

To stop logging

1 **From the Function menu select [Utilities] - [Modification Log (stop)].**
A confirmation screen appears.

2 **Select [OK].**
Logging is stopped.

Reference

Stopping the log from the menu only works temporarily if it is configured in the XG VisionEditor to start automatically when the controller is turned on.

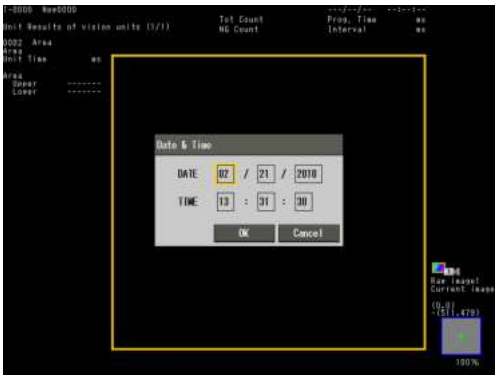
Setting the Clock (Date & Time)

Use the following procedure to set the controllers built in clock. The date and time information is used for time stamping purposes, such as when data is transmitted from the controller.

Reference

This function can also be accessed from the [System Configuration] menu.

1 From the Function menu select [Date & Time].



2 The [Date/Time] screen appears.

3 Specify the [Month], [Day], [Year], [Hour], [Minute], [Second] respectively.

4 To finish settings, Select [OK].

Saving a Program

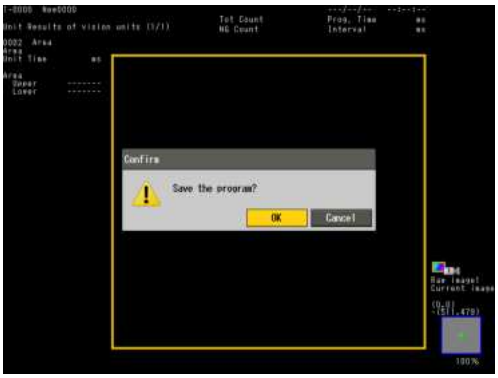
The current program settings can be save to the SD card.

► Note

- If the device is turned off before any settings are saved, all of those changes will be deleted.
- Do not turn off the system power while you are saving the settings. Doing so may cause errors in the internal data

1 **From the Function menu select [Save Program].**

A confirmation screen appears.



2 **Select [OK].**

The settings are saved to the current program file in SD Card 1 or SD Card 2.

► Note

Items specified not to be saved are excluded from the saving operation.
For example, variable values changed in the current program or the default display, and display parts, can be excluded when saving.

Chapter 6

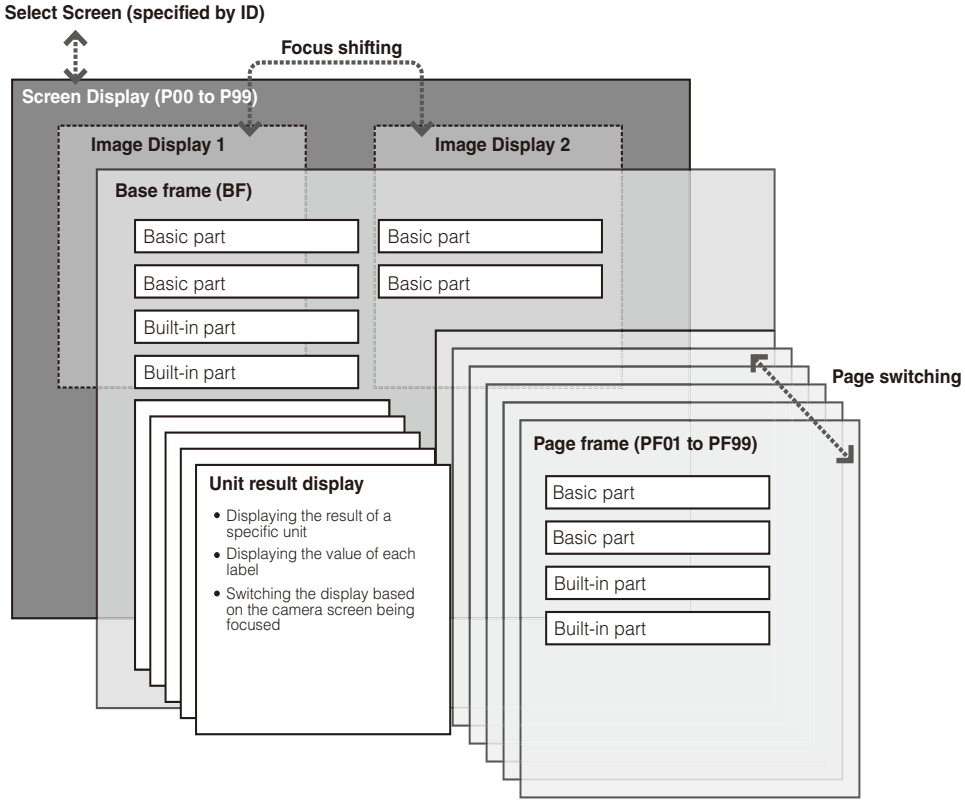
Creating Controller Display Screens (Screen Editor)

Overview of the Creation of Display Templates

It is possible to create a controller display screen by placing various parts on the screen (screen editing).

Organization of Display Screens Created in Screen Editor

The screen editor arranges and manages the display screens created for the controller in groups and hierarchies as outlined below.



Screen elements

Screen display (P00 to P99)
Controller display screens.

Image display (maximum 5 screens)
This is a part which displays the image captured by the camera.

Base frame (BF, only 1)
This is an 800 x 600 pixel (SVGA) or 1024 x 768 pixel (XGA) area part. All display parts can be placed on the base frame.

- **Basic parts**: these parts display shapes and processing results in the controller.
- **Built-in parts**: these parts provide functions for special purposes.

Page frame (PF01 to PF99)
This is an 800 x 600 pixel (SVGA) or 1024 x 768 pixel (XGA) area part with page switching support. Like the base frame, it can be laid out with basic parts and most built-in parts.

Display mechanism

- The parts in the currently selected page frame appear visible on top of the base frame display.
- Parts which need to be visible at all times for the current display template should be placed directly in the base frame, whereas parts that need only be visible in certain situations should be placed in a page frame that is called into use when needed. This allows flexible display possibilities with a single display template.

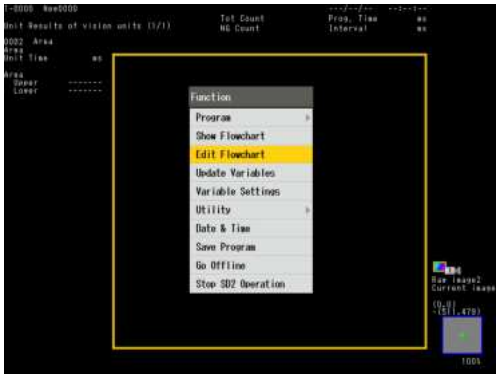
► Note

- Up to 500 parts can be placed in each frame.
- It is not possible to edit display templates when the memory usage reaches 100%.
- The memory usage can be checked in [Screen Display].

Creating Display Templates

This section explains how to create a display template that will serve as the display screen for the controller.

1 **From the Function, click [Edit Flowchart].**



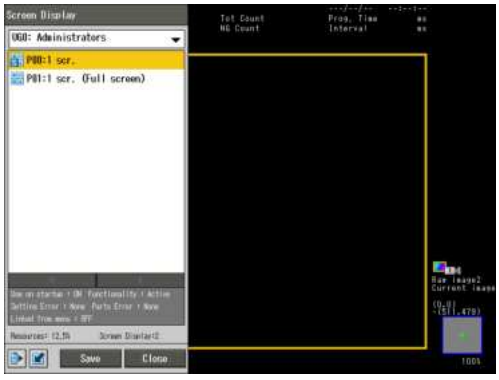
A confirmation screen appears.

2 **Select [OK].**

The flowchart and units can now be edited.

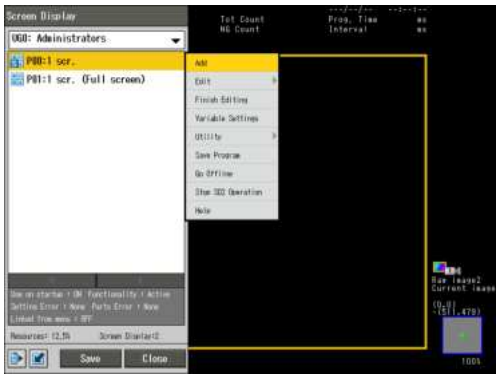
3 **Select [Screen Editor] at the top of the dialog.**

The [Screen Display] menu appears.



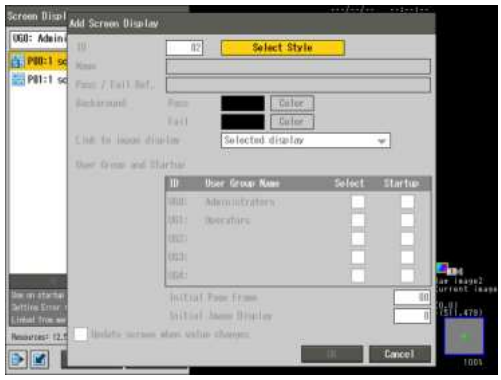
4 **Press the No.1 (FUNCTION) button on the handheld controller.**

The screen editing menu is displayed.



5 **Select [Add].**

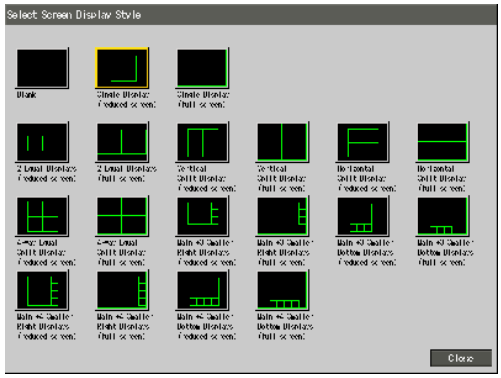
The [Add Screen Display] menu appears.



The [Add] option is disabled when the number of registered display templates has reached the maximum number (99).

6 **Click [Select Style].**

The [Select Screen Display Style] menu appears.



7 **Select the desired display template.**

In this step, select [Single Display] (one screen) as an example.

Reference

The most typically used parts can be quickly added by selecting any of the display templates, except the template labeled [Blank]. For more details, refer to the XG VisionEditor Reference Manual (Programming Edition).

8 **Change the settings of the display template as necessary and then press [OK].**

For more details on the settings, refer to the XG VisionEditor Reference Manual (Programming Edition).

To change the settings of the existing display template:

Place the cursor on the display template to edit, press the No.1 (FUNCTION) button on the handheld controller, and select [Edit] - [Properties] from the screen editing menu.

To delete a display template:

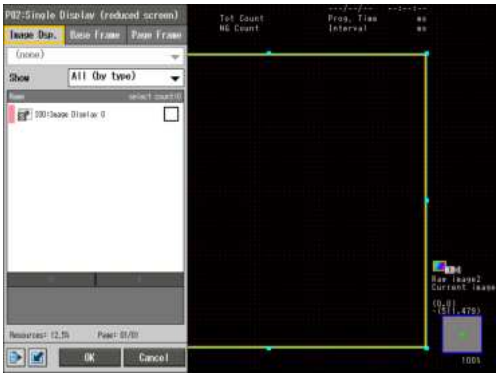
Place the cursor on the display template to delete, press the No.1 (FUNCTION) button on the handheld controller, and select [Edit] - [Delete] from the screen editing menu.

► Note

A display template which has been specified in a menu such as the [Update Variables] menu cannot be deleted.

9 Select the display template added in step 7.

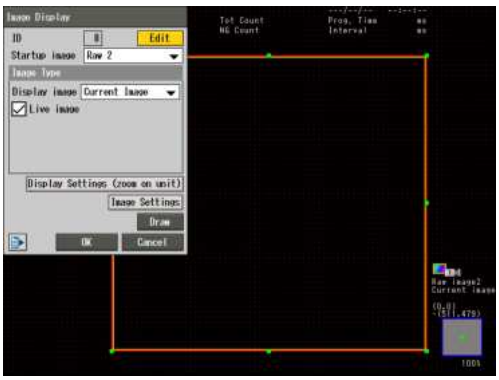
The display template setting menu appears.



10 On the [Image Dsp.] tab, select a [Image Display] part.

In this step, select [I00: Image Display 0] as an example.

The [Image Display] menu appears.



11 Change the settings of the image display as necessary and then press [OK].

For more details on the settings, refer to the XG-7000 Series User's Manual.

To add a image display:

Press the No.1 (FUNCTION) button on the handheld controller and select [Add] from the screen editing menu.

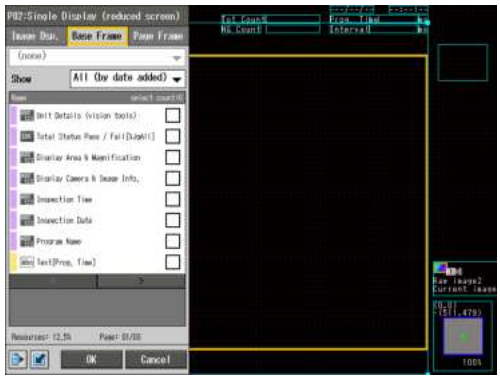
► Note

The [Add] option is disabled when five camera screens have already been placed.

To delete a image display:

Place the cursor on the image display to delete, press the No.1 (FUNCTION) button on the handheld controller, and select [Edit] - [Delete] from the screen editing menu.

12 Select [Base Frame] tab and change the settings as necessary.



The base frame is used to control all parts that appear at all times. In the base frame, both basic and built in parts can be edited.

Reference

Use [Show] to select an option so that only parts which satisfy the selected condition are listed.

To add a part to the base frame:

Press the No.1 (FUNCTION) button on the handheld controller and select [Add] - [(Part name to be added)] from the screen editing menu. The selected part is added at the center of the screen.

Use [Data (Text & Value)] in the parts list to add [Text display] (Variable name) and [Value display] (Variable value) of the selected result data or variable simultaneously.

► Note

- If no base frame exists, no parts can be added. Press the No.1 (FUNCTION) button on the handheld controller and select [Edit Base Frame] - [Add] from the screen editing menu to add a base frame.
- The [Add] option is disabled when the number of registered parts has reached the maximum number.

To edit the part placed in the base frame:

Select a part to edit, and the menu for editing the part is displayed. For more details, refer to the XG-7000 Series User's Manual.

► Note

When two or more parts are selected, only their properties can be viewed, and no editing options other than [Draw] can be selected.

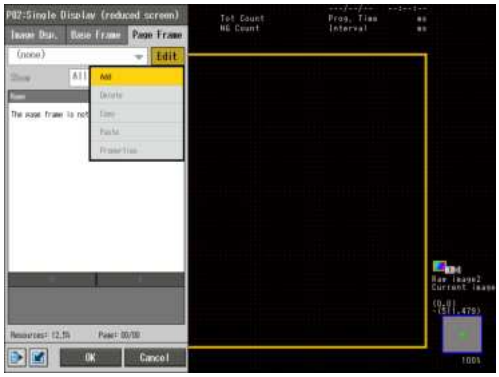
To delete the part placed in the base frame:

Place the cursor on the part to delete, press the No.1 (FUNCTION) button on the handheld controller, and select [Edit] - [Delete] from the screen editing menu.

13 Select the [Page Frame] tab.

The page frame is used to control parts that appear when the user switches to a specific page. In the page frame, it is possible to edit basic parts and most of the built-in parts.

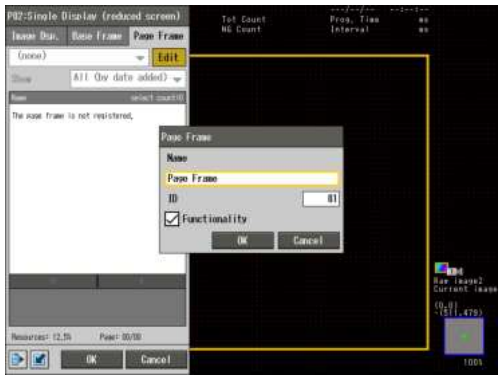
14 Select [Edit] - [Add].



► Note

The [Add] option is disabled when the number of registered page frames has reached the maximum number (99).

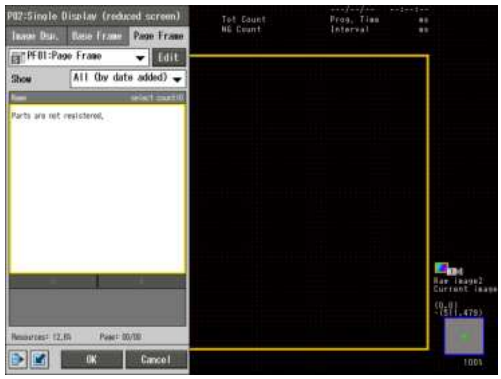
The [Page Frame] menu appears.



15 Change the settings of the page frame, and then click [OK].

The page frame is added and the display template setting menu appears again.

16 Change the settings as necessary.



To add a page frame:

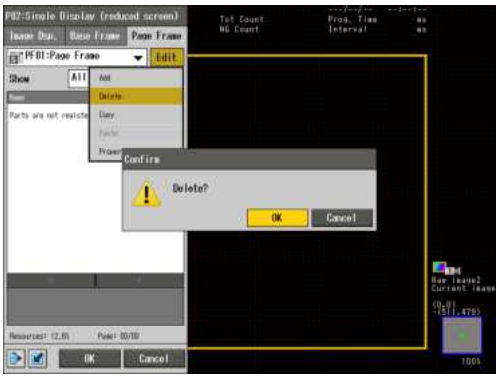
Select [Edit] - [Add] (Refer to the instruction in steps 14 and 15.)

To change the page frame used to edit parts:

Select a desired page frame from the list at the top of the screen.

To delete a page frame:

Select a page frame to delete from the list at the top of the screen and select [Edit] - [Delete].



Select [OK] on the confirmation screen.

To edit the parts in the page frame (add/edit/delete parts):

The operation is the same for the base frame.

Reference

Some parts may not be added or deleted depending on the specified location. Refer to the description of each part for more details.

► Note

To edit the part placed in the page frame, it is necessary to switch to the page frame containing the part.

17 When editing is complete, select [OK].

The display returns to the [Screen Display] menu.

18 Select [Save].

A confirmation screen appears.

19 Select [OK].

Changing the Position of a Placed Part

Reference

To change the display contents of the parts, refer to the description of each part.

Editing the placement position of a part (Draw mode)

To change the placement position of a display part, select [Draw] in the editing dialog of the part, or place the cursor on the part and press the back and ENTER buttons on the handheld controller (Draw mode).

In Draw mode, the currently selected part (current part) is shown in a red frame (a pink thick frame when more than one parts are selected), the other selected parts are shown in pink thin frames, and other parts are shown in blue frames.

- Up/down/right/left key: Move or resize the selected part.
- No.0 (ENTER): Confirm the setting.
- No.2 (ESCAPE): Exit from Draw mode.

Refer to "Key operations on the dialog in Draw/Multi Select menu" (Page 6-10) for more details on other operation.

Editing the placement positions of multiple parts simultaneously (Multi Select mode)

It is possible to directly select multiple parts which have been placed.

To enter Multi Select mode, enter Draw mode once, and then press the No.1 (FUNCTION) button on the handheld controller and select [Edit] - [Start Multi Select mode (Back + ENT)], or press the BACK and ENT buttons.

In Multi Select mode, the currently selected part (current part) is shown in a red frame (a pink thick frame when more than one parts are selected), the other selected parts are shown in pink thin frames, and other parts are shown in green frames.

- Up/down/right/left key: Select a part (Change the current part.).
- No.0 (ENTER): Include the current part in the selected parts or exclude it from them.
- No.2 (ESCAPE): Exit from Multi Select mode.
- Refer to "Key operations on the dialog in Draw/Multi Select menu" (Page 6-10) for more details on other operation.

Arranging parts

It is possible to select multiple parts and arrange them in various ways.
Select two or more display parts, press the No.1 (FUNCTION) button on the handheld controller, select [Align/ & Order] - [Align] or [Distribute], and select a desired option.

Align

All of these options align the selected parts based on the part on which the cursor is currently placed (current part).

- **Left Align**: Align the parts with the left end of the current part.
- **Center Align**: Align the horizontal center of the parts with the horizontal center of the current part.
- **Right Align**: Align the parts with the right end of the current part.
- **Top Align**: Align the parts with the top of the current part.
- **Middle Align**: Align the vertical center of the parts with the vertical center of the current part.
- **Bottom Align**: Align the parts with the bottom of the current part.

Distribute

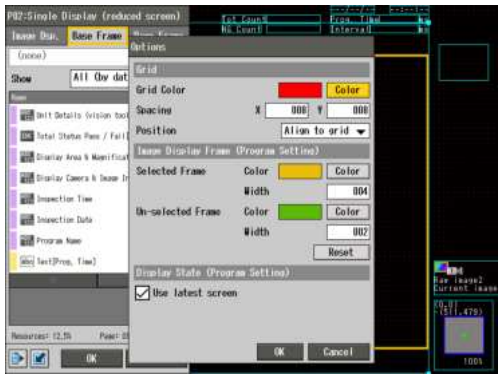
- **Horizontally**: Arrange the selected display parts with equal spacing between the rightmost and leftmost parts. The vertical position of each part does not change.
- **Vertically**: Arrange the selected display parts with equal spacing between the topmost and bottommost parts. The horizontal position of each part does not change.

► Note

The image display parts cannot be aligned or arranged.

Changing the grid display settings

It is possible to change the display options of the grid displayed during screen editing in the [Options] menu. Press the No.1 (FUNCTION) button on the handheld controller and select [Utility] - [Options] from the screen editing menu.



Grid

- **Grid Color**: To change the color of the grid, click [Select Color].
- **Spacing**: Specify the grid interval.
- **Position**: Specify the parts layout method.
  - **Align to grid**: Parts are positioned so that the top left of the part is aligned with the grid.
  - **Free**: Parts can be positioned freely while ignoring the grid.

Reference

- When [Align to grid] is selected with [Scale On] specified, the centers of horizontal line parts and vertical line parts are aligned with the grid.
- As for the case of circle or cross mark parts, their center coordinates are aligned with the grid.

Image Display Frame (Program Setting)

Specify the display color and line thickness of the frame for the cases where the camera screen is in focus or not in focus.

Use latest screen

Check this box to overwrite the initial display status when the settings are saved (Default: Checked).

Reference

- The following items are overwritten in the display status:
  - Initial display template
  - Initial display page
  - Focused image display in the initial display
  - Unit initially displayed on each image display
  - Processed image type initially displayed on each image display
  - Zoom ratio initially displayed on each image display
- The [Use latest screen] setting is saved as part of the program file.

Changing the overlap order of parts

Overlapped parts can be rearranged in a different order. Place the cursor on the part to change the overlap order, press the No.1 (FUNCTION) button on the handheld controller, and select [Overlay] - [On top] or [Underneath].

- **On top**: Move the selected part to the foremost position.
- **Underneath**: Move the selected part to the rearmost position.

Reference

When several parts are selected, these parts are moved as a group with the same overlap order to the foremost/rearmost position.

Other Screen Editing Operations

Sorting/filtering relevant parts

When searching for a part, it is possible to filter the parts based on type, or sort the parts by the order they are added.

On the display template setting dialog, select the appropriate option from [Show] on either the [Base Frame] or [Page Frame] tab.

- **All (by date added)**: Display all parts after sorting them in the order of they are added.
- **All (by type)**: Display all parts after sorting them by their types.
- **Basic parts**: Display basic parts only.
- **Standard parts**: Displays built-in parts only.
- **Selected**: Display parts which are selected for multiple selection only.
- **Value**: Display [Value display] parts only.
- **Text**: Display [Text display] parts only.
- **Active Text**: Display [Active Text] parts only.
- **Horizontal line**: Display [Horizontal line] parts only.
- **Vertical line**: Display [Vertical line] parts only.
- **Point**: Display [Point] parts only.
- **Rectangle**: Display [Rectangle] parts only.
- **Circle**: Display [Circle] parts only.
- **Polygon**: Display [Polygon] parts only.
- **Table**: Display [Table] parts only.
- **Values and Text**: Display [Value] and [Text] parts only.
- **Error or Empty**: Display parts which contain [Error] or [Empty] items.

Reference

The [Show] list does not show the categories to which no part belongs.

Selecting multiple parts for simultaneous operation

It is possible to select multiple display parts to copy, delete, align, or arrange them simultaneously.
To select multiple parts, check desired display parts listed on the display template setting dialog.

Reference

Multi Select mode (Page 6-6) can also be used to select parts directly by viewing the placed parts.

Deleting selected parts simultaneously

Press the No.1 (FUNCTION) button on the handheld controller and select [Edit] - [Cancel Multi Select] from the screen editing menu.

Canceling the previous operation

When a mistake is made, it is possible to undo by one step.
Press the No.1 (FUNCTION) button on the handheld controller and select [Edit] - [Undo] from the screen editing menu.

► Note

When there is no operation to be undone, a message "Undo (BACK+FNC)" is displayed and [Undo] cannot be selected.

Copying, cutting, and pasting parts

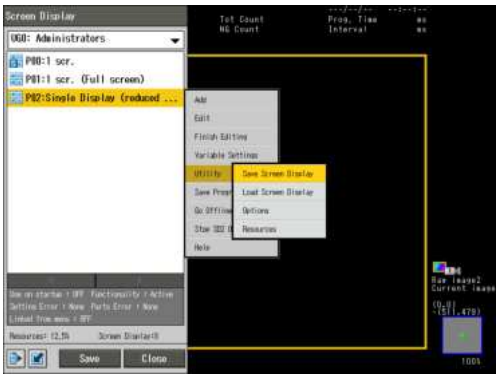
Place the cursor on the part, press the No.1 (FUNCTION) button on the handheld controller, and select [Edit] - [(Desired operation)] from the screen editing menu.

Reference

An item can be pasted to a different display template if the editing object specified at the destination supports the cut or copied part.

Saving or loading display templates

It is possible to save the settings of a specific display template in a display template file (***.srn) and load it into the controller.
Place the cursor on the display template list, press the No.1 (FUNCTION) button on the handheld controller, and select [Utility] - [(Desired operation)] from the screen editing menu.



- **Save Screen Display**: On the displayed dialog, select the display template to save and its file name and click [Execute] to save the display template file.
- **Load Screen Display**: On the displayed dialog, specify the display template file, select the destination display template and click [Execute] to load the display template.

► Note

- If the loaded display template does not conform to the settings of the current program, an error may occur, resulting in improper display. It is recommended to check for errors after loading the template.
- The display template file contains the active text table, the screen frame setting (program-specific) which is an option for screen editing, and the initial display application setting (program-specific). When a display template is loaded, these settings will be overwritten.

Key Operations Related to Screen Editing

Key operations on the [Screen Display] menu

No.6 button (MENU)	Display help.
No.7 Back button + No.6 button (MENU)	Change the transparency of the menu.
No.7 Back button + No.4 button (SCREEN)	Switch between grid layout and free layout
No.7 Back button + Right/left key	Move the dialog to right/left.

Key operations on the display template setting menu

No.6 button (MENU)	Display help.
No.7 Back button + No.6 button (MENU)	Change the transparency of the menu.
No.7 Back button + No.0 button	Switch to Draw mode.
No.7 Back button + Right/left key	Move the menu to right/left.
No.7 Back button + No.4 button (SCREEN)	Switch between grid layout and free layout
No.7 Back button + No.1 button (FUNCTION)	Undo

Key operations on the dialog in Draw/Multi Select menu

No.6 button (MENU)	Display help.
No.7 Back button + No.6 button (MENU)	Change the transparency of the menu.
No.7 Back button + No.0 button	Switch between Draw mode and Multi Select mode
No.7 Back button + 8-way key	• Change the current part (in Draw mode) • Move the current part (in Multi Select mode)
No.7 Back button + No.4 button (SCREEN)	Switch between grid layout and free layout
No.7 Back button + No.1 button (FUNCTION)	Undo

Reference

Switching between grid layout and free layout using key operation does not affect the [Layout method] on the [Options] menu (Page 6-7). The layout returns to the one specified by [Layout method] when the [Options] menu is displayed.

Displaying the key operation list

It is possible to display the help window and see the list of key operations.
Press the No.1 (FUNCTION) button on the handheld controller and select [Help (MENU)] from the screen editing menu.

Reference

The list can also be displayed by pressing the No.6 (MENU) button.

Screen Display Style

Overview of Screen Display Style

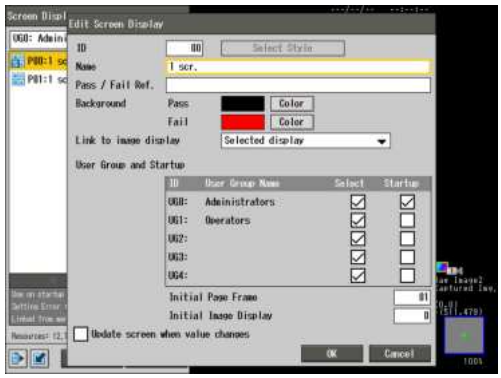
Screen display styles are preset screen templates that display information for the controller.
When creating a new screen display, a display style must be chose in the ScreenEditor. Display styles allow you to create screen displays quickly by allowing users to choose a style and make changes to it.

The following 21 display styles are available.

- Blank (Page 6-13)
- Single Display (reduced screen) (Page 6-13)
- Single Display (full screen) (Page 6-14)
- 2-way Equal Split Display (reduced screen) (Page 6-14)
- 2-way Equal Split Display (full screen) (Page 6-15)
- Vertical Split Display (reduced screen) (Page 6-15)
- Vertical Split Display (full screen) (Page 6-16)
- Horizontal Split Display (reduced screen) (Page 6-16)
- Horizontal Split Display (full screen) (Page 6-17)
- 4-way Equal Split Display (reduced screen) (Page 6-17)
- 4-way Equal Split Display (full screen) (Page 6-18)
- Main +3 Smaller Right Displays (reduced screen) (Page 6-18)
- Main +3 Smaller Right Displays (full screen) (Page 6-19)
- Main +3 Smaller Bottom Displays (reduced screen) (Page 6-19)
- Main +3 Smaller Bottom Displays (full screen) (Page 6-20)
- Main +4 Smaller Right Displays (reduced screen) (Page 6-20)
- Main +4 Smaller Right Displays (full screen) (Page 6-21)
- Main +4 Smaller Bottom Displays (reduced screen) (Page 6-21)
- Main +4 Smaller Bottom Displays (full screen) (Page 6-22)
- 6-way Equal Split Display (reduced screen) (Page 6-22)
- 8-way Equal Split Display (reduced screen) (Page 6-23)

Common Settings for Display Style

The controller can switch between 100 screen displays per program. The Screen Editor offers 21 types (Page 6-11) of display templates. Each type is set in the same way, the only difference being the display template parts (Page 6-24) initially included with the template.
The following is an explanation of the common setting procedures used on the Add Screen Display menu (Page 6-3).



Reference

For details on the screen display parts initially installed on the display template, see the explanation for each individual part.

ID

Specify the screen display ID from 0 to 99.

► Note

- The ID must be unique within the same inspection program.
- The ID of a screen display that is selected as a screen display in the menu cannot be changed.

Name

Enter the name of the display template.
This name appears on controller screen.

Pass / Fail Reference

When changing the background color based on the results, specify the reference value (variable, setting parameter, or results data) for determining OK/NG.

Background color

Specify the background colors to use when the result is normal (OK, no value specified) and when failed (NG).

- **Pass (OK)**: Select the color of the background when the inspection is OK.
- **Fail (NG)**: Select the color of the background when the inspection is NG.

Link to image display

The variable, setting parameter, or results data specified for the [Pass / Fail Reference] can be linked to the result of the image displayed in the image display (Page 6-24).
If the image display is set to display an archived image, the background color will match the result of the archived image.
Otherwise, the background color will match the latest result for the displayed image.

- **None**: Background color always matches the latest result, independent of the image display.
- **Selected display**: Links the background color to the result of the displayed image from the camera image selected on the controller.
- **Image DisplayID**: Permanently links the background color to the result of the displayed image on the specified image display.

► Note

- If the link is set to an image display that has been set to an archived image with no results logging data, the background color will always be the color set for [Pass (OK)].
- A setting error will occur if the image display specified for the display template does not exist.

User Group and Startup

This option designates the display template as the default display and makes it selectable for each user group (Page 5-43).

- **Select**: Makes this display template selectable when the user is logged into the controller for the specified user group. Remove the check mark to prevent the user from selecting this display template.
- **Startup**: Makes the selected display template the default display when the program is loaded with the specified user group.

► Note

- Only one screen display can be set as the Startup screen for each account.
- If there are no screen displays which are set as changeable under [Select], then the screen display with the lowest ID number is used as the Startup screen.

Reference

The Startup screen state for each group can be checked from the Startup icon S that is linked to the [User Group specification] on the Screen Display List, and the selection status can be checked from the color of the icon (blue if selectable, gray if not selectable).

Initial Page Frame

This specifies the first page number to (i.e., page frame part (Page 6-28)), immediately after switching to this display template.

Initial Image Display

This specifies which image display (Page 6-24), when located on the display template, should have focus immediately after switching to this display template.

Updating the camera image and screen display when variables are changed

Check this box to update the camera image and screen display contents when a variable value was changed from the Update Variables menu or by external input.

► Note

If [Update screen when value changes] is enabled, the unit that is specified at the display target for the camera screen will display the corresponding region on the screen even if it has been set as non-executable.

Blank

This template contains a base frame only.



Changing the settings of a screen display

Place the cursor on the screen display to edit, then press the controller No.1 (FUNCTION) button and select [Edit] - [Properties] from the Screen Editor menu.

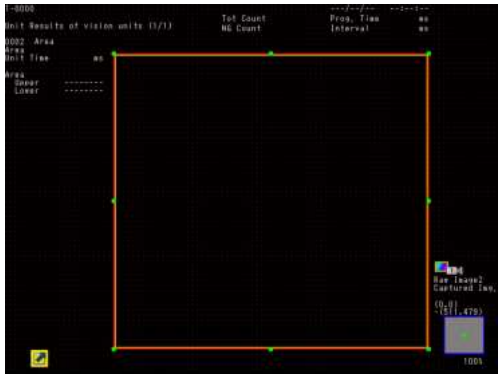
Parts included

The [Blank] template includes the following parts.

- Base frame (x 1) (Page 6-27)

Single Display (reduced screen)

This template displays one image and information related to that image. The template consists of a single image display, and a base frame with parts for displaying related information.



Changing the settings of a screen display

Place the cursor on the screen display to edit, then press the controller No.1 (FUNCTION) button and select [Edit] - [Properties] from the Screen Editor menu.

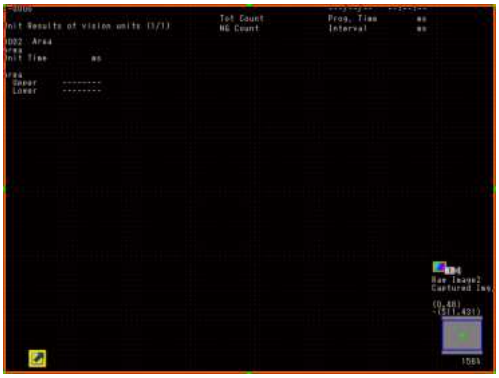
Parts included

The [Single Display (reduced screen)] template includes the following parts.

- Image Display (x 1) (Page 6-24)
- Base frame (x 1) (Page 6-27)
- Basic Parts
  - Value (x 6) (Page 6-28)
  - Text (x 7) (Page 6-30)
- Standard parts
  - Program Name (x 1) (Page 6-41)
  - Inspection Date (x 1) (Page 6-42)
  - Inspection Time (x 1) (Page 6-43)
  - Display Camera & Image Info. (x 1) (Page 6-44)
  - Display Area & Magnification (x 1) (Page 6-45)
  - Total Status Pass / Fail (x 1) (Page 6-46)
  - Unit Details (vision tools) (x 1) (Page 6-47)

Single Display (full screen)

This template displays one image and information related to that image using the entire screen. The template consists of a single image display, and a base frame with parts for displaying related information.



Changing the settings of a screen display

Place the cursor on the screen display to edit, then press the controller No.1 (FUNCTION) button and select [Edit] - [Properties] from the Screen Editor menu.

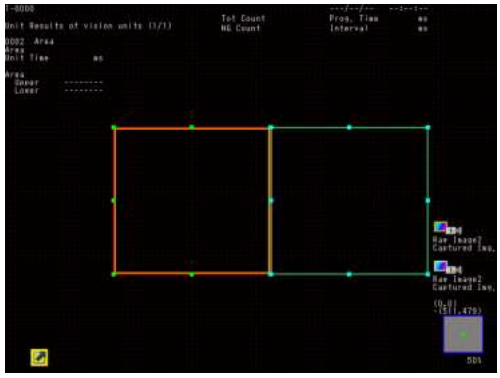
Parts included

The [Single Display (full screen)] template includes these parts.

- Image Display (x 1) (Page 6-24)
- Base frame (x 1) (Page 6-27)
- Basic Parts
  - Value (x 6) (Page 6-28)
  - Text (x 7) (Page 6-30)
- Standard parts
  - Program Name (x 1) (Page 6-41)
  - Inspection Date (x 1) (Page 6-42)
  - Inspection Time (x 1) (Page 6-43)
  - Display Camera & Image Info. (x 1) (Page 6-44)
  - Display Area & Magnification (x 1) (Page 6-45)
  - Total Status Pass / Fail (x 1) (Page 6-46)
  - Unit Details (vision tools) (x 1) (Page 6-47)

2 Equal Displays (reduced screen)

This template displays two images of the same size, side by side, and information related to those images. The template consists of two image displays, and a base frame with parts for displaying related information.



Changing the settings of a screen display

Place the cursor on the screen display to edit, then press the controller No.1 (FUNCTION) button and select [Edit] - [Properties] from the Screen Editor menu.

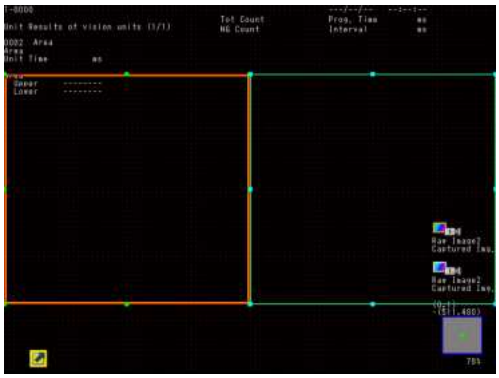
Parts included

The [2 Equal Displays] template includes these parts.

- Image Display (x 2) (Page 6-24)
- Base frame (x 1) (Page 6-27)
- Basic Parts
  - Value (x 6) (Page 6-28)
  - Text (x 7) (Page 6-30)
- Standard parts
  - Program Name (x 1) (Page 6-41)
  - Inspection Date (x 1) (Page 6-42)
  - Inspection Time (x 1) (Page 6-43)
  - Display Camera & Image Info. (x 2) (Page 6-44)
  - Display Area & Magnification (x 1) (Page 6-45)
  - Total Status Pass / Fail (x 1) (Page 6-46)
  - Unit Details (vision tools) (x 1) (Page 6-47)

2 Equal Displays (full screen)

This template displays two images of the same size, side by side, and information related to those images using the entire screen. The template consists of two image displays, and a base frame with parts for displaying related information.



Changing the settings of a screen display

Place the cursor on the screen display to edit, then press the controller No.1 (FUNCTION) button and select [Edit] - [Properties] from the Screen Editor menu.

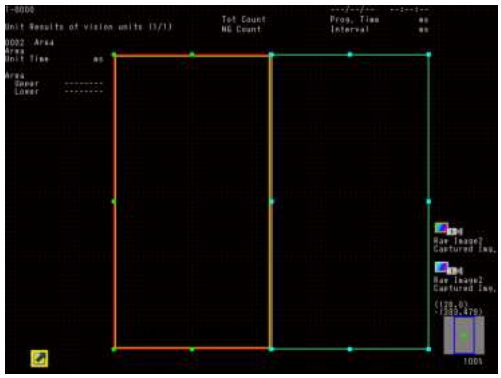
Parts included

The [2 Equal Displays (full screen)] template includes these parts.

- Image Display (x 2) (Page 6-24)
- Base frame (x 1) (Page 6-27)
- Basic Parts
  - Value (x 6) (Page 6-28)
  - Text (x 7) (Page 6-30)
- Standard parts
  - Program Name (x 1) (Page 6-41)
  - Inspection Date (x 1) (Page 6-42)
  - Inspection Time (x 1) (Page 6-43)
  - Display Camera & Image Info. (x 2) (Page 6-44)
  - Display Area & Magnification (x 1) (Page 6-45)
  - Total Status Pass / Fail (x 1) (Page 6-46)
  - Unit Details (vision tools) (x 1) (Page 6-47)

Vertical Split Display (reduced screen)

This template displays two images half of the display size in the X direction, side by side, and information related to those images.
The template consists of two image displays, and a base frame with parts for displaying related information.



Changing the settings of a screen display

Place the cursor on the screen display to edit, then press the controller No.1 (FUNCTION) button and select [Edit] - [Properties] from the Screen Editor menu.

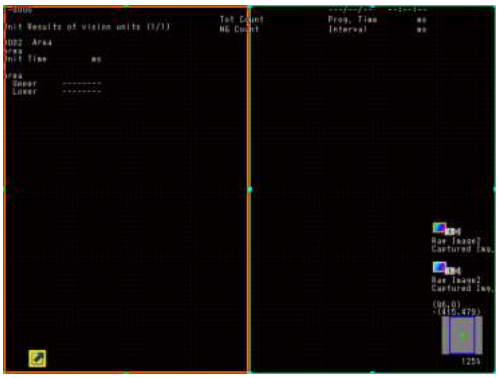
Parts included

The [Vertical Split Display] template includes these parts.

- Image Display (x 2) (Page 6-24)
- Base frame (x 1) (Page 6-27)
- Basic Parts
  - Value (x 6) (Page 6-28)
  - Text (x 7) (Page 6-30)
- Standard parts
  - Program Name (x 1) (Page 6-41)
  - Inspection Date (x 1) (Page 6-42)
  - Inspection Time (x 1) (Page 6-43)
  - Display Camera & Image Info. (x 2) (Page 6-44)
  - Display Area & Magnification (x 1) (Page 6-45)
  - Total Status Pass / Fail (x 1) (Page 6-46)
  - Unit Details (vision tools) (x 1) (Page 6-47)

Vertical Split Display (full screen)

This template displays two images half of the display size in the X direction, side by side, and information related to those images using the entire screen. The template consists of two image displays, and a base frame with parts for displaying related information.



Changing the settings of a screen display

Place the cursor on the screen display to edit, then press the controller No.1 (FUNCTION) button and select [Edit] - [Properties] from the Screen Editor menu.

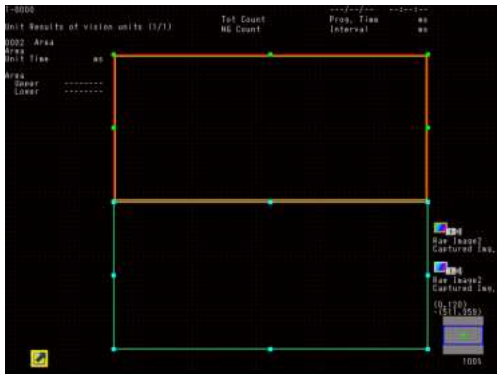
Parts included

The [Vertical Split Display (full screen)] template includes these parts.

- Image Display (x 2) (Page 6-24)
- Base frame (x 1) (Page 6-27)
- Basic Parts
  - Value (x 6) (Page 6-28)
  - Text (x 7) (Page 6-30)
- Standard parts
  - Program Name (x 1) (Page 6-41)
  - Inspection Date (x 1) (Page 6-42)
  - Inspection Time (x 1) (Page 6-43)
  - Display Camera & Image Info. (x 2) (Page 6-44)
  - Display Area & Magnification (x 1) (Page 6-45)
  - Total Status Pass / Fail (x 1) (Page 6-46)
  - Unit Details (vision tools) (x 1) (Page 6-47)

Horizontal Split Display (reduced screen)

This template displays two images half of the display size in the Y direction, top and bottom, and information related to those images.
The template consists of two image displays, and a base frame with parts for displaying related information.



Changing the settings of a screen display

Place the cursor on the screen display to edit, then press the controller No.1 (FUNCTION) button and select [Edit] - [Properties] from the Screen Editor menu.

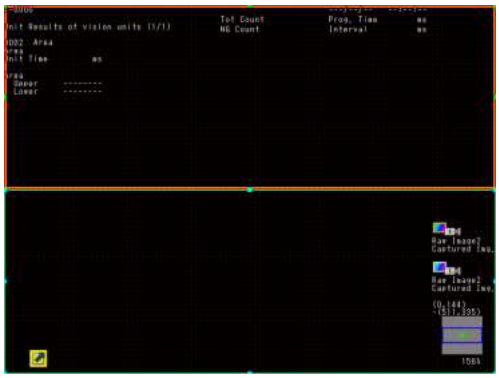
Parts included

The [Horizontal Split Display] template includes these parts.

- Image Display (x 2) (Page 6-24)
- Base frame (x 1) (Page 6-27)
- Basic Parts
  - Value (x 6) (Page 6-28)
  - Text (x 7) (Page 6-30)
- Standard parts
  - Program Name (x 1) (Page 6-41)
  - Inspection Date (x 1) (Page 6-42)
  - Inspection Time (x 1) (Page 6-43)
  - Display Camera & Image Info. (x 2) (Page 6-44)
  - Display Area & Magnification (x 1) (Page 6-45)
  - Total Status Pass / Fail (x 1) (Page 6-46)
  - Unit Details (vision tools) (x 1) (Page 6-47)

Horizontal Split Display (full screen)

This template displays two images half of the display size in the Y direction, top and bottom, and information related to those images using the entire screen. The template consists of two image displays, and a base frame with parts for displaying related information.



Changing the settings of a screen display

Place the cursor on the screen display to edit, then press the controller No.1 (FUNCTION) button and select [Edit] - [Properties] from the Screen Editor menu.

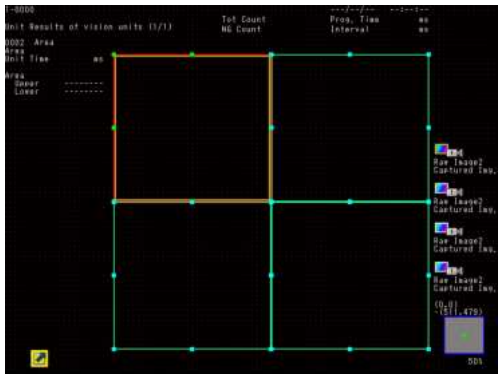
Parts included

The [Horizontal Split Display (full screen)] template includes these parts.

- Image Display (x 2) (Page 6-24)
- Base frame (x 1) (Page 6-27)
- Basic Parts
  - Value (x 6) (Page 6-28)
  - Text (x 7) (Page 6-30)
- Standard parts
  - Program Name (x 1) (Page 6-41)
  - Inspection Date (x 1) (Page 6-42)
  - Inspection Time (x 1) (Page 6-43)
  - Display Camera & Image Info. (x 2) (Page 6-44)
  - Display Area & Magnification (x 1) (Page 6-45)
  - Total Status Pass / Fail (x 1) (Page 6-46)
  - Unit Details (vision tools) (x 1) (Page 6-47)

4-way Equal Split Display (reduced screen)

This template displays four tiled images of the same size and information related to those images. The template consists of four image displays, and a base frame with parts for displaying related information.



Changing the settings of a screen display

Place the cursor on the screen display to edit, then press the controller No.1 (FUNCTION) button and select [Edit] - [Properties] from the Screen Editor menu.

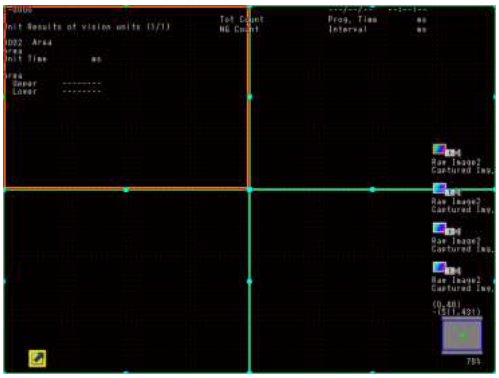
Parts included

The [4-way Equal Split Display] template includes these parts.

- Image Display (x 4) (Page 6-24)
- Base frame (x 1) (Page 6-27)
- Basic Parts
  - Value (x 6) (Page 6-28)
  - Text (x 7) (Page 6-30)
- Standard parts
  - Program Name (x 1) (Page 6-41)
  - Inspection Date (x 1) (Page 6-42)
  - Inspection Time (x 1) (Page 6-43)
  - Display Camera & Image Info. (x 4) (Page 6-44)
  - Display Area & Magnification (x 1) (Page 6-45)
  - Total Status Pass / Fail (x 1) (Page 6-46)
  - Unit Details (vision tools) (x 1) (Page 6-47)

4-way Equal Split Display (full screen)

This template displays four tiled images of the same size and information related to those images using the entire screen.
The template consists of four image displays, and a base frame with parts for displaying related information.



Changing the settings of a screen display
Place the cursor on the screen display to edit, then press the controller No.1 (FUNCTION) button and select [Edit] - [Properties] from the Screen Editor menu.

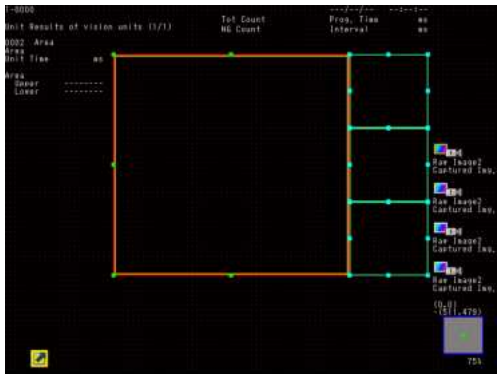
Parts included

The [4-way Equal Split Display (full screen)] template includes these parts.

- Image Display (x 4) (Page 6-24)
- Base frame (x 1) (Page 6-27)
- Basic Parts
  - Value (x 6) (Page 6-28)
  - Text (x 7) (Page 6-30)
- Standard parts
  - Program Name (x 1) (Page 6-41)
  - Inspection Date (x 1) (Page 6-42)
  - Inspection Time (x 1) (Page 6-43)
  - Display Camera & Image Info. (x 4) (Page 6-44)
  - Display Area & Magnification (x 1) (Page 6-45)
  - Total Status Pass / Fail (x 1) (Page 6-46)
  - Unit Details (vision tools) (x 1) (Page 6-47)

Main +3 Smaller Right Displays (reduced screen)

This template displays one large image and three smaller images vertically and to the right, and information related to those images. The template consists of four image displays, and a base frame with parts for displaying related information.



Changing the settings of a screen display
Place the cursor on the screen display to edit, then press the controller No.1 (FUNCTION) button and select [Edit] - [Properties] from the Screen Editor menu.

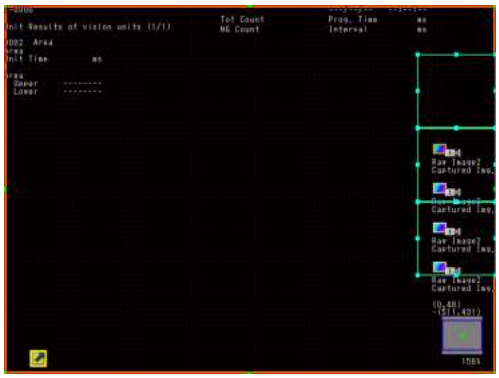
Parts included

The [Main +3 Smaller Right Displays] template includes these parts.

- Image Display (x 4) (Page 6-24)
- Base frame (x 1) (Page 6-27)
- Basic Parts
  - Value (x 6) (Page 6-28)
  - Text (x 7) (Page 6-30)
- Standard parts
  - Program Name (x 1) (Page 6-41)
  - Inspection Date (x 1) (Page 6-42)
  - Inspection Time (x 1) (Page 6-43)
  - Display Camera & Image Info. (x 4) (Page 6-44)
  - Display Area & Magnification (x 1) (Page 6-45)
  - Total Status Pass / Fail (x 1) (Page 6-46)
  - Unit Details (vision tools) (x 1) (Page 6-47)

Main +3 Smaller Right Displays (full screen)

This template displays one large image and three smaller images vertically and to the right, and information related to those images using the entire screen. The template consists of four image displays, and a base frame with parts for displaying related information.



Changing the settings of a screen display

Place the cursor on the screen display to edit, then press the controller No.1 (FUNCTION) button and select [Edit] - [Properties] from the Screen Editor menu.

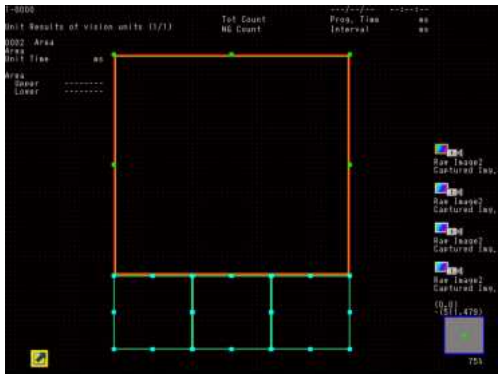
Parts included

The [Main +3 Smaller Right Displays (full screen)] template includes these parts.

- Image Display (x 4) (Page 6-24)
- Base frame (x 1) (Page 6-27)
- Basic Parts
  - Value (x 6) (Page 6-28)
  - Text (x 7) (Page 6-30)
- Standard parts
  - Program Name (x 1) (Page 6-41)
  - Inspection Date (x 1) (Page 6-42)
  - Inspection Time (x 1) (Page 6-43)
  - Display Camera & Image Info. (x 4) (Page 6-44)
  - Display Area & Magnification (x 1) (Page 6-45)
  - Total Status Pass / Fail (x 1) (Page 6-46)
  - Unit Details (vision tools) (x 1) (Page 6-47)

Main +3 Smaller Bottom Displays (reduced screen)

This template displays one large image and three smaller images horizontally below, and information related to the images. The template consists of four image displays, and a base frame with parts for displaying related information.



Changing the settings of a screen display

Place the cursor on the screen display to edit, then press the controller No.1 (FUNCTION) button and select [Edit] - [Properties] from the Screen Editor menu.

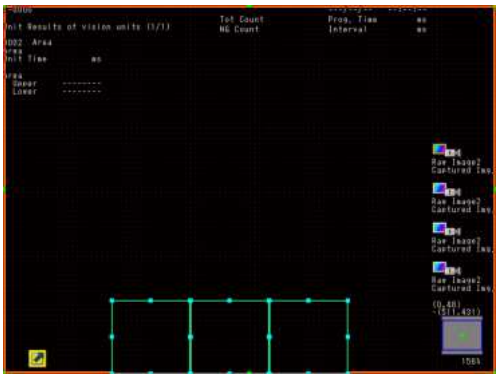
Parts included

The [Main +3 Smaller Bottom Displays] template includes these parts.

- Image Display (x 4) (Page 6-24)
- Base frame (x 1) (Page 6-27)
- Basic Parts
  - Value (x 6) (Page 6-28)
  - Text (x 7) (Page 6-30)
- Standard parts
  - Program Name (x 1) (Page 6-41)
  - Inspection Date (x 1) (Page 6-42)
  - Inspection Time (x 1) (Page 6-43)
  - Display Camera & Image Info. (x 4) (Page 6-44)
  - Display Area & Magnification (x 1) (Page 6-45)
  - Total Status Pass / Fail (x 1) (Page 6-46)
  - Unit Details (vision tools) (x 1) (Page 6-47)

Main +3 Smaller Bottom Displays (full screen)

This template displays one large image and three smaller images horizontally below, and information related to those images using the entire screen. The template consists of four image displays, and a base frame with parts for displaying related information.



Changing the settings of a screen display

Place the cursor on the screen display to edit, then press the controller No.1 (FUNCTION) button and select [Edit] - [Properties] from the Screen Editor menu.

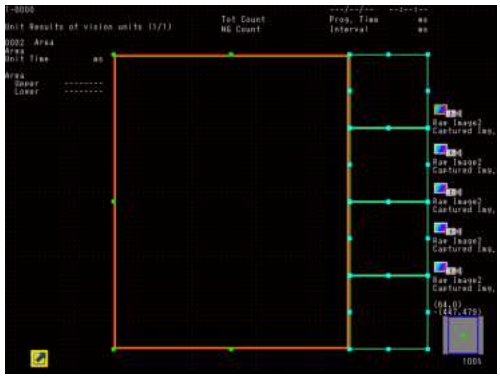
Parts included

The [Main +3 Smaller Bottom Displays (full screen)] template includes these parts.

- Image Display (x 4) (Page 6-24)
- Base frame (x 1) (Page 6-27)
- Basic Parts
  - Value (x 6) (Page 6-28)
  - Text (x 7) (Page 6-30)
- Standard parts
  - Program Name (x 1) (Page 6-41)
  - Inspection Date (x 1) (Page 6-42)
  - Inspection Time (x 1) (Page 6-43)
  - Display Camera & Image Info. (x 4) (Page 6-44)
  - Display Area & Magnification (x 1) (Page 6-45)
  - Total Status Pass / Fail (x 1) (Page 6-46)
  - Unit Details (vision tools) (x 1) (Page 6-47)

Main +4 Smaller Right Displays (reduced screen)

This template displays one large image and four smaller images vertically and to the right, and information related to those images. The template consists of five image displays, and a base frame with parts for displaying related information.



Changing the settings of a screen display

Place the cursor on the screen display to edit, then press the controller No.1 (FUNCTION) button and select [Edit] - [Properties] from the Screen Editor menu.

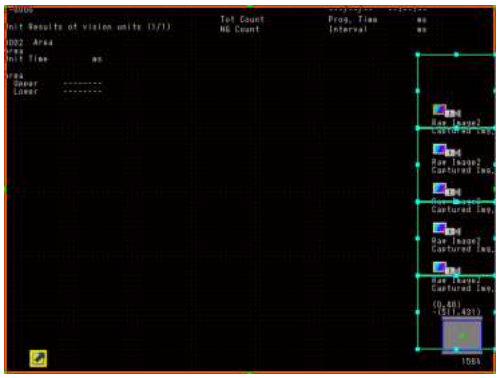
Parts included

The [Main +4 Smaller Right Displays] template includes these parts.

- Image Display (x 5) (Page 6-24)
- Base frame (x 1) (Page 6-27)
- Basic Parts
  - Value (x 6) (Page 6-28)
  - Text (x 7) (Page 6-30)
- Standard parts
  - Program Name (x 1) (Page 6-41)
  - Inspection Date (x 1) (Page 6-42)
  - Inspection Time (x 1) (Page 6-43)
  - Display Camera & Image Info. (x 5) (Page 6-44)
  - Display Area & Magnification (x 1) (Page 6-45)
  - Total Status Pass / Fail (x 1) (Page 6-46)
  - Unit Details (vision tools) (x 1) (Page 6-47)

Main +4 Smaller Right Displays (full screen)

This template displays one large image and four smaller images vertically and to the right, and information related to those images using the entire screen. The template consists of five image displays, and a base frame with parts for displaying related information.



Changing the settings of a screen display

Place the cursor on the screen display to edit, then press the controller No.1 (FUNCTION) button and select [Edit] - [Properties] from the Screen Editor menu.

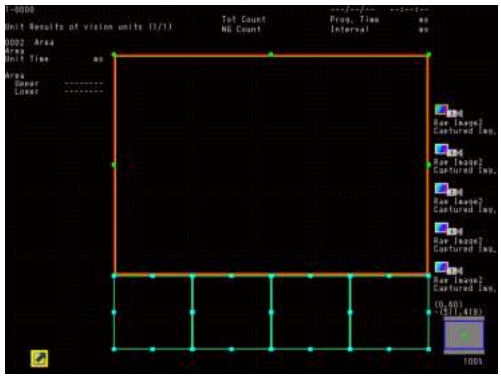
Parts included

The [Main +4 Smaller Right Displays (full screen)] template includes these parts.

- Image Display (x 5) (Page 6-24)
- Base frame (x 1) (Page 6-27)
- Basic Parts
  - Value (x 6) (Page 6-28)
  - Text (x 7) (Page 6-30)
- Standard parts
  - Program Name (x 1) (Page 6-41)
  - Inspection Date (x 1) (Page 6-42)
  - Inspection Time (x 1) (Page 6-43)
  - Display Camera & Image Info. (x 5) (Page 6-44)
  - Display Area & Magnification (x 1) (Page 6-45)
  - Total Status Pass / Fail (x 1) (Page 6-46)
  - Unit Details (vision tools) (x 1) (Page 6-47)

Main +4 Smaller Bottom Displays (reduced screen)

This template displays one large image and four smaller images horizontally below, and information related to those images. The template consists of five image displays, and a base frame with parts for displaying related information.



Changing the settings of a screen display

Place the cursor on the screen display to edit, then press the controller No.1 (FUNCTION) button and select [Edit] - [Properties] from the Screen Editor menu.

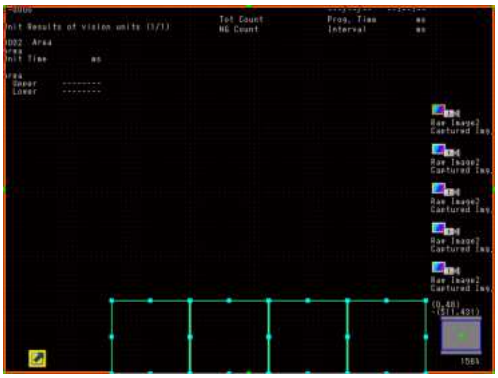
Parts included

The [Main +4 Smaller Bottom Displays] template includes these parts.

- Image Display (x 5) (Page 6-24)
- Base frame (x 1) (Page 6-27)
- Basic Parts
  - Value (x 6) (Page 6-28)
  - Text (x 7) (Page 6-30)
- Standard parts
  - Program Name (x 1) (Page 6-41)
  - Inspection Date (x 1) (Page 6-42)
  - Inspection Time (x 1) (Page 6-43)
  - Display Camera & Image Info. (x 5) (Page 6-44)
  - Display Area & Magnification (x 1) (Page 6-45)
  - Total Status Pass / Fail (x 1) (Page 6-46)
  - Unit Details (vision tools) (x 1) (Page 6-47)

Main +4 Smaller Bottom Displays (full screen)

This template displays one large image and four smaller images horizontally below, and information related to those images using the entire screen. The template consists of five image displays, and a base frame with parts for displaying related information.



Changing the settings of a screen display

Place the cursor on the screen display to edit, then press the controller No.1 (FUNCTION) button and select [Edit] - [Properties] from the Screen Editor menu.

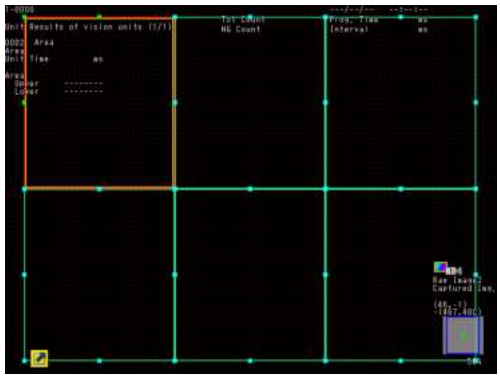
Parts included

The [Main +4 Smaller Bottom Displays (full screen)] template includes these parts.

- Image Display (x 5) (Page 6-24)
- Base frame (x 1) (Page 6-27)
- Basic Parts
  - Value (x 6) (Page 6-28)
  - Text (x 7) (Page 6-30)
- Standard parts
  - Program Name (x 1) (Page 6-41)
  - Inspection Date (x 1) (Page 6-42)
  - Inspection Time (x 1) (Page 6-43)
  - Display Camera & Image Info. (x 5) (Page 6-44)
  - Display Area & Magnification (x 1) (Page 6-45)
  - Total Status Pass / Fail (x 1) (Page 6-46)
  - Unit Details (vision tools) (x 1) (Page 6-47)

6-way Equal Split Display (reduced screen)

This template displays a latticed array of 6 images of the same size, and information related to those images. The template consists of six image displays, and a base frame with parts for displaying related information.



Changing the settings of a screen display

Place the cursor on the screen display to edit, then press the controller No.1 (FUNCTION) button and select [Edit] - [Properties] from the Screen Editor menu.

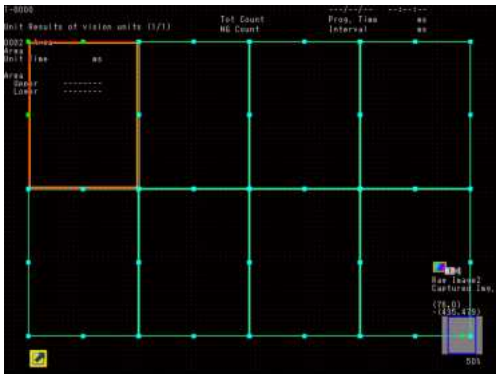
Parts included

The [6-way Equal Split Display (reduced screen)] template includes the following parts.

- Image Display (x 6) (Page 6-24)
- Base frame (x 1) (Page 6-27)
- Basic Parts
  - Value (x 6) (Page 6-28)
  - Text (x 7) (Page 6-30)
- Standard parts
  - Program Name (x 1) (Page 6-41)
  - Inspection Date (x 1) (Page 6-42)
  - Inspection Time (x 1) (Page 6-43)
  - Display Camera & Image Info. (x 1) (Page 6-44)
  - Display Area & Magnification (x 1) (Page 6-45)
  - Total Status Pass / Fail (x 1) (Page 6-46)
  - Unit Details (vision tools) (x 1) (Page 6-47)

8-way Equal Split Display (reduced screen)

This template displays a latticed array of 8 images of the same size, and information related to those images. The template consists of eight image displays, and a base frame with parts for displaying related information.



Changing the settings of a screen display

Place the cursor on the screen display to edit, then press the controller No.1 (FUNCTION) button and select [Edit] - [Properties] from the Screen Editor menu.

Parts included

The [4-way Equal Split Display] template includes these parts.

- Image Display (x 8) (Page 6-24)
- Base frame (x 1) (Page 6-27)
- Basic Parts
  - Value (x 6) (Page 6-28)
  - Text (x 7) (Page 6-30)
- Standard parts
  - Program Name (x 1) (Page 6-41)
  - Inspection Date (x 1) (Page 6-42)
  - Inspection Time (x 1) (Page 6-43)
  - Display Camera & Image Info. (x 1) (Page 6-44)
  - Display Area & Magnification (x 1) (Page 6-45)
  - Total Status Pass / Fail (x 1) (Page 6-46)
  - Unit Details (vision tools) (x 1) (Page 6-47)

Screen parts

Overview of Display Template Parts

Screen display parts are modularized elements that are used to display various information on the controller. Users can place basic parts such as values, text, and lines on a base frame (Page 6-27) or page frame (Page 6-28), or built-in parts such as inspection information and results. The following 25 screen display parts are available.

Parts that can be placed directly on the display template

- Image Display (Page 6-24)
- Base frame (Page 6-27)
- Page frame (Page 6-28)

Parts that can be placed on a base frame or page frame

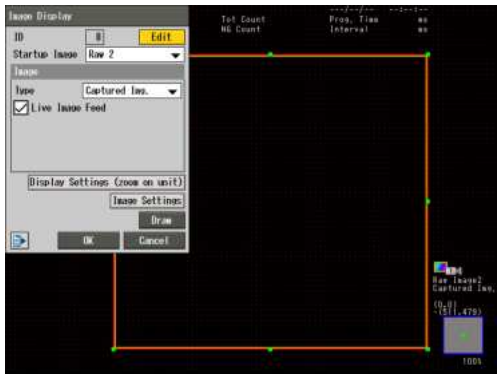
- Basic Parts
  - Value (Page 6-28)
  - Text (Page 6-30)
  - Active text (Page 6-31)
  - Rectangle (Page 6-34)
  - Horizontal line (Page 6-35)
  - Vertical line (Page 6-36)
  - Point (Page 6-37)
  - Circle (Page 6-38)
  - Polygon (Page 6-39)
  - Table (Page 6-40)
- Standard parts
  - Program name (Page 6-41)
  - Inspection date (Page 6-42)
  - Inspection time (Page 6-43)
  - Display Camera & Image Information (Page 6-44)
  - Display Area & Image Magnification (Page 6-45)
  - Total Status Pass / Fail (Page 6-46)
  - Logo Image (BMP) (Page 6-47)
  - Unit Details (vision tools) (Page 6-47)
  - Unit Details (non-vision tools) (Page 6-49)
  - Variable List (Page 6-50)
  - Unit Pass / Fail Graphic (Page 6-51)
  - Unit Result Summary List (Page 6-52)

► Note

- New [Polygon] parts cannot be added. It is also not possible to edit the nodes of existing polygon parts.
- [Unit Details (vision tools)], [Unit Details (non-vision tools)], [Variable List], and [Unit Result Summary List] parts cannot be placed in a page frame.

Image Display

This part adds an area to the display template that displays the image captured by the camera. Up to 8 image display parts can be placed on a single screen display.



Camera screen No.

Displays the screen number (0 to 9). To change the number, select [Edit].

► Note

The image display ID must be unique within the same display screen display.

Startup

Select the image type to display initially for the image display.

Display Image

Select the type of image to display for the unit in the image display.

- **Captured Image**: Displays the current image (image variable) of the selected unit.
- **Registered Image**: Displays the registered image of the selected unit.
- **Image Archive**: Displays an archived image of the selected unit. If you selected [Archive Image], specify which image in the archive to display.
  - **Image Archive**: Specify the image archive (Page 5-20) to reference (0 to 7).
  - **Image archive offset**: Specify the archive count to reference (0 to 1023).
  - **Preceding Image No.**: If you have set the archive method to [Series] (Page 5-23), specify the preceding image number to reference (1 to 512).

► Note

- If these settings do not match the image archive settings (Page 5-20), an error will occur.
- The image displayed will reflect the condition when flow execution reaches the end unit. If the flowchart overwrites image data after the controller executes the selected unit, discrepancies will occur between the displayed image and the processing result of the executed unit.
- During retesting, an image display which shows an archive image appears black.
- When the image memory on the [Resources] menu is close to 100%, it may not be possible to set an archive image.

Live Image Feed

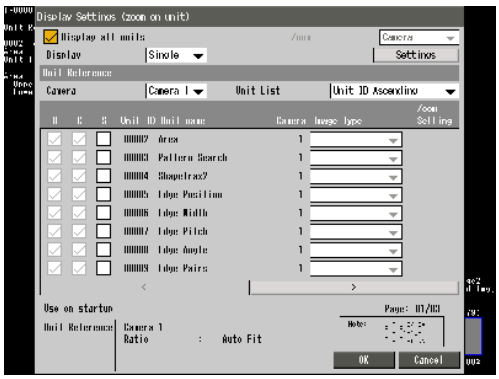
Check this option to display an image from a camera when the Screen Update setting under Trigger Setting in the Capture unit is set to [Continuous]. If this option is unchecked and the Screen Update is set to [Continuous], the screen will only update with a trigger input.

Reference

Continuously updated images are displayed when these conditions are met:

- the image update option for the most recently executed (or currently executing) capture unit is set to continuous.
- the current image variable for the currently selected unit on the screen is the same as the destination image variable for the most recently executed (or currently executing) capture unit.
- the controller is in trigger wait condition regardless of whether background capture is enabled/disabled.

Display Settings (zoom on unit)



- **Display all units**: Check this option to display all units which can be displayed in the image display.

Reference

Units that can be displayed are inspection units, graphics units, position ajustment units, image operation units, C-Plugin units, and calibration units.

- **Area**: Specify how to display the region on the image display.
  - **Single**: Displays only the region for the unit selected on the controller.
  - **Selected**: Simultaneously displays the regions for the applicable display units that reference the same registered image (if [Display Image] on the [Image Type] tab is set to [Registered Image]), or image variable (if [Display Image] is set to [Captured Image]) for the unit selected on the controller.

► Note

If [Single] is selected for [Area], check marks are automatically added to [Change] for the units that have [display] selected.
If a unit that uses a processed image region (Page 3-27) is not the topmost window when [Show] is set to [Multiple], the image display will show the raw image regardless of the image type specified for that unit.

- **Zoom**: Select whether to specify the zoom setting for each camera or each unit.
  - **Camera**: Specify the zoom setting for each camera.
  - **Unit**: Specify the zoom setting for each unit.

Reference

This setting is fixed to [Camera] if the [Display all units] option is selected.

- **Zoom Settings**: The zoom operation varies depending on the [Location] setting. See "Setting the details for zoom operation" (Page 6-26) for more details.
  This is not displayed when [Zoom] is set to [Unit]. Set the [Zoom Setting] for each unit under [Select Unit].
  - **Coordinate**: Select the method to display coordinates when a unit is specified as the target of position correction.
    Before position adjust (default): Displays the coordinate value before correcting the position of the inspection region.
    After position adjust: Displays the coordinate value after correcting the inspection region to the reference position.
  - **Location**
    OFF (default): Disables zoom tracking. The image is displayed at the specified zoom ratio.
    Detected point: Zooms to the specified zoom ratio centered at the result obtained by the position measurement unit.
    Inspection region: Zooms to the specified zoom ratio centered at the position of the measurement region for the unit.

Reference

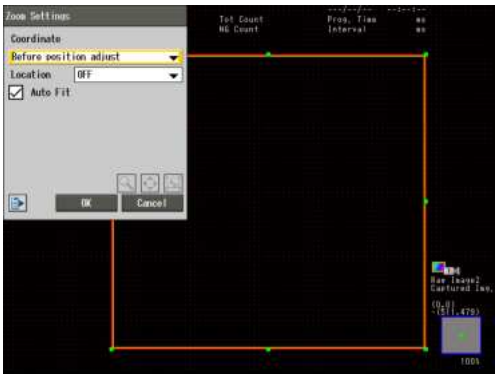
The XY coordinates listed below are the tracking targets when [Detected point] is selected. For measurements that detect multiple positions, the tracking target is set on the primary target or a label specified by an index.

Applicable units		Tracking targets
Pattern Search		Primary target
Edge Position		Primary target
Edge Angle		Center position
Defect	Grouping OFF	Position
	Grouping ON	Center of gravity
Blob		Center of gravity
Grayscale Blob		Center of gravity
Profile Position	Circle/Line OFF	Position
	Circle ON	Circle center
	Line ON	Line center
Profile Defect		Defect Pos
On-screen Graphics		Supports only [Point] at the top of the graphic settings.

Note, if [Detected Point] is set for a unit not listed above, the measurement region position will be displayed as the primary target.

Setting the details for zoom operation

Operation varies depending on the [Location] setting.



- **If turned [OFF]**
  - **Auto Fit**: When checked, this option automatically adjusts the zoom ratio so that the image fits the image display size on the Screen Editor. (All other manual settings become disabled.)
  - **Ratio**: Specifies the zoom ratio to use.
  - **Offset**: Set the amount of offset when displaying the image in the image display.
- **If set to [Detected point]**
  - **Ratio**: Specifies the zoom ratio to use.
  - **Offset**: Set the amount of zoom center offset relative to the detected point.
  - **All scroll to**: Specifies the label to track when there are multiple detected targets (default: Primary Target).
- **If set to [Inspection region]**
  - **Ratio**: Specifies the zoom ratio to use. If set to [Auto], this option automatically adjusts the long end of the inspection region (if the region is not a rectangle, the rectangle surrounding the region) so that it fits within 90% of the image display.
  - **Offset**: Set the amount of zoom center offset.

- **Select Unit**: Specify the image display settings for each unit.
  - **Camera** (only when [Zoom] is set to [Camera]): Displays only the units for the selected camera No.
  - **Unit List**: Select the unit ID display order.
    Unit ID Ascending: Sort in ascending order of unit IDs.
    Unit ID Descending: Sort in descending order of unit IDs.
    Camera No. Ascending (only when [Zoom] is set to [Unit]): Sort in ascending order of camera No.
    Camera No. Descending (only when [Zoom] is set to [Unit]): Sort in descending order of camera No.
  - **Display**: Place a check in this option to display the unit information in the image display for the set unit.
  - **Change**: Place a check in this option to make the unit information selectable on the image display from the console.
  - **Startup**: Place a check in this option to display the unit when the inspection program is loaded.
  - **Unit ID**: Displays the unit ID.
  - **Unit Name**: Displays the unit name.
  - **Camera No.**: Displays the camera number referenced by the unit.
  - **Image Type**: Select whether to display Raw Image1 or Raw Image2 when both raw images are selected when an Image Processing unit (Page 4-286) or C Plug-In unit is executed. Select either [Source 1] (default) or [Source 2].

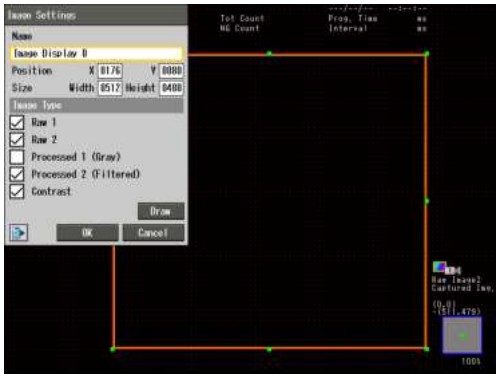
Reference

- [Display] and [Change] are enabled and cannot be disabled if the [Display all units] option is enabled. [Image Type] is also fixed at [Source 1]. (To select [Source 2], remove the check.)
- You can specify up to 64 units to display.
- To display the resultant image from an operation, set the image type to either [Processed 1 (Gray)], [Processed 2 (Filtered)], or [Contrast].

► Note

- Zoom settings cannot be made when none of the valid units have a check mark.
- If the [Zoom] option is set to [Camera], the same settings will be applied to all units that reference the same camera number, except for the selectability and startup settings.
- If the [Display all units] option is not checked, the maximum number of units that can be selected for display is 64.

Parameters



- Name: Enter the name of the image display. This name appears in the Select Screen Display menu.
- Position: Specify the position for displaying the image with the top left coordinate (X: 0 to 974, Y: 0 to 718).
- Size: Specify the image size (width: 50 to 1024, height: 50 to 768).
- Image Type: For each display type, specify whether the display type should be selectable. Check the box to make that type selectable.

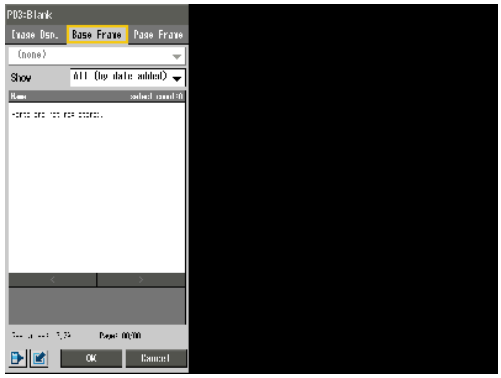
Draw

Change to Draw mode and adjust the part position. See "Editing the placement position of a part (Draw mode)" (Page 6-6) for more details.

Base frame

This part adds a base frame to the display template. The Screen Browser shows and organizes parts such as values, various graphic shapes, and judgment results grouped under a base frame.

- A display template can have only one base frame.
- Unlike the page frame (Page 6-28), parts placed on the base frame appear on the screen at all times regardless of the page selected.



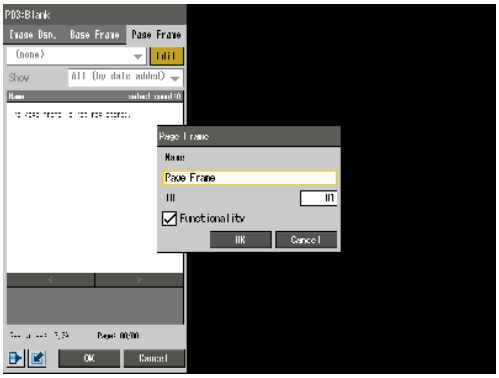
Reference

There are no setting items for the Screen Editor on the controller.

Page frame

This part adds a page frame to the display template. The Screen Browser shows and organizes parts such as values, various graphic shapes, and judgment results grouped under a page frame.

- A screen display can have up to 99 page frames.
- Parts laid out on a page frame support page switching. By using page frames with the base frame (Page 6-27), designers can control the display parts that should appear at all times and those that should appear only when the user switches to that page.



By selecting [Edit Page Frame] - [Properties], you can change the following page frame settings.

Name

Enter the name of the page frame.
This name appears in the Select Screen Display menu.

Page No.

Specify the display page ID for the page frame (1 to 99).

► Note

The page ID must be unique within the same screen display.

Switch Targets

Remove the check to exclude this page from page switching on the console.

Reference

is displayed when the page frame is set as the startup image. is displayed when the page frame is selectable and is displayed when it is not selectable. is displayed when there is an error in the page frame settings.

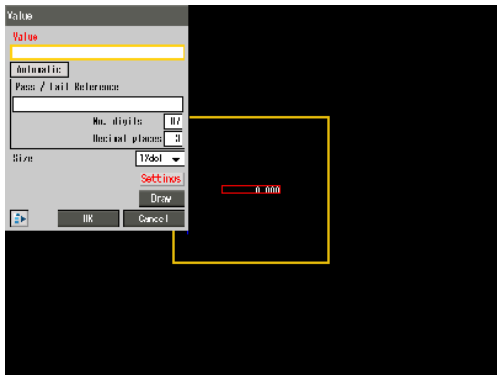
Basic Parts

These parts can be placed directly on the frame of the display template.

- The maximum number of parts, including standard parts (Page 6-41) that can be placed on a single frame is 500.
- The maximum number of parts that can be placed on a single screen display is 4000, excluding the frame.
- The maximum number of parts that can be placed in a single inspection program is 60000, excluding the frame.

Value

This part is used to display measurements and variables as numeric values.



Value

Specify the item to display as a value (variable, setting parameter, or result data).

Auto

If the [Value] field is set to a setting parameter or results data, the judge value and number of digits will be set automatically according to the value.

Reference

All other values will be displayed as a 7-digit integer and to 3 decimal places.

Pass / Fail Reference

If you specified to change the value displayed based on the results, specify the threshold value (variable, setting parameter, or results data) for changing the display. If the first decimal place rounds to 0, the result is OK. Otherwise the value is NG.

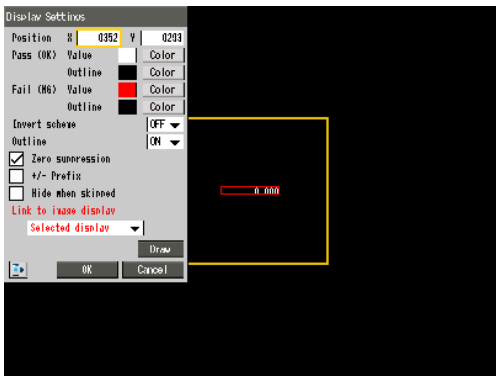
No. Digits

Specify the number of digits to display as 1 to 10 digits for the integer portion and 0 to 6 digits for the decimal portion.

Font Size

Select the display size for the value from 12, 16, 24, 32, or 48 dots (default: 12 dots).

Parameters



- **Position**: Specify the top left coordinate of the position to display the value (-9999 to 9999 for both X and Y).
- **Pass (OK)**: Select the color of the value and the outline for it when the judgment is OK or if no judge value is specified.
  - **Color**: To change the value color, select [Color].
  - **Outline Color**: To change the value outline color, select [Color].
- **Fail (NG)**: Select the color of the value and the outline for the value when the judgment is NG.
  - **Color**: To change the value color, select [Color].
  - **Outline Color**: To change the value outline color, select [Color].
- **Invert scheme**: Select whether to display the value with the colors inverted.
  - **ON**: Invert the colors.
  - **OFF** (default): Does not invert the colors.
- **Outline**: Select whether you want to draw an outline around the value.
  - **ON** (default): Displays the value with an outline.
  - **OFF**: Does not display the value with an outline.
- **Zero Suppress**: Remove the check to display the value with leading zeros. For example, when the number of integer digits is set to 5 and the value is 500, "00500" will be displayed when zero suppression is disabled, and "500" will be displayed when zero suppression is enabled.
- **+/- Prefix**: Place a check in this option to show the "+" symbol before a positive value.
- **Hide when skipped**: Place a check in this option to display the value only when the controller executes the unit for the setting parameter or results data specified in [Value] (Page 6-28) and [Pass / Fail Ref.] (Page 6-28).
- **Link to image display**: The setting parameter or results data specified for the [Value] (Page 6-28) and [Pass / Fail Ref.] (Page 6-28) can be linked with the image shown in the image display (Page 6-24). If the image display is set to show an archived image, the displayed value will be the results data for the archived image. (For any other shown image, the latest value will be displayed.)
  - **None**: Displays the latest results, independent of the image display.
  - **Selected display**: Displays the result associated with the displayed image on the image display that is selected on the controller.
  - **ID**: Always displays the result associated with the displayed image on the specified image display.

► Note

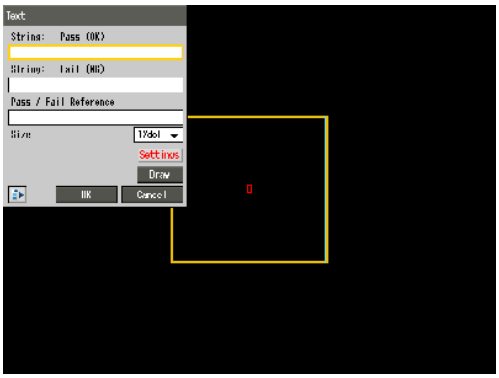
- The [Outline Color] option is only enabled if [Outline] is set to [ON].
- If [Invert scheme] is [ON], [Outline] will be fixed to [OFF].
- If a link is set to a image display that is set to display an archived image which does not have any results data, no value will be displayed.
- A setting error will occur if the specified image display does not exist on the display template.

Draw

Change to Draw mode and adjust the part position. See "Editing the placement position of a part (Draw mode)" (Page 6-6) for more details.

Text

This part is used to display a text string.



Text

- **Pass (OK)**: Specify the text to display when the judgment is OK or if no pass/fail reference is specified.
- **Fail (NG)**: Specify the text to display when the judgment is NG.

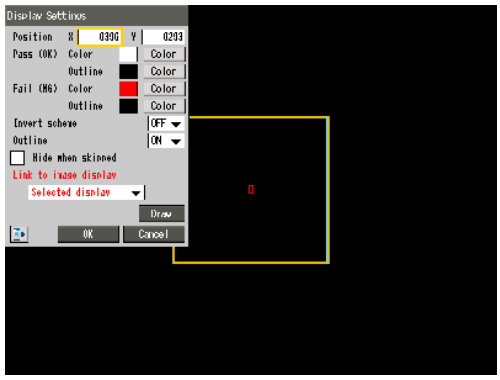
Pass / Fail Reference

Change the text displayed based on a value like a variable, setting parameter, or results data. If the first decimal place rounds to 0, the result is OK. Otherwise the value is NG.

Font Size

Select the display size for the text from 12, 16, 24, 32, or 48 dots (default: 12 dots).

Parameters



- **Position**: Specify the top left coordinate of the position to display the text (-9999 to 9999 for both X and Y).
- **Pass (OK)**: Select the color of the text and the outline for the text when the judgment is OK or if no judge value is specified.
  - **Color**: To change the text color, select [Color].
  - **Outline Color**: To change the text outline color, select [Color].
- **Fail (NG)**: Select the color of the text and the outline for the text when the judgment is NG.
  - **Color**: To change the text color, select [Color].
  - **Outline Color**: To change the text outline color, select [Color].
- **Invert scheme**: Select whether to display the text with the colors inverted.
  - **ON**: Invert the colors.
  - **OFF** (default): Does not invert the colors.
- **Outline**: Select whether you want to draw an outline around the text.
  - **ON** (default): Displays the value with an outline.
  - **OFF**: Does not display the value with an outline.
- **Hide when skipped**: Place a check in this option to display the value only when the controller executes the unit for the setting parameter or results data specified in [Pass / Fail Ref.] (Page 6-30).

- **Link to image display**: The setting parameter or results data specified for the [Pass / Fail Ref.] (Page 6-30) can be linked with the image shown in the image display (Page 6-24). If the image display is set to show an archived image, the displayed text will be linked to the results data for the archived image. (For any other shown image, the display is linked to the latest result.)
  - **None**: Background color always matches the latest result, independent of the image display.
  - **Selected display**: Displays the result associated with the displayed image on the image display that is selected on the controller.
  - **Image DisplayID**: Permanently links the background color to the result of the displayed image on the specified image display.

► Note

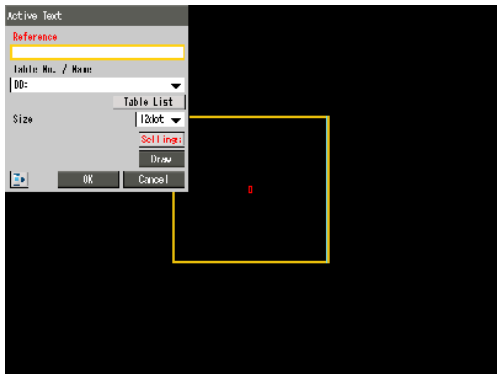
- The [Outline Color] option is only enabled if [Outline] is set to [ON].
- If [Invert scheme] is [ON, [Outline] will be fixed to [OFF].
- If the link is set to a image display that has been set to an archived image with no results logging data, the text will always be the text set for [Pass (OK)].
- A setting error will occur if the specified image display does not exist on the display template.

Draw

Change to Draw mode and adjust the part position. See "Editing the placement position of a part (Draw mode)" (Page 6-6) for more details.

Active Text

In addition to information such as measurement value and judgment results, this part is used to display user-defined text (active text) linked to measurement results.
Up to 512 combinations of values and text can be managed in up to 64 tables. This function is useful when switching between multiple display messages depending on the measurement result.



Value

Specify the item to display as a value (variable, setting parameter, or result data).

Table No./name

Select a table to be used from the predefined tables.

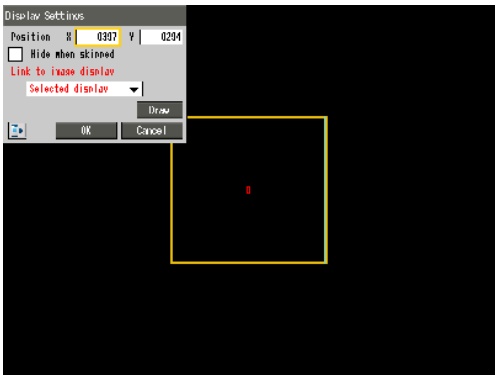
Table Setting

Show the [Table List] menu for editing a table which stores the different strings of text and associated displaying conditions. See "Creating the active text table" (Page 6-32) for more details.

Font Size

Select the display size for the value from 12, 16, 24, 32, or 48 dots (default: 12 dots).

Parameters



- **Position**: Specify the top left coordinate of the position to display the value (-9999 to 9999 for both X and Y).
- **Hide when skipped**: Place a check in this option to display the text only when the controller executes the unit for the setting parameter or results data specified in [Value] (Page 6-31).
- **Link to image display**: The setting parameter or results data specified for the [Value] (Page 6-31) can be linked with the image shown in the image display (Page 6-24). If the image display is set to show an archived image, the displayed text will be linked to the results data for the archived image. (For any other shown image, the display is linked to the latest result.)
  - **None**: Background color always matches the latest result, independent of the image display.
  - **Selected display**: Displays the result associated with the displayed image on the image display that is selected on the controller.
  - **Image DisplayID**: Permanently links the background color to the result of the displayed image on the specified image display.

► Note

- If a link is set to a image display that is set to display an archived image which does not have any results data, no value will be displayed.
- A setting error will occur if the specified image display does not exist on the display template.

Draw

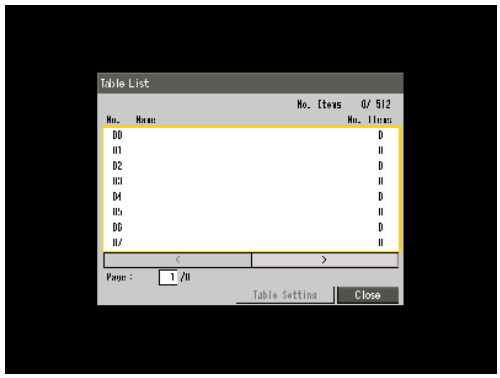
Change to Draw mode and adjust the part position. See "Editing the placement position of a part (Draw mode)" (Page 6-6) for more details.

Creating the active text table

In the [Table List] menu, you can edit tables which store the different strings of text and associated displaying conditions.

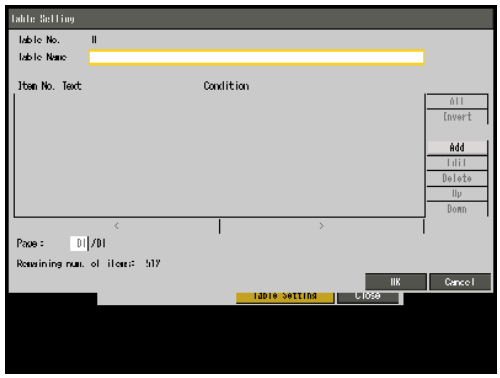
1 On the Active Text tab, select [Table List].

The [Table List] menu appears.



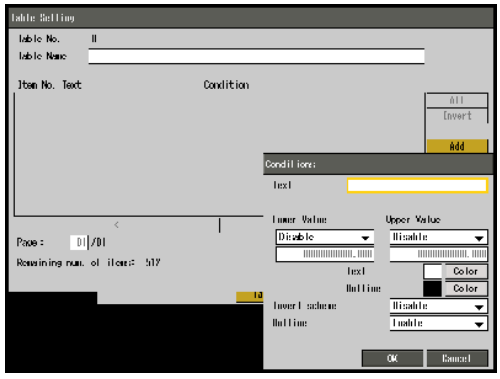
2 Select the line of the table No. to edit and then select [Table Setting].

The [Table Text Listing] menu of the selected table appears.



3 Select [Add].

The [Display Condition] menu appears.



4 **Edit the conditions for text display.**

Text

Enter the text (up to 64 1-byte characters or 32 2-byte characters) that you want to display when the conditions are met.

Lower limit

Choose [Enable] and then set the lower limit for the measurement value, at or above which the text will be displayed.

Upper limit

Choose [Enable] and then set the upper limit for the measurement value, at or below which the text will be displayed.

Reference

When the reference value is within the upper and lower limit of a certain Item No., the text specified for that Item No. will be displayed. For example, if Item No.1 has an upper limit of 10 and a lower limit of 1, a reference value of 5 will display the text for that condition. If Item No.2 has an upper limit of 20 and a lower limit of 11, it will only display the text for Item No.2 if a reference value between 11 and 20 is found.

Character color

Select the color of the text.

Outline Color

Select the color of the outline for the text.

Reference

The [Outline Color] option is only enabled if [Outline] is set to [ON].

Color Invert

Select whether to display the value with the color inverted.

- **OFF** (default): Does not invert the colors.
- **ON**: Inverts the colors.

Cannot be specified.

Select whether you want to draw an outline around the value.

- **OFF**: Does not display the text with an outline.
- **ON** (default): Displays the text with an outline.

► Note

If [Invert scheme] is [ON], [Outline] will be fixed to [OFF].

5 **Click [OK].**

A new display condition will be added to the bottom of the list on the Table Setting screen.

6 **Edit the table details as required.**

- **Table Name**: Enter a table name (up to 64 1-byte characters or 32 2-byte characters).
- **All**: Select all conditions.
- **Invert**: Invert the current checkmark selections.
- **Delete**: Delete the selected text display condition.
- **Move Up**: Move the selected condition up one line.
- **Move Down**: Move the selected condition down one line.

7 **When editing is complete, select [OK].**

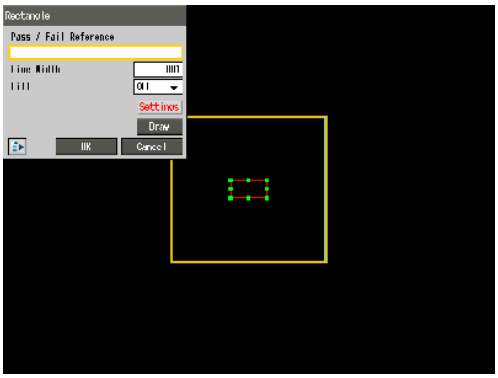
The changed made to the [Table Text Listing] are reflected and the display returns to the [Table List] menu

8 **To edit other tables, repeat steps 2 to 7.**

9 **When the editing of all tables is complete, select [Close].**

Rectangle

This part is used to display a rectangle.



Pass / Fail Reference

Change the rectangle displayed based on a value like a variable, setting parameter, or results data. If the first decimal place rounds to 0, the result is OK. Otherwise the value is NG.

Width

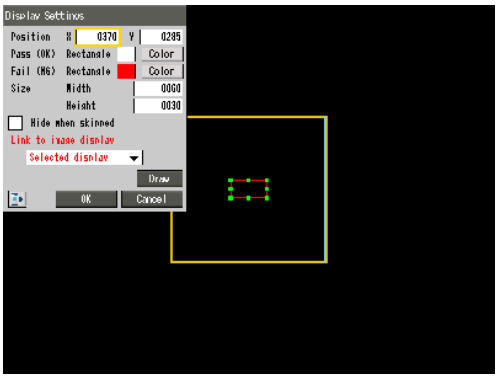
Specify the width of the rectangle lines from 1 to 999 (default: 1).

Fill

Select whether to fill the rectangle.

- **ON**: The rectangle is filled.
- **OFF** (default): Only the outline of the rectangle is displayed.

Parameters



- **Position**: Specify the top left coordinate of the position to display the rectangle (-9999 to 9999 for both X and Y).
- **Pass (OK)**: Select the color of the rectangle when the judgment is OK or if no judge value is specified.
- **Fail (NG)**: Select the color of the rectangle when the judgment is NG.
- **Size**: Specify the width and height of the rectangle from 1 to 9999 (defaults: 60 (width), 30 (height)).
- **Hide when skipped**: Place a check in this option to display the rectangle only when the controller executes the unit for the setting parameter or results data specified in [Pass / Fail Ref.] (Page 6-34).
- **Link to image display**: The setting parameter or results data specified for the [Pass / Fail Ref.] (Page 6-34) can be linked with the image shown in the image display (Page 6-24). If the image display is set to show an archived image, the displayed color will be linked to the results data for the archived image. (For any other shown image, the display is linked to the latest result.)
  - **None**: Background color always matches the latest result, independent of the image display.
  - **Selected display**: Displays the result associated with the displayed image on the image display that is selected on the controller.
  - **Image DisplayID**: Permanently links the background color to the result of the displayed image on the specified image display.

► Note

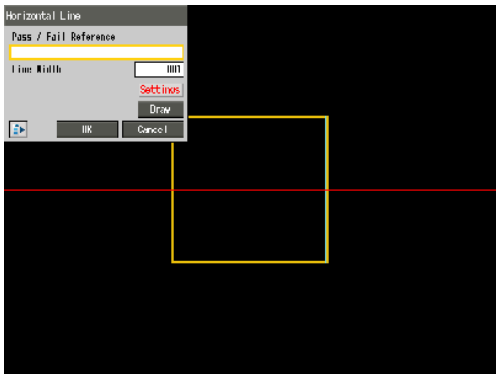
- If the link is set to a image display that has been set to an archived image with no results logging data, the line will always be drawn in the color set for [Pass (OK)].
- A setting error will occur if the specified image display does not exist on the display template.

Draw

Change to Draw mode and adjust the part position. See "Editing the placement position of a part (Draw mode)" (Page 6-6) for more details.

Horizontal Line

This part is used to display a horizontal line.



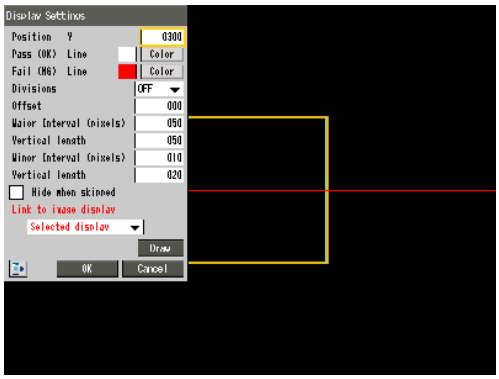
Pass / Fail Reference

Change the horizontal line displayed based on a value like a variable, setting parameter, or results data. If the first decimal place rounds to 0, the result is OK. Otherwise the value is NG.

Width

Specify the width of the horizontal line from 1 to 999 (default: 1).

Parameters



- **Y Coordinate**: Specify the horizontal line Y coordinate from -9999 to 9999.
- **Pass (OK)**: Select the color of the horizontal line when the judgment is OK or if no judge value is specified.
- **Fail (NG)**: Select the color of the horizontal line when the judgment is NG.
- **Scale**: Select whether to show a scale on the line when a horizontal line is drawn.
  - **ON**: Show the scale. Adjust the settings for [offset], [interval(1/2)], and [Length (1//2)] to display the required scale.
  - **OFF** (default): Do not show the scale.
- **Offset:** Specify the offset distance from the left side of the screen from 0 to 999 (default: 0).
- **Major interval (pixels):** Specify the major interval (pixels) on Scale (1) from 0 to 999 (default value: 50).
- **Horizontal length (1):** Specify the length of the marks on the scale (1) from 0 to 999 (default value: 50).
- **Minor interval (pixels):** Specify the minor interval (pixels) on the scale (2) from 0 to 999 (default value: 10).
- **Horizontal length (2):** Specify the length of the marks on the scale (2) from 0 to 999 (default value: 20).
- **Hide when skipped**: Place a check in this option to display the horizontal line only when the controller executes the unit for the setting parameter or results data specified in [Pass / Fail Ref.] (Page 6-35).
- **Link to image display:** The setting parameter or results data specified for the [Pass / Fail Ref.] (Page 6-35) can be linked with the image shown in the image display (Page 6-24). If the image display is set to show an archived image, the displayed color will be linked to the results data for the archived image. (For any other shown image, the display is linked to the latest result.)
  - **None**: Background color always matches the latest result, independent of the image display.
  - **Selected display**: Displays the result associated with the displayed image on the image display that is selected on the controller.
  - **Image DisplayID**: Permanently links the background color to the result of the displayed image on the specified image display.

► Note

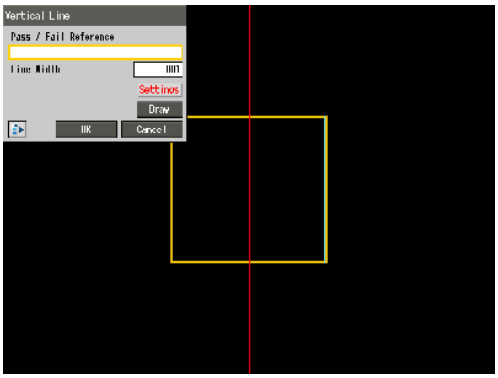
- No scale will be shown even if the hide/show option is set to [ON] if both [Interval (1/2)] and [Length (1/2)] are set to 0.
- If the link is set to a image display that has been set to an archived image with no results logging data, the line will always be drawn in the color set for [Pass (OK)].
- A setting error will occur if the specified image display does not exist on the display template.

Draw

Change to Draw mode and adjust the part position. See "Editing the placement position of a part (Draw mode)" (Page 6-6) for more details.

Vertical line

This part is used to display a vertical line.



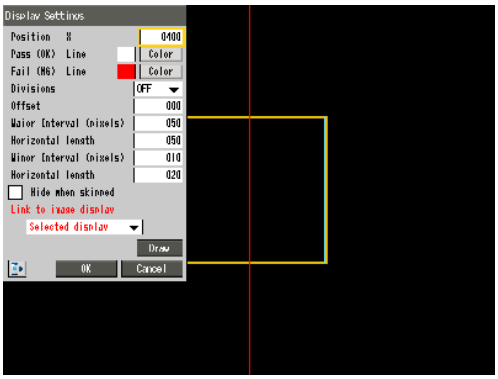
Pass / Fail Reference

Change the vertical line displayed based on a value like a variable, setting parameter, or results data. If the first decimal place rounds to 0, the result is OK. Otherwise the value is NG.

Width

Specify the width of the vertical line from 1 to 999 (default: 1).

Parameters



- **X Coordinate**: Specify the horizontal line Y coordinate from -9999 to 9999.
- **Pass (OK)**: Select the color of the vertical line when the judgment is OK or if no judge value is specified.
- **Fail (NG)**: Select the color of the vertical line when the judgment is NG.
- **Scale**: Select whether to show a scale on the line when a vertical line is drawn.
  - **ON**: Show the scale. Adjust the settings for [offset], [interval(1/2)], and [Length (1//2)] to display the required scale.
  - **OFF** (default): Do not show the scale.
- **Offset:** Specify the offset distance from the top of the screen from 0 to 999 (default: 0).
- **Major interval (pixels):** Specify the major interval (pixels) on the scale (1) from 0 to 999 (default value: 50).
- **Horizontal length (1):** Specify the length of the marks on the scale (1) from 0 to 999 (default value: 50).
- **Minor interval (pixels):** Specify the minor interval (pixels) on the scale (2) from 0 to 999 (default value: 10).
- **Horizontal length (2):** Specify the length of the marks on the scale (2) from 0 to 999 (default value: 20).
- **Hide when skipped**: Place a check in this option to display the vertical line only when the controller executes the unit for the setting parameter or results data specified in [Pass / Fail Ref.] (Page 6-36).
- **Link to image display**: The setting parameter or results data specified for the [Pass / Fail Ref.] (Page 6-36) can be linked with the image shown in the image display (Page 6-24). If the image display is set to show an archived image, the displayed color will be linked to the results data for the archived image. (For any other shown image, the display is linked to the latest result.)
  - **None**: Background color always matches the latest result, independent of the image display.
  - **Selected display**: Displays the result associated with the displayed image on the image display that is selected on the controller.
  - **Image DisplayID**: Permanently links the background color to the result of the displayed image on the specified image display.

► Note

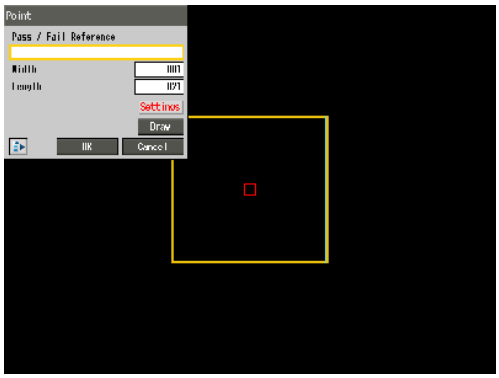
- No scale will be shown even if the hide/show option is set to [ON] if both [Interval (1/2)] and [Length (1/2)] are set to 0.
- If the link is set to a image display that has been set to an archived image with no results logging data, the line will always be drawn in the color set for [Pass (OK)].
- A setting error will occur if the specified image display does not exist on the display template.

Draw

Change to Draw mode and adjust the part position. See "Editing the placement position of a part (Draw mode)" (Page 6-6) for more details.

Point

This part is used to display a point.



Pass / Fail Reference

Change the point displayed based on a value like a variable, setting parameter, or results data. If the first decimal place rounds to 0, the result is OK. Otherwise the value is NG.

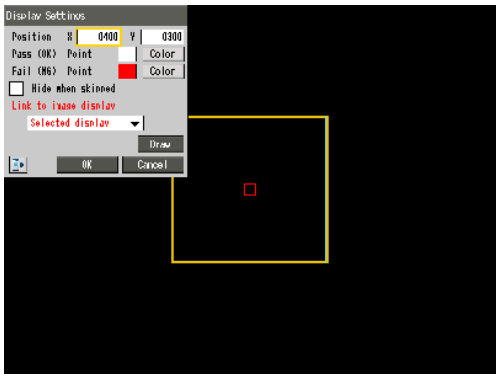
Width

Specify the width of the lines that compose the point from 1 to 999 (default: 1).

Length

Specify the length of the lines that compose the point from 1 to 999 (default: 21).

Parameters



- **Center**: Specify the X and Y center coordinates of the point from -9999 to 9999.
- **Pass (OK)**: Select the color of the point when the judgment is OK or if no judge value is specified.
- **Fail (NG)**: Select the color of the point when the judgment is NG.
- **Hide when skipped**: Place a check in this option to display the point only when the controller executes the unit for the setting parameter or results data specified in [Pass / Fail Ref.] (Page 6-36).
- **Link to image display**: The setting parameter or results data specified for the [Pass / Fail Ref.] (Page 6-37) can be linked with the image shown in the image display (Page 6-24). If the image display is set to show an archived image, the displayed color will be linked to the results data for the archived image. (For any other shown image, the display is linked to the latest result.)
  - **None**: Background color always matches the latest result, independent of the image display.
  - **Selected display**: Displays the result associated with the displayed image on the image display that is selected on the controller.
  - **Image DisplayID**: Permanently links the background color to the result of the displayed image on the specified image display.

▶ Note

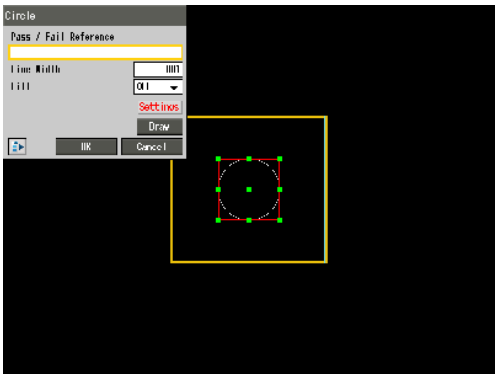
- If the link is set to a image display that has been set to an archived image with no results logging data, the line will always be drawn in the color set for [Pass (OK)].
- A setting error will occur if the specified image display does not exist on the display template.

Draw

Change to Draw mode and adjust the part position. See "Editing the placement position of a part (Draw mode)" (Page 6-6) for more details.

Circle

This part is used to display a circle.



Pass / Fail Reference

Change the circle displayed based on a value like a variable, setting parameter, or results data. If the first decimal place rounds to 0, the result is OK. Otherwise the value is NG.

Width

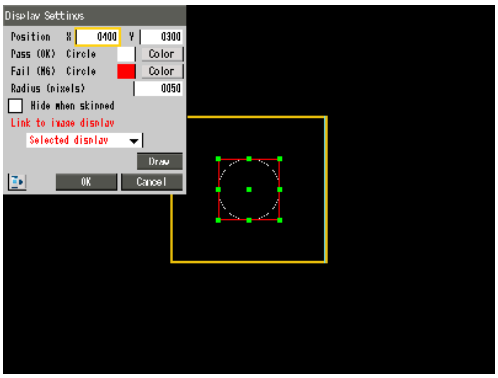
Specify the width of the circle line from 1 to 999 (default: 1).

Fill

Select whether to fill the circle.

- **ON**: The circle is filled.
- **OFF** (default): Only the outline of the circle is displayed.

Parameters



- **Center**: Specify the X and Y center coordinates of the circle from -9999 to 9999.
- **Pass (OK)**: Select the color of the circle when the judgment is OK or if no judge value is specified.
- **Fail (NG)**: Select the color of the circle when the judgment is NG.
- **Radius**: Specify the radius of the circle from 0 to 9999 (default value: 50).
- **Hide when skipped**: Place a check in this option to display the circle only when the controller executes the unit for the setting parameter or results data specified in [Pass / Fail Ref.] (Page 6-38).
- **Link to image display**: The setting parameter or results data specified for the [Pass / Fail Ref.] (Page 6-38) can be linked with the image shown in the image display (Page 6-24). If the image display is set to show an archived image, the displayed color will be linked to the results data for the archived image. (For any other shown image, the display is linked to the latest result.)
  - **None**: Background color always matches the latest result, independent of the image display.
  - **Selected display**: Displays the result associated with the displayed image on the image display that is selected on the controller.
  - **Image DisplayID**: Permanently links the background color to the result of the displayed image on the specified image display.

► Note

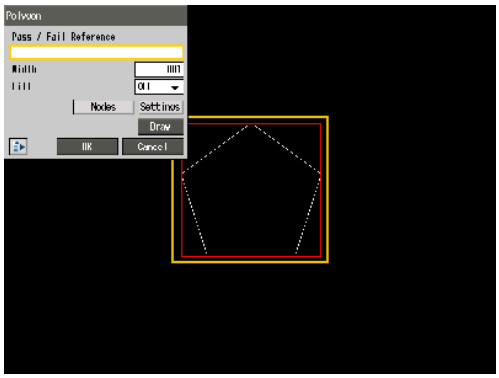
- If the link is set to a image display that has been set to an archived image with no results logging data, the line will always be drawn in the color set for [Pass (OK)].
- A setting error will occur if the specified image display does not exist on the display template.

Draw

Change to Draw mode and adjust the part position. See "Editing the placement position of a part (Draw mode)" (Page 6-6) for more details.

Polygon

This part is used to display a polygon.



► Note

Polygons can only be added with VisionEditor.

Pass / Fail Reference

Change the polygon displayed based on a value like a variable, setting parameter, or results data. If the first decimal place rounds to 0, the result is OK. Otherwise the value is NG.

Width

Specify the width of the polygon lines from 1 to 999 (default: 1).

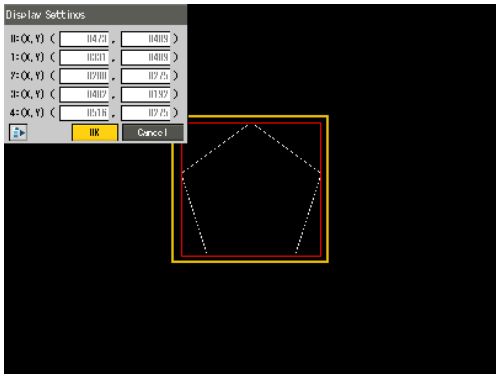
Fill

Select whether to fill the polygon.

- **ON**: The polygon is filled.
- **OFF** (default): Only the outline of the polygon is displayed.

Nodes

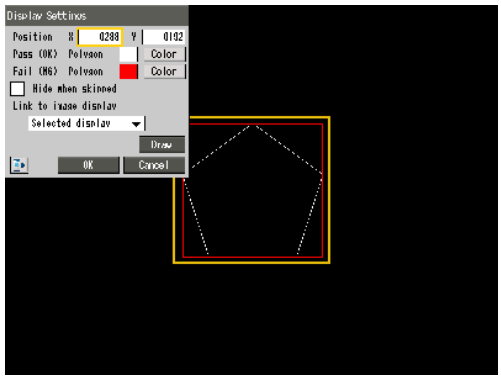
Display the coordinates of each node in the polygon.



► Note

Nodes cannot be edited with the controller.

Parameters



- **Position**: Specify the top left coordinate of the position to display the polygon (-9999 to 9999 for both X and Y).
- **Pass (OK)**: Select the color of the polygon when the judgment is OK or if no judge value is specified.
- **Fail (NG)**: Select the color of the polygon when the judgment is NG.
- **Hide when skipped**: Place a check in this option to display the polygon only when the controller executes the unit for the setting parameter or results data specified in [Pass / Fail Ref.] (Page 6-39).
- **Link to image display**: The setting parameter or results data specified for the [Pass / Fail Ref.] (Page 6-39) can be linked with the image shown in the image display (Page 6-24). If the image display is set to show an archived image, the displayed color will be linked to the results data for the archived image. (For any other shown image, the display is linked to the latest result.)
  - **None**: Background color always matches the latest result, independent of the image display.
  - **Selected display**: Displays the result associated with the displayed image on the image display that is selected on the controller.
  - **Image DisplayID**: Permanently links the background color to the result of the displayed image on the specified image display.

► Note

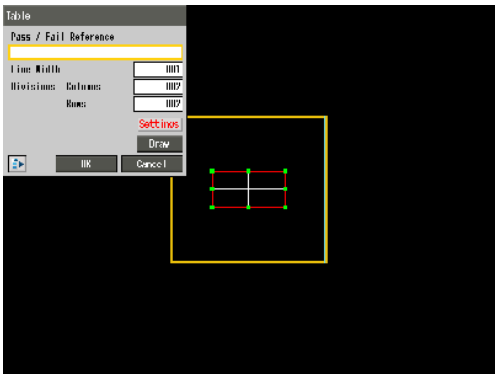
- If the link is set to a image display that has been set to an archived image with no results logging data, the line will always be drawn in the color set for [Pass (OK)].
- A setting error will occur if the specified image display does not exist on the display template.

Draw

Change to Draw mode and adjust the part position. See "Editing the placement position of a part (Draw mode)" (Page 6-6) for more details.

Table

This part is used to display tables.



Pass / Fail Reference

Change the table of lines displayed based on a value like a variable, setting parameter, or results data. If the first decimal place rounds to 0, the result is OK. Otherwise the value is NG.

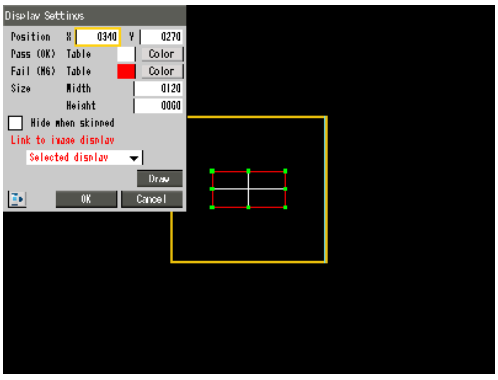
Width

Specify the width of the table lines from 1 to 999 (default: 1).

Divisions

Specify the number of cells in the table by row and column from 1 to 100 (default: 2 for both width and height).

Parameters



- **Position**: Specify the top left coordinate of the position to display the table (-9999 to 9999 for both X and Y).
- **Pass (OK)**: Select the color of the table when the judgment is OK or if no judge value is specified.
- **Fail (NG)**: Select the color of the table when the judgment is NG.
- **Size**: Specify the overall width and height of the table from 1 to 9999 (defaults: 120 (width), 60 (height)).
- **Hide when skipped**: Place a check in this option to display the table only when the controller executes the unit for the setting parameter or results data specified in [Pass / Fail Ref.] (Page 6-40).
- **Link to image display**: The setting parameter or results data specified for the [Pass / Fail Ref.] (Page 6-40) can be linked with the image shown in the image display (Page 6-24). If the image display is set to show an archived image, the displayed color will be linked to the results data for the archived image. (For any other shown image, the display is linked to the latest result.)
  - **None**: Background color always matches the latest result, independent of the image display.
  - **Selected display**: Displays the result associated with the displayed image on the image display that is selected on the controller.
  - **Image DisplayID**: Permanently links the background color to the result of the displayed image on the specified image display.

► Note

- If the link is set to a image display that has been set to an archived image with no results logging data, the line will always be drawn in the color set for [Pass (OK)].
- A setting error will occur if the specified image display does not exist on the display template.

Draw

Change to Draw mode and adjust the part position. See "Editing the placement position of a part (Draw mode)" (Page 6-6) for more details.

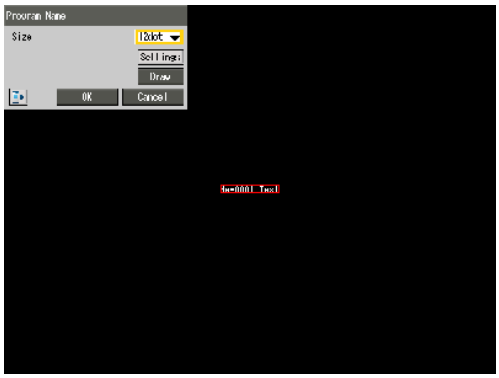
Standard parts

These parts can be placed directly on the frame of the display template. (Some parts can only be placed on the base frame.)

- The maximum number of parts, including basic parts (Page 6-28) that can be placed on a single frame is 500.
- The maximum number of parts that can be placed on a single screen display is 4000, excluding the frame.
- The maximum number of parts that can be placed in a single inspection program is 60000, excluding the frame.

Program Name

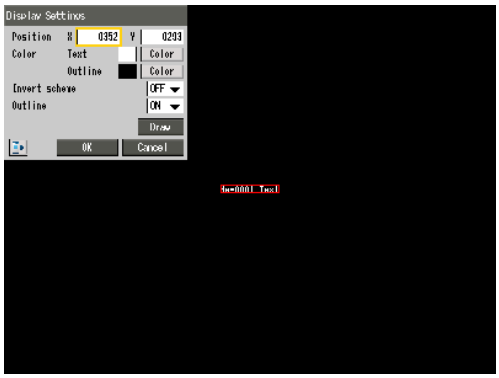
This part is used to display the program name.



Font Size

Select the display size for the program name from 12, 16, 24, 32, or 48 dots (default: 12 dots).

Parameters



- **Position**: Specify the top left coordinate of the position to display the program name (-9999 to 9999 for both X and Y).
- **Color**: Select the color to display the program name and outline.
  - **Text**: To change the program name color, select [Color].
  - **Outline Color**: To change the program name outline color, select [Color].
- Invert scheme: Select whether to display the program name with the color inverted.
  - **ON**: Inverts the colors.
  - **OFF** (default): Does not invert the colors.
- Outline: Select whether you want to draw an outline around the program name.
  - **ON** (default): Displays the value with an outline.
  - **OFF**: Does not display the value with an outline.

► Note

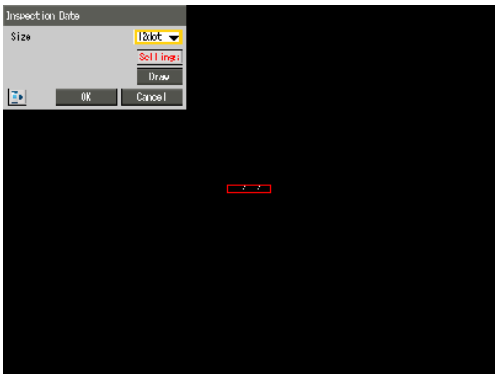
If [Invert scheme] is [ON, [Outline] will be fixed to [OFF].

Draw

Change to Draw mode and adjust the part position. See "Editing the placement position of a part (Draw mode)" (Page 6-6) for more details.

Inspection Date

This part is used to display the date when the flowchart-based inspection started.



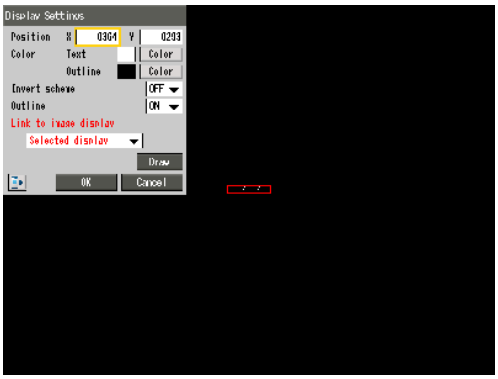
Reference

This is the timing at which the first capture unit in the flowchart starts capturing.

Font Size

Select the display size for the inspection date from 12, 16, 24, 32, or 48 dots (default: 12 dots).

Parameters



- **Position**: Specify the top left coordinate of the position to display the inspection date (-9999 to 9999 for both X and Y).
- **Color**: Select the color to display the date and outline.
  - **Text**: To change the inspection date color, select [Color].
  - **Outline Color**: To change the inspection date outline color, select [Color].
- **Invert scheme**: Select whether to display the inspection date with the color inverted.
  - **ON**: Inverts the colors.
  - **OFF** (default): Does not invert the colors.
- **Outline**: Select whether you want to draw an outline around the inspection date.
  - **ON** (default): Displays the value with an outline.
  - **OFF**: Does not display the value with an outline.
- **Link to image display**: The date can be linked with the image shown in the image display (Page 6-24). If the image display is set to show an archived image, the displayed value will be the inspection starting date for the archived image. (For any other displayed image, the value shown will be the most recent inspection starting date.)
  - **None**: Displays the most recent inspection starting date, independent of the image display.
  - **Selected display**: Displays the inspection starting date associated with the displayed image on the image display that is selected on the controller.
  - **ID**: Always displays the inspection start date associated with the displayed image on the specified image display.

Note

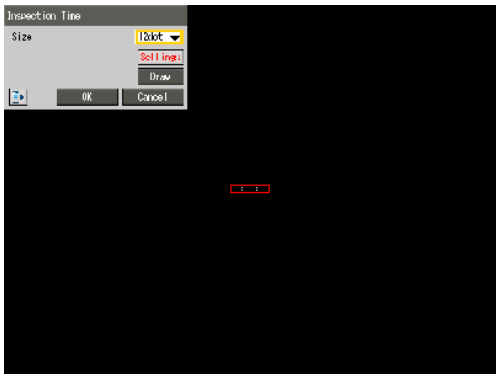
- If [Invert scheme] is [ON, [Outline] will be fixed to [OFF].
- If the link is set to an image display that has been set to an image archive with no results logging data, the date will appear as "--.--.--".
- A setting error will occur if the specified image display does not exist on the display template.

Draw

Change to Draw mode and adjust the part position. See "Editing the placement position of a part (Draw mode)" (Page 6-6) for more details.

Inspection Time

This part is used to display the time when the flowchart-based inspection started.



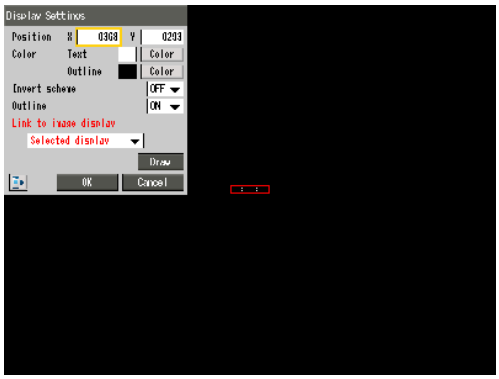
Reference

This is the timing at which the first capture unit in the flowchart starts capturing.

Font Size

Select the display size for the inspection time from 12, 16, 24, 32, or 48 dots (default: 12 dots).

Parameters



- **Position**: Specify the top left coordinate of the position to display the inspection time (-9999 to 9999 for both X and Y).
- **Color**: Select the color to display the time and outline.
  - **Text**: To change the inspection time color, select [Color].
  - **Outline Color**: To change the inspection time outline color, select [Color].
- **Invert scheme**: Select whether to display the inspection date with the color inverted.
  - **ON**: Inverts the colors.
  - **OFF** (default): Does not invert the colors.
- **Outline**: Select whether you want to draw an outline around the inspection date.
  - **ON** (default): Displays the value with an outline.
  - **OFF**: Does not display the value with an outline.
- **Link to image display**: The time can be linked with the image shown in the image display (Page 6-24). If the image display is set to show an archived image, the displayed value will be the inspection starting time for the archived image. (For any other displayed image, the value shown will be the most recent inspection starting time.)
  - **None**: Displays the most recent inspection start time, independent of the image display.
  - **Selected display**: Displays the inspection start time associated with the displayed image on the image display that is selected on the controller.
  - **ID**: Always displays the inspection start time associated with the displayed image on the specified image display.

Note

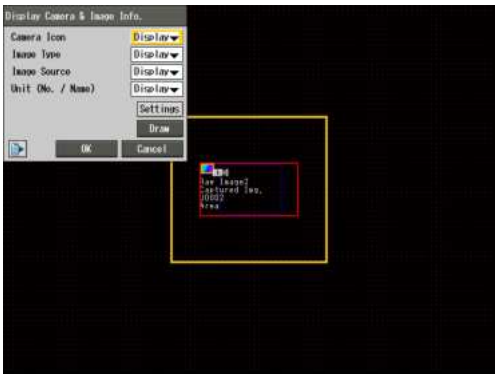
- If [Invert scheme] is [ON, [Outline] will be fixed to [OFF].
- If the link is set to an image display that has been set to an image archive with no results logging data, the date will appear as "--:--:--".
- A setting error will occur if the specified image display does not exist on the display template.

Draw

Change to Draw mode and adjust the part position. See "Editing the placement position of a part (Draw mode)" (Page 6-6) for more details.

Image Display Information

This part is used to display information about the screen, such as the camera icon, image type, display image, and associated units.



Reference

It is not possible to set all settings on the [Display Camera & Image Info.] tab to [Hide].

Camera Icon

Select whether to display the camera icon.

- **Display** (default): Displays the camera icon.
- **Hide**: Hides the camera icon.

Display image type

Select whether to display the image type.

- **Display** (default): Displays the image type.
- **Hide**: Hides the image type.

Display Image

Select whether to display the display image.

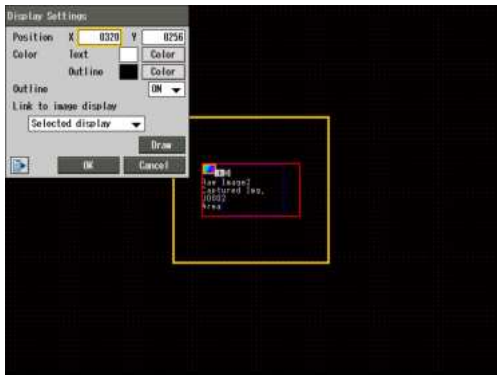
- **Display** (default): Displays the display image.
- **Hide**: Hides the display image.

Units

Select whether to display the unit ID and name.

- **Display** (default): Displays the unit ID and name.
- **Hide**: Hides the unit ID and name.

Parameters



- **Position**: Specify the top left coordinate of the position to display the image information (-9999 to 9999 for both X and Y).
- **Color**: Select the color to display the image information and outline.
  - **Text**: To change the image information color, select [Color].
  - **Outline Color**: To change the image information outline color, select [Color].
- Outline: Select whether to draw an outline around the image information.
  - **ON** (default): Displays the value with an outline.
  - **OFF**: Does not display the value with an outline.
- **Link to image display**: The contents of the image information to display can be linked with the image displayed in the image display (Page 6-24).
  - **Selected display**: Displays the image information for the image display that is selected on the controller.
  - **ID**: Always displays the image information for the specified image display.

► Note

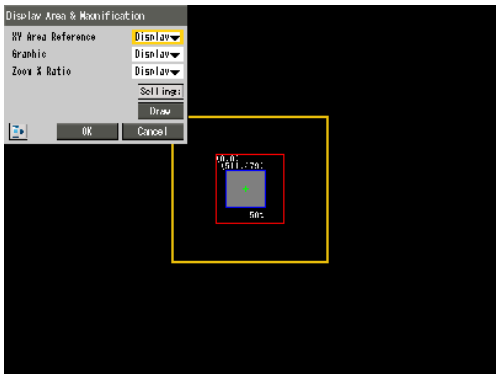
- The [Outline Color] option is only enabled if [Outline] is set to [ON].
- A setting error will occur if the specified image display does not exist on the display template.

Draw

Change to Draw mode and adjust the part position. See "Editing the placement position of a part (Draw mode)" (Page 6-6) for more details.

Zoom Information

This part is used to display zoom information.



Reference

It is not possible to set all settings on the [Display Area & Magnification] tab to [Hide].

Top Left, Bottom Right Position

Select whether to display the coordinates.

- **Display** (default): Displays the coordinates.
- **Hide**: Hides the coordinates.

Overview Image

Select whether to display the capture range of the camera and an overview image of the current display area.

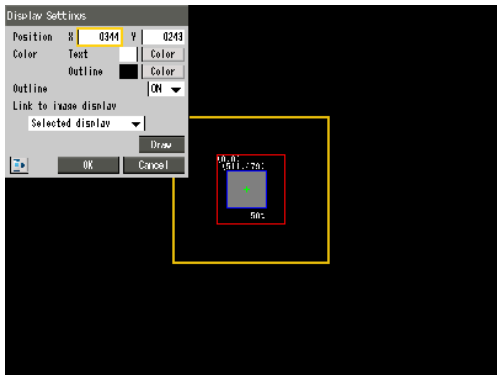
- **Display** (default): Displays the graphic.
- **Hide**: Hides the overview image.

Zoom % Ratio

Select whether to display the zoom ratio.

- **Display** (default): Displays the zoom ratio.
- **Hide**: Hides the zoom ratio.

Parameters



- **Position**: Specify the top left coordinate of the position to display the zoom information (-9999 to 9999 for both X and Y).
- **Color**: Select the color to display the zoom information and outline.
  - **Text**: To change the zoom information color, select [Color].
  - **Outline Color**: To change the zoom information outline color, select [Color].
- **Outline**: Select whether you want to draw an outline around the zoom information.
  - **ON** (default): Displays the value with an outline.
  - **OFF**: Does not display the value with an outline.
- **Link to image display**: The contents of the zoom information to display can be linked with the image displayed in the image display (Page 6-24).
  - **Selected display**: Displays the zoom information for the image display that is selected on the controller.
  - **ID**: Always displays the zoom information for the specified image display.

► Note

- The [Outline Color] option is only enabled if [Outline] is set to [ON].
- A setting error will occur if the specified image display does not exist on the display template.

Draw

Change to Draw mode and adjust the part position. See "Editing the placement position of a part (Draw mode)" (Page 6-6) for more details.

Total Status Pass/Fail

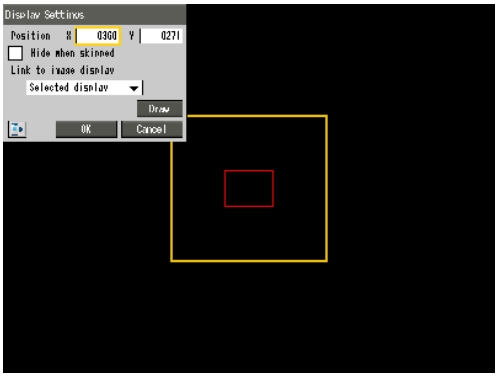
This part is used to display the OK or NG status.



Pass / Fail Reference

Change the OK/NG display based on a value like a variable, setting parameter, or results data (default: %JgAll). If the first decimal place rounds to 0, the result is OK. Otherwise the value is NG.

Parameters



- **Position**: Specify the top left coordinate of the position to display the total status (-9999 to 9999 for both X and Y).
- **Hide when skipped**: Place a check in this option to display the total status only when the controller executes the unit for the setting parameter or results data specified in [Pass / Fail Ref.] (Page 6-46).
- **Link to image display**: The total status Pass / Fail can be linked with the image shown in the image display (Page 6-24). If the image display is set to show an archived image, the Pass / Fail status display will be linked to the results data for the archived image. (For any other shown image, the display is linked to the latest result.)
  - **None**: Background color always matches the latest result, independent of the image display.
  - **Selected display**: Displays the result of the displayed image on the image display that is selected on the controller.
  - **Image DisplayID**: Permanently links the background color to the result of the displayed image on the specified image display.

► Note

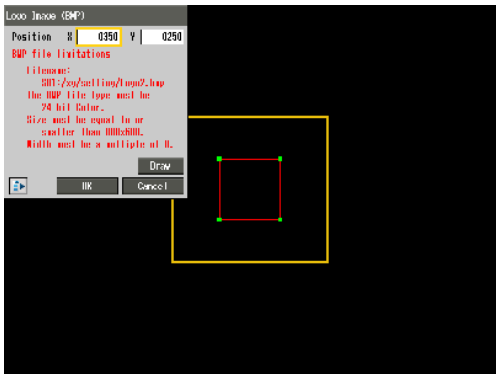
- If the link is set to an image display that has been set to an image archive with no results logging data, no result data will be displayed.
- A setting error will occur if the specified image display does not exist on the display template.

Draw

Change to Draw mode and adjust the part position. See "Editing the placement position of a part (Draw mode)" (Page 6-6) for more details.

Logo Image (BMP)

This part is used to display any user-specified bitmap image file. This allows users to display a custom logo image on the controller screen.



Logo file specifications

To display a custom logo image, save the image as a file that meets these specifications:

- Image file type: 24-bit color bitmap
- Image Size: The image must have a width resolution that is in a multiple of 8. For 800 x 600 display resolution, the maximum logo size is 800 x 600. For 1024 x 768 display resolution, the maximum logo size is 1024 x 768.
- Image filename: Logo2.bmp
- Location of image file: SD1:/xg/setting/

Reference

To allow the background to be visible through the logo image, set the background color to R: 254, G: 1, B: 152.

Position

Specify the top left coordinate of the position to display the logo (-9999 to 9999 for both X and Y).

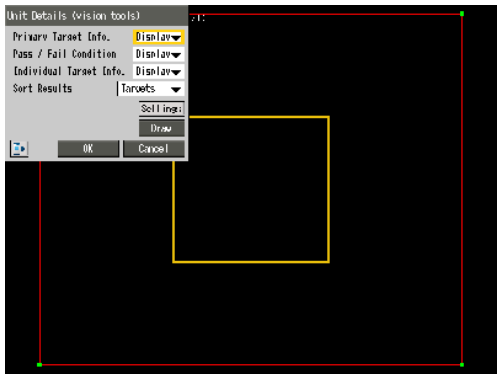
Draw

Change to Draw mode and adjust the part position. See "Editing the placement position of a part (Draw mode)" (Page 6-6) for more details.

Unit Results of Inspection Units

This part is used to display the unit results of inspection units.

- In addition to displaying the inspection results (measurement values and tolerances) for inspection units selected at the controller, this part can also display the unit ID, unit name, unit type, and execution time.
- Some units may support page switching to allow them to display individual results.



Note

The Unit Result of Inspection Units part can not be placed on a page frame. The Unit Result of Non-inspection Units part can not be placed on a page frame.

Primary Target Information

Select whether to display the result of the primary target.

- **ON** (default): Displays the result of the primary target.
- **OFF**: Hides the result of the primary target.

Pass / Fail Condition

Select whether to display the limits.

- **ON** (default): Displays the limits.
- **OFF**: Hides the limits.

Individual Target Information

Select whether to display the individual results.

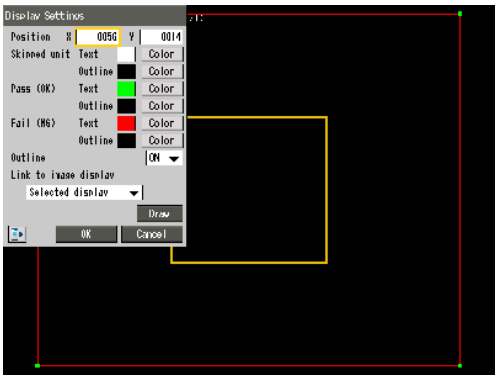
- **ON** (default): Displays the individual results.
- **OFF**: Hides the individual results.

Sort Results

Select the method for sorting the display of unit results of inspection units.

- **Items**: Sorts by result items.
- **Labels** (default): Sorts by labels.

Parameters



- **Position**: Specify the top left coordinate of the position to display the unit results (-9999 to 9999 for both X and Y).
- **Skipped unit**: Select the color to display the inspection unit result and outline under normal conditions (when the unit is not executed, or the judgment result has not been finalized yet).
  - **Text**: To change the unit result (vision unit) color, select [Color].
  - **Outline Color**: To change the unit result (vision unit) outline color, select [Color].
- **Pass (OK)**: Select the color of the unit result (vision unit) and outline when judgment is OK.
  - **Text**: To change the unit result (vision unit) color, select [Color].
  - **Outline Color**: To change the unit result (vision unit) outline color, select [Color].
- **Fail (NG)**: Select the color of the unit result (vision unit) and outline when judgment is NG.
  - **Text**: To change the unit result (vision unit) color, select [Color].
  - **Outline Color**: To change the unit result (vision unit) outline color, select [Color].
- **Outline**: Select whether you want to draw an outline around the unit result.
  - **ON** (default): Displays the value with an outline.
  - **OFF**: Does not display the value with an outline.
- **Link to image display**: The measurement results can be linked with the image shown in the image display (Page 6-24). If the image display is set to show an archived image, the displayed value will be the results data for the archived image. (For any other displayed image, the latest value will be shown.)
  - **Selected display**: Displays the inspection result associated with the displayed image on the image display that is selected on the controller.
  - **ID**: Always displays the inspection result associated with the displayed image on the specified image display.

► Note

- The [Outline Color] option is only enabled if [Outline] is set to [ON].
- If a link is set to an image display that is set to display an image archive which does not have any results data, no result data will be displayed.
- A setting error will occur if the specified image display does not exist on the display template.

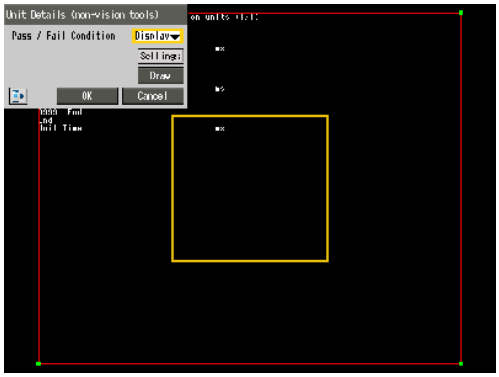
Draw

Change to Draw mode and adjust the part position. See "Editing the placement position of a part (Draw mode)" (Page 6-6) for more details.

Unit Results of Non-inspection Units

This part is used to display a list of the unit results of non-inspection units.

- It can display various information about non-vision units from the start unit to the last end unit in the flowchart, such as unit ID, unit name, unit type, execution time, and various individual results.
- The list is displayed in ascending order of the unit ID.



► Note

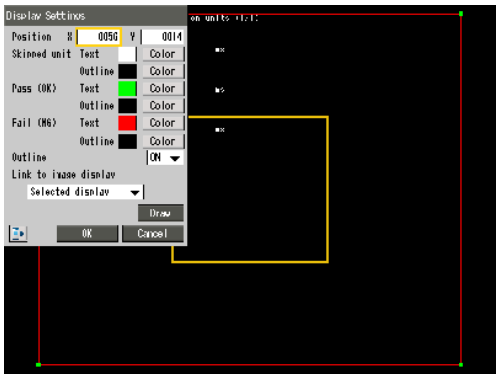
This part supports page switching when there are multiple units. The Unit Result of Non-inspection Units part can not be placed on a page frame.

Pass / Fail Condition

Select whether to display the tolerance.

- **ON** (default): Displays the tolerance.
- **OFF**: Hides the tolerance.

Parameters



- **Position**: Specify the top left coordinate of the position to display the results from non-vision units (-9999 to 9999 for both X and Y).
- **Skipped unit**: Select the color to display the unit result (non-vision units) and outline under normal conditions (when the unit is not executed, or the judgment result has not been finalized yet).
  - **Text**: To change the result (non-vision units) color, select [Color].
  - **Outline Color**: To change the result (non-vision units) outline color, select [Color].
- **Pass (OK)**: Select the color of the unit results (non-vision units) and outline when the judgment is OK.
  - **Text**: To change the result (non-vision units) color, select [Color].
  - **Outline Color**: To change the result (non-vision units) outline color, select [Color].
- **Fail (NG)**: Select the color of the unit results (non-vision units) and outline when the judgment is NG.
  - **Text**: To change the result (non-vision units) color, select [Color].
  - **Outline Color**: To change the result (non-vision units) outline color, select [Color].
- **Outline**: Select whether you want to draw an outline around the unit result (non-vision units).
  - **ON** (default): Displays the value with an outline.
  - **OFF**: Does not display the value with an outline.
- **Link to image display**: The measurement results (non-vision units) can be linked with the image shown in the image display (Page 6-24). If the image display is set to show an archived image, the displayed value will be the results data for the archived image. (For any other displayed image, the latest value will be shown.)
  - **None**: Displays the latest results (non-vision units), independent of the image display.
  - **Selected display**: Displays the unit results (non-vision units) of units associated with the displayed image on the image display that is selected on the controller.
  - **ID**: Always displays the result (non-vision units) associated with the displayed image on the specified image display.

► Note

- The [Outline Color] option is only enabled if [Outline] is set to [ON].
- If a link is set to a image display that is set to display an archived image which does not have any results data, no value will be displayed.
- A setting error will occur if the specified image display does not exist on the display template.

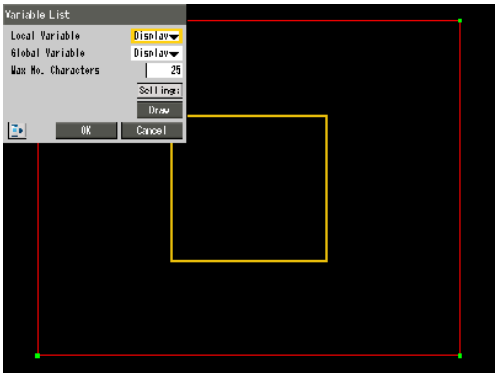
Draw

Change to Draw mode and adjust the part position. See "Editing the placement position of a part (Draw mode)" (Page 6-6) for more details.

List of Variables

This part is used to display a list of the values of local and global variables.

- The list displays all local variables, which includes the defined arrays, structures and global variables in that order.
- This part supports page switching when there are multiple variables.



► Note

The List of Variables part can not be placed on a page frame. The Unit Result of Non-inspection Units part can not be placed on a page frame.

Reference

It is not possible to set all settings on the [Variable List] tab to [OFF].

Local variables

Select whether to display a list of the local variables.

- **ON** (default): Displays a list of the local variables.
- **OFF**: Does not display the list of local variables.

Global variables

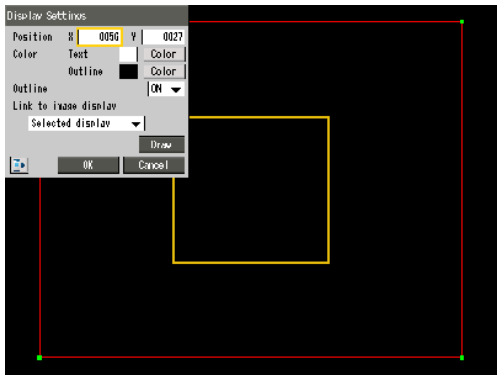
Select whether to display a list of the global variables.

- **ON** (default): Displays a list of the local variables.
- **OFF**: Does not display the list of global variables.

Max No. Characters

Specify the number of characters to include when displaying variable names from 2 to 41 (default: 25). Variable names longer than the specified number of characters will be truncated.

Parameters



- **Position**: Specify the top left coordinate of the position to display the variable list (-9999 to 9999 for both X and Y).
- **Color**: Select the color of the list of variables and outline.
  - **Text**: To change the variable list color, select [Color].
  - **Outline Color**: To change the variable list outline color, select [Color].
- **Outline**: Select whether you want to draw an outline around the variable list.
  - **ON** (default): Displays the value with an outline.
  - **OFF**: Does not display the value with an outline.
- **Link to image display**: The variable list can be linked with the image shown in the image display (Page 6-24). If the image display is set to show an archived image, the displayed value will be the list of variables for the archived image. (For any other displayed image, the values shown will be of the latest variables.)
  - **None**: Displays the latest variable list, independent of the image display.
  - **Selected display**: Displays the variable list associated with the displayed image on the image display that is selected on the controller.
  - **ID**: Always displays the variable list associated with the displayed image on the specified image display.

► Note

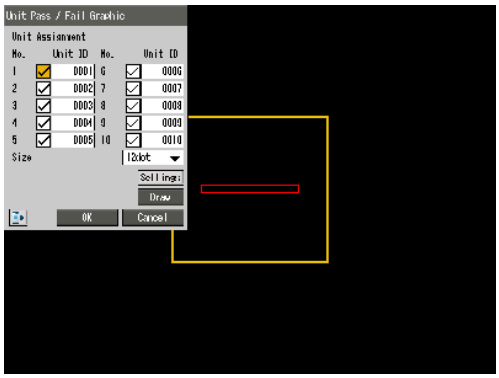
- The [Outline Color] option is only enabled if [Outline] is set to [ON].
- If a link is set to an image display that is set to display an image archive which does not have any results data, no value will be displayed.
- A setting error will occur if the specified image display does not exist on the display template.

Draw

Change to Draw mode and adjust the part position. See "Editing the placement position of a part (Draw mode)" (Page 6-6) for more details.

Unit Judgment Results

This part is used to display a list of icons that indicate up to 10 unit judgment results.



Unit Assignment

Specify up to 10 units to display.

- In the Unit ID field, specify the ID number of the units for which you wish to display the judgment result.
- Removing the check hides the display of that unit.

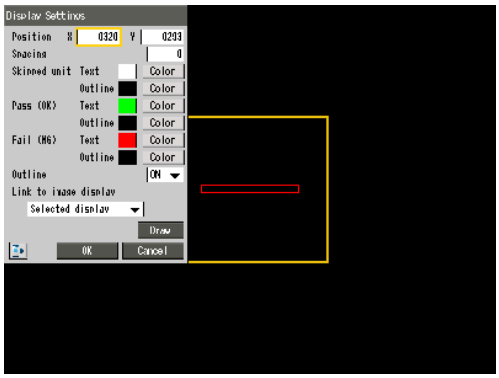
► Note

- If the specified unit ID does not perform a tolerance judgment, the indicator will always show OK.
- Indicators will not appear until the judgment result has been made, such as immediately after the system is started.

Font Size

Select the display size for the unit pass/fail graphic from 12, 16, 24, 32, or 48 dots (default: 12 dots).

Parameters



- **Position**: Specify the top left coordinate of the position to display the unit pass/fail graphic (-9999 to 9999 for both X and Y).
- **Spacing**: Specify the spacing between indicator icons used to display the unit judgment results from 0 - 7 1-bypte spaces (default: 0).
- **Skipped unit**: Select the color to display the unit pass/fail graphic and outline under when the unit is skipped (when the unit is not executed, or the judgment result has not been finalized yet).
  - **Text**: To change the unit pass/fail graphic color, select [Color].
  - **Outline Color**: To change the unit pass/fail graphic outline color, select [Color].
- **Pass (OK)**: Select the color of the unit pass/fail graphic and outline when the judgment is OK.
  - **Text**: To change the unit pass/fail graphic color, select [Color].
  - **Outline Color**: To change the unit pass/fail graphic outline color, select [Color].
- **Fail (NG)**: Select the color of the unit pass/fail graphic and outline when the judgment is NG.
  - **Text**: To change the unit pass/fail graphic color, select [Color].
  - **Outline Color**: To change the unit pass/fail graphic outline color, select [Color].
- **Outline**: Select whether you want to draw an outline around the unit pass/fail graphic.
  - **ON** (default): Displays the value with an outline.
  - **OFF**: Does not display the value with an outline.
- **Link to image display**: The unit pass/fail graphic can be linked with the image shown in the image display (Page 6-24). If the image display is set to show an archived image, the unit judgment results will show the results data for the archived image. (For any other displayed image, the values shown will be of the latest results.)
  - **None**: Displays the latest results, independent of the image display.
  - **Selected display**: Displays the result associated with the displayed image on the image display that is selected on the controller.
  - **ID**: Always displays the result associated with the displayed image on the specified image display.

► Note

- The [Outline Color] option is only enabled if [Outline] is set to [ON].
- If the archived image used in the image display is not set to log results data, nothing will be displayed.
- A setting error will occur if the specified image display does not exist on the display template.

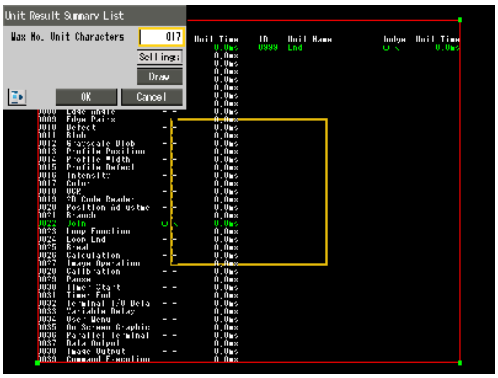
Draw

Change to Draw mode and adjust the part position. See "Editing the placement position of a part (Draw mode)" (Page 6-6) for more details.

Unit Results of All Units

This part is used to display a list of the results of all units in the flowchart.

- It can display various information about all units from the start unit to the last end unit in the flowchart, such as unit ID, unit name, judgment result, and execution time. The list is displayed in ascending order of the unit ID.
- This part may also support page switching when there are multiple units.



▶ Note

The Unit Results of All Units part can not be placed on a page frame. The Unit Result of Non-inspection Units part can not be placed on a page frame.

Max. No. Unit Characters

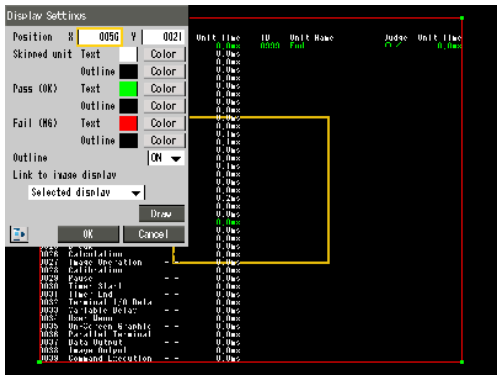
Specify the number of characters to include when displaying unit names from 10 to 100 (default: 17). Unit names longer than the specified number of characters will be truncated.

▶ Note

If you specify more characters than indicated below, some of the items may run off the display area and not be visible.

- When outline is [ON]: 63 characters or more.
- When outline is [OFF]: 91 characters or more.

Parameters



- **Position**: Specify the top left coordinate of the position to display the common unit results list (-9999 to 9999 for both X and Y).
- **Skipped unit**: Select the color to display the inspection unit result and outline under normal conditions (when the unit is not executed, or the judgment result has not been finalized yet).
  - **Text**: To change the common unit results list color, select [Color].
  - **Outline Color**: To change the common unit results list outline color, select [Color].
- **Pass (OK)**: Select the color of the common unit results list and outline when the judgment is OK.
  - **Text**: To change the common unit results list color, select [Color].
  - **Outline Color**: To change the common unit results list outline color, select [Color].
- **Fail (NG)**: Select the color of the common unit results list and outline when the judgment is NG.
  - **Text**: To change the common unit results list color, select [Color].
  - **Outline Color**: To change the common unit results list outline color, select [Color].
- **Outline**: Select whether you want to draw an outline around the common unit results list.
  - **ON** (default): Displays the value with an outline.
  - **OFF**: Does not display the value with an outline.

- **Link to image display**: The unit list can be linked with the image shown in the image display (Page 6-24). If the image display is set to show an archived image, the list of unit results will show the results data for the archived image. (For any other shown image, the value displayed will be the latest value.)
  - **None**: Displays the latest list of all unit results, independent of the image display.
  - **Selected display**: Displays the list of all unit results associated with the displayed image on the image display that is selected on the controller.
  - **ID**: Always displays the unit list associated with the displayed image on the specified image display.

► Note

- The [Outline Color] option is only enabled if [Outline] is set to [ON].
- If a link is set to a image display that is set to display an archived image which does not have any results data, no value will be displayed.
- A setting error will occur if the specified image display does not exist on the display template.

Draw

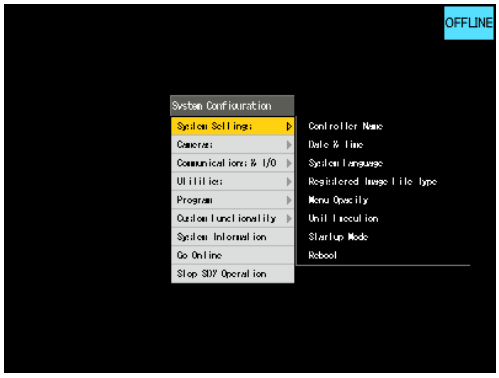
Change to Draw mode and adjust the part position. See "Editing the placement position of a part (Draw mode)" (Page 6-6) for more details.

Chapter 7

Offline Mode Settings

System Configuration

If the controller is offline, the screen displays the [System Configuration] menu. This section explains the functions available in the System Configuration menu.



Functions available from the System Configuration menu

System Settings

- **Controller Name**: Assign and edit the controllers name (Page 7-4).
- **Date & Time**: Set the date and time of the controllers internal clock. This function is also available on the function menu in run mode (Page 5-5).
- **SystemLanguage**: Change the language to Japanese, English, traditional Chinese, and simplified Chinese (Page 7-4).
- **Registered Image File Type**: Set the initial file format for registered images. Registered images are saved in this format when saved via a command from an external device (Page 7-5).
- **Menu Opacity**: Choose the initial opacity when displaying menu (Page 7-6).
- **Unit Execution**: Select whether to enable unit execution settings (Page 4-15) from the controller..
- **Startup Mode**: Choose whether to display the flowchart at startup (Page 7-7).
- **Restart**: Restarts the controller.

Cameras

- **Settings**: Set the default settings for cameras and lights (when the optional light controller CA-DC21E is attached). This option also allows for images coming in from the camera to be checked and saved to an SD card. (Page 7-8).
- **White Balance**: If a color camera is connected, the RGB levels (white balance) can be adjusted to match the lighting environment of the target area and conditions of the connected camera. (Page 7-22).

Communications & I/O

- **Terminal Block & Parallel Port**: Set the default settings for data input and output through the controller's terminals (parallel I/O connector and terminal block) (Page 7-23).
- **Ethernet (TCP/IP)**: Set the default settings for data input/output over the controller's Ethernet port using TCP/IP (Page 7-25).
- **FTP**: Set the FTP client settings (Page 7-27).
- **RS-232C (no protocol)**: Set the default settings for RS-232 communication (Page 7-28).
- **PLC-Link**: Set the default settings for data input/output over PLC-Link (Page 7-29).
- **CC-Link**: Set the default settings for data input/output over CC-Link (Page 7-34).
- **EtherNet/IP**: Set the default settings for data input/output over EtherNet/IP (Page 7-38).
- **VNC**: Change the VNC server function settings (Page 7-42).

Utility

- **File Management**: Displays the File Management menu, which can be used to view, verify and format files on the SD cards used in the controller. This function is also available on the function menu in run mode (Page 5-5).
- **I/O Monitor & Diagnostics**: Displays the I/O Monitor & Diagnostics screen, which can be used to check the real time status of terminal inputs and outputs on the controller. In Offline mode outputs can be forced to checking wiring and functionality. This function is also available on the function menu in run mode (Page 5-5).
- **RS-232C Monitor**: Displays the RS-232C Monitor screen, which can be used to check the real time status of the RS-232C port data on the controller. This function is also available on the function menu in run mode (Page 5-5).
- **Encoder Monitor**: Displays the Encoder Monitor screen, which allows the status of controller encoder input to be checked in real time. This function is also available on the function menu in run mode (Page 5-5).

Program

- **Save/Load Program Settings**: Saves or loads a user specified program from a SD card. This function is also available on the function menu in run mode (Page 4-364).
- **Save/Load Global Settings**: Saves the current global settings or loads global settings from an SD card (Page 7-43).

Custom Functionality

- **OCR Encryption**: Users can create a conversion table to decrypt the data read by the OCR unit (Page 4-231) when an encrypted date, time, or shift is printed on a target (Page 7-45).
- **Custom Instruction Settings**: Input the entry for any standard instruction to create custom instructions for controlling the controller. (Page 7-46).
- **CA Series Touch Panel Setting**: Perform FOV correction for a CA series touch panel (Page 7-51).
- **New Program Options**: Set the resolution that is used when a new inspection program is created (Page 7-52).

System information

Shows information about the controller, including the name, version program files, and available space on the SD card (Page 7-53).

Go Online (run)

Changes to online (run) mode (Page 5-2).

Stop SD Card 2 Operation

Stops all SD Card 2 operation so that it can be safely ejected.

Reference

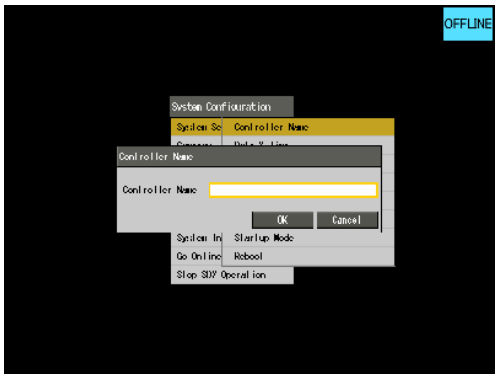
When an option is selected in the System Configuration menu some of the items, such as Settings and White Balance allow, the VIEW bar (Page 3-10) to be displayed by clicking the [View] button.

Changing the Controller Settings (System Settings)

Controller Name

Use this function to assign or edit a controllers name. The assigned name is displayed in the [System Information] menu (Page 7-53).

1 **From the System Configuration menu, select [System Settings] - [Controller Name].**
The [Controller Name] menu appears.



2 **Enter a name in the [Controller Name] field.**
A text string of up to 32 characters can be entered for the controller name.

3 **Click [OK].**

▶ Note

The following characters cannot be used in the controller name: \, |, ?, *, <, >, :, ", .

System Language

The language used on the controller can be changed to Japanese, English, traditional Chinese, or simplified Chinese. The unit text on the flowchart screen can be changed to the unit type display associated with the system language.

1 **From the System Configuration menu, select [System Settings] - [System Language].**
The [System Language] menu appears.



2 **Change the system language setting as required.**
- **Japanese (J)**: Use Japanese.
- **English (E)** (default): Use English.
- **Traditional Chinese (TC)**: Use traditional Chinese.
- **Simplified Chinese (SC)**: Use simplified Chinese.

3 **Change the unit text display settings in the flowchart screen as necessary.**
If [Unit Type] was selected, the unit type text changes according to the controller language setting.
- **Unit Name** (default): Display the text which was set for that unit.
- **Unit Type**: Display fixed text that indicates the unit type.

4 **Click [OK].**

► Note

- To initiate the language change, the controller must be restarted.
- The character codes used with simplified Chinese and traditional Chinese are each different from the other languages. Therefore when Chinese is selected as the language, characters may not be displayed correctly in the following cases.
  - When the language is changed from simplified Chinese to another language
  - When the language is changed from traditional Chinese to another language
  - When simplified Chinese or traditional Chinese is selected after a language other than Chinese was selected
  - When upload or download was executed when the system language settings are not the same at the XG VisionEditor workspace and the controller
- The controller does not support the display of some simplified Chinese characters.

Registered Image File Type

Use this function to set the initial file format for registered images. Registered images are saved in this format when saved via a command from an external device.

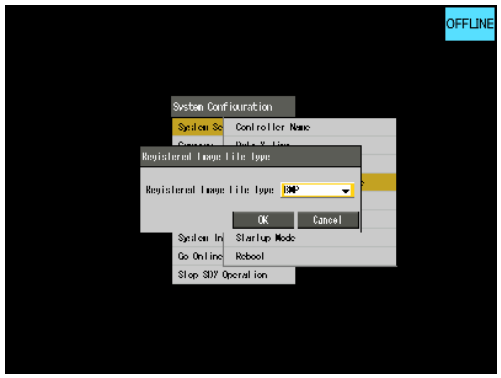
► Note

Saving the registered images in JPE G format has the following advantages and disadvantages. Select the save format that best suits the intended use.

- Advantages:
  The images are compressed. Smaller files mean more registered images and program Nos. can be saved on the SD card.
- Disadvantages:
  - As the image is compressed, so the measurement results for the compressed image may differ to results from uncompressed (BMP format) images.
  - When switching program Nos., the controller takes extra time to expand compressed images. Thus it takes more time to switch program Nos. with JPEG v BMP images.
  - The compression rate varies depending on the image. Thus the image file size and max number of images that can be stored can vary.

1 From the System Configuration menu, select [System Settings] - [Register Image File Type].

The [Register Image File Type] menu appears.



2 Change the settings as required.

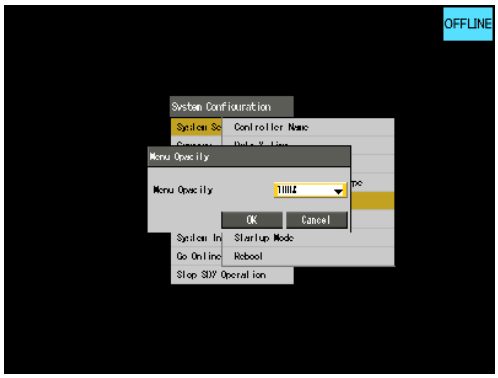
- **BMP** (default): Saves images in bitmap format.
- **JPEG**: Saves the images in JPEG format.

3 Click [OK].

Menu Opacity

Use this function for setting the initial opacity to use when displaying the controller's menus.

1 **From the System Configuration menu, select [System Settings] - [Overall Menu Opacity].**
The [Overall Menu Opacity] menu appears.



2 **Change the settings as required.**
Select any transparency from 25% to 100% (default). Menus are opaque at 100% and gradually become transparent as the percentage decreases.

3 **Click [OK].**

Unit Execution

Select whether to enable unit execution settings (Page 4-15) from the controller.

1 **From the System Configuration menu, select [System Settings] - [Unit Execution].**
The [Unit Execution] menu appears.



2 **Change the settings as required.**

- **PC (XG VisionEditor) only** (default): Units with the [Execute] item on the [Properties] menu set to [Never Execute] will not be processed in the VisionEditor simulation, but will be processed on the controller.
- **PC & XG Controller**: Units with the [Execute] item on the [Properties] menu set to [Never Execute], will not be processed on either the controller or PC software VisionEditor.

3 **Click [OK].**

Reference

Results data for units that are not processed on the controller defaults to "0", in the same was as the branches and loop functions that were skipped (Page 4-278). To determine whether or not a unit is executed for a given measurement, check the count in the executed count (RSLT.EXCT) results for that unit. (The count will be 0 if it has never been executed.)

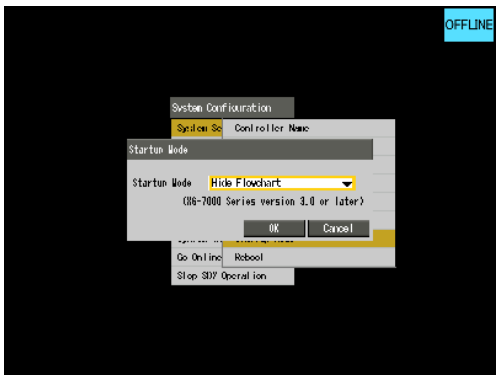
Startup Mode

Use this function for choosing whether to show the flowchart at startup.

Reference

The flowchart can be shown or hidden via the function menu as well (Page 4-2).

1 **From the System Configuration menu, select [System Settings] - [Startup Mode].**
The [Startup Mode] menu appears.



2 **Change the settings as required.**

- **Hide Flowchart** (default): Hide the flowchart when the controller starts up.
- **Show Flowchart**: Show the flowchart when the controller starts up.

3 **Click [OK].**

Obtaining and Checking Images with Camera Settings

Changes can be made to the default camera settings used by the system. Default camera settings set in [System Configuration] are reflected directly to capture units when the [Use System Settings] checkbox is checked. See "Capture" (Page 4-17) for more details.
This option also allows for images coming in from the camera to be checked and saved to an SD card.

Individual Camera Settings

- Camera (Page 7-8)
- Trigger (Page 7-9)
- Shutter Speed (Page 7-10)
- CCD Settings (Page 7-10)
- Light (Page 7-12)
- CCD Imaging Region (Page 7-13)
- Scan (Page 7-15)
- Mirrored CCD (Page 7-16)

Camera Preview

- Display Types (Page 7-16)
- Saving Images (Page 7-16)

Common Camera Settings

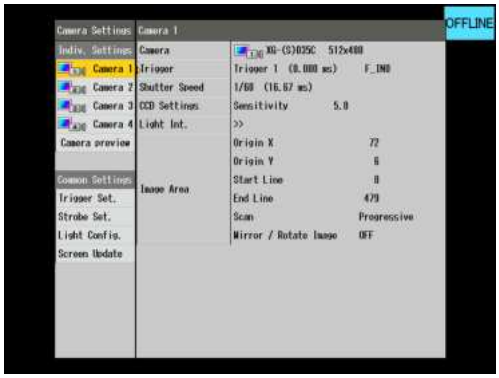
- Trigger Settings (Page 7-17)
- Strobe Settings (Page 7-18)

- Light Config. (Page 7-19, 7-20)
- Screen Update (Page 7-21)

Display the [Camera Settings] screen

From the System Configuration, select [Cameras] - [Camera Settings].

The [Camera Settings] screen appears.



► Note

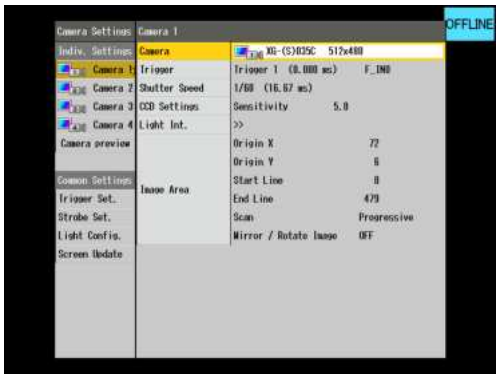
When the [Camera Settings] screen is displayed, any unsaved settings, results and archive data will be cleared (Page 5-19).

Camera Specifications

If multiple cameras are connected to the controller, The individual shutter speed, gain adjustment, process area, image area, trigger, and camera type for each camera can be set. If the camera can be set is an analog camera, the image area and scanning method when configuring the camera settings can be set. When setting individual items for each camera, be sure to choose the correct camera type in [Camera] before setting the parameters.

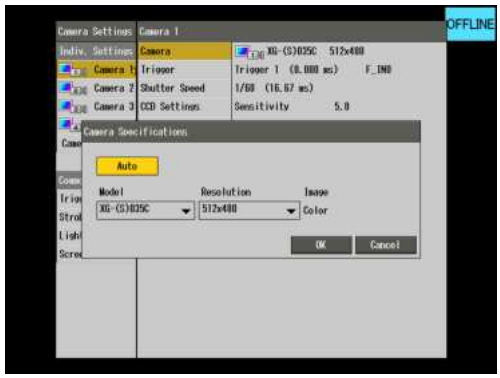
1 Select the camera number (Camera 1 to Camera 4) connected to the controller from [Indiv. Settings] on the [Camera Settings] screen.

The settings screen for the selected camera appears.



2 Select [Camera].

The [Camera Specifications] menu appears.



3 **Change the camera settings, then click [OK].**

- The camera connection will be configured according to the color/monochrome selection and resolution.
- If the connected camera is XG-200C/200M/S200C/S200M/H200C/H200M, then the resolution can be set to [1600 x 1200] or [1024 x 960].
- If the connected camera is XG-035C/035M/S035C/S035M/H035C/H035M: the resolution can be set to [640x480] or [512x480].

Reference

Selecting [Auto] with a digital camera connected will automatically detect and set the connected camera.

► Note

Connect the camera before turning on the controller.

Camera Trigger

Choose which trigger to be used for each camera.

Reference

The trigger can be set individually for each camera.

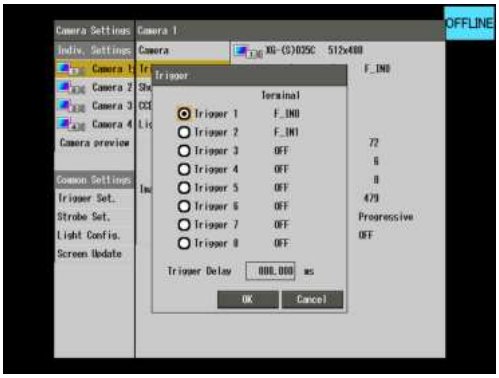
1 **Select the camera number (Camera 1 to Camera 4) connected to the controller from [Indiv. Settings] on the Camera Settings screen (Page 7-8).**

The settings screen for the selected camera appears.

2 **Select [Trigger].**

The [Trigger] menu appears.

The terminal assignment for the trigger (if assigned) is shown.



3 **Select the trigger to be used as the camera input trigger.**

► Note

- A trigger can still be selected even if a terminal hasn't assigned. However that trigger will be non-functional, until it has been assigned.
- Inputting a trigger from the handheld controller acts as a single trigger for all cameras.

4 **To set a delay between the trigger input signal and the capturing of an image, select [Delay] and then specify a delay time.**

The delay can be set from 0 to 999 ms (Default value: 000 ms).

5 **When the setting is complete, click [OK].**

Shutter Speed

Select a shutter speed suitable for the line speed and lighting conditions. Before using a fast shutter speed, make sure there is sufficient light to produce the desired image.

Reference

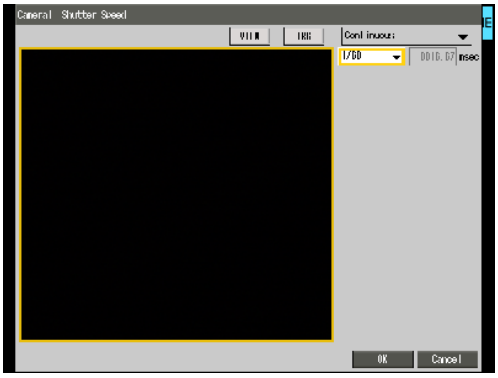
The shutter speed can be individually set for each camera.

1 **Select the camera number (Camera 1 to Camera 4) connected to the controller from [Indiv. Settings] on the Camera Settings screen (Page 7-8).**

The settings screen for the selected camera appears.

2 **Select [Shutter Speed].**

The [Shutter Speed] menu appears.



3 **Select a shutter speed, then select [OK].**

As different shutter speeds are selected the camera image on the left changes accordingly.

Reference

To enter the shutter speed numerically, choose [Custom], then input the shutter speed. For a digital camera, input a value in the range of 0.05 to 9000.00 (ms).
The range allowed for analog cameras varies depending on model type. For more details, refer to "Capture Units" in the XG VisionEditor Reference Manual.

► Note

When using a fast shutter speed with a high intensity light, a smear effect (vertical streaks on the image) may occur. To adjust and compensate for this, adjust the aperture ring and lighting settings.

CCD Settings

Image quality and contrast can be adjusted by changing the cameras CCD sensitivity and gain-adjustment settings. This functionality is useful when needing to optimize an images brightness and adjust for black / white saturation.

► Note

Adjusting the CCD settings may cause a pre-programmed unit to process incorrectly. Be sure to check the processed result after making such adjustments.

Reference

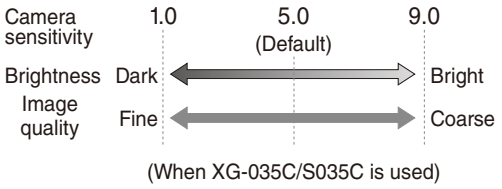
The CCD settings can be set separately for each camera as well as being available as an image enhance filter (contrast conversion) for individual unit processing. See the "Preprocessing" explanation of each unit for more details.

Adjusting the Overall Brightness (Sensitivity)

The brightness of the image is typically adjusted by changing the shutter speed, aperture, or lighting. Camera CCD's, however, can change its sensitivity to improve the image exposure.

Reference

As the sensitivity is increased the overall brightness of the image increases, however noise elements in the image become more visible and the image appears coarser. When the cameras sensitivity is decreased the overall image darkens, the noise elements lessen and the image appears smoother.



(When XG-035C/S035C is used)

► Note

If using a high-speed camera (XG-H035C/H035M/H100C/H100M/H200C/H200M/H500C/H500M), with the camera sensitivity set higher than default, a vertical line may appear on the screen. This phenomenon is a feature of the cameras design and not an error. If this occurs, set the camera sensitivity lower and adjust the external lighting.

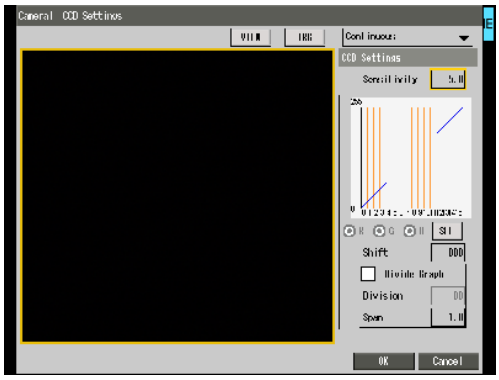
Reference

The range of sensitivity adjustment for each camera type is different.

- XG-H035C/H035M/H100C/H100M/S200C/S200M/H200C/H200M/H500C/H500M/HL02M/HL04M/HL08M: 1.0 to 7.0
- All other cameras: 1.0 - 9.0

1 **Select the camera number (Camera 1 to Camera 4) connected to the controller from [Indiv. Settings] on the Camera Settings screen (Page 7-8).**
The settings screen for the selected camera appears.

2 **Select [CCD Settings].**
The [CCD Settings] menu appears.



3 **Select [Sensitivity], then specify the desired sensitivity level.**
The larger the number, the brighter the image; the smaller the number, the darker the image. As the sensitivity is changed the image display updates accordingly.
The default camera sensitivity is values are:

- 3.0: for XG-H035C/H035M/H100C/H100M
- 4.0: for XG-H200C/H200M/H500C/H500M
- 5.0: for all other cameras not listed above

4 **To finish settings, click [OK].**

► Note

When increasing camera sensitivity and using a fast shutter speed, it may be necessary to open the lens aperture to let in more light. Allowing intense light to enter with the aperture wide open may cause a smear affect (vertical streaks on the image). To adjust and compensate for this, adjust the aperture and lighting.

Adjusting the Image Balance

This setting is used in conjunction with the sensitivity setting to adjust the range of brightness and improve image quality. The adjustment allows for the shift (offset) and span of the intensity for monochrome cameras and RGB elements for color cameras.

Reference

The gain setting can be adjusted for each measurement unit through the [Contrast conversion] filter (image enhancement) (for offset and span adjustment only). However, be aware that filter processing will increase the measurement processing time.

1 **Select the camera connection (Camera 1 to Camera 4) connected to the controller from [Indiv. Settings] on the [Camera Settings] screen (Page 7-8).**
The settings screen for the selected camera appears.

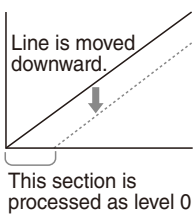
2 **Select [CCD Settings].**
The [CCD Settings] menu appears.

3 **To adjust the RGB elements individually, use [SEL], and then select the color (R, G or B) (color cameras only).**
The graph on the screen will be displayed for the selected color.

Reference

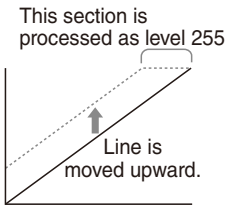
To return be able to adjust all RGB elements at once again, select [ALL]. After selecting [All], individual settings will be used until the settings are changed in [ALL] mode.

4 **Select [Shift], then specify the shift level for the entire signal.**
The range of values you can specify are -255 to +255 (default: 0).



•To darken the image: Use a negative value to move the entire line downward. The range below the minimum value on the Y-axis is processed as 0 (black).

- **To lighten the image:** Use a positive value to move the entire line upward. The range above the maximum value on the Y-axis is processed as 255 (white).



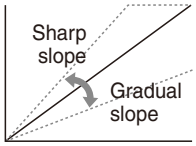
As the value is shifted the displayed image is updated accordingly.

Reference

Shift can be set to a value between 0 and 255.

5 **Select [Span], then specify the rate of contrast change.**

The setting range is from 0.0 to 7.9 (default 1).



- **To increase the contrast in images**: Use a high value so there is a greater rate of change.
- **To decrease the contrast in images**: Use a low value so there is a lesser rate of change.

As the span is changed, the displayed image is updated accordingly.

► Note

In the same way as shift [Shift] in step 3, the range below the minimum value on the Y-axis is processed as 0 (black), and the range above the maximum value is processed as 255 (white).

6 **When the settings are complete, click [OK].**

Setting different rates in change for different shades.

If [Divide Graph] is selected, it is possible to set an individual contrast span for each of the 16 shades of the graph.

Select [Division] to choose a particular range of the graph and then adjust the span accordingly.

Light Intensity

If the CA-DC21E is connected to the controller, the light intensity can be adjusted through the controller. Use this in conjunction with the shutter speed setting to correctly illuminate images.

► Note

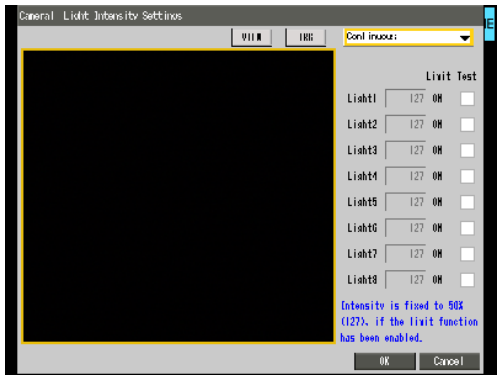
The FLASH terminal associated with the camera selected in lighting configuration (Page 7-19) must be used to control the light for that camera in order to adjust the light intensity for the light.

1 **Select the camera number (Camera 1 to Camera 4) connected to the controller from [Indiv. Settings] on the Camera Settings screen (Page 7-8).**

The settings screen for the selected camera appears.

2 **Select [Light Int.].**

The [Light Intensity Settings] menu appears.



3 **Select the update method for the image displayed on the screen.**

- **Continuous** (default): The image is updated continuously.
- **Trigger**: The image is updated when a trigger input is received.

4 **The intensity of each light can be set in the range 0 to 255 (default 127).**

The light numbers correspond to the connection order of the lighting controllers CA-DC21E.

► Note

If the [50% Limit] is enabled for a light in the Lighting Configuration (Page 7-19), 127 will be the highest light intensity level used (regardless of the set value).

5 **To test the light adjust the light intensity, check the "Test" check box next to the light.**

6 **To finish settings, click [OK].**

CCD Imaging Region

Specify the area on the CCD active area to be used for capturing an image.

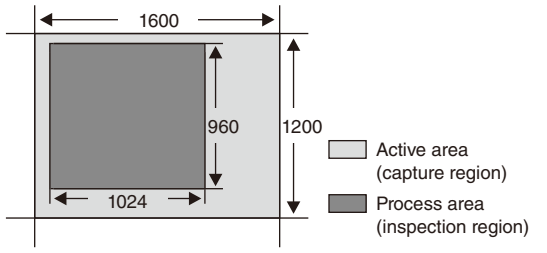
Reference

The image area can be individually set for each camera.

Differences in active and process areas

Active area (CCD) and process area

- The size (in pixels) of the CCD used for capturing images depends on which camera is connected to the controller. This area is known as the active area.
- The controller is not able to use the entire effective area as the target for a single measurement. Only a part of the effective area is used for a single measurement process. This area is known as the process area.



Example when 1-megapixel mode is selected for the XG-200C

- The active and process area size depends on the camera and image capture modes being used.

Reference

The process area within the active area can be set separately for each program No.

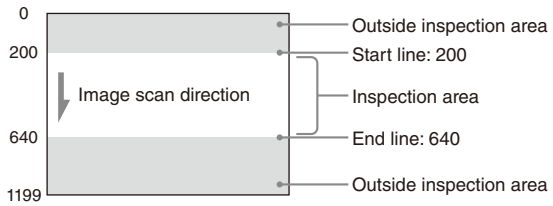
The relationship between camera resolution, active area, and process area

The relationship between the camera resolution, active, and process area are shown below.

Camera resolution	Active area (pixels)	Process area (pixels)
5 megapixels	2432 x 2050	2432 x 2050
2 megapixels	1600 x 1200	1600 x 1200 or 1024 x 960
1 megapixel	1000 x 1000	1000 x 1000
320,000 pixel	656 x 492	640 x 480 or 512 x 480
310,000 pixel	640 x 480	

An image area can be defined within the process area

The process area can be narrowed in the vertical direction to create an image area. By eliminating unnecessary parts of the image, the process area transfer rate can be greatly increased.



CCD imaging region set from 200 to 640

► Note

- Tools will not be processed if they do not lie between the start and end lines, even if they are in the process area.
- A minimum of 100 lines must be set when using the XG-H200C/H200M.

Specifying the process and image area

Specify the area of the CCD to make up the process and image area.

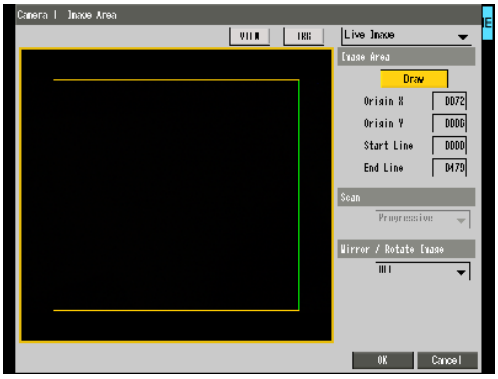
1 **Select the camera number (Camera 1 to Camera 4) connected to the controller from [Indiv. Settings] on the [Camera Settings] screen (Page 7-8).**

The settings screen for the selected camera appears.

2 **Select [Image Area].**

The [(Selected camera) Image area] menu appears.

3 **Select [Draw].**



4 **Select [Draw] and move the 8-way key up, down, left or right to specify the process area, then press the No.0 (ENTER) button (only when using 1 megapixel mode or with 320,000 pixel and 310,000 pixel high speed cameras).**

While specifying the process area, the coordinates of the top left corner of the area displayed appear in the [Origin X] and [Origin Y] fields on the right side of the screen.

Reference

- The origin coordinates displayed represent the top left corner of the process area.
- By default, the process area is set to the center of the active area. Default (X, Y) is (288, 120) (in 1 megapixel mode), (72, 6) (320,000 pixel camera) or (64, 0) (when using a 310,000 pixel high speed camera).

► Note

The area around the captured image might darken if the process area is positioned at the edge of the CCD when using a lens with a small projection image size.

5 **Move up and down to specify the start line, and then press the No.0 (ENTER) button.**

While specifying the start line, the Y coordinate of the start line is shown in the [Start Line] field.

6 **Move up and down to specify the end line, and then press the No.0 (ENTER) button.**

While specifying the end line, the Y coordinate of the start line is shown in the [End Line] field.

7 **When the drawing is complete press the No.2 (ESCAPE) button.**

8 **When the settings are complete, click [OK].**

Scan

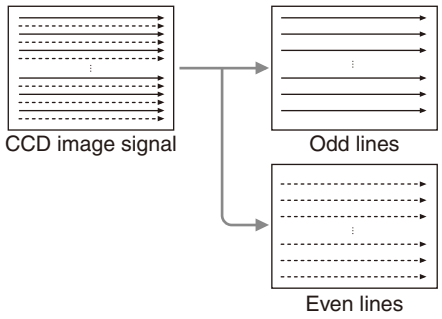
The CCD scanning method used by the camera can be specified.

► Note

Scan settings can only be changed for monochrome area cameras.

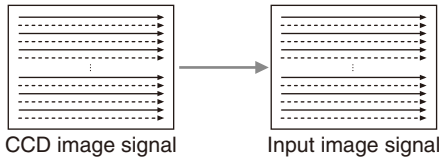
- **Interlace mode**: Transfers images from the CCD of the camera by processing odd then even lines alternatively. This does not offer optimum picture quality per image, but it shortens transfer times and is suitable for fast-moving lines.
  The transfer times are shown in the table below. The numbers in parentheses are the transfer times for conventional cameras.

Camera type	Transfer time
High-speed 5 megapixel camera	40.3 ms
High-speed 2 megapixel camera	16.1 ms (32.7 ms)
High-speed 1 megapixel camera	13.9 ms
High-speed 310,000 pixel camera	2.5 ms (8.8 ms)



- **Progressive mode:** Transfers images from the CCD of the camera in full starting from the top line. This provides better picture quality but transfer times are longer when compared with interlace scanning.
  The transfer times are shown in the table below. The numbers in parentheses are the transfer times for conventional cameras.

Camera type	Transfer time
High-speed 5 megapixel camera	61.2 ms
High-speed 2 megapixel camera	29.2 ms (58.5 ms)
High-speed 1 megapixel camera	20.5 ms
High-speed 310,000 pixel camera	4.7 ms (16.0 ms)

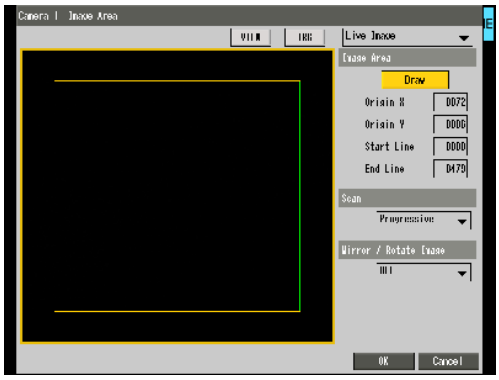


► Note

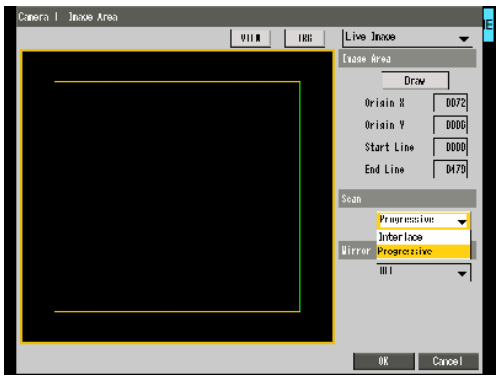
Scan settings can only be changed for monochrome area cameras.

1 **Select the camera connection (Camera 1 to Camera 4) connected to the controller from [Indiv. Settings] on the Camera Settings screen (Page 7-8).**
The settings screen for the selected camera appears.

2 **Select [Draw].**
The [Image area] menu appears.



3 **Select [Scan], and then select the scan mode.**



- **Progressive** (default): Captures images using progressive mode (all lines).
- **Interlaced:** Captures images using interlaced mode (alternate lines).

4 **When the settings are complete, click [OK].**

Mirrored CCD

The captured camera image can be inverted vertically, horizontally, or rotated 180°. This is useful when needing to invert a backwards image due to using a side view attachment or look at a target from behind.

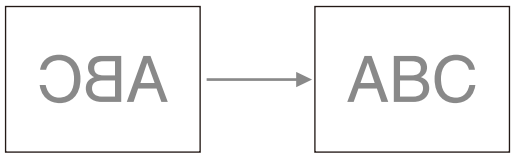


Image on CCD　　Resultant Image

► Note

Once an image has been inverted or rotated it cannot be reverted to its normal orientation later.

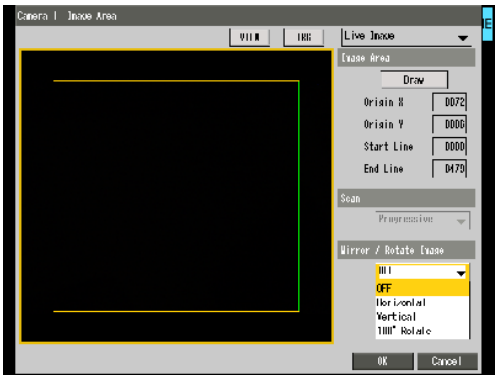
1 **Select the camera connection (Camera 1 to Camera 4) connected to the controller from [Indiv. Settings] on the Camera Settings screen (Page 7-8).**

The settings screen for the selected camera appears.

2 **Select [Draw].**

The [(Selected camera) Image area] menu appears.

3 **Select [Mirrored CCD] then select the appropriate process.**



- **OFF** (default): Do not use the Mirror / Rotate Image function.
- **Horizontal:** Invert the captured image horizontally.
- **Vertical:** Invert the captured image vertically.
- **180° Rotate:** Rotate the captured image by 180°.

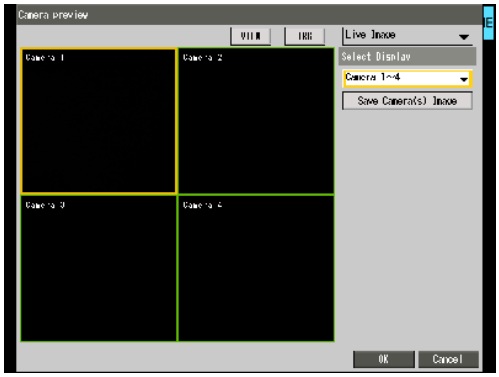
4 **When the settings are complete, click [OK].**

Camera Preview

The camera preview allows for the checking of the images being captured by the camera based on the settings made. The current image can also be saved as a bitmap file to an SD card. This is useful for quickly checking camera settings and saving images for use in XG VisionEditor.

1 **Select [Camera preview] under [Indiv. Settings] on the [Camera Settings] screen.**

The images from the connected cameras appear in the [Camera preview] menu.



Reference

- The camera preview can be set to update in [Continuous] or [Trigger] mode. This setting is independent from the Screen Update setting (Page 7-21).
- Use [VIEW] to display the View toolbar (Page 3-10) for the selected camera, enabling the image to be magnified, auto fit to area, and scrolled around.

2 **From the [Select Display] menu the view can be changed.**

- **Camera1:** Displays the image from Camera 1.
- **Camera2:** Displays the image from Camera 2.
- **Camera3:** Displays the image from Camera 3.
- **Camera4:** Displays the image from Camera 4.
- **Camera1-4:** Displays images from all the connected cameras.

3 **To save the current camera image as a bitmap file on the SD card, click [Save Camera(s) Image].**

Specify the SD card from [Location] on the [Save Camera(s) Image] menu and click [Execute].
The current image from all connected cameras will be saved to the specified SD card under the folder "/xg/cam_img", named: "YYMMDD_MMHHSS_&Cam(Cam No.)Img.bmp".

Reference

This function saves images from all cameras, regardless of the selected preview.

4 **To finish previewing, click [OK].**

Reference

When [Camera preview] is closed by selecting [OK], the update mode and View toolbar settings will stay the same until power is turned off.

Trigger Settings

Use this option to set the system defaults for which trigger signals to use for capturing images.

Reference

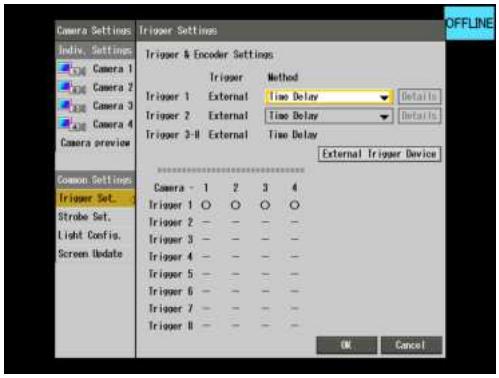
Trigger settings are applied to all cameras.

About the active camera display

The cameras connected to the controller and their respective trigger number are shown at the bottom part of the [Trigger Settings] screen.

Selecting External Trigger Sources

1 **Select [Trigger Settings] under [Common Settings] on the [Camera Settings] screen (Page 7-8).**

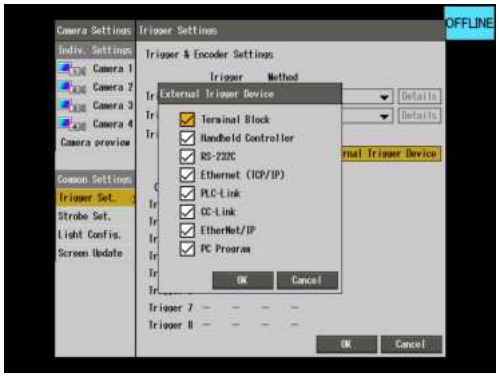


2 **Change [Trigger & Encoder Settings].**

The contents are the same as the [Trigger Parameters] (Page 7-17) for the capture unit. However the trigger type is fixed at [External].

3 **Select [External Trigger Device].**

The External Trigger Device menu appears.



4 **Select the trigger type desired by checking the appropriate checkboxes.**

Users can select more than one type of trigger.

- **Terminal Block**: Trigger through external I/O terminals %Trg1 to %Trg8
- **Handheld Controller**: Trigger using the [TRIGGER] button on the handheld controller
- **RS-232C**: Trigger via commands through RS-232C
- **Ethernet (TCP/IP)**: Trigger via commands through the Ethernet port
- **PLC-Link**: Trigger via commands using the PLC-Link (Ethernet or RS-232C).
- **CC-Link**: Trigger via commands using the CC-Link
- **EtherNet/IP**: Trigger through EtherNet/IP
- **PC Program**: Trigger through the ActiveX control

5 **When the settings are complete, click [OK].**

Strobe Lighting Settings

The settings for controlling lighting can be changed with the system variables %Flash1 to %Flash8 which are assigned to F_OUT0 to F_OUT7 on the controller. For details about signal input/output with external devices, refer to the XG-7000 Series Communications Control Manual.

► Note

F_OUT4 to F_OUT7 can be used only with XG-7502A and XG-7702A.

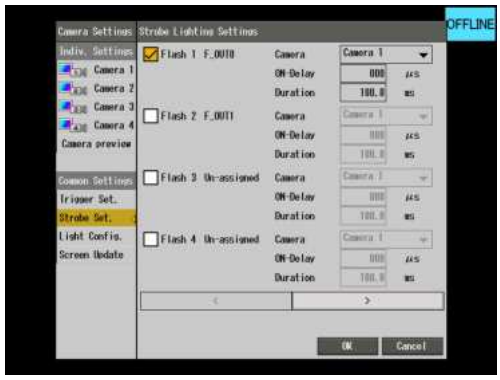
1 **Select [Strobe Lighting Settings] under [Common Settings] on the Camera Settings screen (Page 7-8).**

The Strobe Lighting Settings menu appears.

2 **Place a check next to the FLASH terminal to use and change the settings.**

► Note

A FLASH terminal which is unassigned cannot be used unless a CA-DC21E lighting controller is used. When the CA-DC21E is used, all terminals are enabled even when the FLASH terminal are unassigned.



Camera

Select the camera that will control the strobe signal from Camera1 to Camera4.

ON-delay

Specify the starting point for the flash signal output within the range -500 to 500 (Éþs), where 0 is the start of image capturing (Default: 0 Éþs, the time of trigger input). When encoder count is selected, the setting range is -32767 to 32767 (counts). If a negative value is specified, output starts before the CCD opens. If a positive value is specified, output starts after the CCD opens.

► Note

To use multiple FLASH signals for a single camera, specify values so that the delay in the output starting points is 500 μs or less.

Duration

Set the FLASH signal output time within the range of 0.1 - 999.9 (ms) (default: 100.0 ms).

Reference

The signal type for the FLASH signal output, [Normally open] or [Normally closed], is set in the output assignments. See "Terminal Block & Parallel Port" (Page 7-23) for more details.

3 When the settings are complete, click [OK].

Lighting Configuration

When a lighting controller CA-DC21E is connected to the controller, the lighting configuration can be set.

Assigning FLASH terminal outputs to lights

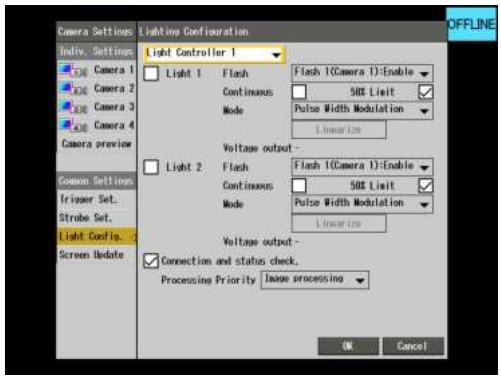
Change settings and assignments of FLASH terminals for controlling the lights connected to the lighting controllers. The FLASH system variables enable the control of lighting without the need for external wiring.

Reference

Refer to "Strobe Lighting Settings" (Page 7-18) for more details on FLASH terminal settings and connections.

1 Select [Light Config.] under [Common Settings] on the [Camera Settings] screen (Page 7-8).

The [Light Config.] menu appears.



2 Select the light controller with the lights needing to be configured.

Reference

When multiple lighting controllers are connected, they will be numbered 1 through 4, with 1 being the unit closest to the controller.

3 Check the box next to the light number to be configured, then adjust the settings.

Flash

Select the FLASH signal to use for lighting control from Flash 1 to 8. The light will illuminate according to the output status of the assigned FLASH signal.

► Note

Flash is disabled and lights will not illuminate even when selected if a terminal is not assigned to the selected FLASH signal (excepting the case when terminals are not assigned to all Flash signals) or when [Strobe Lighting Settings] (Page 7-18) is not checked.

Continuous

Check continuous to keep the light illuminated regardless of the FLASH terminal output.

► Note

FLASH assignments cannot be changed when continuous operation is selected.

4 **Repeat steps 2 and 3 to configure the settings for each light.**

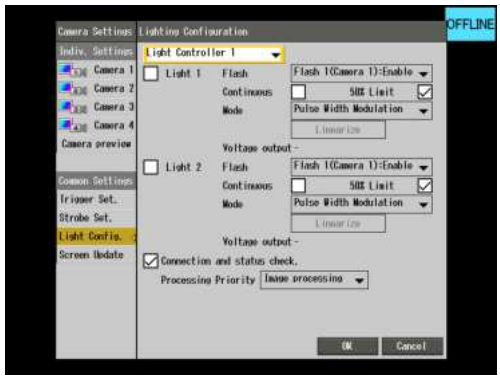
5 **When the settings are complete, click [OK].**

Light controller settings

Settings for the optional light controller CA-DC21E connected to the controller can be changed.

1 **Select [Light Config.] under [Common Settings] on the [Camera Settings] screen (Page 7-8).**

The [Light Config.] menu appears.



2 **Select the light controller to change the settings for.**

Reference

When multiple lighting controllers are connected, they will be numbered 1 through 4, with 1 being the unit closest to the controller.

3 **Change the settings as required.**

Settings can be changed for each light connected to the controller.

Reference

- The [Connection and status check] option applies to all lighting controller modules.
- The [Voltage output] is changed by setting the DIP switches on the light controller module. For more details, see the XG-7000 Series Setup Manual.

Mode

Select the lighting mode.

- **Pulse Width Modulation** (default): Controls and illuminates the light using PWM.
- **D.C.**: Illuminates and controls the light using DC.

Linearize

If the [Mode] is set to [D.C.], the output can be automatically set to the characteristics of the currently connected light source so that the intensity value specified is linear to the light intensity.

50% Limit

Use this option to limit the light output to 50% to prevent degradation of the LED light through overheating (default: ON).

► Note

If this is set to "ON", the light intensity will be fixed at 127 even when the light intensity setting (Page 7-12) is set to 128 or higher.

Connection and status check

Use this option for checking if there are any errors with the lighting controller before capturing an image (Default: ON). Disabling the [Connection and status check.] option results in a quicker processing time, but disables error checking when capturing images.

Processing Priority

Use this option to specify the processing priority when changing light intensity. Change this to [Lighting] to ensure that intensity adjustments are reflected at specific image capture points.

- **Image processing** (default): Adjusts the intensity at a time that does not affect the program cycle.
- **Lighting**: Temporarily stops accepting trigger inputs in the capture unit and immediately adjusts the intensity. If the capture unit is in trigger wait status, %Trg*Ready will turn OFF for approx 1 to 10 ms while the intensity is adjusted.

4 When the settings are complete, click [OK].

Screen Update

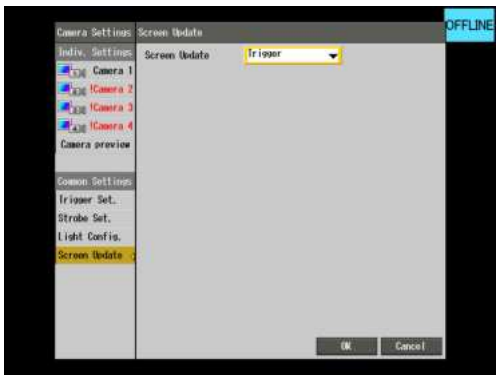
This controls when the display screen is updated while displaying images.

Reference

This setting does not apply to Camera Settings and White Balance adjustment (Page 7-22).

1 Select [Screen Update] under [Common Settings] on the [Camera Settings] screen.

The [Screen Update] menu appears.



2 Change the settings as required.

- **Trigger** (default): Updates the screen based on a trigger input.
- **Live Image**: Displays a live image.

3 When the settings are complete, click [OK].

► Note

When [Continuous] is selected these limitations apply:

- Although the screen is always updated, an inspection will not be performed unless a trigger input is received.
- There will be a time lag equivalent to or less than the "Shutter speed + Image capture time" between the trigger input and the actual image capture.

Adjusting the White Balance

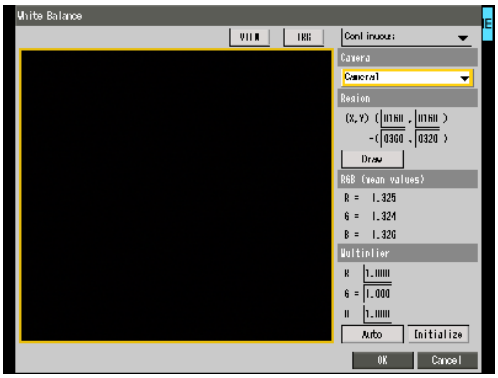
If a color camera is connected, the RGB levels (white balance) can be adjusted to match the lighting environment of the target area. Perform such adjustment when installing a new system or when changing cameras or lighting.

► Note

- The color extraction result may change due to changes in the white balance setting. Be sure to verify the operation after changing the white balance setting.
- Any unsaved settings, results and archive data will be cleared (Page 5-19) when changing the white balance.
- In Run mode, this setting only affects capture units that have the use system settings option enabled. Refer to "Capture" (Page 4-17) for more details about referencing global settings.

1 From the System Configuration, select [Cameras] - [White Balance].

The [White Balance] menu appears.



Reference

Camera images can be updated in [Continuous] or [Trigger] modes.

2 Select the camera to be adjusted.

► Note

A monochrome camera cannot be selected.

Reference

Individual camera settings (such as shutter speed), for making adjustments can be set in the [Camera Settings] in the System Configuration menu.

3 Specify the reference area for adjusting the white balance.

Enter a numerical value or select [Draw] to specify the area.

4 Place a white piece of paper (or other white target) in the area specified in step 3, and then press the No.3 (TRIGGER) button on the handheld controller, or press [TRG] on the screen.

The average color values (R, G, B values) are displayed in the [RGB (mean values)] field.

5 Adjust the screen brightness so that the average RGB values are each within the range of 100 to 200.

If the Trigger button (Button No.3) is held down for 3 seconds, the controller will continuously update the image. When the image is updated continuously, the R, G, and B values will also update continuously.

6 Select [Auto].

The multipliers are calculated automatically so that the white color is within the standard range (in the same way as the RGB values).

Reference

The RGB multiplier can also be specified within the range of 0.000 to 5.000.

7 When the settings are complete, click [OK].

To reset the multiplier

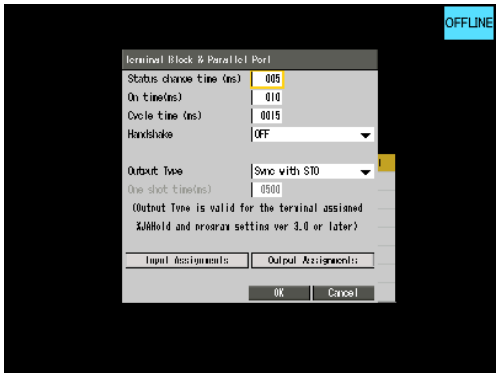
Select [Initialize] to return all multipliers to [1.000].

Terminal Block & Parallel Port

Settings for controlling the input and output of data through the controllers terminals (parallel and terminal block) can be changed. For more information about input/output with external devices, see the XG-7000 Series Communication Control Manual.

1 **From the System Configuration menu, select [Communications & I/O] - [Parallel Port].**
The [Parallel Port] menu appears.

2 **Change the settings as required.**



Status change time (ms)

Set the length of time from when the data is ready for output to the leading edge of %Sto within the range 1 to 999 (ms). (Default: 5 ms)

On Time (ms)

Set the time from the leading edge of %Sto to the trailing edge of %Sto within the range 1 to 999 (ms). (Default: 10 ms)

Reference

- This setting is used in common with the output on time for %Ack and %Nack.
- Only when [Handshake: ON] is selected, 0 ms can be set. When 0 ms is set, the timeout function of handshaking is cancelled. The duration of %Ack and %Nack is changed simultaneously when the cycle time is reached.

Cycle time (ms)

Set the time between two consecutive leading edges of %Sto within the range 2 to 1000 (ms). (Default: 15 ms)

Handshake

Select [OFF] (default) or [ON] to perform handshaking for parallel terminal input and output.

Output Type

Select the method used to control the behavior of %JAHold.

- **Latching**: Latches the output when a NG result occurs. (To unlatch, either reset the program, change the program, or turn the outputs off.)
- **Sync with STO** (default): Turns the output ON/OFF in synchronization with the %Sto output (Page 4-333).
- **One shot**: Turn the output on for the time specified in [One shot time (ms)] and turn off immediately after.

► Note

- If the program was created in version 2.1 or earlier, the outputs will be fixed in [Latching] state regardless of the [Output Type] setting.
- Even if [Sync with STO output] is selected, %Sto will not be output unless at least one parallel terminal output unit is executed in the flowchart.
- A parallel terminal output unit must be executed to synchronize the output of %JAHold with %Sto. The parallel terminal output unit does not have to contain output data if there is no data to output via the parallel port.

One shot time (ms)

Set the [One shot time] within the range of 1 to 9999 (ms) (default: 500 ms).This is only valid if the [Output Type] is set to [One shot].

Input Assignments

Review/edit input assignments.

Output Assignments

Review/edit output assignments.

3 When the settings are complete, click [OK].

Reference

- The strobe output settings can be changed in the [Camera Settings] on the System Configuration menu, or by using the capture unit [Strobe Lighting Settings] menu (Page 4-27).
- For more details on the system variables that can be assigned, refer to the XG VisionEditor Reference Manual (Control/Data Edition).
- Assignment of the same bit on the same system variable to input terminals on the parallel port, RY addresses using CC-Link, or EtherNet/IP output data bit zone is not allowed.

► Note

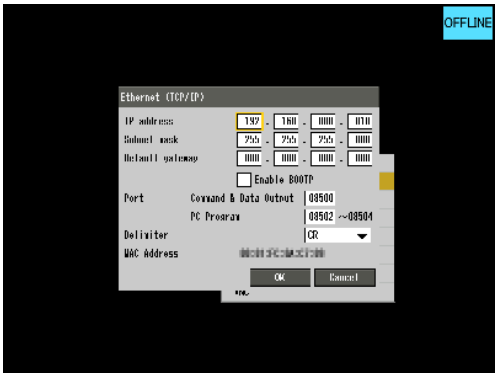
The controller must be restarted if changes are made to the input assignments or output assignments.

Ethernet (TCP/IP) Network Settings

Settings for controlling the input and output of data through the Ethernet port can be changed. For more information about input/output with external devices, see the XG-7000 Series Communication Control Manual.

1 **From the System Configuration menu, select [Communications & I/O] - [Ethernet (TCP/IP)].**
The [Ethernet (TCP/IP)] menu appears.

2 **Change the settings as required.**



► Note

If any incorrect settings are made, not only the controller but also other equipment on the network may not work properly. Consult your system or network administrator for information on setting values.

IP address

Specify the IP address of the controller (default: 192.168. 0.10).

Subnet mask

Specify a subnet mask (Default value: 255.255. 255.0).

Default gateway

Specify a default gateway IP address (Default value: 0.0.0.0).

► Note

- The IP address specified as the destination for archive data using FTP (Page 4-359) must be unique.
- If the PLC-Link (Ethernet) is enabled, the IP address must not be the same as the IP address on the other end of the PLC link.
- If the settings are changed when PLC-Link (Ethernet) is enabled, or if the EtherNet/IP or VNC functions are enabled, the controller must be restarted for changes to take effect.

Enable BOOTP

If BOOTP is enabled on the network that the controller is on, the network settings can automatically be populated in the Ethernet (TCP/IP) settings. If retrieval of network settings from the BOOTP server fails, the last saved settings will be used.

► Note

- When BOOTP is being used, the settings of the IP address, sub-net mask, and default gateway cannot be changed on the [Ethernet (TCP/IP)] menu.
- If the BOOTP server is not started, the controller retries BOOTP processing for about 3 minutes at startup. To interrupt the BOOTP processing, press the ESC key on the console.
- If time-out of retry occurs or if a retry is interrupted, the system starts operation with the network setting saved in the system settings.

Reference

- If BOOTP is not enabled, start the controller while pressing the MENU key. The network information can be retrieved from the BOOTP server. It is convenient to retrieve the network information from the BOOTP server once at startup of the controller and to change settings of the controller. In this case, the network information retrieved is implemented and saved in the system settings.
- BOOTP is available through:
  - IP Setting Tool by Keyence
  - BOOTP-DHCP server by Rockwell Automation
  - BootP server by WAGO

Port

Enter the port number used for data I/O on the controller.

- **Command & Data Output**: Enter the port number used for non-protocol specific commands and data output. (Default: 8500).
- **PC Program**: Enter the port used to communicate with PC programs (XG VisionEditor, XG VisionTerminal, and ActiveX controls). (Default: 8502). Note that PC programs use three consecutive ports from the specified number. For example, when 8710 is specified, ports 8710 to 8712 are used by PC programs; and when 10108 is specified, ports 10108 to 10110 are used.

► Note

The same port number cannot be specified for [Command & Data Output] and [PC Program] or [VNC Server Setup].

Delimiter

Select [CR] (default), [CR+LF], or [LF] for the delimiter used for Ethernet communication.

MAC Address

MAC address of the controller is displayed (change is not allowed).

3 When the settings are complete, click [OK].

Changing the FTP Client Settings

Change the settings for outputting images and data from the controller to an external FTP server using the archive function (Page 5-19).

► Note

For details on the settings for outputting archived data to an FTP server, see [Image Archive] (Page 5-20) and [FTP Settings] (Page 4-359).

1 From the System Configuration menu, select [Communications & I/O] - [FTP].

The FTP menu appears.

2 Change the settings as required.



Timeout

Enter the timeout period in seconds to wait for a response from the FTP server during data output (default: 30 seconds).

Connection retry

Enter the number of attempts to log in when connection to the FTP server fails (default: 1).

Server port No.

Enter the port number of the FTP server used for control (default: 21).

Passive mode

Check this option when using FTP in passive mode (default: ON (passive mode)).

High speed mode

Select whether or not to use High Speed Mode. This setting will raise the FTP output level in order to shorten output time.

- **ON**: Perform FTP output in High Speed Mode.
- **OFF** (default): Perform normal FTP output operations.

► Note

- When [ON] is selected, display updates and outputs other than FTP may be slower.
- To enable the change to High Speed Mode, it is necessary to restart the controller.
- If [Port function] is changed using the touch panel, the touch panel can not be used after change is set. The console (option) or the touch panel that is connected to the port need to be restored.

3 When the settings are complete, click [OK].

RS-232 Network Settings

The function and settings of the controller RS-232 port can be changed. For details on interfacing signals with external devices, refer to Overview of the I/O Interface (Page 8-1) and "Controller Global Settings" in the XG VisionEditor Manual.

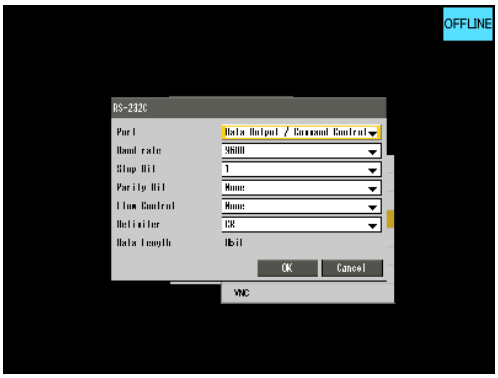
1 From the System Configuration menu, select [Communications & I/O] - [RS-232C (no protocol)].

The RS-232C (no protocol) menu appears.

► Note

This item cannot be selected if PLC-Link (RS-232C) is enabled.

2 Change the settings as required.



Port function

Select [Data Output / Command Control (default)] or [CA Series Touch Panel] for the function of the RS-232C port.

► Note

- If [CA Series Touch Panel] was selected, data output and command control using the RS-232C port are not possible. When PLC-Link (RS-232C) is used, this setting is disabled and neither the CA Series touch panel or no protocol communication can be used.
- If the settings of [CA Series Touch Panel] are changed using the touch panel, the touch panel cannot be used after change is set. The console (option) is needed to restore the settings.

Baud rate

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

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) or [CTS/RTS] for the flow control.

Delimiter

Select [CR] (default), [CR+LF], or [LF] for the delimiter used for RS-232C communication.

3 To finish settings, click [OK].

Reference

Data length is fixed at 8 bits.

Changing the PLC-Link Settings

Settings for controlling the input and output of data through PLC Link can be changed.

Reference

For more details about PLC's compatible with the controller, refer to the XG-7000 Series Communication Control Manual.

► Note

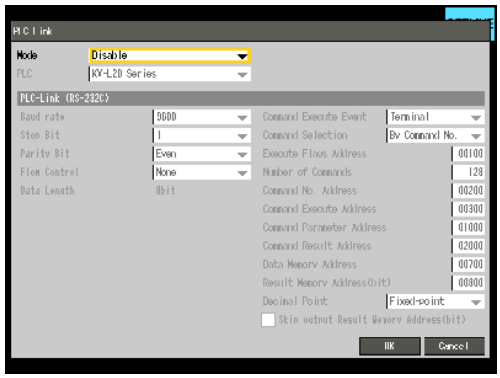
- If [PLC-Link] is enabled, [CC-Link] and [EtherNet/IP] cannot be enabled.
- If the communication mode and PLC-Link mode settings are changed, the controller must be restarted for changes to take effect.
- If the communication mode is changed to [PLC-Link], a message "Initializing PLC-Link *th" appears in the lower right of the screen and disappears after the connection is established.
- If you change to run mode after establishing the [PLC-Link] communication mode, the controller will repeat the initialization process until a connection to the PLC is established. If there is no response from the connected PLC, the warning "PLC communication has failed" is displayed each time initialization is performed. If the warning continues to appear, check to see the PLC is connected correctly.

Using the PLC Link via RS-232C

Use the following procedures when using the PLC-Link via RS-232C between the controller and PLC connected with a RS-232C link unit. For more information about data addressing, refer to the XG VisionEditor Reference Manual (Programming Edition).

1 From the System Configuration menu, select [Communications & I/O] - [PLC-Link].

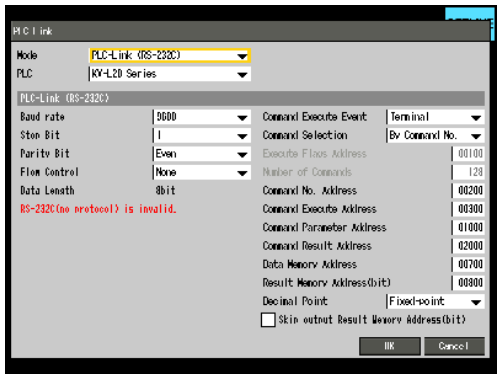
The [PLC-Link] menu appears.



2 Select [PLC-link (RS-232C)] in [Mode].

► Note

When PLC-Link (RS-232C) is used, neither the no protocol communication of RS-232C nor the touch panel function can be used. When the touch panel is used especially, the touch panel cannot be used after [PLC link (RS-232C)] is selected and set. The console (option) is needed to restore the settings.



3 Select the Series name to be connected in [PLC Type].

The settings for the selected PLC type appear.

4 **Change the settings as required.**

The settings on the left side of the menu relate to the PLC link via RS-232C settings. Refer to "PLC-Link Common Settings" (Page 7-31) for details on the settings shown on the right.

Baud Rate

Select 9600 (default), 19200, 38400, 57600, 115200, or 230400 (bps) for the baud rate.

► Note

- If you selected [SYSMAC C series] in [PLC Type], only "19200" or "9600" can be selected.
- [230400] is selected only when [KV-L20 Series], [MELSEC Q/L Series], or [SYSMAC CJ/CS1/CP1 Series] is selected for [PLC].

Stop Bit

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

► Note

If you selected [KV-L20 Series] in [PLC Type], the stop bit is fixed to [1].

Parity Bit

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

► Note

If you selected [KV-L20 Series] in [PLC Type], the parity bit is fixed to [Even].

Flow Control

Select [None] (default) or [CTS/RTS] for the flow control.

► Note

If [MELSEC AnN Series] or [MELSEC Q/L Series] is selected for [PLC], the flow control is fixed to [CTS/RTS]. If [KV-L20 Series], [SYSMAC C Series], [SYSMAC CJ/CS1/CP1 Series], or [YASKAWA MP Series] is selected, the flow control is fixed to [None].

Data Length

Fixed at 8 bits.

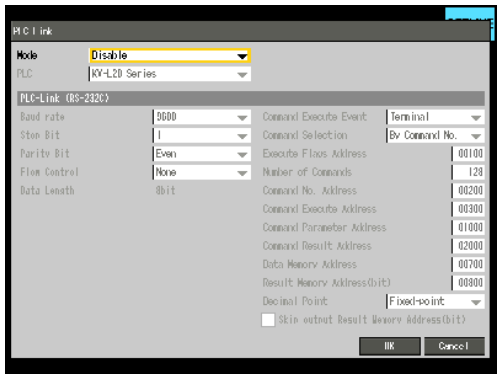
5 **When the settings are complete, click [OK].**

Using PLC-Link Via the Ethernet

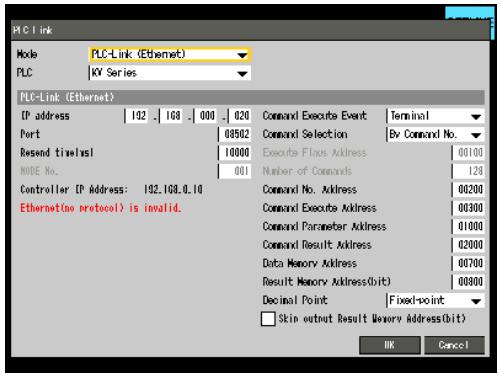
Use the following procedures when using the PLC-Link via the Ethernet between the controller and PLC connected with an Ethernet unit. For more information about data addressing, refer to the XG VisionEditor Reference Manual (Programming Edition).

1 **From the System Configuration menu, select [Communications & I/O] - [PLC-Link].**

The [PLC-Link] menu appears.



2 **Select [PLC-Link (Ethernet)] in [Mode].**



3 **Select the Series name to be connected in [PLC Type].**

The settings for the selected PLC type appear.

4 **Change the settings as required.**

The settings on the left side of the menu relate to the PLC link via RS-232 settings. Refer to "PLC-Link Common Settings" (Page 7-31) for details on the settings shown on the right.

IP address

Enter the IP address for the unit that the controller is communicating with (default: 192.168.0.20).

► Note

The IP address must be different from the controller's IP address.

Port

Enter the port number of the port using the PLC-Link (default: 8502 for the KV-LE20 Series, 5000 for the MELSEC Q/L Series, and 9600 for the SYSMAC CJ/CS1/CP1 Series, and 1024 for the YASKAWA MP Series).

► Note

Changing the [PLC Type] returns the values to their initial settings.

Resend time

Enter the resend time (ms) for use if a communication error occurs (default: 10000 ms).

NODE No.

Specify the node number (available only when [SYSMAC CJ/CS1/CP1 Series] is selected).

Controller IP Address

Shows the IP address of the controller.

5 **When the settings are complete, click [OK].**

PLC-Link Common Settings

Common settings for the PLC-link

PLC-Link settings regardless of communication type.

Command Execute Event

Choose the method used for executing commands sent via PLC-Link.

- **Terminal (default)**: Execute commands on the leading edge of the terminal assigned as the PLC terminal.
- **Polling**: Execute commands when the value in a data memory designated as the control address changes from 0 to 1.

► Note

- Only custom commands can be executed using the PLC-Link.
- Depending on the communication quality, polling may result in slower command execution when compared to using terminal.

Reference

- For details on custom commands that can be used via PLC-Link, refer to the XG VisionEditor Reference Manual (Control/Data Edition).
- For details on custom commands defined by default, see "List of Custom Instructions" (Page 7-48).

Command Selection

Select the method used to specify commands sent via PLC-Link.

- **By Command No.** (default): Commands are specified by using the custom command number in the data memory designated as the [Command No. Address].
- **By Execute Flags**: Commands are specified by using "1"'s in data memory words that correspond to the custom command to be executed. This data memory begins at the [Execute Flags Address].

Specifying commands (By Command No.)

Command No. Address

Specify the address (default: 00200) of the data memory used for custom command numbers.

- Use 1 word addresses.
- The command is executed by entering the number of the custom command (0 to 127).

Command Execute Address

Specify the address (default: 00300) of the data memory word used for executing commands that are entered by their command number. This address is used to verify command results (0: Success, Error Code: Fail), and for executing commands using the polling method (1: execute).

The function uses 1 word addresses.

Specifying commands (By Execute Flags)

Execute Flags Address

Specify the starting address (default: 00100) of the data memory used for specifying commands individually.

- This function uses the number of data memory addresses is specified in the [Number of Commands] field (1 word per command, max 128 words).
- In addition to specifying individual commands to execute and verifying command results, this address is also used to execute commands by polling.

► Note

- Custom commands are always specified from a 0-based address. Non 0-based addresses cannot be used.
- If a "1" is entered in two or more data memory words at the same time, only the command from the smaller address will be executed.

Number of Commands

Specify the number of data memory words (commands) used when executing commands by flags. (0 to 128, default: 128)

Reference

Response time for executing commands using the polling method can be improved by specifying the smallest number required.

Common settings for commands

Command Parameter Address

Specify the starting address (default: 01000) of the data memory used for command parameters (*01 to *16).

- This function uses 2 words of addresses for each parameter from the data address (max 32 words for 16 parameters).
- Enter values for the parameters defined in commands and specify the command parameters for execution.

Reference

For commands that use text string parameters, the parser will read 2 words per character (1 byte) from the designated parameter data address (terminate strings with a "0" or "NULL").

Command Result Address

Specify the starting address (default: 02000) of the data memory used for storing data from commands that return results.

- This function uses 2 words per data item (or 2 words per character (1 byte) if the command returns text strings).
- The actual range of data memory used to receive command results depends on how the command is defined.

Specifying result data output

Data Memory Address

Specify the starting address (default: 00700) of the data memory used for storing data from data output units.

- This function uses 2 words per data item (or 2 words per character (1 byte) if the command returns text strings).
- The range of data memories required for storing data depends on the settings in the [Item] tab of the data output unit (Page 4-336).

Result Memory Address (bit)

Specify the address (default: 00800) of the data memory used for confirming the data has been output.

- The specification uses 1 word addresses.
- A "1" will be written if the result output for one data output unit completes normally.
- The location in the data memory where the result output completion status is written depends on the settings in the [Item] tab of the data output unit (Page 4-336).

Decimal Point

Choose the method for handling numbers from output units, parameters used with MW/MR/MS/MWX/MRX/MXS commands, and for command data and results.

- **Fixed-point** (default): Process the number by multiplying it by 1000 and storing it as 32 bits of signed integer data in the data memory (address m: lower 16 bits, address m+1: upper 16 bits).
- **Floating-point**: Processes the number as single-precision floating point data (32 bits) in the data memory.

Result Memory Address Output Skip

When the box is checked and the function enabled, writing to the Result Memory Address (bit) is not performed (default: disabled).

► Note

When this setting is enabled, the communication time for writing the Result Memory Address signal can be reduced. However, it is necessary to pay attention to the data reception timing control at the PLC side.

Changing the CC-Link Settings

Use the following procedures to setup and communicate with the optional CC-Link module CA-NCL10E. For more details about synchronizing CC-Link variables, refer to the XG-7000 Series Communication Control Manual.

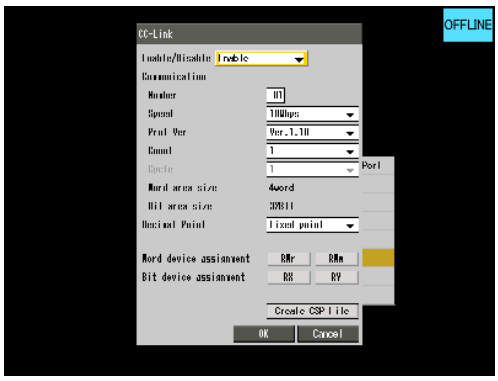
► Note

- If any settings other than the [Decimal Point] settings are changed, the controller must be restarted for changes to take effect.
- After restarting with the CC-Link set to [Enable], the controller will repeat the initialization process until a connection to the CC-Link unit is established. If there is no response from the connected CC-Link unit, the confirmation menu "CC-Link communication has failed" is displayed each time initialization fails.

1 From the System Configuration menu, select [Communications & I/O] - [CC-Link].

The [CC-Link] menu appears.

2 Specify [Enable] in the [Enable/Disable] field.



► Note

If the input terminal assignment and coinciding system variable/bit is set to RY, the [OK] button will remain disabled, preventing changes to be confirmed, even when choosing [Enable] selecting [Enable]. Change the input assignment or coinciding RY setting, then choose [Enable].

3 Change the settings as required.

Number

Select station number (1 to 64) of the CC-Link on the controller (Default: 1). With the CC-Link, up to 64 stations can be connected to one master station (fixed to 0). The controller has exclusive use of the number of stations set in [Count] starting from the number set in [Number]. For example, if [Number] is set to 10 and [Count] is set to 4 stations, the controller will have exclusive use of station numbers 10, 11, 12, and 13.

Reference

Set the station numbers so that the same number is not used on multiple devices.

Speed

Select 156 Kbps, 625 Kbps, 2.5 Mbps, 5 Mbps, or 10 Mbps (default) for the communication speed.

Reference

- The speed should be set to the same setting as the master station.
- The maximum transmission distance changes depending on the selected speed. Refer to the XG VisionEditor Reference Manual (Control/Data Edition) for more details.

Prot Ver

Select the CC-Link protocol version.

- **Ver. 1.10** (default): Communication with Ver. 1.10.
- **Ver. 2.00**: Communication with version 2.00. This can only be used when the master station is compatible to Ver. 2.00. Using version 2.00 means the cyclic settings can be configured.

Reference

Lowering the protocol version from Ver. 2.00 to Ver. 1.10 will disable any previously set word device assignments.

Count

Set the number of stations (1 to 4) reserved by the controller (default: 1). Increasing the number of stations increases the amount of data that can be transferred.

Cycle

If [Ver. 2.00] is selected for [Prot Ver], set the number of cycles (1 to 8) in the cycle settings (default: 1). Increasing the number of cycles increases the amount of data that can be sent or received with the same number of stations.

► Note

- Increasing the number of multiples slows down the response time.
- Reducing the number of stations may disable the previously configured word and bit device assignment settings and prevent output. After changing the number of stations and cycles, check the assignment status display to see if the necessary inputs and outputs are enabled.
- The number of data points allocated by setting the number of stations and cycles includes the data range used by the system. The actual number of data points available to the user are listed below.

Cycle: 1x

Data type	Word device		Bit device	
	RWr	RWw	RX	RY
1 exclusive stations	4	4	11	12
2 exclusive stations	8	8	43	44
3 exclusive stations	12	12	75	76
4 exclusive stations	16	16	107	108

Cycle: 2x

Data type	Word device		Bit device	
	RWr	RWw	RX	RY
1 exclusive stations	8	8	11	12
2 exclusive stations	16	16	75	76
3 exclusive stations	24	24	139	140
4 exclusive stations	32	32	203	204

Cycle: 4x

Data type	Word device		Bit device	
	RWr	RWw	RX	RY
1 exclusive stations	16	16	43	44
2 exclusive stations	32	32	171	172
3 exclusive stations	48	48	299	300
4 exclusive stations	64	64	427	428

Cycle: 8x

Data type	Word device		Bit device	
	RWr	RWw	RX	RY
1 exclusive stations	32	32	107	108
2 exclusive stations	64	64	363	364
3 exclusive stations	96	96	619	620
4 exclusive stations	128	128	875	876

Reference

The word device uses two words for each item, excluding the Command Result and Command Number items.

4 Change the [Decimal Point] settings as required.

Choose the appropriate data expression method for each command parameter MW/MR/MS/MWX/MRX/MSX, commands data output, and result data output for the word device input and output.

- **Fixed-point** (default): Processes the number by multiplying it by 1000 and storing it as 32 bits of signed integer data in the word device.
- **Floating-point**: Processes the number as singleprecision floating point data (32 bits) in the word device output (RWrX: lower 16 bits, RWrX+1: upper 16 bits).

Reference

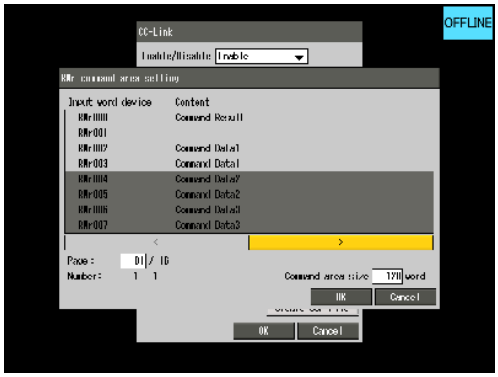
If a command uses an integer, the controller will read the command parameter as an integer by rounding off the tenth digit regardless of the setting, and write the command data output as an integer.

5 Confirm the word device assignment as necessary.

This function shows the word device output and input and is useful for finding unused ranges.

RWr

A list of word outputs appear in the [RWr command area setting] menu.



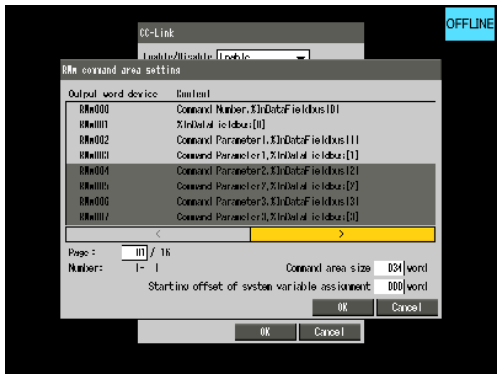
- Data output units (Page 4-336) used in the flowchart that specify CC-Link as the destination are listed by their unit ID in the write data range.
- The items used by commands are written to the continuous 128 words block (by default). The command result is written to RWr000 and command data1 to 63 is written to RWr002 to RWr127.
- Reducing the command area size reduces the command area 2 words at a time from RWr127.
- Any device ranges that cannot be used in the current settings are grayed out.
- The result data Command Data1 to 63 is registered using the method chosen in [Decimal Point].

Reference

If data outputs and commands are used at the same time, their data ranges may overlap. Avoid this by reducing the command area size to the least amount of words required, and by changing the starting address for outputting results in the [Offset of RWr] setting for the data output unit. Refer to "Data output" (Page 4-336) and "Control/Data Output via CC-Link" in the XG VisionEditor Reference Manual (Control/Data Edition) for more details.

RWw

A list of word inputs appear in the [RWw command area setting] menu.



- By default, the system variables for variable synchronizing starting at %InDataFieldbus [0] are assigned to RWw000, 2 words for each item.
- The items used by commands are written to the continuous 34 words block (by default). The command number is written to RWr000 and command parameter1 to 16 is written to RWw002 to RWw034.
- Reducing the command area size reduces the command area 2 words at a time from RWw033.
- Any device ranges that cannot be used in the current settings are grayed out.
- Data that includes decimal points and is used in Command Parameter1 to 16 is registered using the method chosen in [Decimal Point].

► Note

Only custom commands can be executed using CC-Link.

Reference

- If command control and variable synchronization are used via CC-Link at the same time, their data ranges may overlap in the word devices used for RWw even when their default settings are used. Avoid this by reducing the command area size to the least amount of words required, and by changing the starting address for synchronizing variables in the [Starting offset of assignment of system variables] setting on the variable synchronization unit. Refer to "Controlling and Outputting Data with CC-Link" in the XG VisionEditor Reference Manual (Control/Data Edition) for more details.
- For details on custom commands that can be used via CC-Link refer to the XG VisionEditor Reference Manual (Control/Data Edition).
- For details on default custom commands, see "List of Custom Instructions" (Page 7-48).

6 Change the bit assignments as required.

Any user-specified system variable related to parallel output control can be assigned to bit device outputs and inputs. Only devices available with the current settings are displayed.

► Note

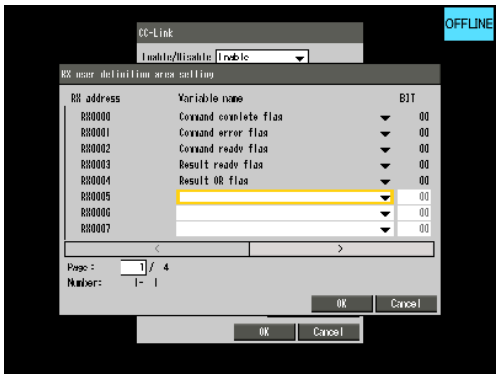
As CC-Link performs communication by scanning the links, high speed switching may not be picked up. The scan cycle changes depending on the number of stations, cycles, and settings of other devices on the network. Be sure to check the signal reliability of signals when using CC-Link.

Reference

The bits required for commands and data outputs are assigned to a reserved area and cannot be changed. For more information about device assignments, refer to the XG VisionEditor Reference Manual (Control/Data Edition).

RX

The [RX user definition area setting] menu appears. Use this menu to assign system variable outputs and their bits to the devices address.



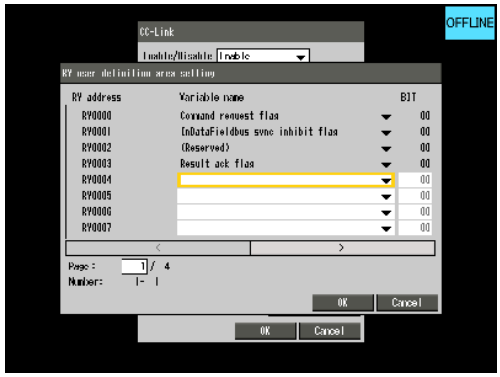
- Use the columns under [Variable name] and [BIT] to assign the desired output-type system variable and its bit to an RX address. Only system variables related to parallel port control can be assigned.
- Any device ranges that cannot be used in the current settings are not displayed.

Reference

For more details on the system variables that can be assigned, refer to the XG VisionEditor Reference Manual (Control/Data Edition).

RY

The [RY user definition area setting] menu appears. Use this menu to assign system variable inputs and their bits to the devices address.



- Use the columns under [Variable name] and [BIT] to assign the desired input-type system variable and its bit to an RY address. Only system variables related to parallel port control can be assigned.
- Any device ranges that cannot be used in the current settings are not displayed.

Reference

- For more details on the system variables that can be assigned, refer to the XG VisionEditor Reference Manual (Control/Data Edition).
- It is not possible to assign the same bit of the same system variable to multiple RY addresses and input terminals on the parallel port.

7 Select [Create CSP File] to create a CSP file.

This outputs a CSP file that is used when the master station references the controller CC-Link settings. A CSP file is named based on the following naming rules.

- When Ver. 1.10 is used: CA-NCL10E_[No. of exclusive stations].csp
- When Ver. 2.00 is used: CA-NCL10E_[No. of exclusive stations]_V2-00_E[Cycle value].csp

Reference

The BMP icon file for the controller is CA-NCL10E.bmp that is located in the "Doc" folder in the XG VisionEditor installation folder.

8 When the settings are complete, click [OK].

Changing the EtherNet/IP Settings

Follow the procedure below for communication and control using EtherNet/IP. For more information about synchronizing EtherNet/IP variables, refer to the XG VisionEditor Reference Manual (Control/Data Edition).

Reference

IP address, subnet mask, and other controller Ethernet settings are changed from the Ethernet menu (Page 7-25).

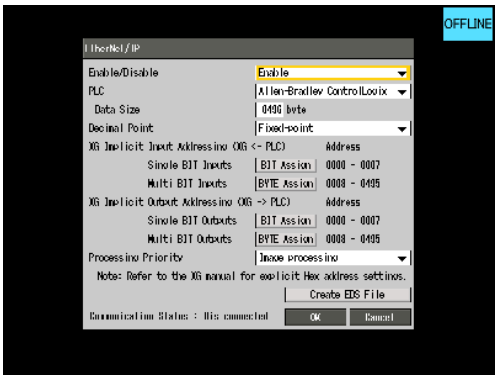
► Note

- If any settings other than the [Decimal Point] and [Starting address of output data on XG Implicit Output Addressing (XG → PLC): Multi BIT Output Settings] settings are changed, the controller must be restarted for changes to take effect.
- Cyclic communication settings such as cycle (RPI), data size, time out, transmission trigger, etc. are specified at the PLC. During cyclic communication with the controller, set the RPI value to 5 ms or more. When COS (Change Of State) for the PLC (Keyence's KV-3000/5000/5500, etc.) that allows selection of the communication trigger is selected, set the minimum transmission interval (Inhibit Time) to 5 ms or more.
- If RPI is set to 5 ms or more, use of other communications such as measurement settings, dialog operation, command, FTP, remote desktop, etc. of the controller may give excessive load to the controller. This may result in delay of processing or temporary time-out of the communication. In this case, it is necessary to review the cyclic communication settings, operating conditions, or to put priority on the communication processing to the image processing with the EtherNet/IP settings in off-line mode. Be sure to verify if the performance is acceptable before operation.
- In the network connecting to a lot devices including the EtherNet/IP device, if a large load applies to the network continuously/temporarily, delay or packet loss may occur. Before operation, be sure to perform enough verification.

1 From the System Configuration menu, select [Communications & I/O] - [EtherNet/IP].

The EtherNet/IP menu appears.

2 Select [Enable] in the [Enable/Disable] field.



3 Change the settings as required.

PLC type

Select the type of connection.

The settings for the selected PLC type appear. Refer to "Controlling and Outputting Data with EtherNet/IP" in the XG VisionEditor Reference Manual (Control/Data Edition) for more details.

► Note

Changing the PLC types will initialize some of the EtherNet/IP settings.

Data Size

Specify the data size assigned to the EtherNet/IP cyclic communication (4 bytes increments). From the starting address of the cyclic communication, various data areas are assigned to the area for the size specified in this setting. The range that can be specified and the default value vary depending on the PLC type selected.

- **Allen-Bradley ControlLogix**: 16 to 496 bytes (Default value: 496 bytes)
- **Allen-Bradley SLC5/05**: 16 to 248 bytes (Default value: 248 bytes)
- **Keyence KV**: 16 to 1436 bytes (Default value: 496 bytes)
- **OMRON SYSMAC**: 16 to 1436 bytes (default: 496 bytes)
- **Other**: 16 to 1436 bytes (Default value: 496 bytes)

► Note

The data size which is actually sent/received is in accordance with the PLC settings. Although it is acceptable to set the cyclic communication data size differently between the PLC and controller, it is recommend to set the value the same between the two devices so data is sent and received correctly.

Reference

The value set here is used as the data size to gain access to the input data (instance 100, attribute 3) and output data (instance 101, attribute 3) of the Assembly Object in the message communication.

4 Change the [Decimal Point] settings as required.

Choose the appropriate data expression method for each command parameter MW/MR/MS/MWX/MRX/MSX, commands data output, and result data output for input and output.

- **Fixed-point**(default): Processes the number by multiplying it by 1000 and storing it as 32-bits of signed integer data.
  When the integer of the calculation result is 7 digits, write
  ±999999999. (The sign is either + or -.)
- **Floating-point**: Processes the number as singleprecision floating point data (32 bits) in the data memory.

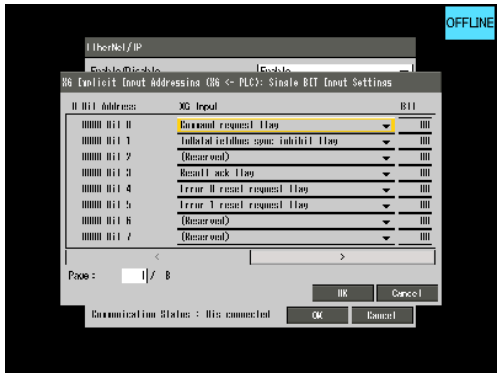
Reference

If a command uses an integer, the controller will read the command parameter as an integer by rounding off the tenth digit regardless of the setting, and write the command data output as an integer.

5 Check the allocation of input data (data to the controller) as necessary.

BIT Assign

The [XG Implicit Input Addressing (XG ← PLC): Single BIT Input Settings] menu, which is an assignment list of the input data (data to the controller) bit information, is displayed.



Use the columns under [Variable name] and [BIT] to assign the desired input-type system variable and its bit to an address. Only system variables related to parallel port control can be assigned.

Reference

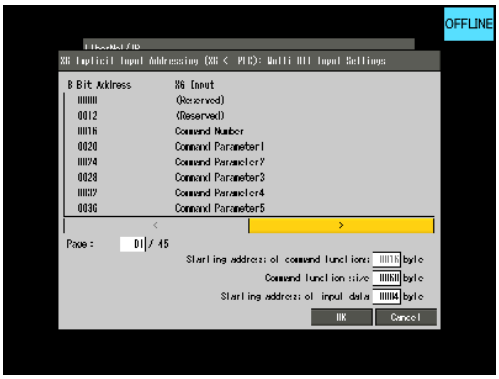
For more details on the system variables that can be assigned, refer to the "List of System Variables" in the XG VisionEditor Reference Manual (Control/Data Edition).

► Note

- The system variables which have been assigned to the input terminals on the parallel port cannot be used as another assignment for the EtherNet/IP.
- Assignment of the same bit on the same system variable to multiple output data (reception of the controller) addresses and input terminals on the parallel port is not allowed.

BYTE Assign

The [XG Implicit Input Addressing (XG ← PLC): Multi BIT Input Settings] menu, which is an assignment list of the input data (data to the controller) byte information, is displayed.



- **Starting address of command functions**: Specifies the position to start assignment of items necessary for command control. In the controller, it is fixed to 16 bytes and cannot be changed.
- **Command function size**: Items necessary for command control are assigned up to 68 bytes which are the area size upper limit (default). Command Numbers are assigned from 16 to 19 bytes, and Command Parameter 1 to 16 are assigned from 20 to 83 bytes.
- **Starting address of input data**: Specifies the position to start assignment of %InDataFieldbus[] in system variable synchronization. In the default, 4 bytes for each item from the 84th byte have already been assigned.

► Note

- Any device ranges that cannot be used in the current settings are grayed out.
- The decimal data written to Command Parameter is expressed using the method set in [Decimal Point].

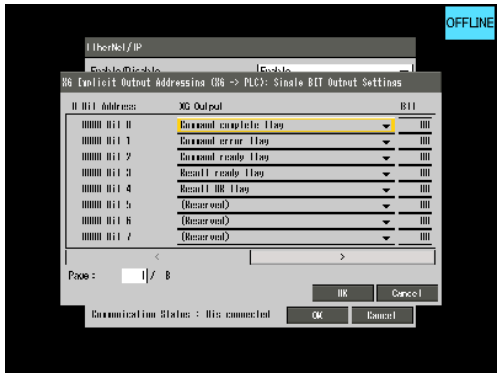
► Note

Only custom commands can be executed using the EtherNet/IP.

6 Check the allocation of output data (data from the controller) as necessary.

BIT Assign

The [XG Implicit Output Addressing (XG → PLC): Single BIT Output Settings] menu, which is an assignment list of the output data (data from the controller) bit information, is displayed.



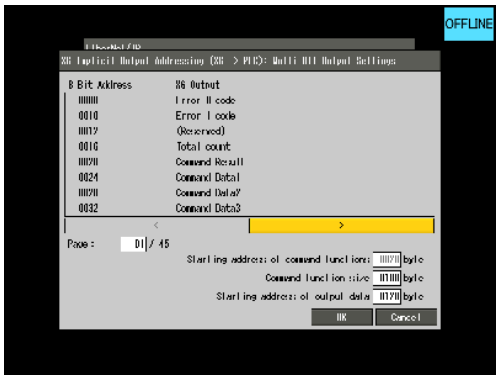
Use the columns under [Variable name] and [BIT] to assign the desired output-type system variable and its bit to an address. Only system variables related to parallel port control can be assigned.

Reference

For more details on the system variables that can be assigned, refer to the "List of System Variables" in the XG VisionEditor Reference Manual (Control/Data Edition).

BYTE Assign

The [XG Implicit Output Addressing (XG → PLC): Multi BIT Output Settings] menu, which is an assignment list of the output data (data from the controller) byte information, is displayed.



- **Starting address of command functions**: Specifies the position to start assignment of items necessary for command control. In the controller, it is fixed to 20 bytes and cannot be changed.
- **Command function size**: Items necessary for command control are assigned to 100 bytes of the area size (default). Command Results are assigned from 20 to 23 bytes and Command Data1 to 24 are assigned from 24 to 119 bytes.
- **Starting address of output data**: The starting address for output data can be set here. If the data output size is not sufficient, reduce the command area size to the least amount required, and change the starting address position for outputting results in the [Starting address of output data] setting.

Reference

- Any address ranges that cannot be used in the current settings are grayed out.
- The decimal data in the Command Data is expressed using the method set in [Decimal Point].

► Note

The data range, which is actually used for a command response, varies depending on the command. Be sure to provide a sufficient area for the command response of the command used. For details, see "Results Output Unit" (Page 4-336) and also "Control/Data Output via EtherNet/IP" in the XG-7000 Series Communication Control Manual.

7 Change the setting for [Processing Priority] as required.

Select the processing to be prioritized in the EtherNet/IP communication.

- **Image processing** (default): Prioritize image processing. Depending on the image processing contents, a timeout error in EtherNet/IP communications or a delay in the output of the results data may occur.
- **Communication**: Priority is given to the EtherNet/IP communication processing. Since the communication processing is performed by interrupting the image processing, delay or variation of the measuring time may occur.

8 Select [Create EDS File] to create an EDS file.

The EDS file including the information for the EtherNet/IP function of the controller is output. A EDS file is named based on the following naming rules.

- File name: Keyence_5001_0102.eds
- Output path: SD2/XG/EDS

Reference

- Since the EDS file does not include the information set or changed by the controller or the XG VisionEditor global settings, the prepared EDS file is always the same.
- The BMP icon file for the controller is XG-7000_7000.ico that is located in the "Doc" folder in the XG VisionEditor installation folder.

9 When the settings are complete, click [OK].

Changing the VNC Server Function Settings

Change the VNC server function settings.

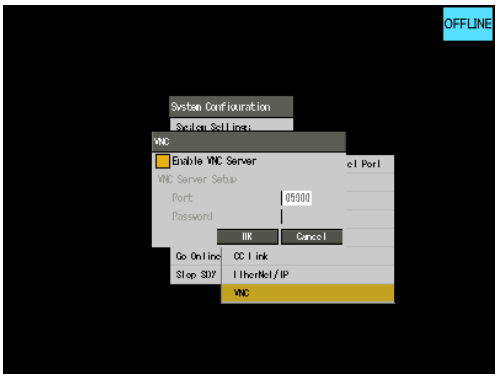
► Note

To apply a change to the enabled/disabled setting of VNC server functions, it is necessary to restart the controller.

1 **From the System Configuration menu, select [Communications & I/O] - [VNC].**

The VNC menu appears.

2 **Change the settings as required.**



Enable the VNC server function.

Check the box to use the VNC server function.

VNC Server Setup

- **Port No.**: Specify the communications port No. which is used with the VNC server functions (default: 5900).
- **Password**: Enter the password for access to the VNC server.

► Note

The same port number cannot be specified for both [Ethernet] (Page 7-25) [Command & Data Output] and [PC Program].

3 **When the settings are complete, click [OK].**

Tested VNC clients

Keyence has verified the connections with the following VNC clients (as of March 2011).

PC software

- UltraVNC_1.0.8.2

Touch panel displays (Supports monitor screen display only.)

- Keyence VT3-X15, VT3-S12, VT3-S10
- Digital Electronics Corporation GP-3700/GP-3600 Series

Save/Load System Settings

The current global settings can be saved to an SD card, or loaded from an SD card.

► Note

Do not turn off the system power while you are saving the settings. Doing so may cause errors in the internal data

Reference

With the menu displayed by selecting [Program] - [New/Edit/Del Programs] on the function menu in Run mode, or by clicking [Program] - [Save/Load Program Settings] on the System Configuration menu, all the program files and system settings can be saved in a single operation. These functions are useful for making backups of all settings on the controller (Page 4-365).

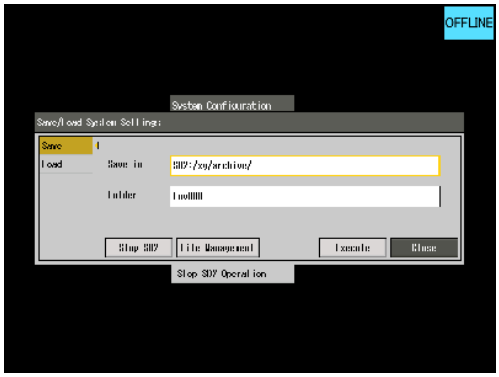
Saving the Global Settings

Global settings can be saved to an SD card.

1 Select [Program] from the System Configuration menu and select [Save/Load System Settings].

The [Save/Load System Settings] menu appears.

2 Click [Save].



3 Select [Save in] and specify where to save the system settings.

Specify a folder, (if necessary), where the controller manages all program files.

4 Select [Folder] and specify where to save the system settings.

5 Click [Execute].

The system settings will be saved.

6 When the settings have been saved, a confirmation screen appears.

Reference

Use [View Files] to bring up the View Files menu (Page 5-35) and confirm that the global settings file env.dat is saved in the specified folder.

Loading the System Settings

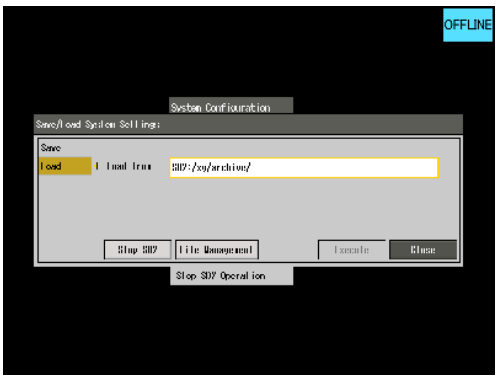
System settings can be loaded onto the controller from the SD card.

► Note

If the system data is loaded from the SD card, all the existing system data will be overwritten. Save the current system data in the SD card as required, and then perform the following operations.

1 **Select [Program] from the System Configuration menu and select [Save/Load System Settings].**
The [Save/Load System Settings] menu appears.

2 **Select [Load].**



3 **Select [Load from] and specify the location of the system data.**
Specify a folder, (if necessary), where the controller manages all program files.

4 **Click [Execute].**
The system settings will be loaded.
When loading operation is completed, a confirmation screen appears.

Reference

The loaded system settings will not take effect until the controller is restarted. The controller can be restarted by clicking [Restart now] on the confirmation screen.

5 **Restart the controller.**

► Note

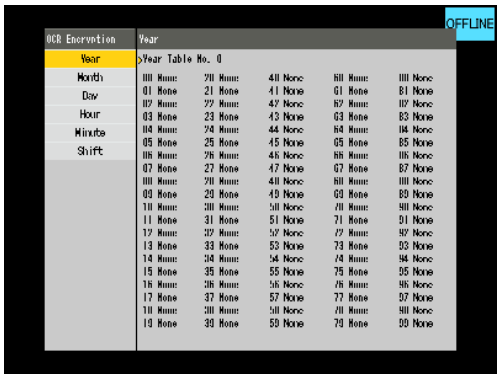
The new system settings will not take effect until the controller is restarted.

OCR Encryption

Users can create a conversion table to decrypt the data read by the OCR unit (Page 4-231) when an encrypted date, time, or shift is printed on a target. Use this conversion table to keep the encoded register string and the internal calendar linked and thus allow encoded date and time stamps to be read as normal character strings.

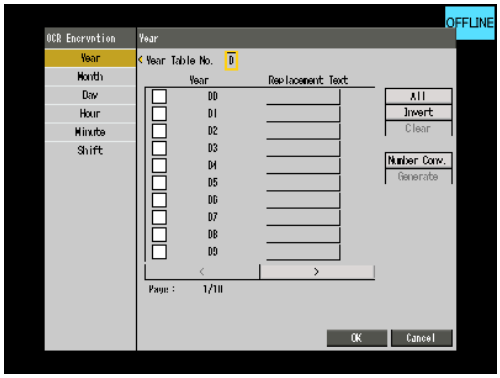
1 **From the System Configuration menu, select [OCR Encryption].**

The [OCR Encryption] menu appears.



2 **Select a conversion target unit (year, month, etc) or [Shift].**

The encryption table appears.



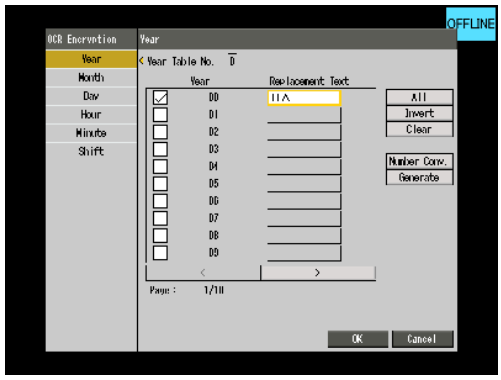
For example, select [Shift] to create an encryption table that indicates a specified period of time as a character, such as 9:00 to 12:00 as A, 12:00 to 15:00 as B or 15:00 to 18:00 as C.

3 **Specify a Table No. (0 to 9).**

Up to 10 tables can be created. Changing encryption tables is an easy way to use an encoding pattern different than the inspection target.

4 **Create an encryption table.**

Register the replacement text for each original number (YYMMDDMMHH).

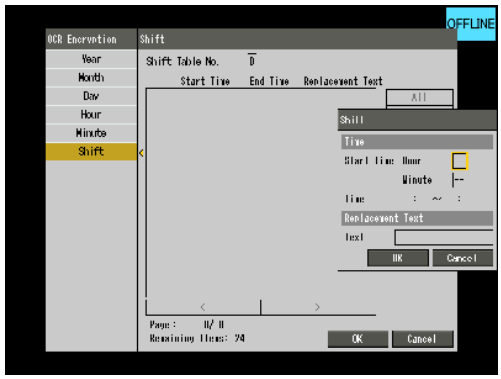


For example, BA (year), JM (month), and BC (date) can be read as Oct. 12, 2010.

Conversion unit specified in step 2	Original	Replacement text
Year	10	BA
Month	10	JM
Day	12	BC

If [Shift] was selected in step 2

From the encryption table, select [Add] then register the time and replacement text on the Shift menu.



Each table can encrypt up to 24 replacements.

5 **When the settings are complete, click [OK].**

► Note

- Complete setting of all replacement text for the encryption table that is used.
- Characters for which the replacement text field is empty in the current conversion table will be handled as if they were unset in the register string. Unset characters are removed and the remaining characters move forward to take their place. Additionally, if the entire registered string is unset, it will be read as blank space.

Custom Instruction Setting (Custom Commands)

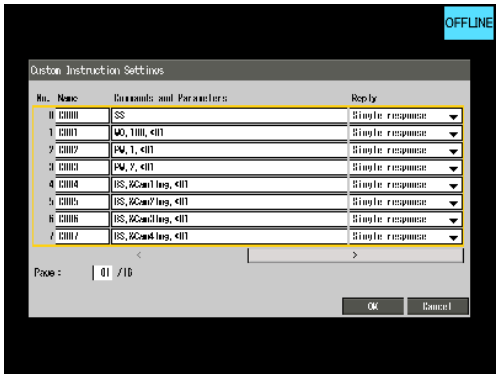
Input the commands and parameters for any standard instruction to create custom instructions for controlling the system.

Reference

See the XG VisionEditor Reference Manual (Control/Data Edition) for more details on the standard instructions and custom instructions.

1 **From the System Configuration menu, select [Custom Functionality] - [Custom Instruction Settings].**

The [Custom Instruction Settings] menu is displayed.



2 **Change the necessary settings for the custom instruction number (0 to 127) that you want to define as a custom instruction.**

Reference

Commonly used commands have already been assigned by default. Change the setting as necessary.

- For details on custom commands defined by default, see "List of Custom Instructions" (Page 7-48).
- See the XG VisionEditor Reference Manual (Control/Data Edition) for more details on the assigned standard instructions.

Command name

Enter the name of the custom instruction to be defined using up to 31 single-byte alphanumeric characters.

Reference

When no protocol communication is used, you can execute the custom instruction by directly entering this name and necessary arguments.

Note

- The name of a custom instruction is case-sensitive.
- 1-byte symbols may be used, however a comma (,) cannot be used in the name of a custom instruction.
- The name must be unique among the standard instructions and existing custom instructions.
- Using names consisting of three or less uppercase characters and numbers is not recommended. A name with those characteristics may be used as standard instruction in a future version upgrade. It is recommended to use four or more characters or to include at least one lowercase character for the name of a custom instruction.

Execution content

The current content of the custom instruction is displayed. To edit the contents of a command, select the line of the command to edit.

- Up to 256 single-byte alphanumeric characters can be used in one custom instruction (A line feed is counted as two characters.).
- See the XG VisionEditor Reference Manual (Control/Data Edition) for more details on how to enter the contents to execute.
- To execute several standard instructions sequentially, separate them with a line feed. Up to 16 standard instructions can be executed in sequence.

Reply

Select the method to return the command execution result to the controller.

- **Batch**: The execution result is returned when all standard instructions included in the custom instruction have been executed.
- **Single response**: The execution results are returned from each of the standard instructions included in the custom instruction.
- **No response**: No execution result is returned for either the custom instruction as a whole or the individual standard instructions.

Reference

- When a custom instruction consists of several standard instructions and one of the standard instructions encounters an error, the subsequent standard instructions are not executed. When [Batch] is selected for [Reply], the error code of the standard instruction which encountered an error is returned as the response. If a custom instruction includes a standard instruction which is not support by the device used to issue the instruction, the custom instruction itself is not executed. See the XG VisionEditor Reference Manual (Control/Data Edition) for more details on the handling of command devices.
- For command execution via the terminal block & parallel port, PLC Link, CC-Link, or EtherNet/IP, the execution result is always returned as [Batch] even when [Single response] is selected for [Reply].
- When using with a command unit, console command assignment, and dialog part, there is no response regardless of the setting.

3 When the settings are complete, select [OK].

List of Custom Instructions

This list shows the default custom commands (and their assignments) that can be used for control purposes and in the command unit (Page 4-345).

Reference

For more information on the individual commands and their parameters, refer to the XG VisionEditor Reference Manual (Control/Data Edition).

Custom instruction No.	Assigned commands	Description
0	SS	Save program
1	WO,100,*01	Write terminal offset
2	PW,1,*01	Switch program No. (SD1)
3	PW,2,*01	Switch program No. (SD2)
4	BS,&Cam1Img,*01	Register image (Camera1)
5	BS,&Cam2Img,*01	Register image (Camera 2)
6	BS,&Cam3Img,*01	Register image (Camera3)
7	BS,&Cam4Img,*01	Register image (Camera 4)
8	RR,AL	Update position reference using the current image
9	BC	Capture image
10	HS,IM,*01,AL,AL	Save archived data
11	UW,FC,*01	Change display unit ID
12	VW,*01	Change display template ID
13	GW,*01	Switch page No.
14	TS,2,\xg\stat	Save statistical data
15	T1	Issue trigger
16	T2	Issue trigger
17	T3	Issue trigger
18	T4	Issue trigger
19	T5	Issue trigger
20	T6	Issue trigger
21	T7	Issue trigger
22	T8	Issue trigger
23	TA	Issue all triggers
24	TE,*01	Enable/disable trigger input
25	TQ	Read trigger acceptance
26	LK,*01,*02,*03	Enable/disable device input
27	OE,*01	Enable/disable output
28	R0	Switch to run mode
29	S0	Switch to offline mode
30	RM	Read run/offline mode
31	PW,*01,*02	Switch program No.
32	PR	Program No. readout
33	RS	Reset
34	RB	Restart
35	SS	Save program
36	NW,AL,*01	Write registered image No.
37	NW,*01,*02	Write registered image No.
38	NR,*01	Read registered image No.

Custom instruction No.	Assigned commands	Description
39	NU,AL	Update referenced registered image No.
40	NU,*01	Update referenced registered image No.
41	CE,*01	Clear error
42	RE	Return to beginning of flowchart
43	WG,*01	Waiting status release
44	RR,AL,*01	Updating the reference position adjustment value
45	RR,*01,*02	Updating the reference position adjustment value
46	RU,AL	Update image reference
47	RU,*01	Update image reference
48	TG,*01	Teaching
49	UT,*01,*02	Test Unit
50	UE	Reset unit after test
51	CA,*01,*02,*03,*04	Register character to library
52	CA,*01,*02,*03,*04,*05,*06	Register character to library
53	CD,*01,*02	Delete character from library
54	CW,*01	Write REG
55	CW,*01,*02,*03	Write REG
56	CR,*01,*02	Read REG
57	WO,*01,*02	Write terminal offset
58	VW,*01	Change display template ID
59	VW,PV	Change display template ID
60	VW,NX	Change display template ID
61	VR	Read display template ID
62	GW,*01	Switch page No.
63	GW,PV	Switch page No.
64	GW,NX	Switch page No.
65	GR	Read page No.
66	UW,FC,*01	Change display unit ID
67	UW,FC,PV	Change display unit ID
68	UW,FC,NX	Change display unit ID
69	UR,FC	Read display unit ID
70	FW,*01	Change camera screen
71	FW,PV	Change camera screen
72	FW,NX	Change camera screen
73	FR	Read camera screen No.
74	WI,FC,*01	Change image type
75	RI,FC	Read image type
76	ZM,FC,*01,*02,*03,*04	Zoom
77	SC,FC,*01,*02	Scroll
78	FT,FC	Fit
79	DC,*01,*02	Close dialog
80	DC,AL	Close dialog
81	DO,*01	Open dialog
82	DR	Read dialog ID
83	BU,*01,*02	Open unit properties dialog
84	TC	Statistics data clear
85	TS,*01,\xg\stat	Save statistical data

Custom instruction No.	Assigned commands	Description
86	HE,*01	Start/stop archive
87	HR,*01	Read archive status
88	HC,*01	Clear archived data
89	HC,AL	Clear archived data
90	HS,IM,*01,AL,AL	Save archived data
91	HS,AL,*01,AL,AL	Save archived data
92	LE,*01	Start/stop modification logging
93	LQ	Read modification logging status
94	BC	Capture image
95	PS,Administrator,*01,*02	Change password
96	PS,Operator,*01,*02	Change password
97	WH	Read user account
98	UC,Administrator,*01	Change login user
99	UC,Operator,*01	Change login user
100	TW,*01,*02,*03,*04,*05,*06	Write date/time
101	TR	Read date/time
102	PC,*01,*02,*03,*04	Copy program
103	PM,*01,*02,*03,*04	Move program
104	PD,*01,*02	Delete program
105	OW,*01,*02	Change fixed name in file naming rule
106	OR,*01	Read fixed name in file naming rule
107	ES,*01	Switch between run/edit program
108	EI	Read run/edit program status
109	FV,*01	Show flowchart in run mode
110	FI	Read show/hide flowchart status
111	KY,*01	Console virtual input
112	KY,*01,*02	Console virtual input
113	VI	Version information readout

Calibrating CA Series Touch Panels

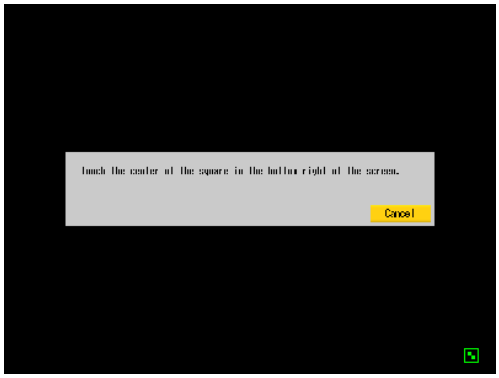
When a CA Series touch panel is connected, field of view (FOV) correction can be performed so the touch panel can be operated correctly.

1 **From the System Configuration menu, select [Custom Functionality] - [Calibrate CA series Touch Panel].**

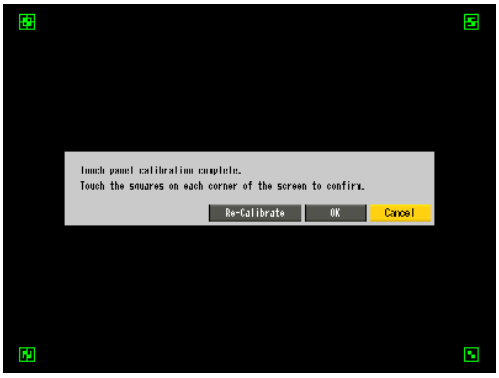
2 **Touch the at the top left of the screen.**



3 **Touch the at the bottom right of the screen.**



4 **Touch the at the four corners of the screen, and verify that the touched locations were each selected correctly.**



If one was not selected correctly, the at the touched location turns red.

Reference

If FOV correction is not correct, or to perform correction again, select [Re-Calibrate] and perform correction again.

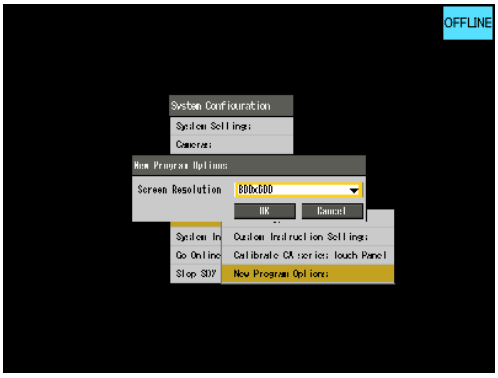
5 **When the settings are complete, click [OK].**

Screen Resolution (New Program Options)

Select the display resolution to be used on the controller.

1 **From the System Configuration menu, select [Communications & I/O] - [New Program Options].**
The [New Program Options] menu appears.

2 **Select the display resolution to use.**



- **800 x 600** (default): Set the resolution to 800 x 600 (SVGA size).
- **1024 x 768**: Set the resolution to 1024 x 768 (XGA size).

3 **When the settings are complete, click [OK].**

System Information

Use this option to display information about the controller, including the controller name, controller hardware version, program file version, and available space.

1 **Select [System Information] from the System Configuration menu.**

The [System Information] menu appears.



2 **Review the information.**

- **Model (version):** Shows the controller model and firmware version.
- **Serial No.:** Shows the serial number of the controller.
- **Controller ID:** Shows the unique ID of the controller.
- **MAC Address**: Shows the MAC address of the controller. (Cannot be changed.)
- **Controller Name:** Shows the name assigned to the controller.
- **Hardware Version**: Shows the hardware version of the controller.
- **Camera No. (Model, Serial No.)**: Shows the information for the currently connected camera.
- **Version Information**: Shows the versions of the program files currently on the controller.
- **Free area:** Shows the available memory on each SD card displayed in the form "available memory / total capacity".

Reference

- The [Controller Name] field will be empty if a name has not been set for the controller (Page 7-4).
- If an SD card is not inserted, the "Free area" field will display "0 KB/ 0 KB".

3 **Click [Close].**

Chapter 8

I/O Interface Specifications

Overview of the I/O Interface

The controller has 4 communication ports and 2 I/O ports.

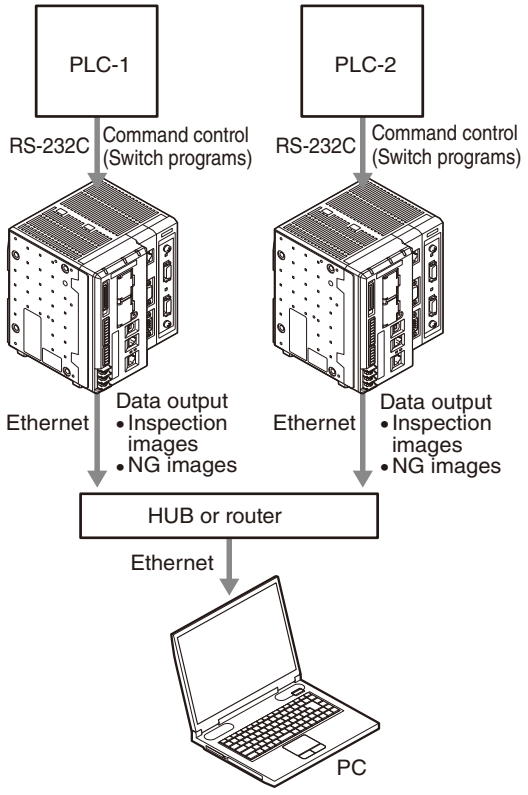
- RS-232C interface (Page 8-2)
- Ethernet Interface (Page 8-4)
- USB Interface (Page 8-8)
- CC-Link interface (Page 8-19)
- Parallel I/O interface (Page 8-21)
- Terminal Block Interface (Page 8-23)

Commands can be sent and data output via the RS-232C and Ethernet communication ports in no-protocol mode. Multiple communication ports can be used at the same time.

- In addition to standard communication, data output and control can also be done using PLC link communication via the RS-232 and Ethernet interfaces. For more details, see the XG-7000 Series Communication Control Manual.
- The Ethernet interface also supports data output and control by EtherNet/IP. For more details, see the XG-7000 Series Communication Control Manual.

Example of multi port usage

Data such as measurement results and NG images are output to the PC via Ethernet while the inspection settings are controlled from the PLC via RS-232C.



► Note

Communication software is required to correctly display data on the computer.

RS-232C Interface

The RS-232C port on the system can be used to communicate with external equipment. The system can communicate with external equipment using two communication modes: no protocol mode or the PLC link mode.
The transmitted data will differ depending on the communication mode. Switch modes depending on the environment. Refer to "List of Communication Commands" in the XG VisionEditor Reference Manual for more details on the no protocol mode and switching the communication mode.

► Note

The signal GND and power GND are common to both communication modes. Take care to avoid voltage differences when connecting external devices to the controller.

RS-232C Port Specifications

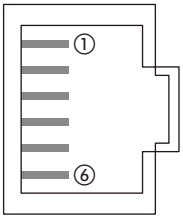
RS-232 basic specifications

- Connector: RJ-11 (Port 1), D-sub 9-pin (Port 2)
- Standards: The connected device must comply with EIA (Electronic Industries Association) RS-232C standards.

Item	Compatibility
Communication System	Full-duplex
Synchronous system	Asynchronous
Transmission Code	ASCII (Part binary code)
Data-bit Length	8-bit
Stop-bit Length	1-bit/2-bit
Parity Check	None/odd/even
Communication speed	9600/19200/38400/57600/115200/ 230400 bps
Delimiter	CR/CR+LF/LF
Flow Control	None, CTS/RTS
Maximum cable length	15 m

Connector specifications (RS-232C port 1)

Specifications for RS-232C port 1 are as shown below.



(Controller Side)

No.	Signal	Signal Description	Signal direction
1	CS (CTS)	Data Transmission Permission	Output
2	Not used	—	—
3	SD (TXD)	Data Transmission	Inputs
4	SG (GND)	GND	—
5	RD (RXD)	Data Reception	Output
6	RS (RTS)	Data Transmission Request	Inputs

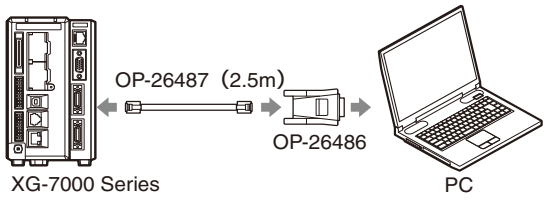
Reference

Since the controller uses the RS-232C modem definition, SD is assigned to input and RD is assigned to output.

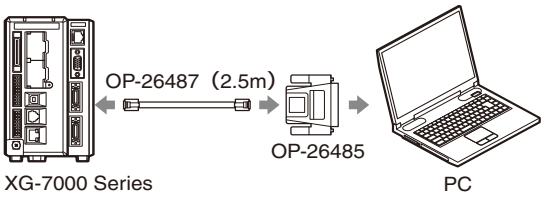
Connecting to a PC

The controller can be connected to your computer using a dedicated serial cable (optional).

When the PLC / PC has a D-sub 9-pin connector



When the PLC / PC has a D-sub 25-pin connector



► Note

- In the connection examples above, flow control is not possible. If flow control is necessary, connect using the Page 8-10 method.
- The controller uses the communication settings selected in the communication mode specified in the System Settings in XG VisionEditor. For more details, refer to "Controller System Settings" in the XG VisionEditor Reference Manual. The baud rate for no protocol mode and parity bit settings can be viewed and changed using [RS-232C (no protocol)] (Page 7-28) on the System Configuration menu.

Ethernet

The Ethernet port on the controller can be used to communicate with external equipment in addition to connecting to Keyence software XG VisionEditor, XG VisionTerminal, and ActiveX control. The controller can communicate with external equipment using 3 communication modes: no protocol mode based on the RS-232C command set, the PLC link mode, or EtherNet/IP. The system also acts as an FTP client and an external FTP server can be specified as the output destination for sending stored images and history data.

Reference

For more details about various types of communications control using the Ethernet port, refer to the XG-7000 Series Communications Control Manual.

Ethernet Port Specifications

Standard specifications

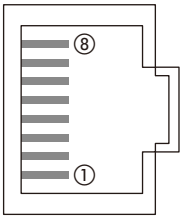
- Connector: RJ-45
- Medium: 10 BASE-T/100 BASE-TX/1000 BASE-T
- Communications protocols:
  - TCP/IP (other than PLC link, EtherNet/IP)
  - UDP (PLC link)
  - TCP/IP, UDP (EtherNet/IP)

Reference

The Keyence software (XG VisionEditor, XG VisionTerminal, and ActiveXcontrol) uses both TCP/IP and UDP.

Connector Specifications

The specifications of the Ethernet port are as follows:



(Controller Side)

	10 BASE-T/ 100 BASE-T		1000 BASE-T	
No.	**Signal**	**Signal direction**	**Signal**	**Signal direction**
1	TX +	Output	TRX+	Input/Output
2	TX -	Output	TRX-	Input/Output
3	RX +	Inputs	TRX+	Input/Output
4	Not used	—	TRX-	Input/Output
5	Not used	—	TRX-	Input/Output
6	RX -	Inputs	TRX-	Input/Output
7	Not used	—	TRX+	Input/Output
8	Not used	—	TRX-	Input/Output

► Note

Use a category 5e LAN cable or above when connecting via 1000 Base-T. An STP type is recommended for the cable structure.

Preparation for Transmission via Ethernet

The controller can be controlled via Ethernet by connecting to a PLC / PC using an Ethernet cable. The controller can transmit various data types including settings, images, measurement values and inspection results.

► Note

- Consult your controller or network administrator when connecting to an existing LAN. If any incorrect settings are made, the system as well as other network equipment may not work properly.
- The controller may truncate parts of the output data, depending on the network conditions. (The controller does not resend data with packet loss)
- Some delays may occur with data transmission between the network and the controller, depending on the network conditions. If a response is required, such as a trigger input, communicating via the I/O interface is recommended.
- The firewall function on the connected PC must be disabled, as it may cause a problem with the communication.
- Use equipment that is intended for use in a factory environment (such as hubs and LAN cables) for the network. Using commercial equipment meant for office applications may cause unstable operations.

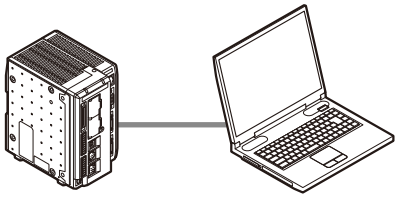
Communication specifications

The Ethernet communication specifications are as follows:

- Communications protocols:
- Communications protocols:
  - TCP/IP (other than PLC link, EtherNet/IP)
  - UDP (PLC link)
  - TCP/IP, UDP (EtherNet/IP)
- Topology: Peer to Peer

One-to-one connection with a PC

This section describes how to prepare and communicate when the controller is controlled in a one-to-one connection with a PC, and not via the LAN. To connect to your PC, a cross cable (3 m) OP-66843 should be used.



Cross cable (3 m)
(OP-66843)

Connecting the controller to a PC

1 **Change the TCP-IP settings on the system.**
The system uses the TCP/IP settings specified in the System Settings in XG VisionEditor. For more details, refer to "Controller System Settings" in the XG VisionEditor Reference Manual.
The IP address, subnet mask, and default gateway settings can be viewed and changed using [Ethernet] (Page 7-25) on the System Configuration menu.

2 **Change the TCP-IP settings on a PC.**
When the controller is directly connected to a PC with a cross cable, set the IP address between 192.168.0.1 and 192.168.0.255 excluding 192.168.0.10 (when the subnet mask of the controller and PC are 255.255.255.0).
See the instruction manual for your computer or LAN settings for more information.

3 **Turn off the controller and the PC and connect the Ethernet connector on the PC to the Ethernet port using a cross cable.**

4 **Turn on the controller and the PC.**

5 **Start [Command Prompt] on the PC.**



Reference

To start the command prompt (Windows XP), click the [Start] menu then click [All Programs] - [Accessories] - [Command Prompt].

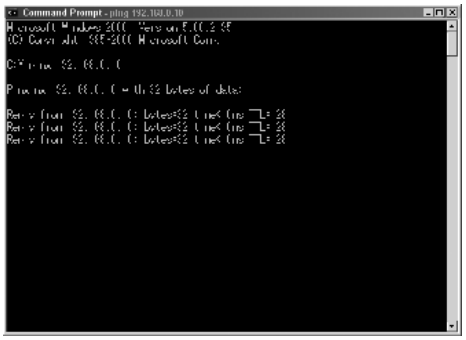
6 **Enter [ping] followed by the IP address of the controller in alphanumeric characters and press the Enter key.**

When the IP address of the controller is [192.168.0.10]

Enter [ping 192.168.0.10].



If the controller and the PC are properly configured, a message [Reply from (the IP address of the controller) ~] will appear.



When [Request timed out] appears

If a message [Request timed out] appears and the correct IP address of the controller has been specified in the ping command, the setting and configuration of the controller and the PC is incorrect.



Check that the steps from 1 to 3 described on the previous page have been properly performed.

An example of communicating with the controller using Telnet software and no protocol mode

You can use Telnet software to communicate with the controller. In this example, the operation process using Tera Term (free software) is described.

Reference

See the following URL for details on Tera Term (as of August 2011).
http://www.vector.co.jp/soft/win95/net/se067018.html

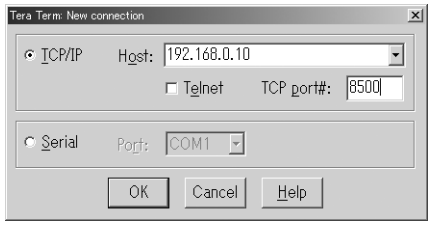
1 **Prepare Telnet software.**

Install Telnet software such as Tera Term (freeware).

2 **Start Telnet software on your PC and configure settings for the host.**

- Host: Enter the IP address of the controller. (Default value: 192.168.0.10).
- TCP port#: Enter the communication port specified for the controller. (Default value: 8500).

Example of host settings in using Tera Term

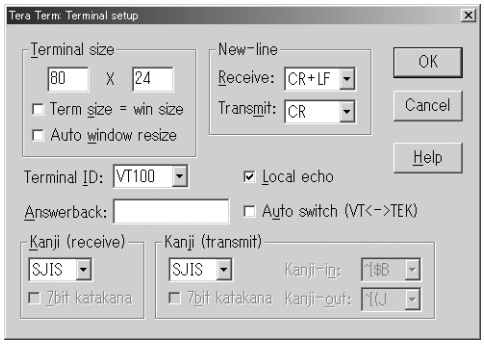


3 **Connect the host.**

If Tera Term is used, click [OK] after configuring the host computer connections.

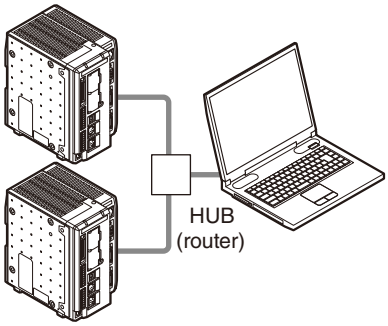
The command system used in communication is the same as that of the no protocol mode in RS-232C. For more details, refer to "Standard Instruction" in the XG VisionEditor Reference Manual.

Setting example of Tera Term Terminal Setup



One-to-n connection with a PLC / PC

This section describes how to prepare and communicate when more than one controller is controlled by one PC via a LAN.



Differences between one-to-one connections and one-to-n connections

Preparation and control methods for one-to-n connection are basically the same as those for one-to-one connection. However, the following points differ.

- To connect multiple controllers, a hub or router that supports 1000BASE-T, 100BASE-TX or 10BASE-T is required.
- To connect a controller to a hub (or router), use a commercial straight cable. Keyence recommends using a shielded twisted pair (STP) straight cable, category 5e or greater.
- The IP addresses of the controllers on the network and that of the PC must be different to prevent communication breakdown.

  An example of using two controllers (In this example the subnet mask of the controller and PC is 255.255.255.0)
  - IP address of the first controller: 192.168.0.10 (default)
  - IP address of the second controller: 192.168.0.11 (changed because the default value would be the same as first controller)
  - The IP address of the PC: 192.168.0.12 (changed to not interfere with the other addresses but using the same first three ABC classes)
- If a router is used, the Ethernet settings of the controllers must be changed according to the settings of the router. For more details, see the instruction manual of the router or consult your system or network administrator.

Notes on one-to-n connections

- Multiple controllers cannot exchange data with each other or control each other.
- The maximum number of computers that can be connected at once depends on the software and hardware of the devices connected. For more details, contact the manufacturer of the software or hardware of the devices connected.
- Consult your controller or network administrator when connecting to an existing LAN. If any incorrect settings are made, the system as well as other network equipment may not work properly.
- The baud rate and or connection stability may vary depending on the combination of connected devices and the network status. Make sure to check the operational functionality of the network before starting actual operation.

USB Interface

The USB port on the controller is used exclusively for connecting to Keyence software XG VisionEditor and XG VisionTerminal. The USB port cannot be used with any other software.

► Note

The connector shield, signal GND, and power GND are common. Take care to avoid voltage differences when connecting external devices to the controller.

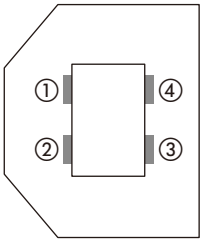
USB Port Specifications

Standard specifications

- Connector: Female B connector
- Standard: USB Version 2.0.

Connector Specifications

Specifications of the USB port on the controller are as follows:



No.	Signal	Signal Description	Signal direction
1	VBUS	VBUS	—
2	D-	Differential signal -	Input/Output
3	D+	Differential signal+	Input/Output
4	GND	GND	—

Connecting to a PC

You can connect the controller to the PC via the USB port. To connect the controller to the PC, use the optional USB cable (2 m) OP-66844.

► Note

- Only 1 controller can be connected to a single PC.
- If a cable other than OP-66844 or an extension cable is used, the controller may not operate correctly.
- Conventional USB devices such as a USB mouse, card reader or thumb drive cannot be connected to this port.
- Communication may be interrupted due to high voltage or electrical noise near the system. If communication is interrupted, disconnect and re-connect the USB cable, and restart the software.
- If communication interruption occurs frequently, check the surrounding area for noise sources (inverter, solenoid valve, etc.).

System requirements

To connect the controller to a PC via the USB port, a PC with the following requirements is needed.

- Operating system: Microsoft Windows 7 Home Premium/ Professional/Enterprise/Ultimate Edition, Microsoft Windows Vista Home Basic/Premium/Business/Ultimate/ Enterprise Edition, Microsoft Windows XP Home Edition/ Professional SP2 or later (Other Windows operating systems are not supported.)
- USB 2.0 compatible connector
- CD-ROM/DVD drive

► Note

Supports the Microsoft Windows 7 64-bit version. For all other operating systems, only the 32-bit version is supported.

Installing the driver

You must install the USB driver before connecting the controller to a PC. After the driver is installed, the controller can communicate correctly with a PC running the Keyence software XG VisionEditor, XG VisionTerminal.

► Note

USB driver installation must be performed by a user with Administrator privileges.

This section describes how to install the driver, using Windows XP as an example.

► Note

The installation wizard does not automatically appear on Windows 7. To install on Windows 7, connect the controller and the PC, then use Device Manager to manually install the USB driver.
To install drivers, in Device Manager click [Update driver] under [Other devices] on the property page for the [XG-7000/7000 Series], and specify the folder that contains the USB driver.

1 Turn on the controller and the PC.

2 When the PC starts, insert the XG-H8N CD-ROM in the CD-ROM drive.

3 Connect the USB port of the controller and that of the PC using the OP-66844 cable (optional).
[Found New Hardware Wizard] will appear on the PC screen.



4 Select [No, not this time], and click [Next].

5 Select [Install from the list or specified location] and specify the folder that contains the USB driver.
Installation of the USB driver starts.

Reference

- The USB driver is located in \driverUSB on the XG-H8NCD-ROM. After installing XG VisionEditor and XG VisionTerminal, the driver is also stored in c:driversV-Works for XG H8N.
- When installing drivers in Windows XP or Windows 7, a warning message may appear confirming the installation. When such a warning message appears, click [Continue] to continue installation.

6 When installation of the USB driver is completed, click [Finish].



The controller is now ready to communicate with PC via the USB port.

PLC-Link

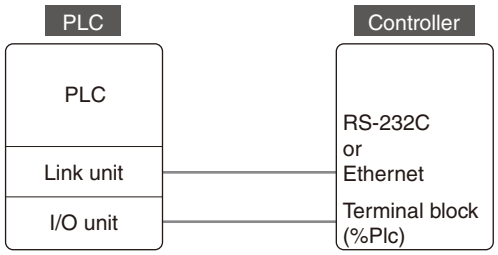
PLC link is an intelligent dedicated link between controller and the PLC that allows direct input/output access to data memories in a PLC (programmable logic controller) via the RS-232C or Ethernet interface.
Command execution can be configured to use polling or the system's PLC terminal control input.

► Note

- PLC-Link cannot be used on the RS-232C and Ethernet interfaces simultaneously.
- The RS-232C interface cannot be used in its basic (no protocol mode) and with the CA Series touch panel when it is used for the PLC link.
- PLC Link, CC-Link, and EtherNet/IP cannot be used simultaneously.

1. Wiring Overview

The PLC is wired to the controller in the following way.



Reference

- When the controller is not receiving commands from the PLC or when it is polling, the PLC does not need to be connected to the input terminal %Plc.
- Since the controller complies with the modem definition, when connecting the controller to a device that complies with the terminal definition via RS-232C, connect the SD signal of the controller to the SD signal of the device and the RD signal of the controller to the RD signal of the device.

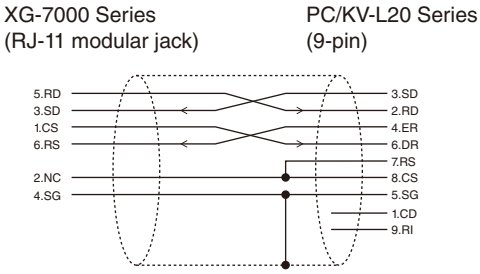
2. PLC-Link settings

The controller uses the communication mode selection and PLC-Link communication settings specified in the System Settings in XG VisionEditor. Refer to "Changing the PLC-Link Settings" (Page 7-29) for more details.

3.Wiring for the PLC Link and Setting the Link Unit (RS-232C)

When connecting to a Keyence KV-L20 Series PLC

- Use OP-26486 (D-sub 9-pin female connector) and OP-26487 (2.5 m straight cable).
- Set the link unit operation mode to [KV-Builder mode] (for the KV-700) or [KV-STUDIO mode] (for the KV-1000/3000/5000/5500).



⚠ **Warning**

The controller's signal GND, and power GND are common. Take care to avoid voltage discrepancies when connecting external devices to the controller.

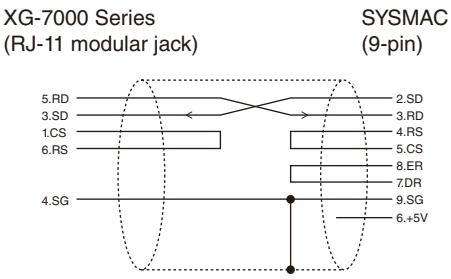
When connecting to an Omron a SYSMAC PLC

Reference

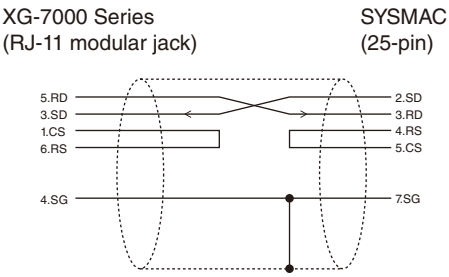
When connecting to a SYSMAC C, adapt the wiring described here to the pins on the actual connectors used for the connection.

- Use OP-84384 (D-sub 9-pin male connector for the SYSMAC) and OP-26487 (2.5 m straight cable).
- Set the link unit operation mode to "upper link (SYSWAY)".
- Set the 1:1 or 1:N process to "1:N process".
- Set the unit number to "No.0".
- Set the CS control to "None".
- When enabling settings using CX-Programmer 6.0 or later, make sure to set the [Optional settings on/off] item to [On]. When set to "Off" changes to other settings will not be active.

For 9-pin



For 25-pin



⚠ Warning

- If OP-26486 is used to connect to a SYSMAC (9 pin), it may cause damage to the controller or the connected device. Do not use this connector.
- The controller's signal GND, and power GND are common. Take care to avoid voltage discrepancies when connecting external devices to the controller.

When connecting to a Mitsubishi MELSEC Series PLC

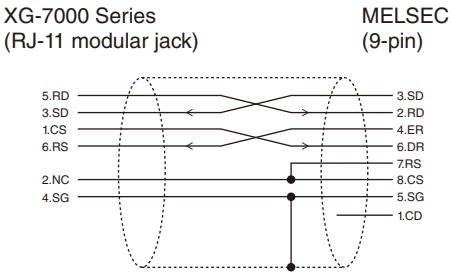
- Use OP-86930 (D-sub 9-pin male connector) and OP-26487 (2.5 m straight cable).
- Set the operation mode for the link unit to [MC protocol format 5] (for Q and L Series) or [exclusive protocol format 1] (for A Series). Set the checksum setting to [On].

► Note

When connected to the A Series, "RS-232C CD terminal unchecked" must be defined in the ladder. Refer to the manual for the Mitsubishi Electric computing link unit for more details.

Reference

- It is necessary to convert to a D-sub 9 pin male connector when using the OP-26486 (D-sub 9 pin female connector). Use a commercially available gender converter (D-sub 9 pin female to D-sub 9 pin male, straight connection).
- To use the Q Series link unit QJ71C24 (N) -R2 set "Baud rate 115200 bit/s, data length 8 bits, stop bit 1 bit, even parity", and the switch setting in the PC parameters to "0BEE (hexadecimal)".

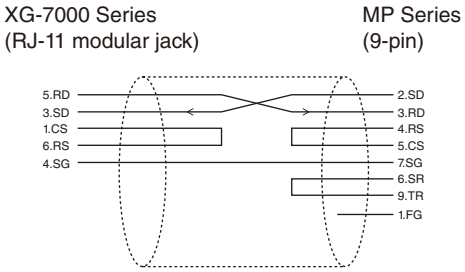


⚠ Warning

The controller's signal GND, and power GND are common. Take care to avoid voltage discrepancies when connecting external devices to the controller.

Connecting to a YASKAWA MP Series PLC

- Use OP-26487 (2.5 m straight cable) and connect it to a commercially available D-sub 9 pin male connector as shown in the figure below.
- Set the communication protocol to "MEMOBUS".
- Set Master/Slave to "Slave".
- Set the transmission mode to "RTU".
- Set the device address to "1".
- Describe the MSG-RCV processing in the ladder or set the automatic reception to "Specified" for a module that allows automatic reception. Refer to the manual for the YASKAWA Electric communication unit for more details.



⚠ Warning

- If OP-26486 is used to connect to a SYSMAC (9 pin), it may cause damage to the controller or the connected device. Do not use this connector.
- The controller's signal GND, and power GND are common. Take care to avoid voltage discrepancies when connecting external devices to the controller.

3. Wiring for the PLC-Link and Setting the Link Unit (Ethernet)

- Make sure that the specified IP address is unique and different than the IP addresses for other devices.
- For all devices on a connected network use the same subnet mask. For additional networks use a unique different subnet mask.
- Use a category 5e or greater shielded twisted pair (STP) cable for connection. When connecting the equipment directly (1 to 1), use a cross cable. When connecting through a hub, use a straight cable.

When connecting to a Keyence KV Series PLC

Change settings using KV BUILDER Ver. 3.52 or later.

- **IP address:** In the PLC link settings on the controller, set the specified IP address in [IP Address].
- **Port number (VT):** In the PLC link settings on the controller, set the specified port number in [Port].

When connecting to an Omron a SYSMAC PLC

Change the settings using CX-Programmer.

- **Node No.:** Set this to a value that is different from the node number used for other equipment on the network. This includes the node number specified in the PLC link setting on the controller. (The default system node number is 001.)
- **IP address:** In the PLC link settings on the controller, set the specified IP address in [IP Address].
- **FINS UDP port:** Select [Define user], and in the PLC link settings on the controller, set the specified port number in [Port].
- **IP address table:** Set the IP address and node address specified in the Ethernet menu (Page 7-25) on the controller. The node address is normally [1].
- **IP router table:** Only set this item when using a router. In router address, set the IP address for the router. In IP address, set the IP address specified in the [Ethernet] menu (Page 7-25) on the controller.

► Note

- Interruptions will occur if there is a device performing EtherNet/IP communications with a multicast setting on the same network as the CP1 Series.
- When connecting to a CP1E, a communication error occurs due to a function problem under the conditions below.
  - When 134 or more result data are output from one data output unit
  - When 134 or more data are retrieved with the command including the MRX command
  - When 135 or more data are set with the command including the MWX command

Reference

Use the IP setting switch on the back of the PLC to set the IP address on the CS1W-ETN11 PLC.

When connecting to a Mitsubishi MELSEC link unit

Change settings using the network parameters in GX-Developer or GX-Works2.

[MELSECNET/Ethernet]

- **Network type:** Select [Ethernet].
- **Mode:** Select [Online].

[Operation settings]

- **Communication data code setting:** Select [Binary code communication].
- **Initial timing setting:** Select [Always OPEN].
- **IP address setting:** In the PLC link settings on the controller, set the specified IP address in [IP Address].
- **Send frame setting:** Select [Ethernet (V2.0)].
- **Authorize writing during RUN:** Select [Authorize].

► Note

- In normal operations, do not change the communication port number of the MELSEC side from 5000 (default).
- To check the setting of the communication port number of the MELSEC side, select [Ethernet diagnosis] in the [Diagnosis] menu of the GX-Developer or GX-Works2, and then check the [Auto Open UDP Port] in the displayed window. If the communication port number is set to 5000, it is displayed as "1388" in hexadecimal.

Connecting to a Mitsubishi MELSEC PLC with built-in Ethernet port

Change settings via a PC in GX-Developer or GX-Works2.

► Note

Due to limitations with the built-in Ethernet port, a communication error may occur when the MELSEC receives incomplete IP packets.

- When using PLC link communication via a hub, do not connect to a network (company LANs, etc.) where incomplete data may occur with IP packets being sent and received.
- Connect via a dedicated link unit when using the PLC link over normal networks.

[Ethernet Port Settings]

- **IP address:** In the PLC link settings on the controller, set the specified IP address in [IP Address].
- **Communication data code setting:** Select [Binary code communication].
- **Authorize writing during RUN:** Check [Authorize].

[Open Settings]

Add these settings.

- **Protocol:** Select [UDP].
- **Open method:** Select [MCprotocol].
- **Local node port number:** Specify a hexadecimal value within the range 0401 to 1387, and 1392 to FFFE. Numbers from 1388 to 1391 (5000 to 5009 in decimal) are reserved.
  Specify the [Port] setting in the controller with the decimal notation of the hexadecimal value specified here. (Example, if the local node port number is 1387, specify 4999 in the controller).

► Note

- The built-in Ethernet port does not support Auto open UDP port (port number default: 5000) like the QJ71E71-100. Specify the communications port on the controller to a value from 1025 to 4999, and 5010 to 65535.
- When connected to a hub do not set more than one controller to the same port number. Set each controller with a different communication port number, and register local port numbers to the specific controller.

Connecting to a YASKAWA MP Series PLC

Use MP720 for setting.

- **Communication protocol**: Select [Extended MEMOBUS].
- **Master/Slave**: Select [Slave].
- **Code**: Select [BIN].
- **Connection type**: Select [UDP].
- **IP address**: In the PLC link settings on the controller, set the specified IP address in [IP Address].
- **Port number**: In the PLC link settings on the controller, set the specified port number in [Port].
- Describe the MSG-RCV processing in the ladder or set the automatic reception to "Specified" for a module that allows automatic reception.

Refer to the manual for the YASKAWA Electric communication unit for more details.

Compatible PLC-Link connections

The following PLCs are compatible with the PLC-Link connection.

► Note

- Except for the built-in Ethernet port on certain PLCs, only connections via a link unit are supported.
- The range of data memories differ depending on the system. For more details, refer to the manual for each PLC.

RS-232C Interface

Keyence Corporation

Series name	PLC Controller	Link unit	PLC operation mode	PLC type
KV	KV-700	KV-L20	KV BUILDER mode	KV-L20 Series
	KV-1000	KV-L20R	KV STUDIO mode	KV-L20 Series
	KV-3000, KV-5000, KV-5500	KV-L20V	KV STUDIO mode	KV-L20 Series

Mitsubishi Electric Corporation

Series name	PLC Controller	Link unit	PLC operation mode	PLC type
MELSEC-AnS	A1S, A1SH, A1SJ, A1SJH1, A2S, A2SH, A171S, A171SH	A1SJ71 (U) C24-R2, A1SJ71 (U) C24-PRF	Exclusive protocol format 1	MELSEC AnN Series
	A1CPUC24-R2	Calculator link port	Exclusive protocol format 1	MELSEC AnN Series
	A2US, A2USH	A1SJ71 (U) C24-R2, A1SJ71 (U) C24-PRF	Exclusive protocol format 1	MELSEC AnN Series
MELSEC-A0J2	A0J2, A0J2H	A0J2-C214-S1	Exclusive protocol format 1	MELSEC AnN Series
MELSEC-AnN	A1N, A2N, A3N	AJ71C24, AJ71C24-S3, AJ71C24-S6, AJ71C24-S8, AJ71UC24	Exclusive protocol format 1	MELSEC AnN Series
MELSEC-AnA	A2A, A3A	AJ71C24-S6, AJ71C24-S8, AJ71UC24	Exclusive protocol format 1	MELSEC AnN Series
MELSEC-AnU	A2U, A3U, A4U	AJ71C24-S6, AJ71C24-S8, AJ71UC24	Exclusive protocol format 1	MELSEC AnN Series
MELSEC-QnA	Q2A, Q2A-S1, Q3A, Q4A	AJ71QC24 (N), AJ71QC24 (N) R2	Exclusive protocol format 1	MELSEC AnN Series
	Q2AS, Q2AS-S1, Q2ASH, Q2ASH-S1	A1SJ71QC24, A1SJ71QC24-R2	Exclusive protocol format 1	MELSEC AnN Series
MELSEC-Q	Q00CPU, Q01CPU	QJ71C24, QJ71C24 (N)-R2	MC protocol format 5	MELSEC Q/L Series
	Q02CPU, Q02HCPU, Q02UCPU, Q03UDECPU, Q04UDEHCPU, Q06UDEHCPU, Q10UDEHCPU, Q13UDEHCPU, Q20UDEHCPU, Q26UDEHCPU, Q06HCPU, Q12HCPU, Q25HCPU, Q02UCPU	QJ71C24, QJ71C24 (N)-R2	MC protocol format 5	MELSEC Q/L Series
	Q02CPU-A, Q02HCPU-A, Q06HCPU-A	A1SJ71 (U) C24-R2, A1SJ71 (U) C24-PRF	Exclusive protocol format 1	MELSEC AnN Series
MELSEC-L	L02CPU, L26CPU-BT	LJ71C24, LJ71C24-R2	MC protocol format 5	MELSEC Q/L Series

Omron Corporation

Series name	PLC Controller	Link unit	PLC operation mode	PLC type
SYSMAC SPM1	SRM1-C01, SRM1-C02	CPM1-C1F01	Upper link (SYSWAY)	SYSMAC C Series
SYSMAC CPM1 SYSMAC CPM1A	CPM1, CPM1A	CPM1-C1F01	Upper link (SYSWAY)	SYSMAC C Series
SYSMAC CPM2A	CPM2A-30CD**, CPM2A-40CD**, CPM2A-60CD**	CPM1-C1F01	Upper link (SYSWAY)	SYSMAC C Series
SYSMAC CPM2C	CPM2C-10CD**, CPM2C-20CD**	CPM1-C1F01 CPM2C-C1F01	Upper link (SYSWAY)	SYSMAC C Series
SYSMAC CQM1H	CQM1H-CPU11*, CQM1H-CPU21*, CQM1H-CPU51/61	CPM1-C1F01 CQM1H-SCB41	Upper link (SYSWAY)	SYSMAC C Series
SYSMAC C	C120, C120F	C120-LK201-V1	Upper link (SYSWAY)	SYSMAC C Series
	C200H	C200H-LK201 (-V1)	Upper link (SYSWAY)	SYSMAC C Series
	C200HS-CPU01, C200HS-CPU03, C200HS-CPU21/23, C200HS-CPU31/33	C200H-LK201 (-V1)	Upper link (SYSWAY)	SYSMAC C Series
	C500, C500F, C1000H, C1000HF, C2000, C2000H	C120-LK201-V1, C500-LK201-V1, C500-LK203	Upper link (SYSWAY)	SYSMAC C Series
SYSMAC α	C200HE-CPU11, C200HE-CPU32, C200HE-CPU42	C200H-LK201 (-V1)	Upper link (SYSWAY)	SYSMAC C Series
	C200HG-CPU33, C200HG-CPU43, C200HG-CPU53, C200HG-CPU63	C200H-LK201 (-V1)	Upper link (SYSWAY)	SYSMAC C Series
	C200HX-CPU34, C200HX-CPU44, C200HX-CPU54, C200HX-CPU64, C200HX-CPU65-Z, C200HX-CPU85-Z	C200H-LK201 (-V1)	Upper link (SYSWAY)	SYSMAC C Series
SYSMAC CJ	CJ1M-CPU11-ETN, CJ1M-CPU12, CJ1M-CPU12-ETN, CJ1M-CPU13, CJ1M-CPU13-ETN, CJ1M-CPU22, CJ1M-CPU23, CJ1G-CPU44, CJ1G-CPU45, CJ1G-CPU42H, CJ1G-CPU43H , CJ1G-CPU44H, CJ1G-CPU45H, CJ1H-CPU64H-R, CJ1H-CPU65H, CJ1H-CPU65H-R, CJ1H-CPU66H, CJ1H-CPU66H-R, CJ1H-CPU67H, CJ1H-CPU67H-R, CJ2M-CPU11, CJ2M-CPU12, CJ2M-CPU13, CJ2M-CPU14, CJ2M-CPU15, CJ2M-CPU31, CJ2M-CPU32, CJ2M-CPU33, CJ2M-CPU34, CJ2M-CPU35, CJ2H-CPU64-EIP, CJ2H-CPU65-EIP, CJ2H-CPU66-EIP, CJ2H-CPU67-EIP, CJ2H-CPU68-EIP	CJ1W-SCU21 (-V1), CJ1W-SCU41, CJ1W-SCU22	Upper link (SYSWAY)	SYSMAC-CJ/CS1/CP1 Series
SYSMAC CS1	CS1G-CPU42(H), CS1G-CPU43(H), CS1G-CPU44(H), CS1G-CPU45(H), CS1H-CPU63(H), CS1H-CPU64(H), CS1H-CPU65(H), CS1H-CPU66(H), CS1H-CPU67(H)	CS1W-SCU21 (-V1)	Upper link (SYSWAY)	SYSMAC-CJ/CS1/CP1 Series
SYSMAC CP1	CP1H-Y20DT-D, CP1H-XA40D*-*, CP1H-X40D*-*, CP1L-M60D*-*, CP1L-M40D*-*, CP1L-M30D*-*, CP1L-L20D*-*, CP1L-L14D*-*, CP1E-NA20D*-*, CP1E-N60D*-*, CP1E-N40D*-*, CP1E-N30D*-*	CP1W-CIF01	Upper link (SYSWAY)	SYSMAC CJ/CS1/CP1 Series

* The CQM1H-SCB41 link unit cannot be used.

YASKAWA Electric Corporation

Series name	PLC Controller	Link unit	PLC operation mode	PLC type
MP2000	MP2200, MP2300, MP2310, MP2300S	217IF-01, 218IF-01 218IF-02	MEMOBUS	YASKAWA MP Series
MP900	MP920*, MP930*	217IF**	MEMOBUS	YASKAWA MP Series

* Also compatible with the built-in RS-232C interface on the system.
** Cannot be connected to MP930.

Ethernet Interface

Keyence Corporation

Series name	PLC Controller	Link unit	PLC type
KV	KV-700, KV-1000	KV-LE20, KV-LE20A	KV Series
	KV-3000, KV-5000*, KV-5500*	KV-LE20V, KV-LE21V, KV-EP21V**	KV Series

* Also compatible with the built-in Ethernet interface on the system.
** Only CPU version 2 or later can be used.

Mitsubishi Electric Corporation

Series name	PLC Controller	Link unit	PLC type
MELSEC-Q	Q00CPU, Q01CPU, Q02CPU, Q02HCPU, Q02UCPU, Q03UDECPU*, Q04UDEHCPU*, Q06UDEHCPU*, Q10UDEHCPU*, Q13UDEHCPU*, Q20UDEHCPU*, Q26UDEHCPU*, Q06HCPU, Q12HCPU, Q25HCPU	QJ71E71 QJ71E71-100	MELSEC Q/L Series
MELSEC-L	L02CPU*, L26CPU-BT*	None	MELSEC Q/L Series

* Also compatible with the built-in Ethernet interface on the system.

Omron Corporation

Series name	PLC Controller	Link unit	PLC type
SYSMAC CJ	CJ1M-CPU11-ETN*, CJ1M-CPU12, CJ1M-CPU12-ETN*, CJ1M-CPU13, CJ1M-CPU13-ETN*, CJ1M-CPU22, CJ1M-CPU23, CJ1G-CPU44, CJ1G-CPU45, CJ1G-CPU42H, CJ1G-CPU43H , CJ1G-CPU44H, CJ1G-CPU45H, CJ1H-CPU64H-R, CJ1H-CPU65H, CJ1H-CPU65H-R, CJ1H-CPU66H, CJ1H-CPU66H-R, CJ1H-CPU67H, CJ1H-CPU67H-R, CJ2M-CPU11, CJ2M-CPU12, CJ2M-CPU13, CJ2M-CPU14, CJ2M-CPU15, CJ2M-CPU31*, CJ2M-CPU32*, CJ2M-CPU33*, CJ2M-CPU34*, CJ2M-CPU35*, CJ2H-CPU64-EIP*, CJ2H-CPU65-EIP*, CJ2H-CPU66-EIP*, CJ2H-CPU67-EIP*, CJ2H-CPU68-EIP*	CJ1W-ETN11, CJ1W-ETN21	SYSMAC CJ/CS1/CP1 Series
SYSMAC CS1	CS1G-CPU42 (H), CS1G-CPU43 (H), CS1G-CPU44 (H), CS1G-CPU45 (H), CS1H-CPU63 (H), CS1H-CPU64 (H), CS1H-CPU65 (H), CS1H-CPU66 (H), CS1H-CPU67 (H)	CS1W-ETN11, CS1W-ETN21	SYSMAC CJ/CS1/CP1 Series
SYSMAC CP1	CP1H-Y20DT-D, CP1H-XA40D*-*, CP1H-X40D*-*	CP1W-CIF41, CJ1W-ETN21*2	SYSMAC CJ/CS1/CP1 Series
	CP1L-M60D*-*, CP1L-M40D*-*, CP1L-M30D*-*, CP1L-L20D*-*, CP1L-L14D*-*, CP1E-NA20D*-*, CP1E-N60D*-*, CP1E-N40D*-*, CP1E-N30D*-*	CP1W-CIF41	

* Also compatible with the built-in Ethernet interface on the system.

*2 CJ unit adapter CP1W-EXT01 is required.

YASKAWA Electric Corporation

Series name	PLC Controller	Link unit	PLC type
MP2000	MP2200, MP2300, MP2310*, MP2300S*, MP2400*	218IF-01, 218IF-02	YASKAWA MP Series

* Also compatible with the built-in Ethernet interface on the system.

CC-Link Interface

The controller can be used as a remote device station on a network connection with a CC-Link master station by connecting the optional CA-NCL10E unit. The CC-Link interface supports command execution, input / output control and measurement result data.
The settings in the Global Settings are used to set the station type, communication speed, and number of exclusive stations on the CC-Link. For more details, see the XG-7000 Series Communication Control Manual.

Reference

See "Installing the Communication Expansion Module" (Page 2-5) for more details on connecting the CA-NCL10E unit.

► Note

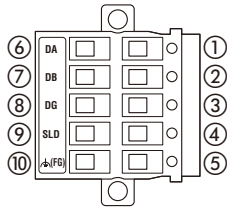
- The controller must be turned off before connecting or disconnecting the CA-NCL10E unit.
- Restart the controller and master station after changing the CC-Link settings.

CA-NCL10E CC-Link Specifications

Standard specifications

Item	
CC-Link station type	Ver. 1.10 remote device station
	Ver. 2.00 remote device station
Communication speed	156 kbps, 625 kbps, 2.5 Mbps, 5 Mbps, 10 Mbps
Connection cable	Ver. 1.10 compatible CC-Link cable FANC-110SBH, FA-CBL200PSBH, CS110 OP-79426, OP-79427
Max. total cable length	156 kbps 1200 m 625 kbps 900 m 2.5 Mbps 400 m 5 Mbps 160 m 10 Mbps 100 m
Count	Select 1 station, 2 stations, 3 stations, or 4 stations.
Cyclic settings (Ver. 2.00 only)	Select 1x, 2x, 4x, or 8x.

Connector Specifications



No.	Wire color	Signal name	Function
1, 6	Blue	DA	Communication wire "DA" for CC-Link. Connects to the master station or other slave stations (1 and 6 are shorted).
2, 7	White	DB	Communication wire "DB" for CC-Link. Connects to the master station or other slave stations (2 and 7 are shorted).
3, 8	Yellow	DG	Communication wire "DG" for CC-Link. Connects to the master station or other slave stations (3 and 8 are shorted).
4, 9	Bare wire	SLD	Shield. Connect the shielded wire of the CC-Link Ver. 1.10 compatible cable (OP-79426, OP-79427, etc.) (4 and 9 are shorted.).
5, 10	—	FG	Frame ground "FG" for CC-Link. Ground using Class D ground* (100 Ω or less) (5 and 10 are shorted).

*Use a cable with a nominal cross-section area of at least 2 mm^2 as the grounding cable.

Connecting to the CC-Link

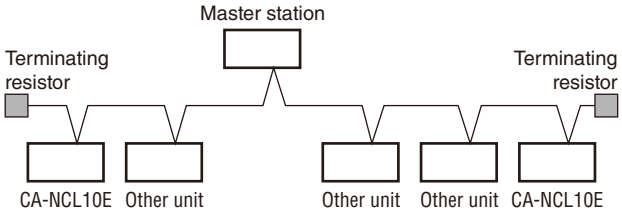
Precautions when wiring

Take note of the following when wiring the CA-NCL10E unit.

- When connecting the CA-NCL10E to a CC-Link network/ device, always use a CC-Link Ver. 1.10 compatible cable or a cable approved by the CC-Link Partner Association. Correct operation cannot be assured when using another type of cable.
- When a CC-Link cable is used near a high voltage/ current source or cable, electrical noise may cause operational errors. When using both a CC-Link cable and high voltage/current devices maintain at least 100 mm of separation between them.

Terminating resistor

When connecting a CA-NCL10E unit to both ends of the CC Link network, install a terminating resistor between CA-NCL10E terminals DA and DB. Make sure to install the terminating resistors, as they reduce signal noise and stabilize communications.

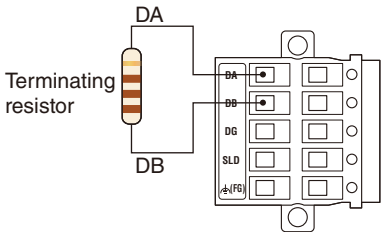


The terminating resistor will differ depending on the cable type

Two of each are shipped, one for terminating each end of the network with CA-NCL10E. Use the correct terminating resistor for the type of CC-Link cable being used.

Cable type	Terminating resistor
Ver. 1.10 compatible CC-Link cable FANC-110SBH, FA-CBL200PSBH, CS110 OP-79426, OP-79427	110Ω 1/2W Brown Brown Brown Gold
CC-Link cable	
CC-Link high-performance cable	130Ω 1/2W Brown Orange Brown Gold

CA-NCL10E terminating resistor installation



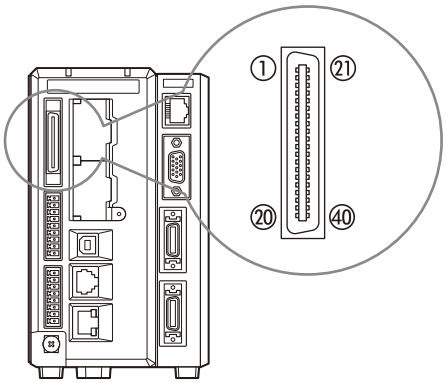
Reference

Because terminals 1 and 6, and terminals 2 and 7, are shorted, the terminating resistor can be installed either onto terminals 1 and 2, or onto terminals 6 and 7.

Parallel I/O Interface

Connector Specifications

The following details the parallel I/O connector specifications for the system.



Connector

FX2B-40SA-1.27R (Hirose Electric)

Color ribbon cable

UL20028-FRX-CF-40 (Fujikura, equivalent wire gauge AWG28)

Reference

In normal situations, use the specialized parallel connection cable (3 m) OP-51657 (optional).

Default pin assignment: Cable color when using OP-51657.

No.	Terminal name	Terminal description	Signal direction	Assigned default state*1				Circuit diagram (Page 8-25)	Cable color
				Assigned variable	Variable function*2	Bit	N.O/N.C		
1	COMIN2	Connector input common	-	-	-	-	-	-	Brown
2	IN0	General purpose input 0	Inputs	%CmdParam	Custom instruction parameter input	0	-	B	Red
3	IN1	General purpose input 1	Inputs	%CmdParam		1	-	B	Orange
4	IN2	General purpose input 2	Inputs	%CmdParam		2	-	B	Yellow
5	IN3	General purpose input 3	Inputs	%CmdParam		3	-	B	Green
6	IN4	General purpose input 4	Inputs	%CmdParam		4	-	B	Blue
7	IN5	General purpose input 5	Inputs	%CmdParam		5	-	B	Purple
8	IN6	General purpose input 6	Inputs	%CmdParam		6	-	B	Gray
9	IN7	General purpose input 7	Inputs	%CmdParam		7	-	B	White
10	IN8	General purpose input 8	Inputs	%CmdCode	Custom instruction No. input	0	-	B	Black
11	IN9	General purpose input 9	Inputs	%CmdCode		1	-	B	Brown
12	IN10	General purpose input 10	Inputs	%CmdCode		2	-	B	Red
13	IN11	General purpose input 11	Inputs	%CmdCode		3	-	B	Orange
14	IN12	General purpose input 12	Inputs	%CmdStrobe	Custom instruction assignment input (terminal)	0	-	B	Yellow
15	IN13	General purpose input 13	Inputs	%Reset	Reset input	0	-	B	Green
16	IN14	General purpose input 14	Inputs	%Pst	Output data input switch	0	-	B	Blue
17	COMOUT2	Connector output common	-	-	-	-	-	-	Purple

No.	Terminal name	Terminal description	Signal direction	Assigned default state*1				Circuit diagram (Page 8-25)	Cable color
				Assigned variable	Variable function*2	Bit	N.O/N.C		
18	OUT0	General purpose output 0	Output	%Ack	Pin command success confirmation output	0	N.O.	D	Gray
19	OUT1	General purpose output 1	Output	%Nack	Pin command failure confirmation output	0	N.O.	D	White
20	OUT2	General purpose output 2	Output	%Busy	Busy output	0	N.O.	D	Black
21	OUT3	General purpose output 3	Output	%CmdReady	Permission output for command input	0	N.O.	D	Brown
22	OUT4	General purpose output 4	Output	%Trg1Ready	Permission output for trigger 1 input	0	N.O.	D	Red
23	OUT5	General purpose output 5	Output	%Trg2Ready	Permission output for trigger 2 input	0	N.O.	D	Orange
24	OUT6	General purpose output 6	Output	%OutDataA	Data output of system variable %OutDataA	0	N.O.	D	Yellow
25	OUT7	General purpose output 7	Output	%OutDataA		1	N.O.	D	Green
26	OUT8	General purpose output 8	Output	%OutDataA		2	N.O.	D	Blue
27	OUT9	General purpose output 9	Output	%OutDataA		3	N.O.	D	Purple
28	OUT10	General purpose output 10	Output	%OutDataA		4	N.O.	D	Gray
29	OUT11	General purpose output 11	Output	%OutDataA		5	N.O.	D	White
30	OUT12	General purpose output 12	Output	%OutDataA		6	N.O.	D	Black
31	OUT13	General purpose output 13	Output	%OutDataA		7	N.O.	D	Brown
32	OUT14	General purpose output 14	Output	%OutDataA		8	N.O.	D	Red
33	OUT15	General purpose output 15	Output	%OutDataA		9	N.O.	D	Orange
34	OUT16	General purpose output 16	Output	%OutDataA		10	N.O.	D	Yellow
35	OUT17	General purpose output 17	Output	%OutDataA		11	N.O.	D	Green
36	OUT18	General purpose output 18	Output	%OutDataA		12	N.O.	D	Blue
37	OUT19	General purpose output 19	Output	%OutDataA		13	N.O.	D	Purple
38	OUT20	General purpose output 20	Output	%OutDataA		14	N.O.	D	Gray
39	OUT21	General purpose output 21	Output	%OutDataA		15	N.O.	D	White
40	COMOUT2	Connector output common	-	-		-	-	-	Black

*1 The default assigned state refers to the default system variables assigned to each pin in the Global menu. These assignments may vary if the Global settings have been changed.

*2 For more details, see "List of System Variables" in the XG VisionEditor Reference Manual.

► Note

- COMOUT2 for Pin 17 and Pin 40 are common.
- Power source 0V and COMIN1, COMIN2, COMOUT1, COMOUT2, COMOUT_F+, and COMOUT_F- are all isolated.
- COMIN2 is a common terminal exclusively for input pins 2 to 16 on the parallel I/O connector.
- COMOUT2 is a common terminal exclusively for output pins 18 to 39 on the parallel I/O connector.

Terminal Block Interface

Specifications

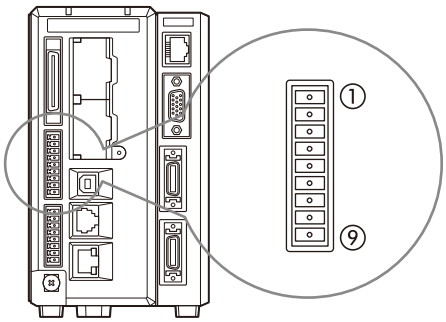
The terminal block specifications for the controller are as follows.

► Note

Tightening above the specified torque may cause damage to the terminal block

OUTPUT connector

Socket block



MC1.5/9-ST-3.5BK (Phoenix Contact)

Suitable wiring

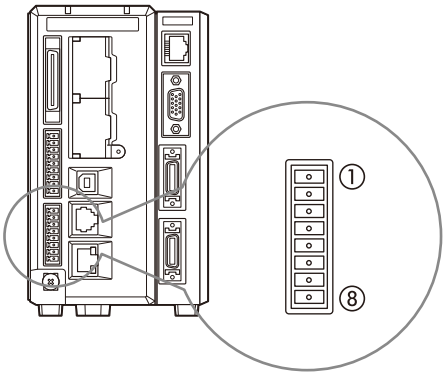
AWG 16 - 28

Terminal block screw torque

0.25 Nm or less

INPUT connector

Socket block



MC1.5/8-ST-3.5BK (Phoenix Contact)

Suitable wiring

AWG 16 - 28

Terminal block screw torque

0.25 Nm or less

Pin layout

OUTPUT connector

No.	Terminal name ( ) indicates labels printed on terminal blocks at time of shipment	Terminal description	Signal direction	Assigned default state*1				Circuit diagram (Page 8-26)
				Assigned variable	Variable function*2	Bit	N.O/N.C	
1	OUT22 (STO)	General purpose output 22	Output	%Sto	Strobe output for reading parallel terminal output unit data	0	N.O.	D
2	OUT23 (OR)	General purpose output 23	Output	%JAHold	Hold output general status	0	N.O.	D
3	F_OUT2 (ERR)	High-speed general purpose output 2	Output	%Error0	Error 0 output	0	N.O.	C
4	F_OUT3 (RUN)	High-speed general purpose output 3	Output	%Run	Run mode output	0	N.O.	C
5	COMOUT1 (COMOUT)	Common for terminal block outputs	-	-	-	-	-	-
6	F_OUT0 (FLS1)	High-speed general purpose output 0	Output	%Flash1	Strobe light output 1	0	N.C.	C

No.	Terminal name ( ) indicates labels printed on terminal blocks at time of shipment	Terminal description	Signal direction	Assigned default state*1				Circuit diagram (Page 8-26)
				Assigned variable	Variable function*2	Bit	N.O/N.C	
7	F_OUT1 (FLS2)	High-speed general purpose output 1	Output	%Flash2	Strobe light output 2	0	N.C.	C
8	COMOUT_F+ (COMF+)	(+) common for high-speed general purpose output terminals	-	-	-	-	-	-
9	COMOUT_F- (COMF-)	(-) common for high-speed general purpose output terminals	-	-	-	-	-	-

► Note

- Power source 0V and COMIN1, COMIN2, COMOUT1, COMOUT2, COMOUT_F+, and COMOUT_F- are all isolated.
- COMOUT1 is the OUT connector for the common terminals 1 to 2.
- COMOUT_F+ and COMOUT_F- are the common terminals for outputs 3 to 4 and 6 to 7.

INPUT connector

No.	Terminal name ( ) indicates labels printed on terminal blocks at time of shipment	Terminal description	Signal direction	Assigned default state*1				Circuit diagram (Page 8-26)
				Assigned variable	Variable function*2	Bit	N.O/N.C	
1	COMIN1 (COMIN)	Common for terminal block inputs	-	-	-	-	-	-
2	IN15 (PLC)	General purpose input 15	Inputs	%Plc	Custom instruction execution input (PLC)	0	-	B
3	F_IN0 (TRG1)	High-speed general purpose input 0	Inputs	%Trg1	Trigger 1 input	0	-	A
4	F_IN1 (TRG2)	High-speed general purpose input 1	Inputs	%Trg2	Trigger 2 input	0	-	A
5	F_IN2 (TEST)	High-speed general purpose input 2	Inputs	%Test	Trial run input	0	-	A
6	F_IN3 (EXT)	High-speed general purpose input 3	Inputs	%Ext	Disable trigger input	0	-	A
7	24VDC	+ power supply (DC 24 V) input	-	-	-	-	-	-
8	0 V	- power supply (0 V) input	-	-	-	-	-	-

*1 The default assigned state refers to the default system variables assigned to each pin in the Global menu. These assignments may vary if the Global settings have been changed.

*2 For more details, see "List of System Variables" in the XG VisionEditor Reference Manual.

► Note

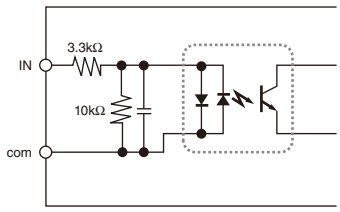
- Power source 0V and COMIN1, COMIN2, COMOUT1, COMOUT2, COMOUT_F+, and COMOUT_F- are all isolated.
- COMIN1 is the IN connector for the common terminals 2 to 6.

Input/Output Circuit

Input Connections

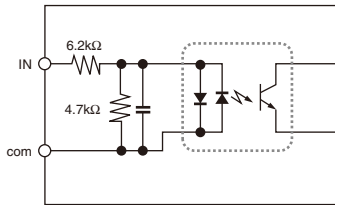
Input circuit diagram

Circuit A (For F_IN0 - 3, IN1 - 3 only, EV)



- Max. applied voltage: 26.4 V
- ON voltage: 10.8 V or greater
- ON current: 3 mA or greater
- OFF voltage: 5 V or less
- OFF current: 1 mA or less

Circuit B (other inputs)



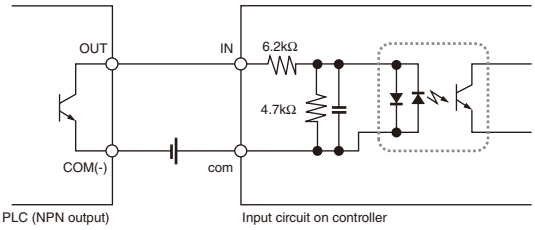
- Max. applied voltage: 26.4 V
- ON voltage: 10.8 V or greater
- ON current: 2 mA or greater
- OFF voltage: 3 V or less
- OFF current: 0.3 mA or less

Reference

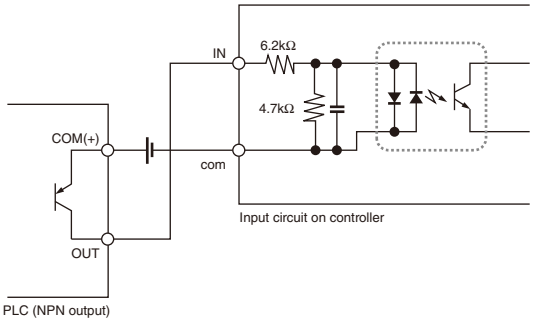
See "Pin layout" (Page 8-23) for common connections.

Example of connections

When connecting a NPN PLC output to the system input



When connecting a PNP output to the controller input



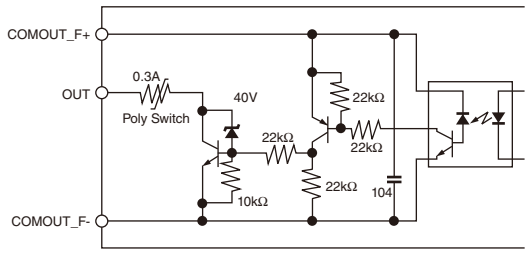
Output Connections

► Note

The overcurrent protective Poly Switch is set to trip at 1 A. For the power supplied to output, use a 1 A or larger power source.

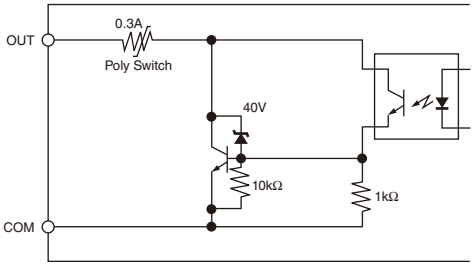
Output circuit diagram (NPN output type)

Circuit C (F_OUT0 - 3)



- Max. applied voltage: 30 V
- Max. sink current: 50 mA
- Leakage current: 0.1 mA or less
- Residual voltage:
  1.4 V or less (50 mA)
  1.0 V or less (20 mA)

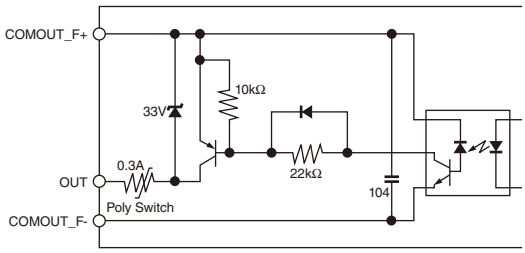
Circuit D (other outputs)



- Max. applied voltage: 30 V
- Max. sink current: 50 mA
- Leakage current: 0.1 mA or less
- Residual voltage:
  1.4 V or less (50 mA)
  1.0 V or less (20 mA)

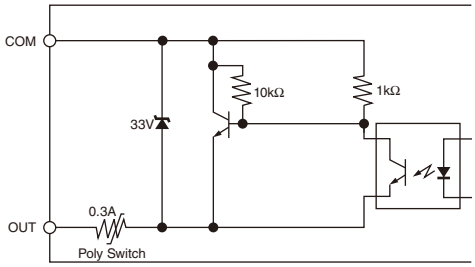
Output circuit diagram (PNP output type, controllers with a "P" at the end of the part number eg. XG-7702P)

Circuit C (F_OUT0 - 3)



- Max. applied voltage: 30 V
- Max. sink current: 50 mA
- Leakage current: 0.1 mA or less
- Residual voltage:
  1.4 V or less (50 mA)
  1.0 V or less (20 mA)

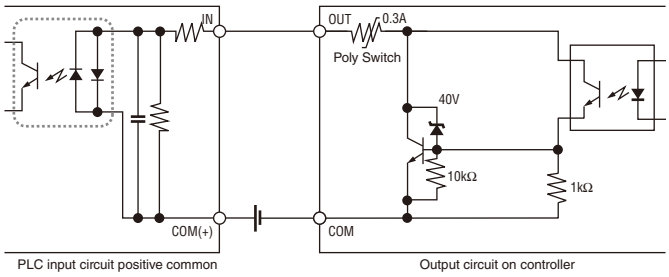
Circuit D (other outputs)



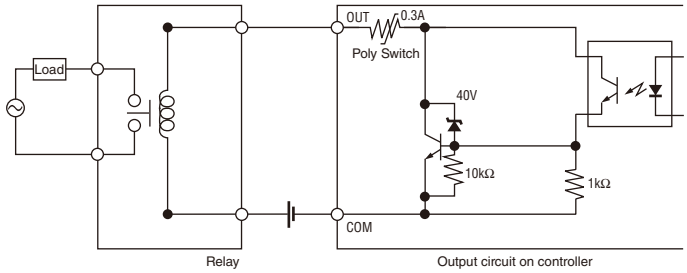
- Max. applied voltage: 30 V
- Max. sink current: 50 mA
- Leakage current: 0.1 mA or less
- Residual voltage:
  1.4 V or less (50 mA)
  1.0 V or less (20 mA)

Example of connections (system with NPN outputs)

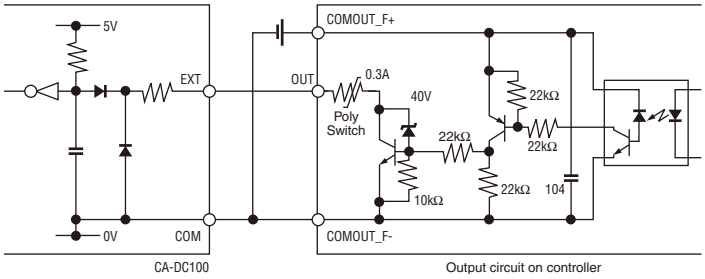
When connecting a NPN output from the controller to a PLC with a positive common



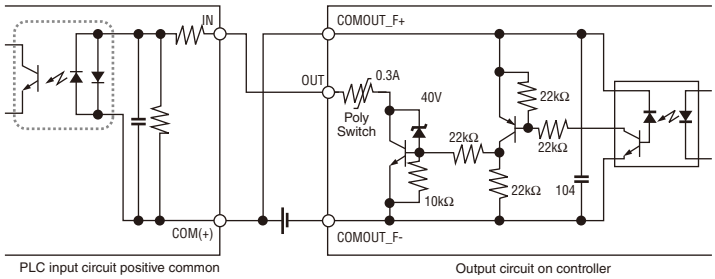
When connecting a NPN output from the controller to a relay



When connecting the F_OUT output (NPN) from the controller to the no-voltage input terminal for the CA-DC100 LED light controller



When connecting the F_OUT output (NPN) from the controller to a PLC with a positive common

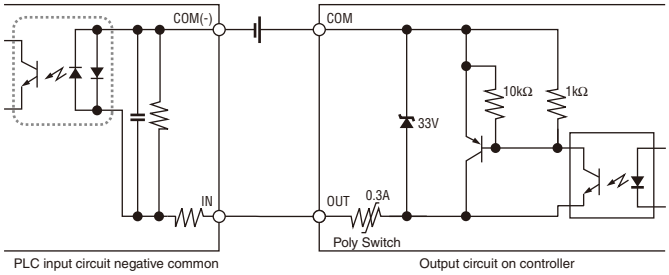


► Note

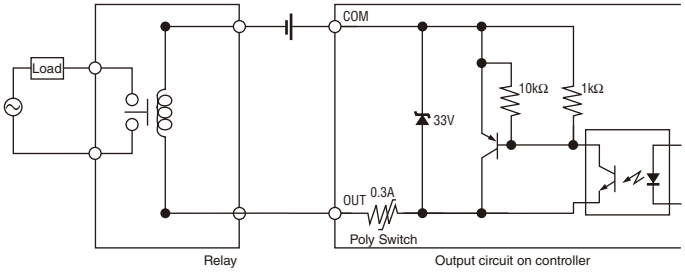
- The COMMON output terminal for the terminal block is the COMOUT1 terminal.
- The COMMON output terminal for the parallel I/O is the COMOUT2 terminal.

Example of connections (PNP output type, controllers with a "P" at the end of the part number eg. XG-7702P)

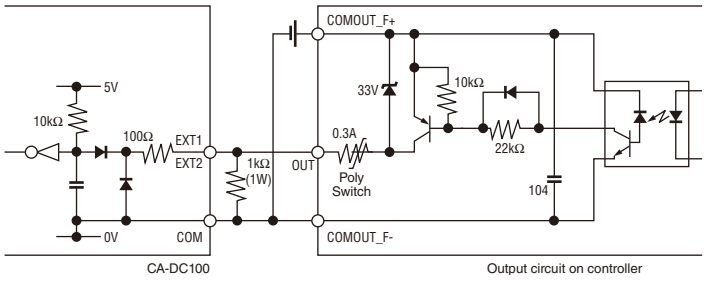
When connecting a PNP output from the controller to a PLC with a negative common



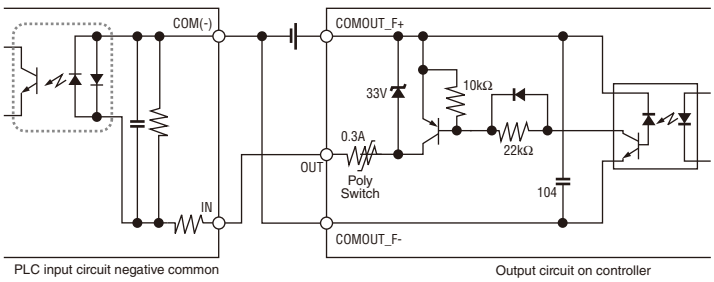
When connecting a PNP output from the controller to a relay



When connecting the F_OUT output (PNP) from the controller to the no-voltage input terminal for the CA-DC100 LED light controller



When connecting the F_OUT output (PNP) from the controller to a PLC with a negative common



► Note

- The COMMON output terminal for the terminal block is the COMOUT1 terminal.
- The COMMON output terminal for the parallel I/O is the COMOUT2 terminal.

Chapter 9

Specifications

Main Specifications

► Note

The number of settings available for all items listed depends on the total amount of available memory in the system.

Controller Unit (XG-7702/7502/7002/7002A)

	XG-7702	XG-7502	XG-7002	XG-7002A
Resolution	When XH-H500C/H500M is connected • 5 megapixel mode: 2432 (H) x 2050 (V), approx 4,990,000 pixels When XG-200C/S200C/ H200C/200M/S200M/ H200M is connected • 2 megapixel mode: 1600 (H) x 1200 (V), 1,920,000 pixels • 1 megapixel mode: 1024 (H) x 960 (V), approx. 980,000 pixels When XG-H100C/H100M is connected • 1 megapixel mode: 1000 (H) x 1000 (V), 1,000,000 pixels When XG-035C/S035C/ 035M/S035M/H035C/ H035M is connected • 310,000 pixel mode: 640 (H) x 480 (V), approx. 310,000 pixels • 240,000 pixel mode: 512 (H) x 480 (V), approx. 240,000 pixels	When XG-200C/S200C/ H200C/200M/S200M/ H200M is connected • 2 megapixel mode: 1600 (H) x 1200 (V), 1,920,000 pixels • 1 megapixel mode: 1024 (H) x 960 (V), approx. 980,000 pixels When XG-H100C/H100M is connected • 1 megapixel mode: 1000 (H) x 1000 (V), 1,000,000 pixels When XG-035C/S035C/ 035M/S035M/H035C/ H035M is connected • 310,000 pixel mode: 640 (H) x 480 (V), approx. 310,000 pixels • 240,000 pixel mode: 512 (H) x 480 (V), approx. 240,000 pixels	• 310,000 pixel mode: 640 (H) x 480 (V), approx. 310,000 pixels • 240,000 pixel mode: 512 (H) x 480 (V), approx. 240,000 pixels	640 (H) x 480 (V), approx. 310,000 pixels
Camera Inputs	Two digital color/ monochrome cameras (Compatible with XG-H500C/200C/S200C/ H200C/H100C/035C/ S035C/H035C/H500M/ 200M/S200M/H200M/ H100M/035M/S035M/ H035M, mixed connection possible)	Two digital color/ monochrome cameras (Compatible with XG-200C/S200C/H200C/ H100C/035C/S035C/ H035C/200M/S200M/ H200M/H100M/035M/ S035M/H035M, mixed connection possible)	Two digital color/ monochrome cameras (Compatible with XG-035C/S035C/H035C/ 035M/S035M/H035M, mixed connection possible.)	In addition to two analog cameras Keyence Corporation cameras (monochrome CA-CM20), the following cameras have also been tested to verify compatibility, however mixed connection is not supported: Sony (XC-HR50/XC-HR57/XC-56/ XC-ST50/XC-EI50/XC-EI30/XC-EU50), Toshiba Teli (CS8550Di/ CS8570D/CS8560D)
	• Two extra cameras can be connected by using the expansion unit XG-E700, for up to four cameras in total.			• Two extra cameras can be connected by using the expansion unit XG-E700A, for up to four cameras in total.
Trigger input	4-camera simultaneous/individual capture can be selected. (Simultaneous capture support limited to 2 cameras if XG-E700 is not connected.)			4-camera simultaneous capture/individual capture can be selected. (Simultaneous capture support limited to 2 cameras if XG-E700A is not connected.)
Main image processor	DSP (High-speed)		DSP	DSP (High-speed)
Program capacity	SD Cards 1 and 2 can each hold 1,000 programs (depending on the size of the SD card and the size of the programs), external switching possible.			
Number of registered images	Maximum 1,000 screens per set camera (depending on SD card size). Image registration and partial image registration support JPEG compression for saving and position adjustment. External switching is possible through referencing variables.			

			XG-7702	XG-7502	XG-7002	XG-7002A
SD card			SD card slot x 2 (SDHC compatible) Compatible with OP-87133 (512 MB), CA-SD1G (1 GB: equipped as standard in SD1 slot), and CA-SD4G (4 GB: SDHC).	• SD card slot x 2 (SDHC compatible) • Compatible with OP-87133 (512 MB: Equipped as standard in SD1 slot), CA-SD1G (1 GB), CA-SD4G (4GB: SDHC).		
Number of units			1,000 units maximum per inspection program (depending on system memory capacity)			
Image Acquisition Unit		Capture	• Supports simultaneous capture for up to four cameras • Supports buffered image processing using image buffer memory • Supports multiple placement and loop execution • Compatible with HDR capture (cannot be used simultaneously with image capture buffer). • Supports variable referencing across a range of setting parameters • Supports trigger delay for each camera • Supports CA-DC21E lighting module, pattern, strobing and intensity settings.			
Vision Tools	Processing	Inspection region (Regions supported depends on unit)	• Supported region shapes: rectangle, rotated rectangle, circle, oval, ring, arc, polygon (up to 12 sides), and composite (up to 32 individual regions including masks). • Image region (inspection region generated from a binary image) • Supported mask regions: 4 per single unit (excluding composite regions). • Supports variable referencing for both inspection and mask regions.			
		Inspection region (Regions supported depends on unit)	• Available filters: Expand, Shrink, Average, Median, Edge Sharpening, Edge Extract X, Edge Extract Y, Sobel, Prewitt, Roberts, Laplacian, Binary, Subtract, Preserve Intensity, Contrast Conversion, Image Extraction, Shading Correction, Blur, Custom (3 x 3 or 5 x 5), Custom (Advance) (up to 21 x 21 convolution, expand, shrink), Blob. • Iterations: The same enhancement can be repeated individually up to 9 times. (except: binarization, subtract, preserve intensity, contrast conversion, shading correction, blur, blob: 1 iteration). Stacking: 13 steps, any combination (binarization, subtract, blob: can only be applied once in stack). • Supports variable referencing across a range of setting parameters			
		Color extraction (Only available when a color camera is connected)	• Color to binary, color to gray, fine color, gray, RGB gray (Color can be specified in HSB terms fine color can only be selected for defect mode) • Supports variable referencing across a range of setting parameters			
		Calibration function	• Individual calibration can be applied to units X, Y and length data (variable referencing allowed). • Calibration can be turned ON/OFF for each inspection unit.			
		Execute	• Unit execution can be configured in the system settings to apply only to XG VisionEditor or to the controller. • Unit results, variable referencing allowed.			
	Presence / Absence	Area	Counts the number of white or black pixels.			
	Position detection	Pattern Search	• Supports multiple pattern searches for up to 99 patterns oriented throughout 360 degrees. • Supports variable referencing for search, pattern and 4 mask regions. • Supports variable referencing for detection point offsets. • Supports referencing of registered images using image variables for processing.			
		Edge Position	• Measures up to 3,600 positions simultaneously. • Supports angle measurement using ring and arc inspection regions.			
		Profile Position	• Measures the average, maximum, and minimum edge positions in a single inspection region divided into up to 5,000 segments. • Supports angle measurement using ring and arc inspection regions. Detects straight lines and circles from a group of detection points using the least-squares method (with correction).			
		Blob	Measures the center of gravity and main axis angle (180/360 degrees selectable) for up to 9,999 blobs.			

			XG-7702	XG-7502	XG-7002	XG-7002A
Vision Tools (continued)	Inspection Tools	Edge Width	Measures the distance between two edges (outer gap, inner gap, specified edges for up to 1800 detected edges).			
		Edge Pitch	Measures the gap pitch and center pitch for up to 1,800 detected edges.			
		Edge Angle	Measures the angle between two detected edges.			
		Edge Pair	Measures the gap pitch and center pitch for up to 3,600 detected edges formed into pairs from two scans.			
		Profile Width	Measures the average, maximum, and minimum edge widths between two edges (outer gap, inner gap) in a single inspection region that has been divided into up to 5,000 segments.			
		Blob	Labels and counts up to 9,999 blobs measuring the center of gravity, main axis angle (180/360 degrees selectable), area, feret diameter, perimeter, roundness, width, aspect ratio, major axis, box height and axes ratio.			
		Defect	• Detects flaws and defects inside a region by comparing the average intensity of segments. • Supports image subtracted defect detection by using a subtraction filter from a registered image. • Supports multiple detection of up to 99 groups using the defect grouping function, detected position, and filtering based on feature characteristics. • Supports direct measurement of the color image using fine color. • Supports image contrast display.			
		Profile Defect	• Detects a defect (protrusion or indentation) that deviates in shape with respect to a model line based on detected edge points of a target profile. • Supports flaw detection using straight lines, circles, ovals, and free-form curves as model lines.			
		Intensity	• Measures the pixel intensity value. • Required as the reference unit for the preserve intensity filter.			
		Color (Only available when a color camera is connected)	RGB and HSB measurement supported.			
		OCR	• Supports character recognition of alphanumeric characters and user specified symbols for up to 2 lines of 20 characters (40 total) identified automatically or from a fixed region. • Supports a user-definable library of up to 200 characters, including 20 custom characters. Supports a calendar tolerance function (with zero suppression and offset function). • Supports encrypted date and time and shift codes.			
		2D Code Reader	• Supports reading of 2D codes (QR codes: Model 1/Model 2, Micro QR, DataMatrix, Rectangular DataMatrix: ECC200) up to 512 characters, and data splitting (up to 8 sections). • Supports up to 16 registered patterns and date & time tolerances (with zero suppression, and offset function).			
Position Adjustment Unit			• Provides 1- or 2-point position correction for X, Y, and q (±180 degree) orientation of inspection, image operation and on-screen graphics units. • Supports referencing by all or individual measurement units. • Supports batch reference registration using a registered image.			
Flowchart Units		Branch Join	• Supports up to 64 flow branches per unit based on a reference (unit results, variable reference). • Supports forced branch instructions for retesting.			
		Loop Function	Supports multiple unit execution control based on the number of loops (fixed or variable reference) specified.			
		Break	Forced exit from loops.			
		End	Ends the flow processing.			

		XG-7702 XG-7502 XG-7002 XG-7002A
Operation Units	Calculation	• Allows multiple calculation processing separated by line feeds. Can contain up to 5000 characters including comments. • Supports Timeout-based and answer-based (ANS) unit judgment. • Arithmetic operators: Add, subtract, multiply, divide, remainder, power. • Logic operators: NOT, AND, OR, XOR. • Comparison operators: equal, not equal, greater than, less than, more than inclusive, less than inclusive. • Arithmetical functions: Abs, AsCircle, AsLine, AsPoint, Atoi, Ave, Ave2 (array), AveR (range), AveR2 (array, range), Ceil (round up), Deg (radian to degree), Exp, Floor, Int (round off), Ln, Log, Max, Min2 (array), MaxN (index), MaxN2 (index, array), Min, Min2 (array), MinN (index), MinN2 (index, array), Pi, Rad, Round (round up), Sort, Sqr, Sqrt, Sum (array) • Trigonometric functions: Sin, Cos, Tan, Asin, Acos, Atan, Atan2 (P1/P2) • Geometric functions: AngC, Angle, AngW, Circle3 (3 points), CircleLs (array), CircleTangent, ConvCrd, ConvCrd2, Dist, ISect, I2Circle, ILineCircle, Line (2 points), LineLs (array), LLAngle, LnAngle, LnDist, LnDistP (sign), LnDistXY, VMidLine, MidXY, Rotate, RotCenter, MidLine, ConvPixToWld, ConvWldToPix, MultiPtCalib, AddVector, SubVector, OuterProd, InnerProd • Calender functions: ShiftDay, ShiftMonth, ShiftYear • Bit functions: B_And, B_Not, B_Or, B_Xor, Bind • Statements: FOR, STEP, NEXT, EXIT FOR, IF, ELSE IF, END IF, DO WHILE (undefined loop), EXIT DO (undefined loop), comments, continue to next line • Others: Calculation results • Displays and highlights calculation errors.
	Image operation	• Creates images based off of a feature extracted from one or multiple images, or an image with enhanced intensity differences. • Operation: Processing across multiple images. Supports a combination of 1:1, n:1, n:n (max n is 32) images • Conversion: Operation processing performed on one image. • Operation types: Add, Subtract, AbsoluteDifference, Average, Multiply (with normalization), Multiply (without normalization), Max, Min, AND, OR, XOR, NAND, NOR, XNOR • Conversion types: Add, Subtract, AbsoluteDifference, Multiply, Rotation, Translation, Z, Trapezoid Correct, Pixel Val. Conv., Blob, NOT, AND, OR, XOR, NAND, NOR, XNOR, Right Bit Shift, Left Bit Shift
	C Plug in	• C language source files can be compiled for both controller and PC simulation environments.(Supported compilers: For the controller: Texas Instruments C6000 Code Generation Tools 6.0.* or 6.1.* (6.0.11 recommended), For the PC: Microsoft Visual Studio 2005/2008/2010, Visual C++ 2008/2010 Express Edition.) • Supports access to pixel values from the specified image variable. • Local variables, global variables, and system variables values can be passed for referencing and rewriting (rewriting not supported for system variables). • Visual Studio debugging.
	Calibration	• Lens and trapezoidal distortion can be corrected by teaching a calibration pattern. • Supports two forms of correction, based off of the image itself, and by calculating the coordinates. • Multiple calibration patterns can be used during teaching. • User defined calibration patterns available for printing.
Timing Units	Pause	Pause flow for specified time (0 ms to 1 hour: fixed or variable reference)
	Timer start	Start user timer (0 to 7)
	Timer end	Pause flow for time based on user timer (0 to 7)
	Terminal I/O delay	• Pause flow based on AND/OR evaluation of up to 20 terminals for state changes (edge/level, ON/OFF, rising/trailing edge). • Supports CC-Link bit devices
	Variable Delay	Pause flow based on AND/OR evaluation from comparing results of variables (max 8) and reference values (max 2).
	User menu	Pause flow from the time a dialog is open to the time it is closed.
Display Unit	On-screen graphics	Displays graphic objects and characters linked to variables and step results. Graphic objects: rectangle, rotated rectangle, circle, oval, ring, arc, point (rotating crosshair), line Characters: text, values, active text, OCR/codes.

		XG-7702	XG-7502	XG-7002	XG-7002A
Output Unit	Parallel terminal output	• Outputs user-defined inspection results to the I/O terminals. • Supports time-delayed separated outputs of up to of 28 points up to 8 times. • Skips data output for unexecuted units. • Output priority can be set for processing images or outputs.			
	Data output	• User-defined inspection results (256 maximum) can be output to any of the following: the SD card, RS-232C, Ethernet, CC-Link, EtherNet/IP, PLC-Link, or PC Program (ActiveX). • Supports use of up to 16 custom-formatted output strings. • Skips data output for unexecuted units. • User defined output folder and file naming rules (when outputting to the SD card or PC Program (ActiveX)) • Output priority can be set for processing images or outputs.			
	Image output	• Outputs image data for an image variable to either the SD card or PC Program (ActiveX). (BMP / JPG selectable file format) • User defined output folder, folder spanning (by no. of images or date), and file naming rules. • Output priority can be set for processing images or outputs.			
Command Units	Command Execution	Any command can be issued to the controller during Run mode from the image processing flow.			
Common Outputs	Total Status Output	Outputs the logical OR of the results of selected units as the total status.			
	Total Error Output	Outputs the logical OR of unit errors of selected units as the total error.			
Setting editing function	Program editing function	• Allows the creation of new programs and deleting/copying/renaming of programs in run mode. • Adding units to a flowchart or editing units in a flowchart (Image Acquisition, Vision Tool, Operations, Functions, Timing, Display, Output, Execute Command) • Available menus: Variables, Setup Total Status, Setup Total Error, Setup Scale Factor, Camera Selection, Image Capture Buffer Settings, Setup Statistics, Setup Image Archive, Setting FTP Server, Update Variables, Update Reference Image Information, and Update Reference Position Information • Supports creation and editing of display template screens using the Screen Editor.			
	Global settings editing function	• The global settings can be edited in offline mode. • System Settings (Controller name, Date & Time, Language, Registered Image File Type, Overall Menu Opacity, Unit Execution, Startup Mode) • Cameras (Settings, White Balance), Communications & I/O (Parallel Port, Ethernet (TCP/IP), RS-232C (no protocol), PLC-Link, CC-Link, EtherNet/IP, VNC), OCR Custom Calendar, Custom Command Settings, Calibrate CA series Touch Panel			
Retest Function		• Supports re-measurement and inspection program edit using archived images, selected image files, and master images (specified via the image strip) during retest mode (non-stop optional selection available). • Supports the function that links with statistical analysis from batch tests.			
Image capture range	Processing area setting	• The applicable 980,000 pixels (1024 (H) x 960 (V)) can be captured from 1,920,000 pixels (1 megapixel mode). • 240,000 pixels (512 (H) x 480 (V)) can be captured at any position from the 320,000 pixels* (standard mode). *310,000 pixels when XG-H035C/H035M is connected		The applicable 240,000 pixels (512 (H) x 480 (V)) can be captured from 320,000 pixels*	-
	Scanning method selection (only when a monochrome camera is connected)	Progressive/interlace selectable			Choice of progressive/ interlace scanning (XC-ST50 and XC-E*** fixed to interlace)
	Capture Start/ End Line Setting function	Capture start/end lines can be set anywhere within the image capture range. (XG-H200C and H200M cannot capture fewer than 100 lines.) Capture start line be changed for each capture unit by referencing variables.			• Scanning lines cannot be specified. • Partial capture supported by the selection of the default width in Y axis.(XC-ST50 and XC-E*** not supported)

		XG-7702	XG-7502	XG-7002	XG-7002A
Correction function	Camera gain adjustment	Sensitivity offset and span adjustment (RGB batch/individual and span can be set for each of 16 brightness levels. RGB individual settings are supported when a color camera is connected.)			
	White Balance adjustment (color camera only)	Manual adjustment using white target			
	Image inversion function	Mirrored image generation			
	Scaling function	Supports calibration and scaling for X, Y, and length for each camera. Scaling also supported based on measurement and calculation values.			
Display Screens	Screen configurations	Supports 100 screens per program with external switching possible. Display control according to user group.			
	Frames	99 frames per screen with, external switching possible.			
	Image displays	• 5 individually customizable (layout and size) displays per screen. • Display the current image from a user-specified camera, a registered image, as well as any user-specified archived image stored in the system's image memory. • Zoom capability linked to inspection regions of user-specified vision tools or primary targets. • Selection with external control.			
	Screen parts	• Display base frame, page frame • Basic parts: values, text, active text, horizontal line, vertical line, point, rectangle, circle, polygon. • Standard parts: program name, date, time, display camera & image information, display area & magnification, Total Status Pass / Fail, Logo Image (BMP), Unit Details (Vision Tools), Unit Details (Non-Vision Tools), Variable List, Unit Pass / Fail Graphic, Unit Result Summary List.			
Menus	Menus	• Maximum of 900 per program with, external switching possible. • Supports dialog based menus that can be used to change or set various parameters while the controller is in Run mode. (Dialog transparency can be changed to 100%, 90%, 75%, 50%, or 25%) • Screens can be linked to dialogs being used.			
	Elements	Text, numerical input, drop down menus, option button, confirmation button.			
	Built-in Menus	Inspection Region, Register Image, Color Extraction, Statistics, Image Archive, Library, Unit Properties, View Toolbar, Retest, Function, Change Program, File Management, I/O Monitor & Diagnosis, RS-232C Monitor, Change User, Setup Date/Time, Save Program, Rename Program, Copy/Delete Settings, Save/Load Settings, Stop SD2 Operation, Update Variables, Resources, Settings, Variables, Total Status Output, Total Error Output, Setup Scale Factor, Image Capture Buffer Settings, Setup Statistics, Setup Image Archive, Camera Selection, FTP Settings, Variable Update Settings • Inspection Region, Color, library dialogs support changes based on login permissions. • Image Registration dialog can reference the amount of correction provided by the reference unit. • Unit properties dialog can be used for all units except the C PlugIn unit dialogs. • Holding default variable values can be enabled for Variables and New / Edit / Delete Programs dialogs.			
	Edit Unit Unit edit menus	• Supports changes to settings of pre-configured units (Image Acquisition, Vision Tools, Position Adjustment, Operations, Functions, Timing, Display, Output, Execute Command). • Supports the choice of image to be displayed (current or registered image) and controller operation (trigger input, and outputs) when dialog opened. • Supports the updating of registration reference values from registered images.			

			XG-7702	XG-7502	XG-7002	XG-7002A
Support functions	Statistics	Data points	Maximum of 100,000 data points per item and maximum of 256 items (can be saved onto an SD card in a single operation).			
		Data	Maximum, minimum, average, deviation (3σ), total status OK/NG count			
	Image Archive		• The number of images that can be archived in the controller's image memory is as follows: - Maximum 1013 images (monochrome camera in 240,000 pixel mode) - Maximum 501 images (monochrome camera in 310,000 pixel mode) - Maximum 245 images (monochrome camera in 1 megapixel mode) - Maximum 117 images (monochrome camera in 2 megapixel mode) - Maximum 40 images (monochrome camera in 5 megapixel mode) - Maximum 1008 images (color camera in 240,000 pixel mode) - Maximum 498 images (color camera in 310,000 pixel mode) - Maximum 240 images (color camera in 1 megapixel mode) - Maximum 112 images (color camera in 2 megapixel mode) - Maximum 35 images (color camera in 5 megapixel mode)	- Maximum 501 images (monochrome camera in 240,000 pixel mode) - Maximum 245 images (monochrome camera in 310,000 pixel mode) - Maximum 117 images (monochrome camera in 1 megapixel mode) - Maximum 53 images (monochrome camera in 2 megapixel mode) - Maximum 496 images (color camera in 240,000 pixel mode) - Maximum 242 images (color camera in 310,000 pixel mode) - Maximum 112 images (color camera in 1 megapixel mode) - Maximum 48 images (color camera in 2 megapixel mode)	- Maximum 501 images (monochrome camera in 240,000 pixel mode) - Maximum 245 images (monochrome camera in 310,000 pixel mode) - Maximum 496 images (color camera in 240,000 pixel mode) - Maximum 242 images (color camera in 310,000 pixel mode)	- Maximum 245 images (CA-CM20: 310,000 pixel mode)
			• Simultaneously processing of up to 8 archives with different content. • Archive images as single or multiple images. Choice of buffer control either by overwriting the buffer each time or by processing until the buffer is full. • Supports storage of result data to allow reproduction of measurement conditions at the time the image was recorded. • Supports archived data output to SD card, PC Program (ActiveX), or FTP server for each archive.			
	Setting assistance	Image zoom in/out	Capable of zooming during operation from 4% to 2500%. Supports display scrolling by handheld controller or linked to the measurement position. (Zoom ratio can be set individually when showing multiple displays).			
		Edge differential waveform display	Graphically displays edge waveform and measurement values during operation.			
		Profile display	Graphically displays profile position and width of all detected edges during operation.			
		Contrast display	Graphically displays defect detection (defect level) during operation.			
		Waveform display	Graphically displays OCR character extraction during operation			
		Defect graph display	Displays a defect graph of profile defects during operation.			
		Variable Change	• Allows local variables, global variables, or system variables to be checked and changed during operation. (System variables can be checked only.) • Supports group settings and screen display selection.			
	SD card save function		• The following data can be saved (apart from program data) directly while running inspections: Measurement value, judgment result, NG count, processed image BMP/JPG, archived image (BMP/JPG), raw image, statistical analysis data, RS-232C communication log, program datas, operation log. • User-specified camera images can be saved in offline mode.			
	Other		Screen capture change logged in user, file management, I/O monitoring, RS-232C monitoring (with logging capability)			

		XG-7702	XG-7502	XG-7002	XG-7002A
Interface	Control inputs (user-assignable)	20 inputs (including 4 high-speed inputs assignable as trigger inputs). Input rating 26.4 V or less, 2 mA or more (high-speed inputs 3 mA or more).			
	Control outputs (user-assignable)	28 outputs (including 4 high-speed outputs usable as FLASH outputs synchronized with the trigger inputs). NPN open collector, maximum 50 mA (30 V or less) *1			
	Monitor output	Analog RGB output SVGA 800 x 600 (24-bit color 60 Hz)			
	Operation indicators	Power, Error LED display			
	RS-232C	Numerical value and control input/output, max baud rate 115200 bps (used exclusively with the CA series touch panel)			
	PLC-Link	• Allows numerical value output and control input/output using the RS-232C port or Ethernet port (cannot be used together with CC-Link or EtherNet/IP) (CA port cannot be used together with a CA Series touch panel.)) • The following PLC are supported through PLC link. *2 - Keyence KV-700 Series, KV-1000 Series, KV-3000 Series, KV-5000 Series, KV-5500 Series - Mitsubishi Electric: A Series (RS-232C only), Q Series, L Series - OMRON: SYSMAC C Series (RS-232C only), CP1/CS1/CJ1/CJ2 Series - Yasukawa Electric MP900 Series (RS-232C only), MP2000 Series			
	Ethernet	• Numerical value, and control input/output. • PC connectivity for Keyence V-Works software to connect to the system for the upload/download of programs and data including images, and to perform various simulations. • Supports FTP client functions • Supports BOOTP functions • 1000BASE-T/100BASE-TX/10BASE-T			
	USB	• PC connectivity for Keyence V-Works software to connect to the system for the upload/download of numerical value output, programs, data including images, and to perform various simulations. • USB 2.0 only			
	CC-Link	• The optional CC-Link unit CA-NCL10E can be connected for numerical value output and control input/output (cannot be used together with PLC-Link or Ethernet/IP). • Compatible with Ver. 1.10 and Ver. Ver. 2.00 remote device stations			
	EtherNet/IP	• Allows numerical value output and control input/output using the Ethernet port (cannot be used at the same time as PLC-Link or CC-Link). • Supports cyclic communication (max. 1436 bytes) and message communication. • Max. connections: 32 • Complies with conformance test Version A7.			
	Handheld controller	• OP-84231 or OP-84236 (blank) providing menu access and navigation. • Programmable function buttons. • Button functionality enabled / disabled based by user groups.			
	Touch panel	• Using the RS-232C port, the setting operation is possible from the CA series touch panel (No protocol communication using the RS-232C, Cannot be used with the PLC link). • Supports the special touch menu and control buttons.			
Display language		Japanese/English/Simplified Chinese/Traditional Chinese switching			
Illumination control		Optional illumination expansion unit CA-DC2021E for LED light (12 V, 24 V) illumination and intensity control 2channels per unit, maximum of 4 units (8 channels total)			
Rating	Power supply voltage	24 V DC ±10%			
	Power consumption *3	2.4 A (2 cameras connected) / 3.2 A (4 cameras connected)		2.2 A (2 cameras connected) / 2.8 A (4 cameras connected)	2.2 A (2 cameras connected) / 2.6 A (4 cameras connected)
Environmental resistance	Ambient temperature	• With 2 cameras connected: 0 to +50°C (single megapixel camera: 0 to +45°C) • With 4 cameras connected: 0 to 45°C		0 to +50°C	• With 2 cameras connected: 0 to +50°C • With 4 cameras connected: 0 to +45°C
	Relative humidity	35 to 85% RH (no condensation)			
Weight		Approx. 1250 g			Approx. 1,300 g

*1 Inquire to Keyence when your application requires a PNP-type interface.

*2 Models equipped with an Ethernet port on the CPU unit support direct connection to the Ethernet port.

*3 Includes rush current at startup (under maximum load)

Cameras (XG-H500C/H500M)

		XG-H500C	XG-H500M
CCD		2/3-inch color CCD, square element all pixels 11x-speed reading (2 outputs), 5,050,000 pixels	2/3-inch monochrome CCD, square element all pixels 11x-speed reading (2 outputs), 5,050,000 pixels
CCD pixel size		3.45 µm x 3.45 µm	
Effective pixels		4,990,000 pixels 2432 (H) x 2050 (V)	
Scanning method		Progressive (61.2 ms)	Progressive (61.2 ms), interlace (40.3 ms) Interlace is a binning process which sums the odd lines and even lines.
Image transfer frequency		130 MHz (65 MHz x 2 ch)	
Transfer system		Digital serial transfer	
Electronic shutter		1/15, 1/30, 1/60, 1/120, 1/240, 1/500, 1/1000, 1/2000, 1/5000, 1/10000, 1/20000 0.05 ms to 9000 ms can be set through manual input	
Lens mount		C-mount	
Environmental resistance	Ambient temperature	0 to +40°C	
	Relative humidity	35 to 85% RH (no condensation)	
Weight		Approx. 130 g (lens not included)	

Cameras (XG-H200C/H200M)

		XG-H200C	XG-H200M
CCD		1/1.8-inch color CCD, square element all pixels 7x-speed reading, 2,010,000 pixels	1/1.8-inch monochrome CCD, square element all pixels 7x-speed reading, 2,010,000 pixels
CCD pixel size		4.4 µm x 4.4 µm	
Effective pixels		1,920,000 pixels, 1600 (H) x 1200 (V) (In the 1 megapixel mode, 980,000 pixels (1024 x 960) of the 1,920,000 pixels are in the process area.)	
Scanning method		Progressive (29.2 ms: 2 megapixel mode, 24.2 ms: 1 megapixel mode)	Progressive (29.2 ms: 2 megapixel mode, 24.2 ms: 1 megapixel mode), interlace (16.1 ms: 2 megapixel mode, 13.6 ms: 1 megapixel mode) Interlace is a binning process which sums the odd lines and even lines.
Image transfer frequency		82 MHz (41 MHz x 2 ch)	
Transfer system		Digital serial transfer	
Electronic shutter		1/15, 1/30, 1/60, 1/120, 1/240, 1/500, 1/1000, 1/2000, 1/5000, 1/10000, 1/20000 0.05 ms to 9000 ms can be set through manual input	
Lens mount		C-mount	
Environmental resistance	Ambient temperature	0 to +40°C	
	Relative humidity	35 to 85% RH (no condensation)	
Weight		Approx. 130 g (lens not included)	

Cameras (XG-200C/S200C)

		XG-200C	XG-S200C
CCD		1/1.8 type color CCD, square pixels reading, 2x-speed reading 2,010,000 pixels	
CCD pixel size		4.4 µm x 4.4 µm	
Effective pixels		Color 1,920,000 pixels, 1600 (H) x 1200 (V) In the 1 megapixel mode, 980,000 pixels (1024 x 960) of the 1,920,000 pixels are in the process area.)	
Scanning method		Progressive (58.5 ms: 2 megapixel mode, 47.6 ms: 1 megapixel mode)	
Image transfer frequency		40 MHz	
Transfer system		Digital serial transfer	
Electronic shutter		1/15, 1/30, 1/60, 1/120, 1/240, 1/500, 1/1000, 1/2000, 1/5000, 1/10000, 1/20000 0.05 ms to 9000 ms can be set through manual input	
Lens mount		C-mount	Special mount (M15.5 P0.5 male)
Environmental resistance	Ambient temperature	0 to +40°C	• Head: 0 to +40°C • Amplifier: 0 to +40°C (35°C or less when using partial capture of 50 lines or less)
	Relative humidity	35 to 85% RH (no condensation)	
Weight		Approx. 110 g (lens not included)	• Head: approx. 210 g (cable included, lens not included) • Amplifier: approx. 70 g

Cameras (XG-200M/S200M)

		XG-200M	XG-S200M
CCD		1/1.8 type monochrome CCD, square pixels reading, 2x-speed reading 2,010,000 pixels	
CCD pixel size		4.4 µm x 4.4 µm	
Effective pixels		1,920,000 pixels, 1600 (H) x 1200 (V) (In the 1 megapixel mode, 980,000 pixels (1024 x 960) of the 1,920,000 pixels are in the process area.)	
Scanning method		Progressive (58.5 ms: 2 megapixel mode, 47.6 ms: 1 megapixel mode) Interlace (32.7 ms: 2 megapixel mode, 27.0 ms: 1 megapixel mode) Interlace is a binning process which sums the odd lines and even lines.	
Image transfer frequency		40 MHz	
Transfer system		Digital serial transfer	
Electronic shutter		1/15, 1/30, 1/60, 1/120, 1/240, 1/500, 1/1000, 1/2000, 1/5000, 1/10000, 1/20000 0.05 ms to 9000 ms can be set through manual input	
Lens mount		C-mount	Special mount (M15.5 P0.5 male)
Environmental resistance	Ambient temperature	0 to +40°C	• Head: 0 to +40°C • Amplifier: 0 to +40°C (35°C or less when using partial capture of 50 lines or less)
	Relative humidity	35 to 85% RH (no condensation)	
Weight		Approx. 110 g (lens not included)	• Head: approx. 210 g (cable included, lens not included) • Amplifier: approx. 70 g

Cameras (XG-H100C/H100M)

		XG-H100C	XG-H100M
CCD		2/3-inch color CCD, square element all pixels 7x-speed reading (2 outputs), 1,040,000 pixels	2/3-inch monochrome CCD, square element all pixels 7x-speed reading (2 outputs), 1,040,000 pixels
CCD pixel size		7.4 µm x 7.4 µm	
Effective pixels		1 megapixel 1000 (H) x 1000 (V)	
Scanning method		Progressive (20.5 ms)	Progressive (20.5 ms), interlace (13.9 ms) Interlace is a binning process which sums the odd lines and even lines.
Image transfer frequency		80 MHz (40 MHz x 2 ch)	
Transfer system		Digital serial transfer	
Electronic shutter		1/15, 1/30, 1/60, 1/120, 1/240, 1/500, 1/1000, 1/2000, 1/5000, 1/10000, 1/20000 0.05 ms to 9000 ms can be set through manual input	
Lens mount		C-mount	
Environmental resistance	Ambient temperature	0 to +40°C	
	Relative humidity	35 to 85% RH (no condensation)	
Weight		Approx. 120 g (lens not included)	

Cameras (XG-H035C/H035M)

		XG-H035C	XG-H035M
CCD		1/3-inch color CCD, square element all pixels 7x-speed reading (2 outputs), 340,000 pixels	1/3-inch monochrome CCD, square element all pixels 7x-speed reading (2 outputs), 340,000 pixels
CCD pixel size		7.4 µm x 7.4 µm	
Effective pixels		31,000,000 pixels, 640 (H) x 480 (V) (In standard mode, 240,000 pixels (512 x 480) of the 310,000 pixels, or else all 310,000 pixels (640 x 480), are used in the process area.)	
Scanning method		Progressive (4.7 ms)	Progressive (4.7 ms), interlace (2.5 ms) Interlace is a binning process which sums the odd lines and even lines.
Image transfer frequency		80 MHz (40 MHz x 2 ch)	
Transfer system		Digital serial transfer	
Electronic shutter		1/15, 1/30, 1/60, 1/120, 1/240, 1/500, 1/1000, 1/2000, 1/5000, 1/10000, 1/20000 0.05 ms to 9000 ms can be set through manual input	
Lens mount		C-mount	
Environmental resistance	Ambient temperature	0 to +40°C	
	Relative humidity	35 to 85% RH (no condensation)	
Weight		Approx. 120 g (lens not included)	

Cameras (XG-035C/S035C)

		XG-035C	XG-S035C
CCD		1/3 type color CCD, square pixels 2x-speed reading 350,000 pixels	
CCD pixel size		7.4 µm x 7.4 µm	
Effective pixels		Color 320,000 pixels 656 (H) x 492 (V) (In standard mode, 240,000 pixels (512 x 480) of the 320,000 pixels, or else all 310,000 pixels (640 x 480), are used in the process area.)	
Scanning method		Progressive (16.0 ms)	
Image transfer frequency		24.5 MHz	
Transfer system		Digital serial transfer	
Electronic shutter		1/15, 1/30, 1/60, 1/120, 1/240, 1/500, 1/1000, 1/2000, 1/5000, 1/10000, 1/20000 0.05 ms to 9000 ms can be set through manual input	
Lens mount		C-mount	Special mount (M10.5 P0.5 male)
Environmental resistance	Ambient temperature	0 to +50°C	• Head: 0 to +50°C • Amplifier: 0 to +40°C
	Relative humidity	35 to 85% RH (no condensation)	
Weight		Approx. 100 g (lens not included)	• Head: approx. 160 g (cable included, lens not included) • Amplifier: approx. 70 g

Cameras (XG-035M/S035M)

		XG-035M	XG-S035M
CCD		1/3 type monochrome CCD, square pixels double-speed reading, 350,000 pixels	
CCD pixel size		7.4 µm x 7.4 µm	
Effective pixels		320,000 pixels 656 (H) x 49 2 (V) (In standard mode, 240,000 pixels (512 x 480) of the 320,000 pixels are in the process area.)	
Scanning method		Progressive (16.0 ms), interlace (8.8 ms) Interlace is a binning process which sums the odd lines and even lines.	
Image transfer frequency		24.5 MHz	
Transfer system		Digital serial transfer	
Electronic shutter		1/15, 1/30, 1/60, 1/120, 1/240, 1/500, 1/1000, 1/2000, 1/5000, 1/10000, 1/20000 0.05 ms to 9000 ms can be set through manual input	
Lens mount		C-mount	Special mount (M10.5 P0.5 male)
Environmental resistance	Ambient temperature	0 to +50°C	• Head: 0 to +50°C • Amplifier: 0 to +40°C
	Relative humidity	35 to 85% RH (no condensation)	
Weight		Approx. 100 g (lens not included)	• Head: approx. 160 g (cable included, lens not included) • Amplifier: approx. 70 g

Cameras (CA-CM20: for XG-7002A)

		CA-CM20
CCD		1/3 type monochrome CCD, square pixels double-speed reading, 350,000 pixels
CCD pixel size		7.4µm x 7.4µm
Effective pixels		32,000,000 pixels, 648 (H) x 492 (V) (310,000 pixels (640 x 480) is the processing range)
Scanning method		Progressive (16.9 ms), interlace (8.5 ms)
Image transfer frequency		24.5 MHz
Transfer system		Analog transmission
Electronic shutter		1/15, 1/30, 1/60, 1/120, 1/240, 1/500, 1/1000, 1/2000, 1/5000, 1/10000, 1/20000 0.05 ms to 125 ms can be set through manual input
Lens mount		C-mount
Environmental resistance	Ambient temperature	0 to +40°C
	Relative humidity	35 to 90% RH (no condensation)
Weight		Approx. 50 g (lens not included)

Illumination Expansion Unit (CA-DC21E)

		CA-DC21E
Output	Illumination control	(1) Rated voltage (DC) (2) Pulse width modulation (light emission frequency 100 kHz) (Controller selectable.)
	Intensity level	255 digital levels (controller selectable)
	Lighting connections	2 channels (LED connector or terminal block connection)
	Voltage	12 V DC / 24 V DC (DIP switch selectable)
	Capacity	Max. 40 W (However 30 W per channel)
	Synchronous	FLASH output synchronization/continuous illumination (controller selectable)
	Response speed	(1) Rated voltage control: Within 10 ms (with 12 V output), within 20 ms (24 V output) (2) Pulse width modulation: Within 1 ms (with 12V/24V output)
Inputs	Force illumination OFF	Rated voltage: 26.4 V or less, 2 mA or more
Display	LED display	Illumination level display: Green/Orange (Min. 128) Error display: Red (All lit)
Rating	Power supply voltage	24V DC±10%
	Current consumption	3.0 A (12 V output) / 6.5 A (24 V output) Figures indicate maximum load including include rush current at startup.
Environmental resistance*1	Ambient temperature	0 to +50°C*2
	Relative humidity	35 to 85% RH (no condensation)
Weight		Approx. 590 g

*1 The environmental resistance of just the LED lights is ambient temperature 0 - 40。C and relative humidity 35 - 65% (no condensation).

*2 This is limited by the ambient temperature of the connected controller.

Using the Camera Cable Extension Amplifier (CA-CNX10U/CHX10U)

Product name		Camera cable extension amplifier standard cameras	Camera cable extension amplifier high speed cameras
Item		CA-CNX10U	CA-CHX10U
Support cameras		• XG-035C/035M • XG-S035C/S035M • XG-200C/200M • XG-S200C/S200M	• XG-H035C/H035M • XG-H100C/H100M • XG-H200C/H200M • XG-H500C/H500M
Transfer system		Digital serial transfer	
Environmental resistance	Ambient temperature	• When connected to XG-035C/035M: 0 to +50°C • When connected to other cameras: 0 to +40°C	0 to +40°C
	Relative humidity	35 to 85% RH (no condensation)	
Outside dimensions		112.6 (W) x 26 (D) x 21 (H)	
Weight		Approx. 60 g	

Controller power consumption ratings when using an amplifier

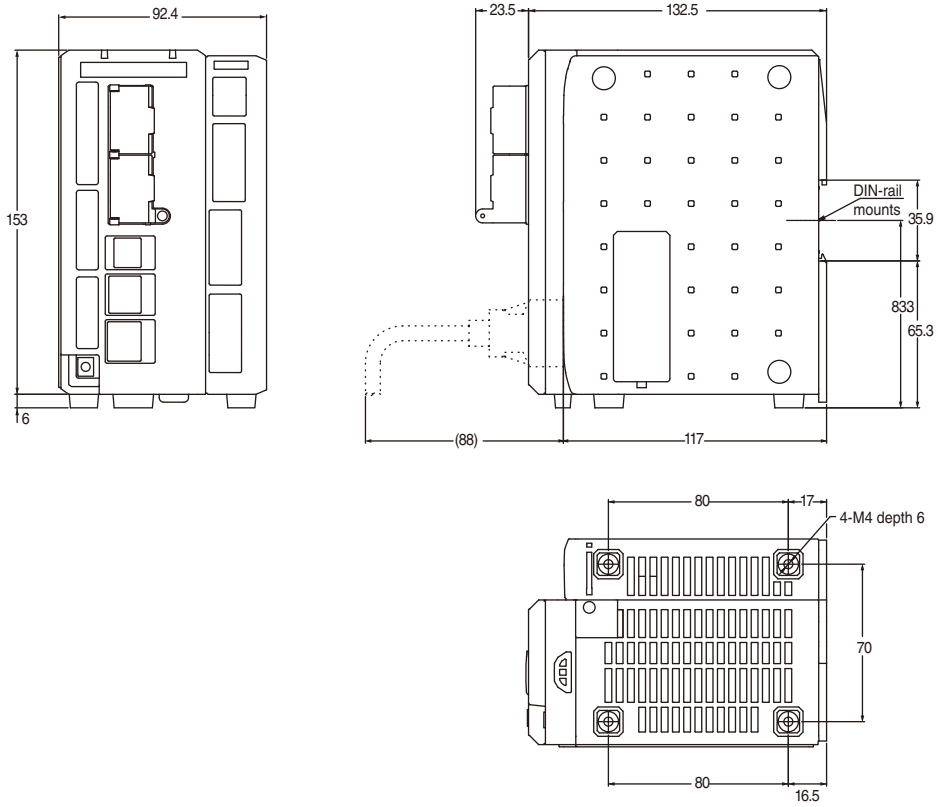
Connecting an amplifier increases the rated power consumption of the controller.

Controller type	Cameras connected	Power consumption with amplifier* (Without amplifier)
XG-7002	2	3.0 A (2.9 A)
	4	3.8 A (3.5 A)
XG-7502/7702	2	3.2 A (3.0 A)
	4	4.1 A (3.8 A)

* Figures indicate maximum load including include rush current at startup.

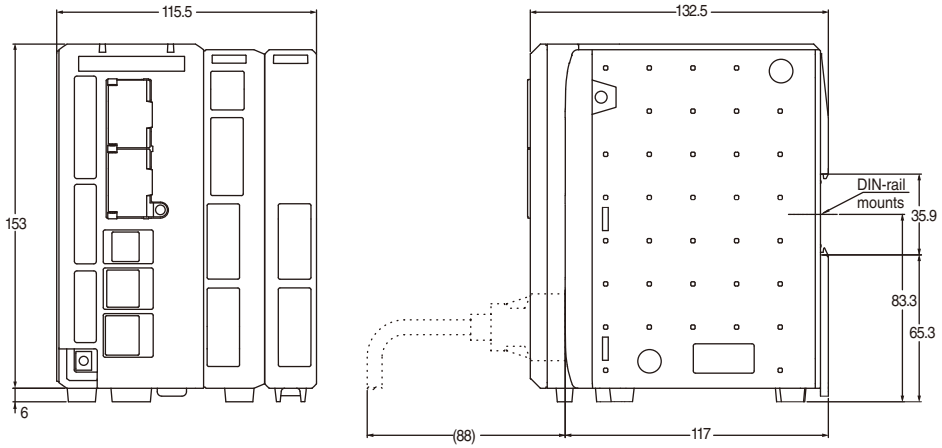
Outside dimensions

Controller Unit (XG-7702/7502/7002)



Unit: mm

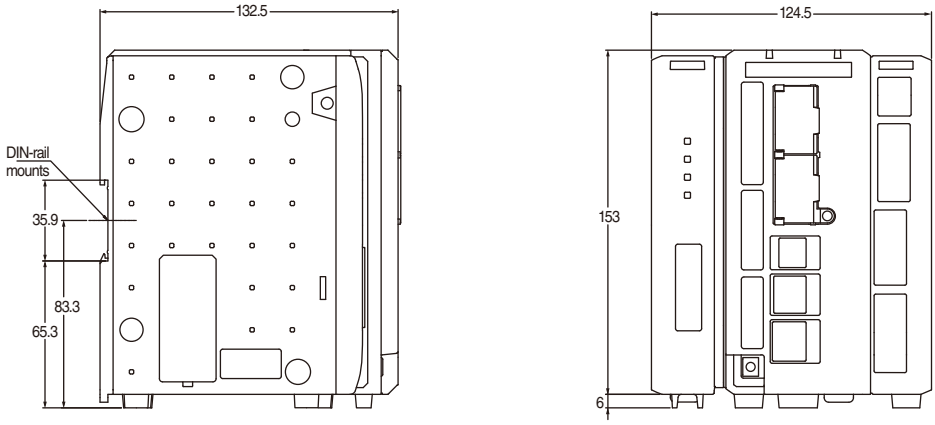
With camera expansion unit XG-E700 connected



Unit: mm

(Total weight: approx. 1480 g)

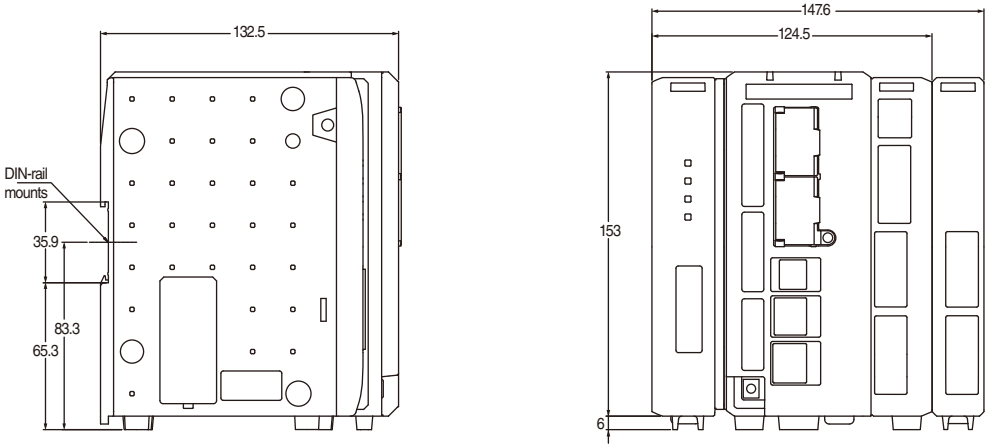
With the CC-Link unit CA-NCL10E installed



Unit: mm

(Total weight: approx. 1610 g)

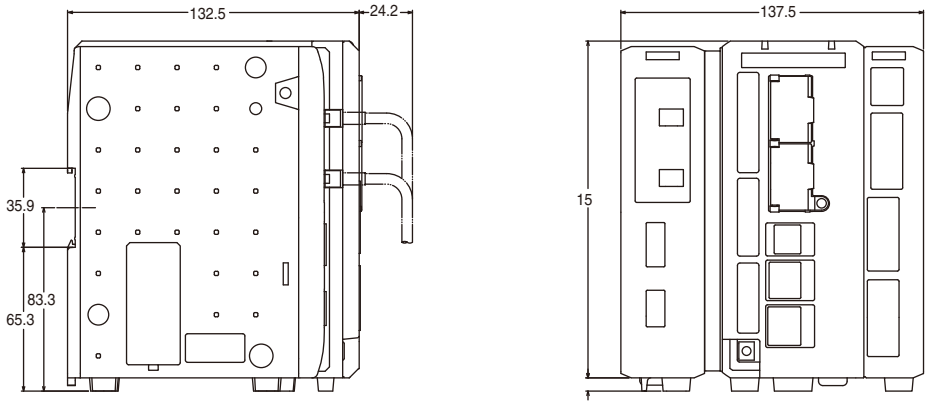
With the camera expansion unit XG-E700 and CC-Link unit CA-NCL10E connected



Unit: mm

(Total weight: approx. 1840 g)

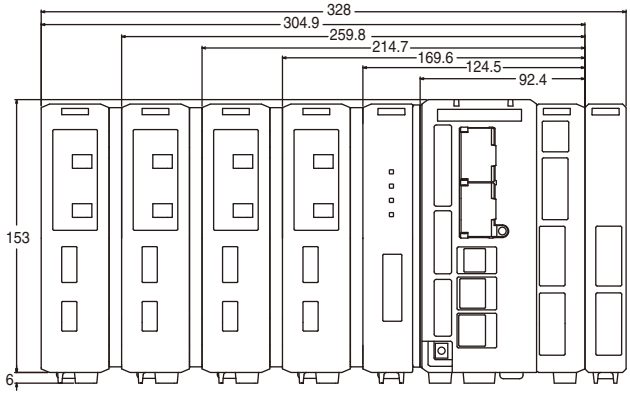
Light controller CA-DC21E connected



Unit: mm

(Total weight: approx. 1840 g)

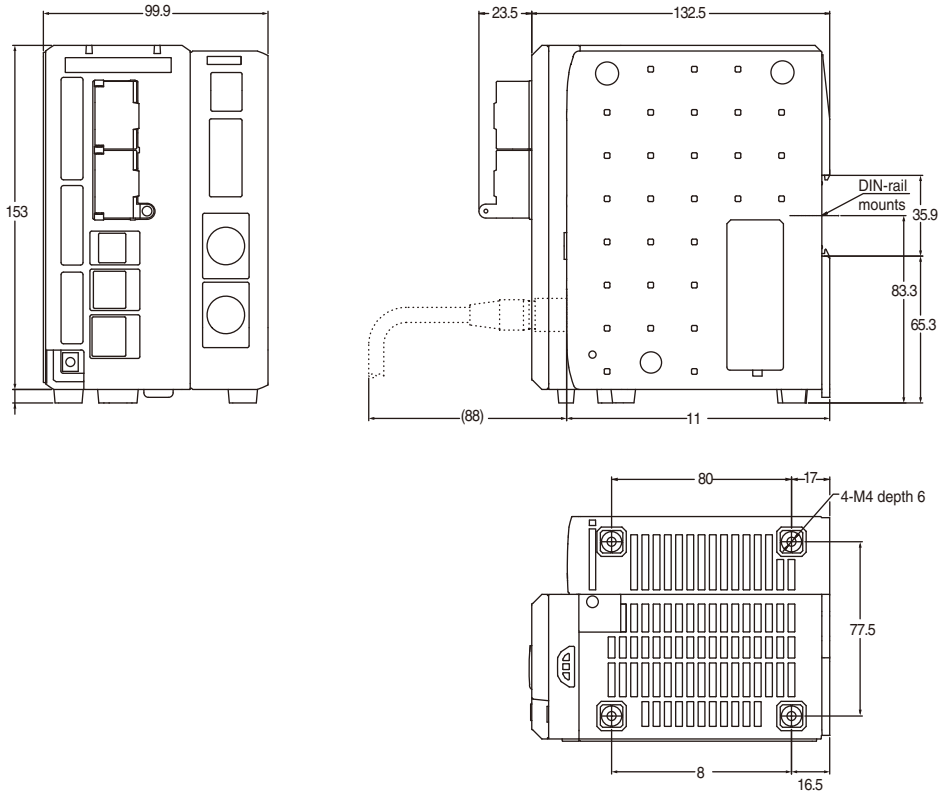
With camera expansion unit XG-E700/CC-Link unit CA-NCL10E, and light controller CA-DC21E installed



Unit: mm

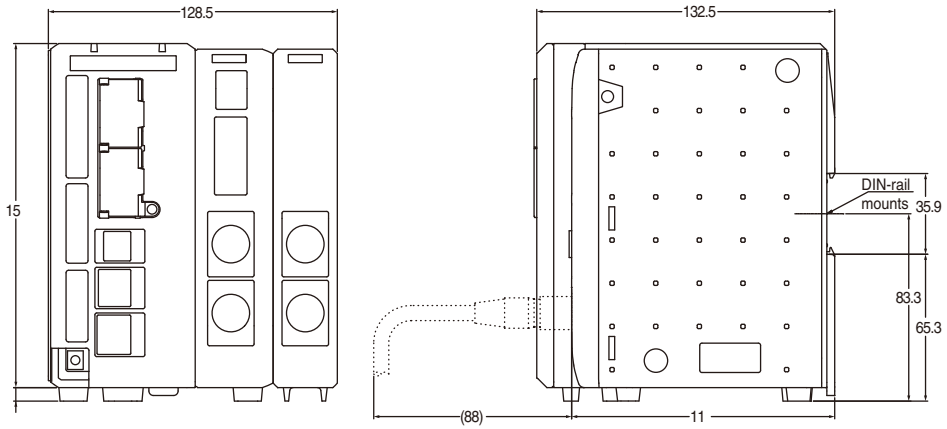
(Total weight: approx. 4200 g)

Controller (XG-7002A)



Unit: mm

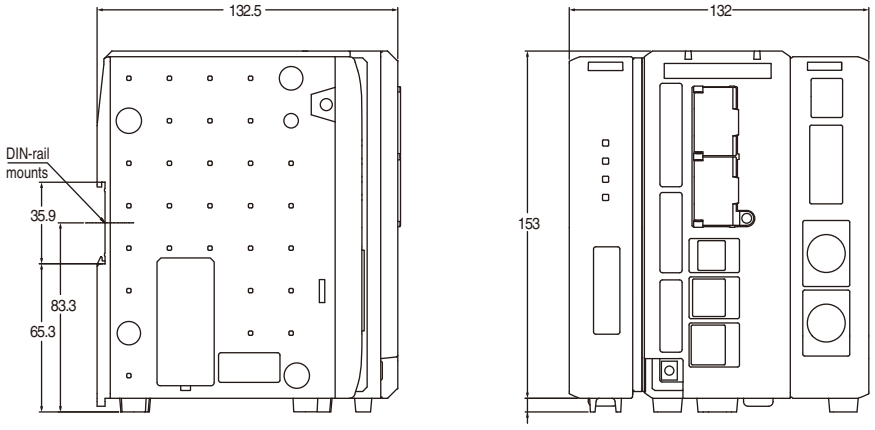
With camera expansion unit XG-E700A connected



Unit: mm

(Total weight: approx. 1580 g)

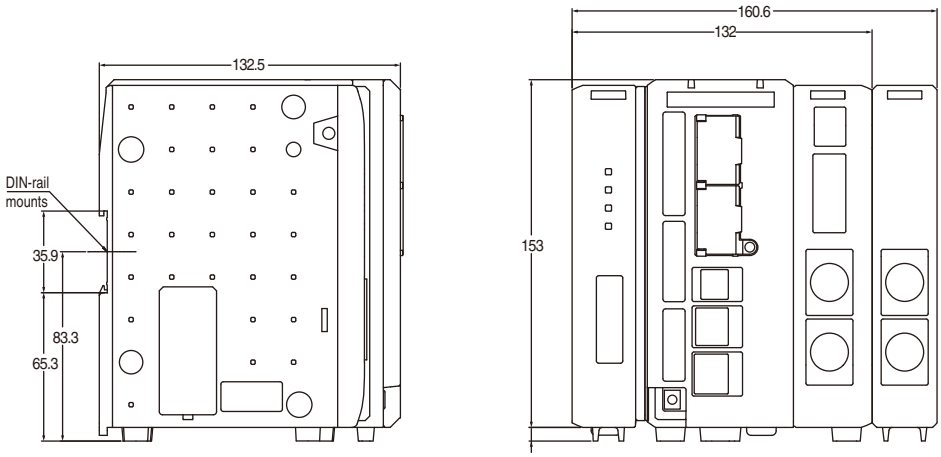
With the CC-Link unit CA-NCL10E installed



Unit: mm

(Total weight: approx. 1660 g)

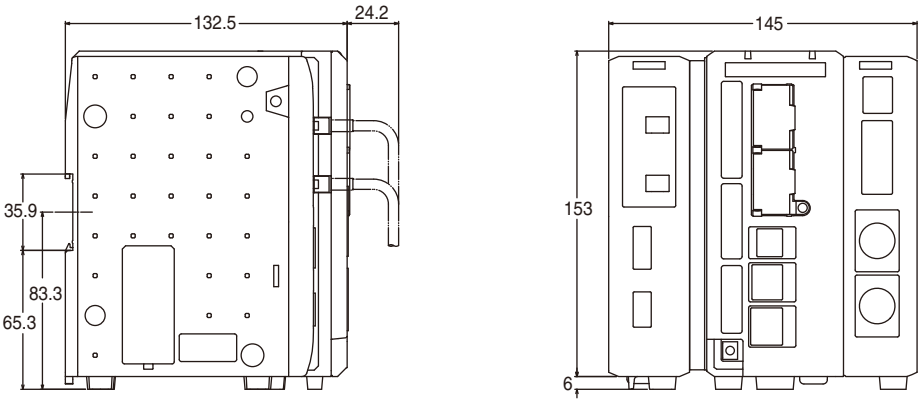
With the camera expansion unit XG-E700A and CC-Link unit CA-NCL10E connected



Unit: mm

(Total weight: approx. 1940 g)

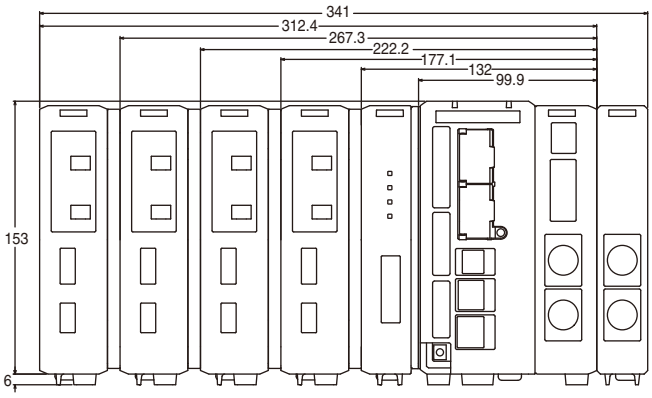
Light controller CA-DC21E connected



Unit: mm

(Total weight: approx. 1890 g)

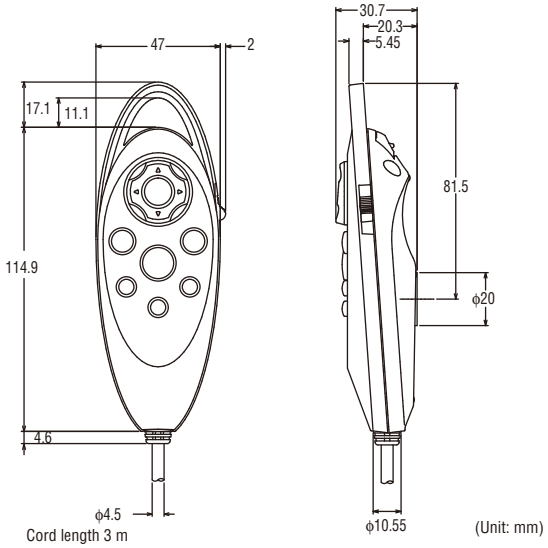
With camera expansion unit XG-E700A, CC-Link unit CA-NCL10E, and light controller CA-DC21E installed



Unit: mm

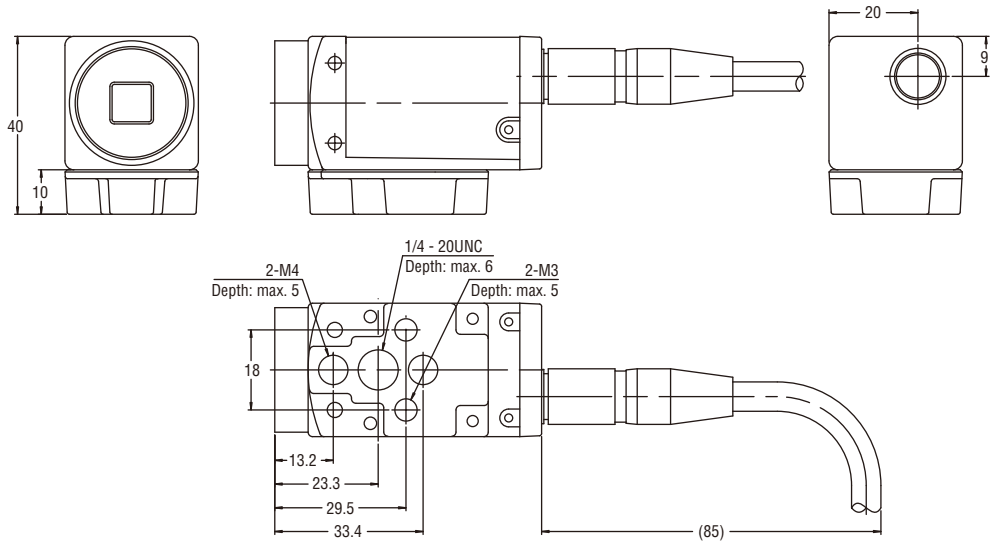
(Total weight: approx. 4300 g)

Handheld Controller (OP-84231: with Printing /OP-84236: blank)

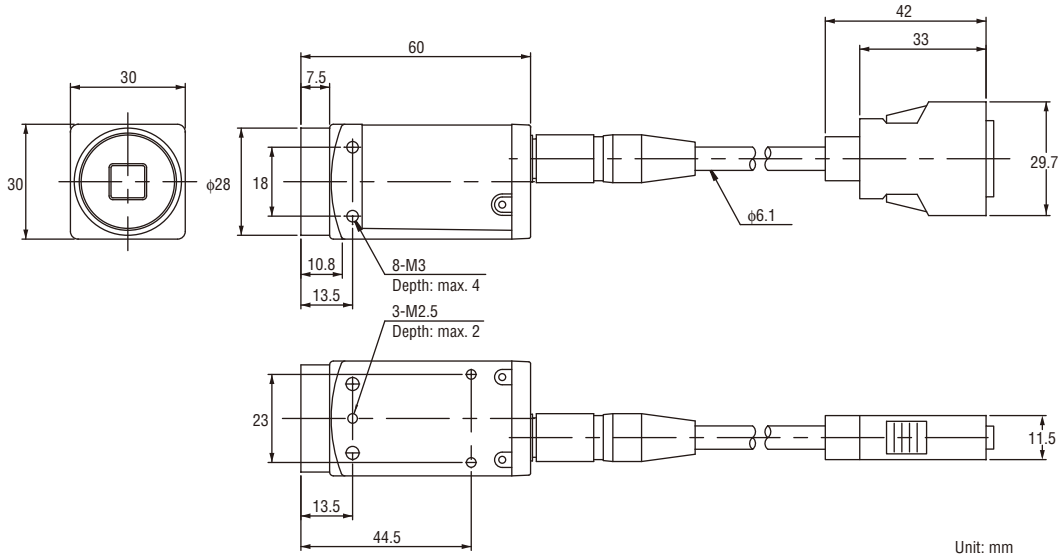


Digital Cameras (XG-200C/200M)

With plastic mount attached (factory shipped condition)

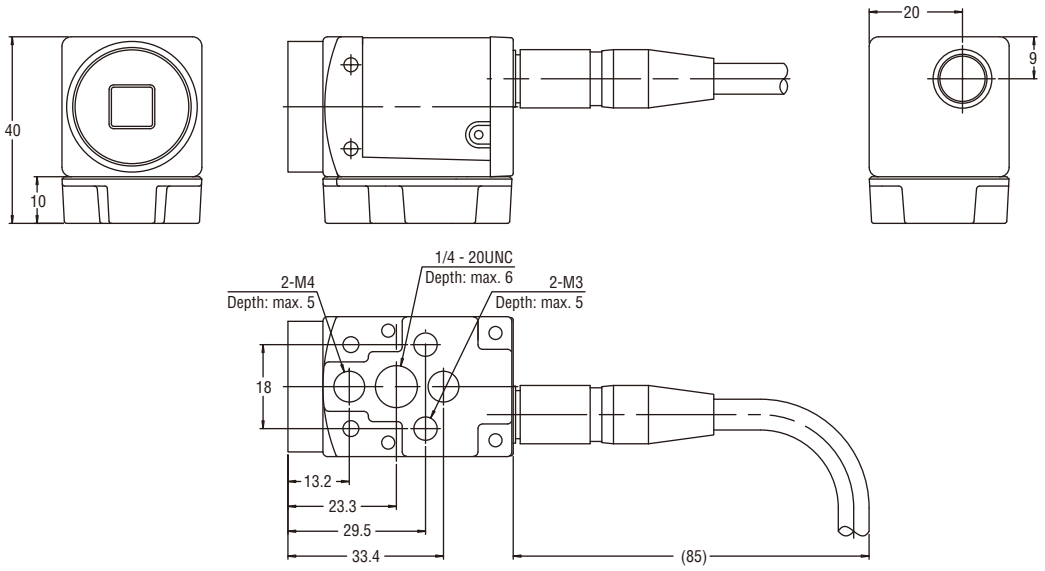


Without plastic mount

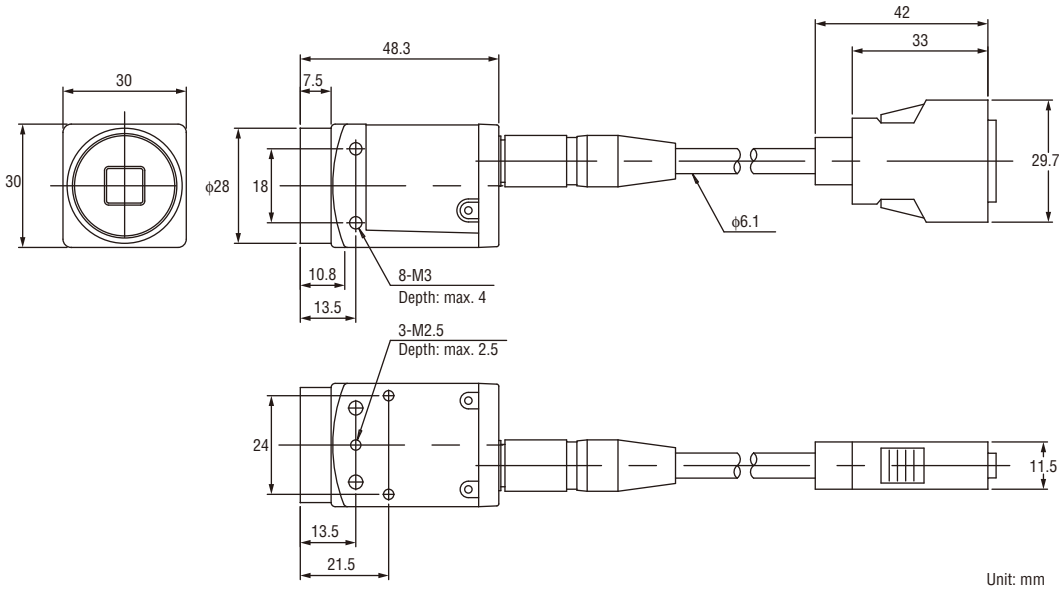


Digital Cameras (XG-035C/035M)

With plastic mount attached (factory shipped condition)

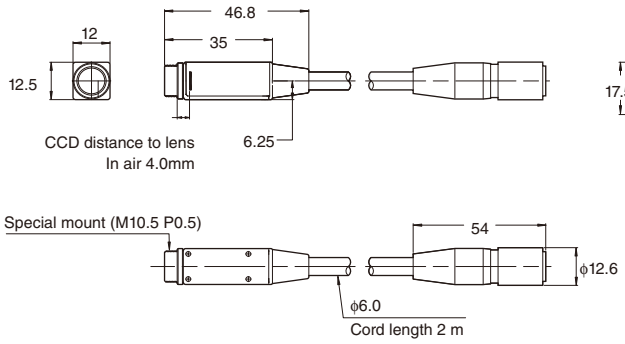


Without plastic mount

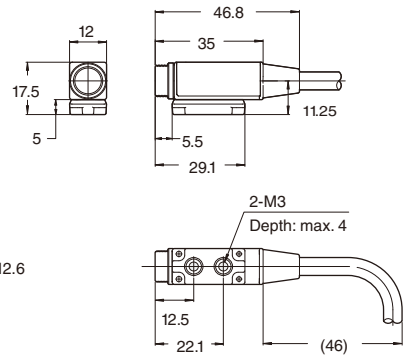


Digital Cameras (XG-S035C/S035M/S200C/S200M)

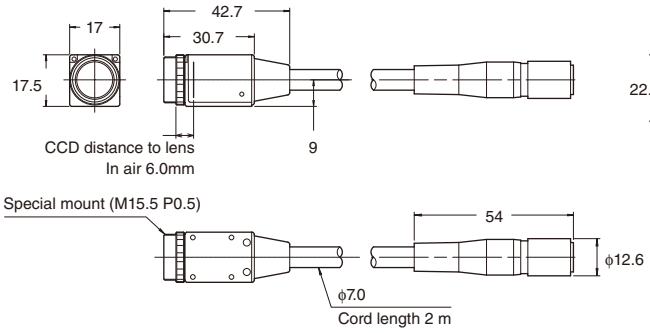
Camera XG-S035CH /XG-S035MH



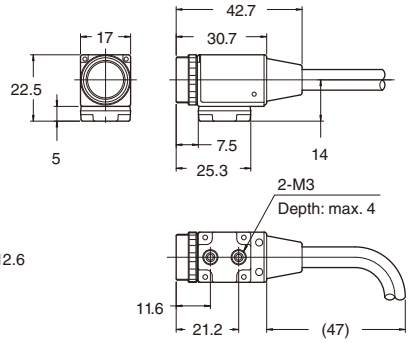
With plastic mount



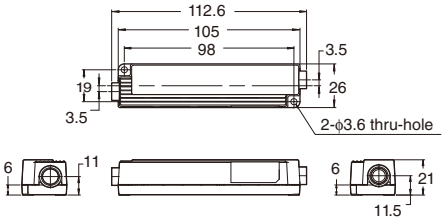
Camera XG-S200CH /XG-S200MH



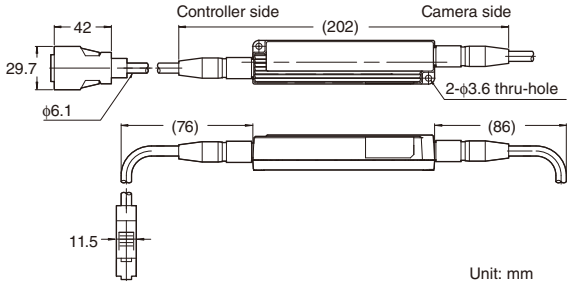
With plastic mount



Camera control unit
XG-S200CU/S200MU/S035CU/S035MU



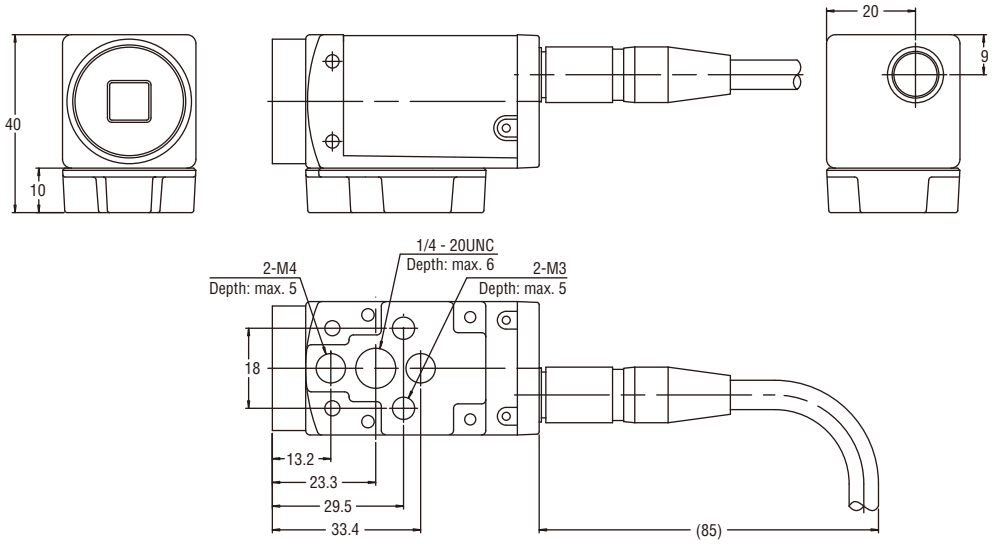
With cable connected



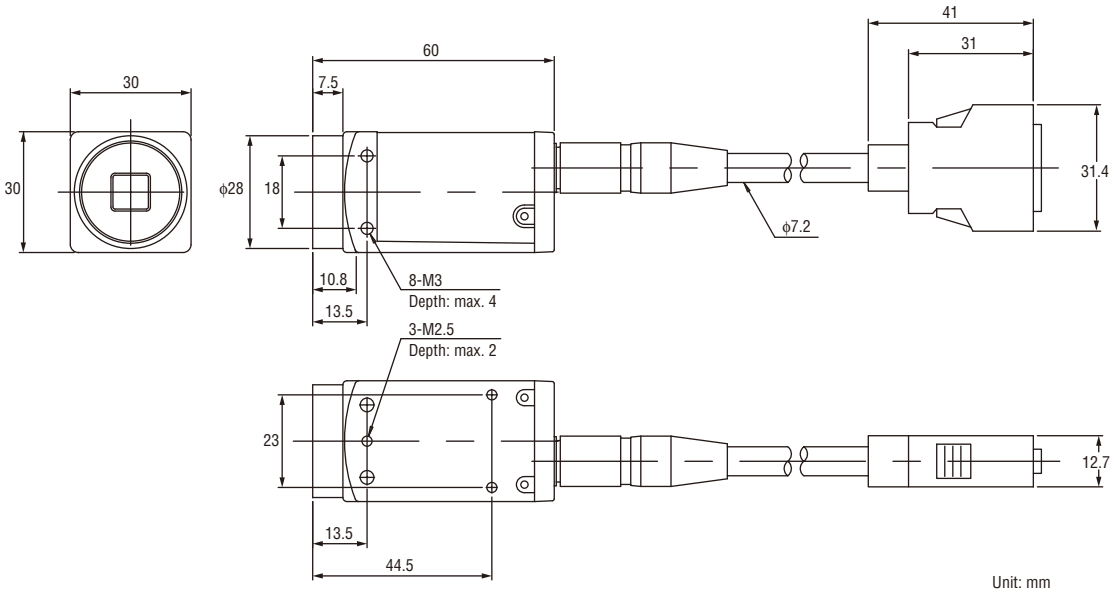
Unit: mm

Digital Cameras (XG-H500C/H500M/H200C/H200M/H100C/H100M/H035C/H035M)

With plastic mount attached (factory shipped condition)



Without plastic mount



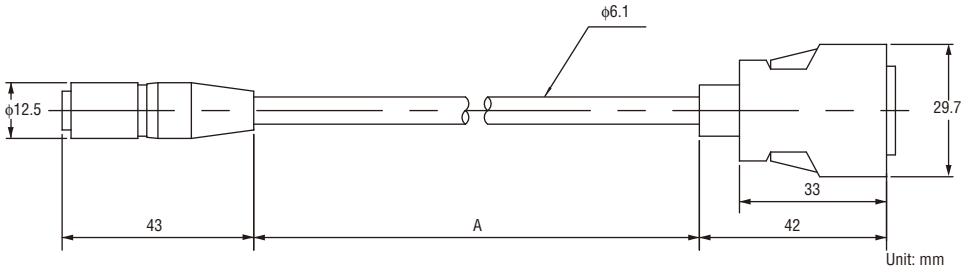
Unit: mm

Camera Cable (Digital Cameras)

► Note

Cannot be connected to high-speed cameras (XG-H****).

Standard cable

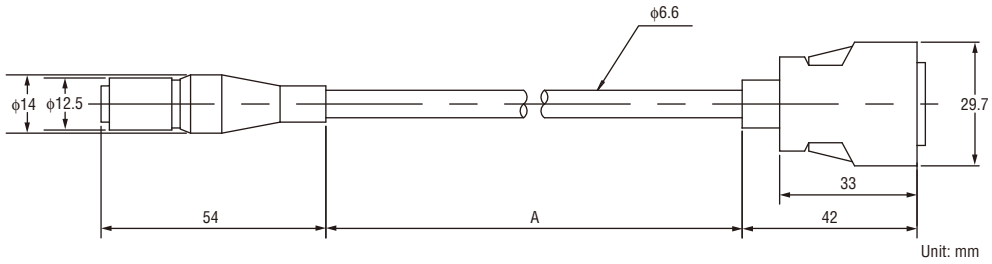


Item	Cable length (A)	Weight	XG-035C/035M	XG-200C/200M	XG-S035C/ S035M	XG-S200C/ S200M
CA-CN1	1 m	100 g	○	○	○	○
CA-CN3	3 m	220 g	○	○	○	○
CA-CN5	5 m	330 g	○	○	○	○
CA-CN10	10 m	660 g	○	○	○	○
CA-CN17	17 m	1100 g	○	x	x	x

○: Connection possible, x: Connection not possible

High flex robotic cable

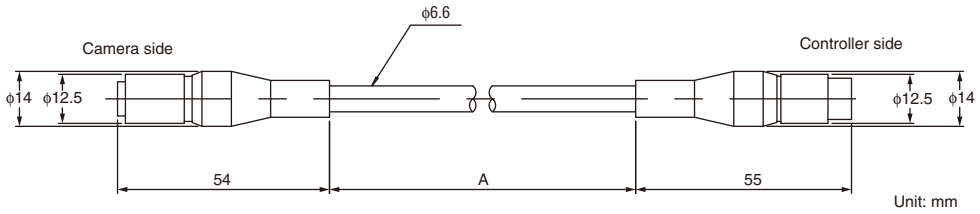
•CA-CN–R



Item	Cable length (A)	Weight	XG-035C/035M	XG-200C/200M	XG-S035C/ S035M	XG-S200C/ S200M
CA-CN3R	3 m	240 g	○	○	○	○
CA-CN5R	5 m	310 g	○	○	○	○
CA-CN10R	10 m	720 g	○	○	○	○
CA-CN17R	17 m	1190 g	○	x	x	x

○: Connection possible, x: Connection not possible

•CA-CN–RE



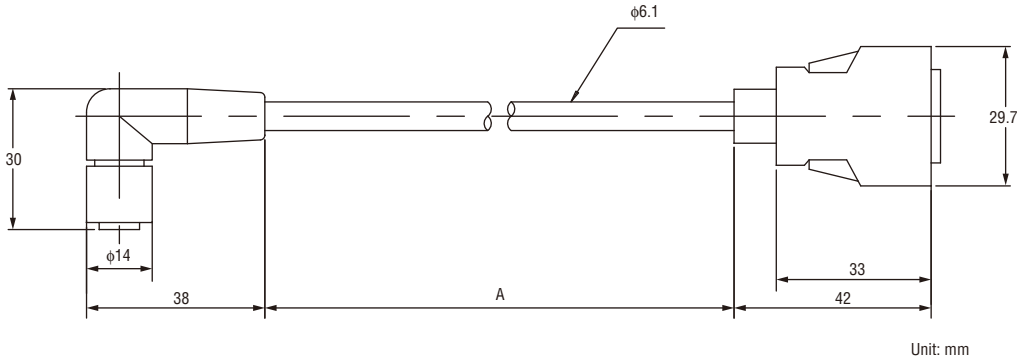
Item	Cable length (A)	Weight	XG-035C/035M	XG-200C/200M	XG-S035C/ S035M	XG-S200C/ S200M
CA-CN7RE	7 m extension	500 g	○ (17 m)	○ (10 m)	○ (10 m)	○ (10 m)

Figures in ( ) indicate maximum total length.

► Note

- CA-CN7RE is an extension cable and cannot be used alone.
- Connect CA-CN1/CN3/CN10/CN3R/CN10R to the controller side connector and make sure that the camera is within its maximum range.

L-shape cable



Item	Cable length (A)	Weight	XG-035C/035M	XG-200C/200M	XG-S035C/ S035M	XG-S200C/ S200M
CA-CN3L	3 m	220 g	○	○	○	○
CA-CN5L	5 m	340 g	○	○	○	○
CA-CN10L	10 m	660 g	○	○	○	○
CA-CN17L	17 m	1100 g	○	x	x	x

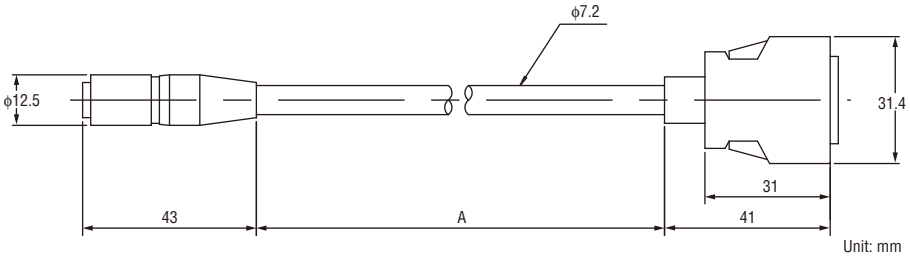
○: Connection possible, x: Connection not possible

Camera Cables (for High-speed Cameras XG-H****)

► Note

Use these cables only with high-speed cameras (XG-H****). Failure to do so may cause damage to the connector pins.

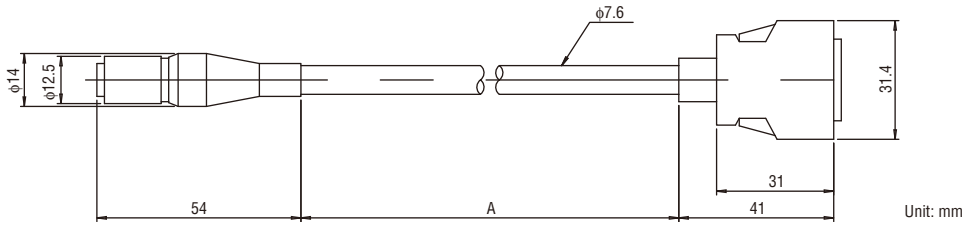
Standard cable



Item	Cable length (A)	Weight	XG-H035C/ H035M	XG-H100C/ H100M	XG-H200C/ H200M	XG-H500C/ H500M
CA-CH3	3 m	290 g	○	○	○	○
CA-CH5	5 m	440 g	○	○	○	○
CA-CH10	10 m	880 g	○	○	○	○

○: Connection possible, x: Connection not possible

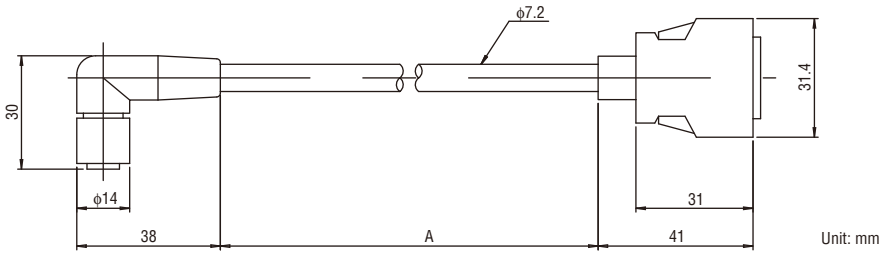
High flex robotic cable



Item	Cable length (A)	Weight	XG-H035C/ H035M	XG-H100C/ H100M	XG-H200C/ H200M	XG-H500C/ H500M
CA-CH3R	3 m	250 g	○	○	○	○
CA-CH5R	5 m	410 g	○	○	○	○
CA-CH10R	10 m	740 g	○	○	○	○

○: Connection possible, x: Connection not possible

L-shape cable

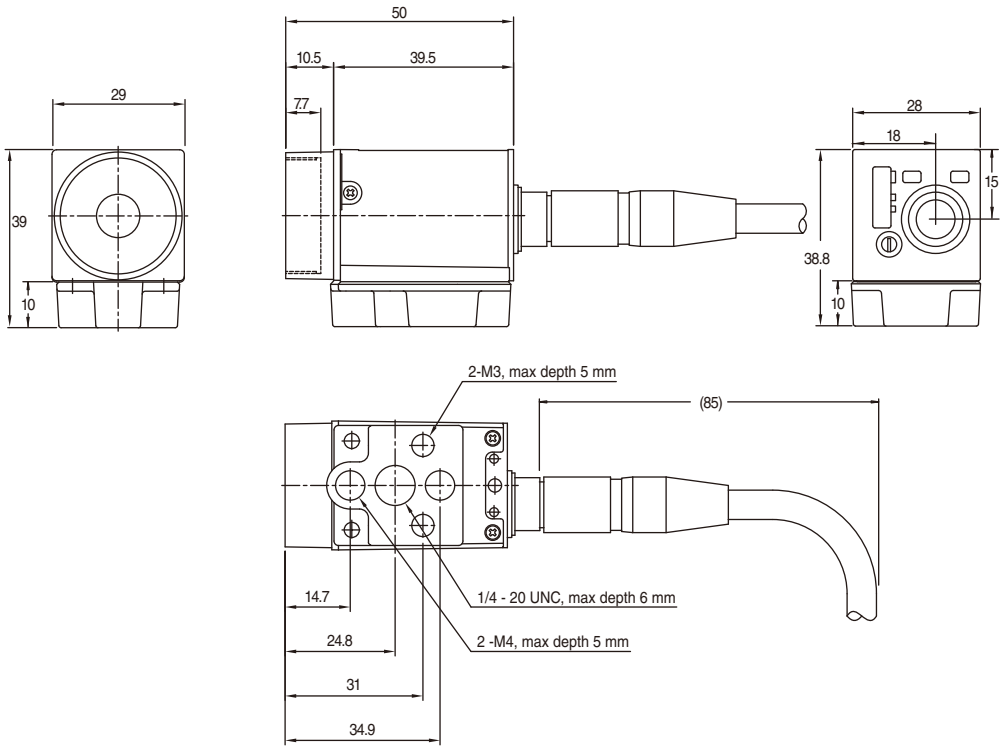


Item	Cable length (A)	Weight	XG-H035C/ H035M	XG-H100C/ H100M	XG-H200C/ H200M	XG-H500C/ H500M
CA-CH3L	3 m	270 g	○	○	○	○
CA-CH5L	5 m	450 g	○	○	○	○
CA-CH10L	10 m	810 g	○	○	○	○

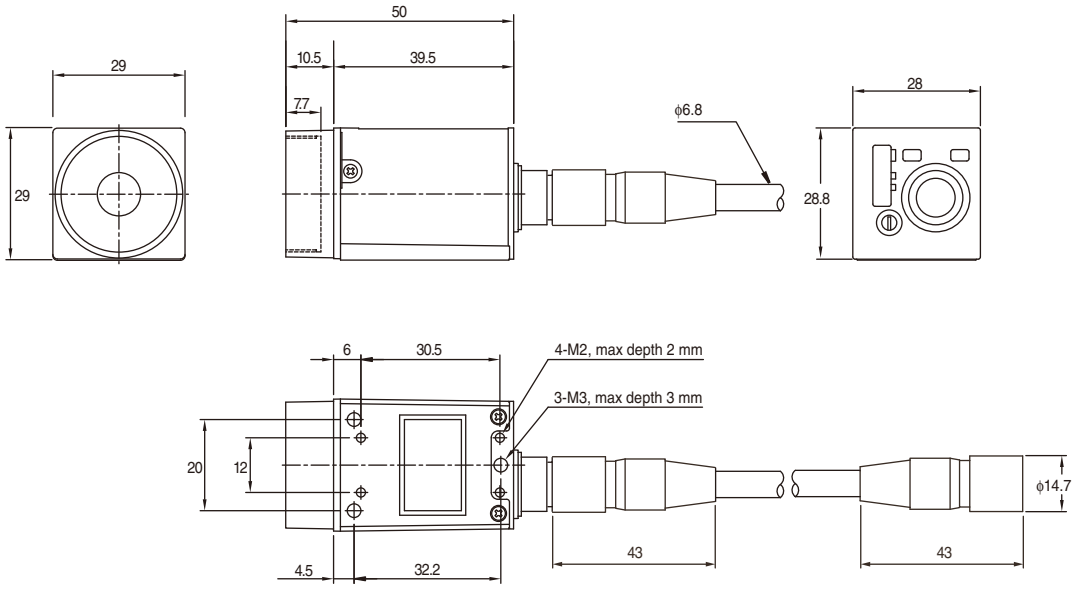
○: Connection possible, x: Connection not possible

Analog Cameras (CA-CM20: for XG-7002A)

With plastic mount attached (factory shipped condition)

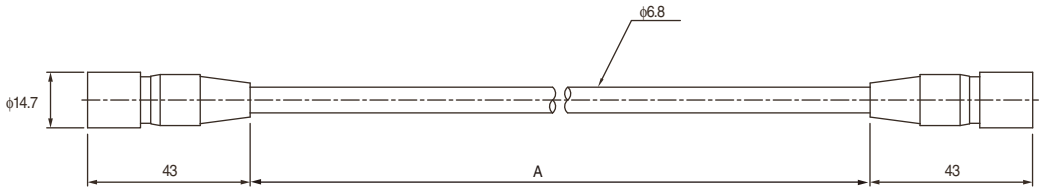


Without plastic mount



Unit: mm

Camera Cable (Analog Cameras)

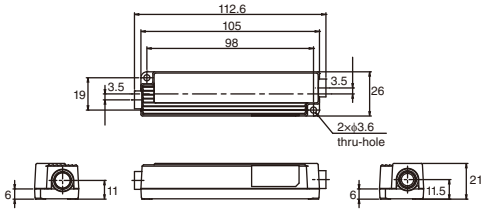


Item	Cable length (A)	Weight	Remarks
CA-C3	3 m	260g	Supports Keyence CA-CM20 and other specified compatible analog cameras
CA-C10	10 m	760 g	
OP-84389	25 m	1530 g	

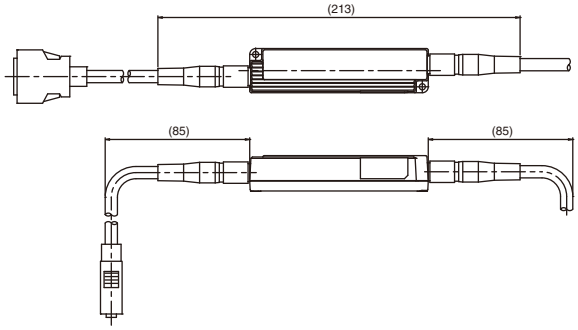
Using the Camera Cable Extension Amplifier (CA-CNX10U/CHX10U)

Outside dimensions

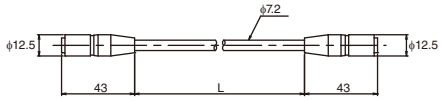
CA-CNX10U/CHX10U



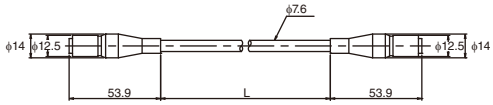
CA-CHX10U (with cable connected)



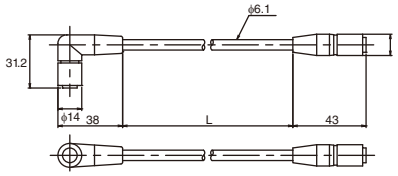
CA-CN3X/CN10X/CN17X/CH3X/CH10X



CA-CN3RX/CN10RX/CN17RX/CH10RX



CA-CN3LX/CN10LX/CN17LX



Unit: mm

Item	Cable length (L)	Weight
CA-CN3X	3 m	200 g
CA-CN10X	10 m	600 g
CA-CN17X	17 m	990 g
CA-CH3X	3 m	270 g
CA-CH10X	10 m	820 g

Item	Cable length (L)	Weight
CA-CN3RX	3 m	190 g
CA-CN10RX	10 m	540 g
CA-CN17RX	17 m	900 g
CA-CH10RX	10 m	740 g
CA-CN3LX	3 m	210 g
CA-CN10LX	10 m	610 g
CA-CN17LX	17 m	1000 g

List of supported controllers and maximum cable lengths by camera

Up to 2 amplifiers can be connected in series.

- The following table shows the maximum levels of extension and maximum cable length for each camera.
- Don't exceed the maximum camera cable length and maximum number of extensions allowed.

Controller [1]	Camera	Applicable amplifier	Cable length specifications	
			Maximum number of extensions	Maximum cable length
XG-7702/ 7502/ 7002	XG-035C/035M	CA-CNX10U	2/1[2]	51 m/34 m[2]
	XG-S035C/S035M		1	20 m
	XG-200C/200M		2	30 m
	XG-S200C/S200M		2/1[3]	30 m/20 m[3]
	XG-H035C/H035M	CA-CHX10U	2	30 m
	XG-H100C/H100M		2	30 m
	XG-H200C/H200M		1	20 m
	XG-H500C/H500M		1	20 m

[1] Amplifiers can be used with controllers and camera expansion units manufactured after September, 2009.

[2] If the camera is used for partial capturing of less than 350 lines, the maximum number of extensions is 1, and the maximum cable length is 34 m.

[3] If the camera is used for partial capturing of less than 1000 lines, the maximum number of extensions is 1, and the maximum cable length is 20 m.

► Note

Amplifiers can only be used with Keyence digital cameras. They cannot be used with analog cameras.

Options

List of Options

C-mount camera options

Item	Function	Reference page
CV-L3	Standard lens (focal distance 3 mm)	Page 2-19, 9-40
CV-L6	Standard lens (focal distance 6 mm)	Page 2-19, 9-40
CV-L16	Standard lens (focal distance 16 mm)	Page 2-19, 9-40
CA-LC16	Standard lens (focal distance 16 mm)	Page 2-19, 9-41
CV-L25	Standard lens (focal distance 25 mm)	Page 2-19, 9-41
CV-L35	Standard lens (focal distance 35 mm)	Page 2-19, 9-41
CV-L50	Standard lens (focal distance 50 mm)	Page 2-19, 9-42
CA-LH4	Low distortion lens (focal distance 4 mm)	Page 2-19, 9-43
CA-LH8	Low distortion lens (focal distance 8 mm)	Page 2-19, 9-43
CA-LH12	Low distortion lens (focal distance 12 mm)	Page 2-19, 9-43
CA-LH16	Low distortion lens (focal distance 16 mm)	Page 2-19, 9-43
CA-LH25	Low distortion lens (focal distance 25 mm)	Page 2-19, 9-44
CA-LH35	Low distortion lens (focal distance 35 mm)	Page 2-19, 9-44
CA-LH50	Low distortion lens (focal distance 50 mm)	Page 2-19, 9-44
CA-LH75	Low distortion lens (focal distance 75 mm)	Page 2-19, 9-44
CA-LHR5	High-resolution, low distortion lens (focal distance 5 mm)	Page 2-19, 9-46
CA-LHR8	High-resolution, low distortion lens (focal distance 8 mm)	Page 2-19, 9-46
CA-LHR12	High-resolution, low distortion lens (focal distance 12 mm)	Page 2-19, 9-46
CA-LHR16	High-resolution, low distortion lens (focal distance 16 mm)	Page 2-19, 9-47
CA-LHR25	High-resolution, low distortion lens (focal distance 25 mm)	Page 2-19, 9-47
CA-LHR35	High-resolution, low distortion lens (focal distance 35 mm)	Page 2-19, 9-47
CA-LHR50	High-resolution, low distortion lens (focal distance 50 mm)	Page 2-19, 9-48
OP-51612	Close-up spacer	Page 2-21, 9-48
CA-LM1	Macro lens with 1x optical magnification	Page 2-20, 9-49
CA-LM2	Macro lens with 2x optical magnification	
CA-LM4	Macro lens with 4x optical magnification	
CA-LM6	Macro lens with 6x optical magnification	
CA-LM8	Macro lens with 8x optical magnification	
CA-LMA1	Coaxial macro with 1x optical magnification	
CA-LMA2	Coaxial macro with 2x optical magnification	
CA-LMA4	Coaxial macro with 4x optical magnification	
CA-LM0510	Telecentric macro zoom lens (straight) with 0.5x to 1.0x optical magnification (standard magnification)	Page 2-20, 9-49
OP-66852	Plastic camera mount	Page 9-23, 9-24

High Resolution Ultra Small Camera (XG-S200C/S200M) Options

Item	Function	Reference page
CA-LHS8	Low distortion lens (focal distance 8 mm)	Page 9-51
CA-LHS16	Low distortion lens (focal distance 16 mm)	
CA-LHS25	Low distortion lens (focal distance 25 mm)	
CA-LHS50	Low distortion lens (focal distance 50 mm)	
OP-66830	Close-up ring (5 mm)	Page 9-51
OP-66831	Close-up ring (10 mm)	
OP-66832	Polarizing filter	
OP-66833	Side view attachment	

Ultra Small Camera (XG-S035C/S035M) Options

Item	Function	Reference page
CA-LS4	Standard lens (focal distance 4 mm)	Page 2-20, 9-51
CA-LS6	Standard lens (focal distance 6 mm)	
CA-LS16	Standard lens (focal distance 16 mm)	
CA-LS30	Standard lens (focal distance 30 mm)	
OP-51500	Close-up ring (5 mm)	Page 9-51
OP-51501	Close-up ring (10 mm)	
OP-51502	Polarizing filter	
OP-51503	Side view attachment	

Lighting

Item	Function	Reference page
CA-DRR4F	LED light (direct ring light, red)	Page 2-26, 9-52
CA-DRW4F	LED light (direct ring light, white)	
CA-DRB4F	LED light (direct ring light, blue)	
CA-DRR10F	LED light (direct ring light, red)	
CA-DRW10F	LED light (direct ring light, white)	
CA-DRB10F	LED light (direct ring light, blue)	
CA-DLR7	LED light (low angle light, red)	Page 2-26, 9-52
CA-DLR12	LED light (low angle light, red)	
CA-DBR5	LED light (bar light, red)	Page 2-26, 9-52
CA-DBW5	LED light (bar light, white)	
CA-DBB5	LED light (bar light, blue)	
CA-DBR8	LED light (bar light, red)	
CA-DBW8	LED light (bar light, white)	
CA-DBB8	LED light (bar light, blue)	
CA-DBR13	LED light (bar light, red)	
CA-DBW13	LED light (bar light, white)	
CA-DBB13	LED light (bar light, blue)	

Item	Function	Reference page
CA-DDR8	LED light (dome light, red)	Page 2-27, 9-52
CA-DDW8	LED light (dome light, white)	
CA-DDB8	LED light (dome light, blue)	
CA-DDR15	LED light (dome light, red)	
CA-DDW15	LED light (dome light, white)	
CA-DDB15	LED light (dome light, blue)	
CA-DSR2	LED light (back light, red)	Page 2-26, 9-53
CA-DSW2	LED light (back light, white)	
CA-DSB2	LED light (back light, blue)	
CA-DSR3	LED light (back light, red)	
CA-DSW3	LED light (back light, white)	
CA-DSB3	LED light (back light, blue)	
CA-DSR9	LED light (back light, red)	
CA-DSW7	LED light (back light, white)	
CA-DSB7	LED light (back light, blue)	
CA-DSR15	LED light (back light, red)	
CA-DSW15	LED light (back light, white)	
CA-DSB15	LED light (back light, blue)	
CA-DXR3	LED light (coaxial light, red)	Page 2-27, 9-53
CA-DXW3	LED light (coaxial light, white)	
CA-DXB3	LED light (coaxial light, blue)	
CA-DXR5	LED light (coaxial light, red)	
CA-DXW5	LED light (coaxial light, white)	
CA-DXB5	LED light (coaxial light, blue)	
CA-DXR7	LED light (coaxial light, red)	
CA-DXW7	LED light (coaxial light, white)	
CA-DXB7	LED light (coaxial light, blue)	
CA-DQR10	LED light (square bar light, red)	Page 2-27, 9-53
CA-DQW10	LED light (square bar light, white)	
CA-DQB10	LED light (square bar light, blue)	
CA-DQR15	LED light (square bar light, red)	
CA-DQW15	LED light (square bar light, white)	
CA-DQB15	LED light (square bar light, blue)	
CA-DRR8M	LED light (round multi-angle light, red)	Page 2-26, 2-27, 9-54
CA-DRW8M	LED light (round multi-angle light, white)	
CA-DRB8M	LED light (round multi-angle light, blue)	
CA-DRR13M	LED light (round multi-angle light, red)	
CA-DRW13M	LED light (round multi-angle light, white)	
CA-DRB13M	LED light (round multi-angle light, blue)	
CA-DQR7M	LED light (square multi-angle light, red)	Page 2-26, 2-27, 9-54
CA-DQW7M	LED light (square multi-angle light, white)	
CA-DQB7M	LED light (square multi-angle light, blue)	
CA-DQR10M	LED light (square multi-angle light, red)	
CA-DQW10M	LED light (square multi-angle light, white)	
CA-DQB10M	LED light (square multi-angle light, blue)	
CA-DQW12M	LED light (square multi-angle light, red)	
CA-DQB12M	LED light (square multi-angle light, white)	
CA-DQR12M	LED light (square multi-angle light, blue)	

Item	Function	Reference page
CA-DPR2	LED light (spot, red)	Page 2-27, 9-54
CA-DPW2	LED light (spot, white)	
CA-DPB2	LED light (spot, blue)	
CA-DPU2	Special power adapter for spot lights	
CA-DP3R	Spot light cable (3 m)	
CA-DP5R	Spot light cable (5 m)	
CA-DC21E	Lighting Configuration	Page 9-14
CA-DC100	LED light controller	Page 9-55
CV-R10	Fluorescent ring light	Page 9-57
CA-R20	Fluorescent large-diameter ring light	

Cables

Item	Function	Reference page
CA-CN1	Camera cable (1 m)	Page 9-27
CA-CN3	Camera cable (3 m)	
CA-CN5	Camera cable (5 m)	
CA-CN10	Camera cable (10 m)	
CA-CN17	Camera cable (17 m)	
CA-CN3R	High flex robotic camera cable (3 m)	
CA-CN5R	High flex robotic camera cable (5 m)	
CA-CN10R	High flex robotic camera cable (10 m)	
CA-CN17R	High flex robotic camera cable (17 m)	
CA-CN7RE	High flex robotic camera extension cable (7 m)	
CA-CN3L	L-shape connector camera cable (3 m)	Page 9-28
CA-CN5L	L-shape connector camera cable (5 m)	
CA-CN10L	L-shape connector camera cable (10 m)	
CA-CN17L	L-shape connector camera cable (17 m)	
CA-CH3	High-speed camera cable (3 m)	Page 9-29
CA-CH5	High-speed camera cable (5 m)	
CA-CH10	High-speed camera cable (10 m)	
CA-CH3R	High-speed camera high flex robotic cable (3 m)	Page 9-29
CA-CH5R	High-speed camera high flex robotic cable (5 m)	
CA-CH10R	High-speed camera high flex robotic cable (10 m)	
CA-CH3L	High-speed camera L-shape connector cable (3 m)	
CA-CH5L	High-speed camera L-shape connector cable (5 m)	
CA-CH10L	High-speed camera L-shape connector cable (10 m)	

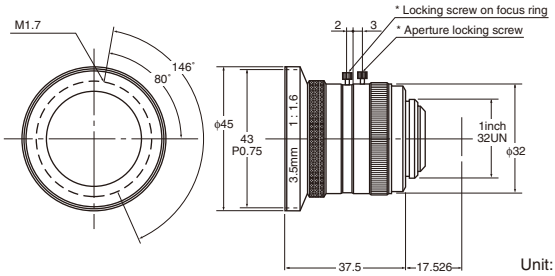
Item	Function	Reference page
CA-CNX10U	Camera cable extension amplifier standard cameras	Page 2-22, 9-15, 9-32
CA-CHX10U	Camera cable extension amplifier high speed cameras	
CA-CN3X	Amplifier camera cable (3 m)	
CA-CN10X	Amplifier camera cable (10 m)	
CA-CN17X	Amplifier camera cable (17 m)	
CA-CH3X	Amplifier high speed camera cable (3 m)	
CA-CH10X	Amplifier high speed camera cable (10 m)	
CA-CN3RX	Amplifier high flex robotic camera cable (3 m)	
CA-CN10RX	Amplifier high flex robotic camera cable (10 m)	
CA-CN17RX	Amplifier high flex camera cable (17 m)	
CA-CH10RX	Amplifier high flex high speed camera cable (10 m)	
CA-CN3LX	Amplifier L-shape camera cable (3 m)	
CA-CN10LX	Amplifier L-shape camera cable (10 m)	
CA-CN17LX	Amplifier L-shape camera cable (17 m)	
CA-D2	LED light cable (2 m)	Page 9-56
CA-D5	LED light cable (5 m)	
CA-D3R	High flex robotic LED light cable (3 m)	
CA-D5R	High flex robotic LED light cable (5 m)	
CA-D10R	High flex robotic LED light cable (10 m)	
CA-D17R	High flex robotic LED light cable (17 m)	
CA-D1W	Y-split LED light cable (0.5 m)	
OP-84457	Bare wire type LED light cable (1 m)	
OP-26487	Serial connection cable (2.5 m, straight)	Page 8-3
OP-26486	D-sub 9-pin connector (female)	Page 8-3
OP-26485	D-sub 25-pin connector (female)	Page 8-3
OP-84384	D-sub 9-pin connector (male, for SYSMAC)	
OP-86930	D-sub 9-pin connector (male, for MELSEC)	
OP-66843	Ethernet cable (3 m, cross cable)	
OP-51657	Parallel port ribbon cable (3 m)	Page 8-21
OP-66844	USB 2.0 cable (2 m)	Page 8-3
OP-66842	Monitor cable (3 m)	Page 2-23
OP-87055	Monitor cable (10 m)	
OP-79426	Ver. 1.10 compatible CC-Link cable (20 m)	Page 8-20
OP-79427	Ver. 1.10 compatible CC-Link cable (100 m)	Page 8-20
OP-87258	Touch panel RS-232C cable (3 m)	Page 9-62
OP-87259	Touch panel RS-232C cable (10 m)	
OP-87260	Handheld controller relay cable (3 m)	
OP-87261	Handheld controller relay cable (10 m)	
OP-87264	Touch panel modular RS-232C cable (3 m)	
OP-87265	Touch panel modular RS-232C cable (10 m)	

Other

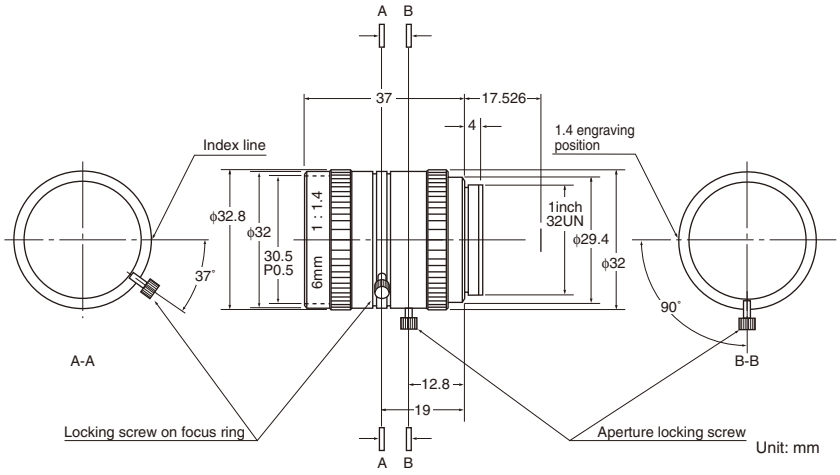
Item	Function	Reference page
CA-U3	24 V DC power supply	Page 9-59
CA-MP81	RGB LCD color monitor	Page 9-61
OP-42279	Monitor stand	
OP-87133	SD card (512 MB)	Page 2-37
CA-SD1G	SD card (1 GB)	
CA-SD4G	SD card (4 GB)	
OP-84231	Remote console	Page 1-8, 9-22
OP-84236	Handheld controller (blank)	Page 1-8, 9-22
OP-84364	Ferrite core for CA-NCL10E	Page 6
OP-87262	Monitor stand for CA Series LCD monitor	Page 9-62
OP-87263	Touch panel scratch-prevention sticker	

Standard Lenses

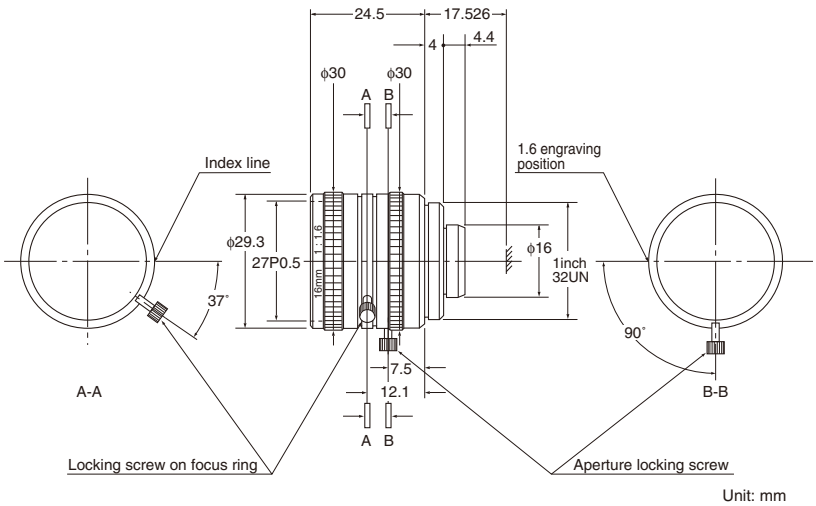
3.5-mm lens (CV-L3)



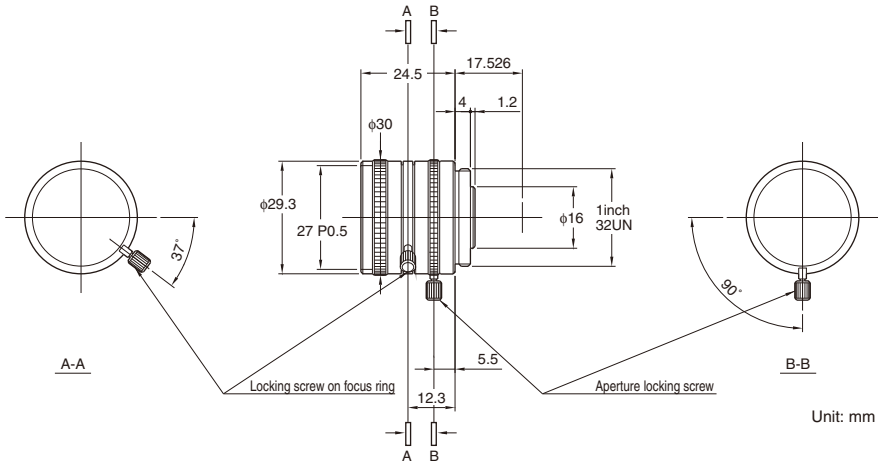
6-mm lens (CV-L6)



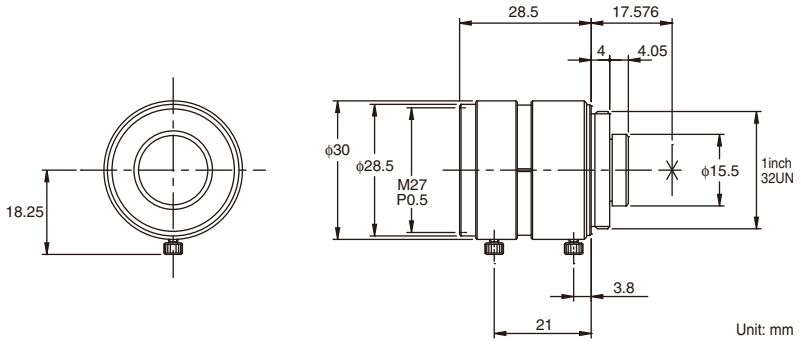
16-mm lens (CV-L16)



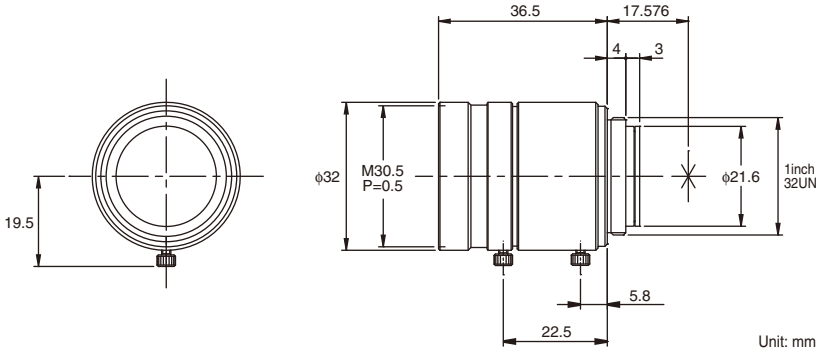
16-mm lens (CA-LC16)



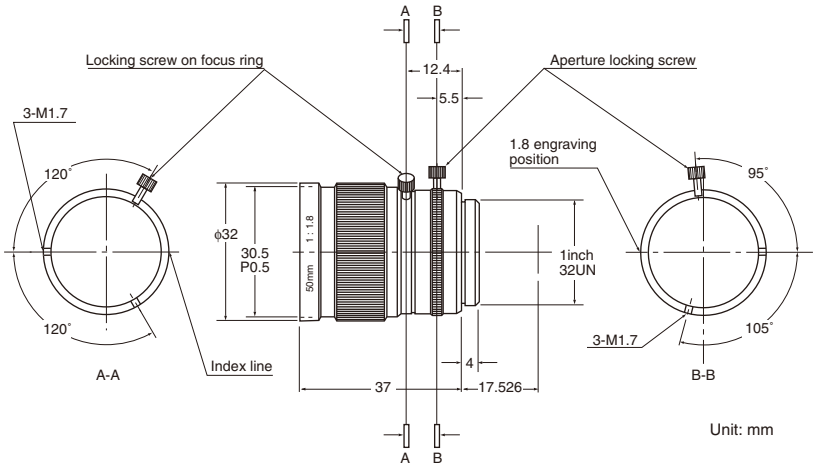
25-mm lens (CV-L25)



35-mm lens (CV-L35)



50-mm lens (CV-L50)



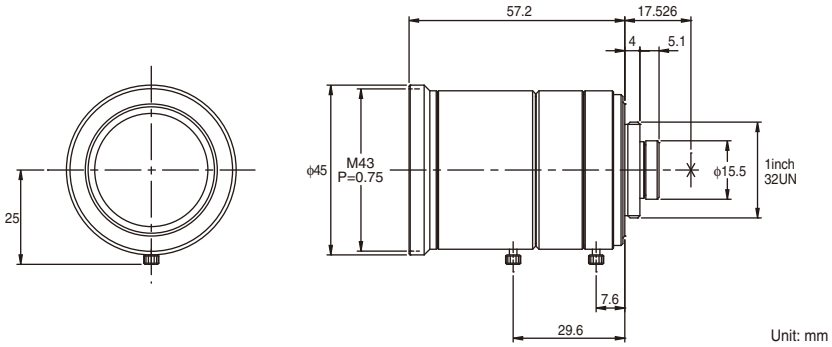
Specifications

Item	CV-L3	CV-L6	CV-L16	CA-LC16	CV-L25	CV-L35	CV-L50
Focal Distance	3.5 mm	6 mm	16 mm	16 mm	25 mm	35 mm	50 mm
Aperture	F1.6 - CLOSE	F1.4 - CLOSE	F1.6 - CLOSE	F1.4 - CLOSE	F1.6 - F16	F1.6 - F16	F1.8 - CLOSE
Minimum working distance	0.1 m	0.2 m	0.4 m	0.4 m	0.2 m	0.3 m	1.0 m
Mount	C-mount						
Filter thread diameter	43.0 mm P0.75	30.5 mm P0.5	27.0 mm P0.5	27.0 mm P0.5	27.0 mm P0.5	30.5 mm P0.5	30.5 mm P0.5
Maximum CCD size	1/2 inch		2/3 inch				
TV distortion*	-10.0% (-5.0%)	-1.8% (-1.4%)	-0.8% (-0.2%)	-0.6% (-0.2%)	-0.6% (-0.1%)	-0.2% (-0.08%)	-0.2% (-0.1%)
Operating temperature/humidity range	0 to +50°C, 35 to 80% RH (no condensation)						
Weight	Approx. 90 g	Approx. 70 g	Approx. 44 g	Approx. 44 g	Approx. 58 g	Approx. 85 g	Approx. 50 g

* The indicated values are for a 2/3-inch CCD. The values for 1/3 inch are indicated in parenthesis ( ).

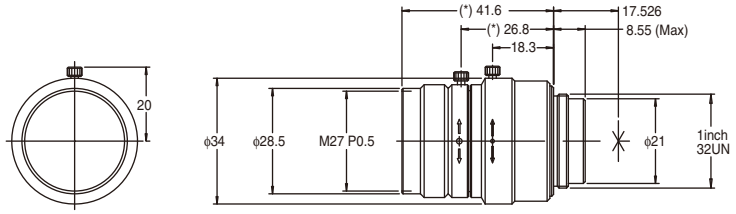
Low Distortion Lenses

4-mm lens (CA-LH4)



Unit: mm

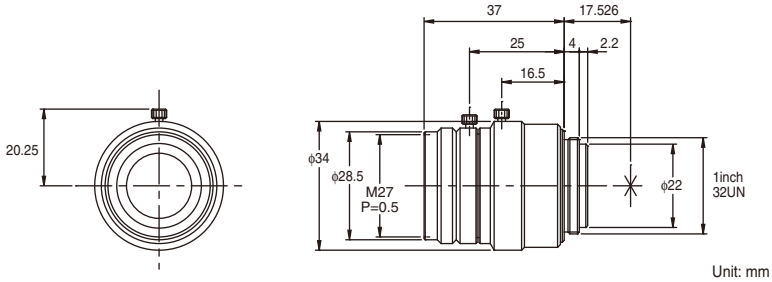
8-mm lens (CA-LH8)



* Varies based on focal distance. 0 mm (infinite apofocus) to 1.2 mm (minimum apofocus)

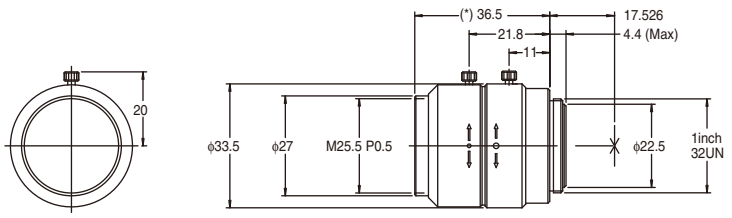
Unit: mm

12-mm lens (CA-LH12)



Unit: mm

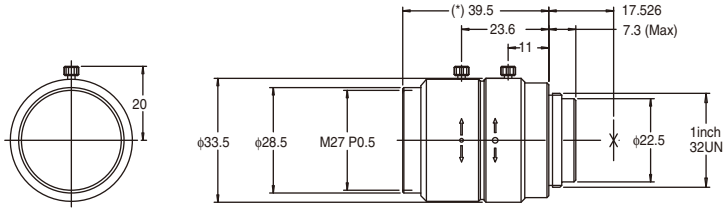
16-mm lens (CA-LH16)



* Varies based on focal distance. 36.5 mm (infinite apofocus) to 38.6 mm (minimum apofocus)

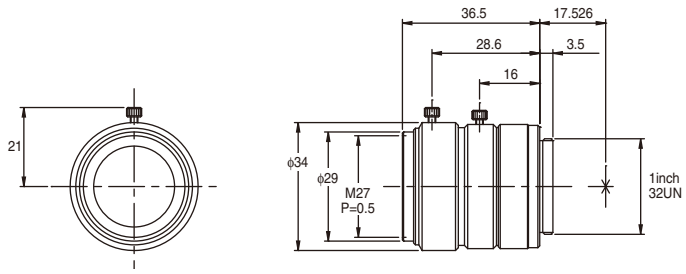
Unit: mm

25-mm lens (CA-LH25)



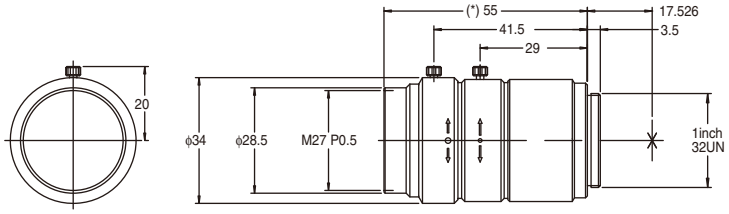
* Varies based on focal distance. 39.5 mm (infinite apofocus) to 44.0 mm (minimum apofocus) Unit: mm

35-mm lens (CA-LH35)



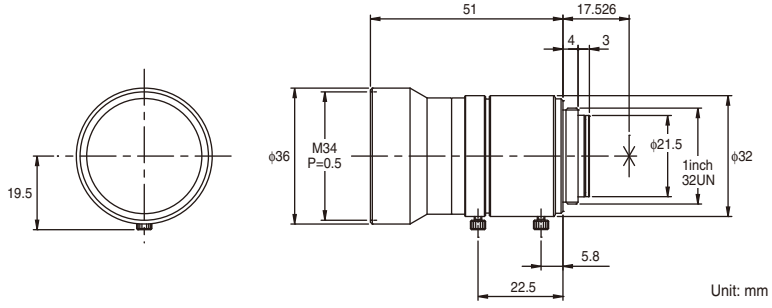
Unit: mm

50-mm lens (CA-LH50)



* Varies based on focal distance. 55.0 mm (infinite apofocus) to 73.0 mm (minimum apofocus) Unit: mm

75-mm lens (CA-LH75)



Unit: mm

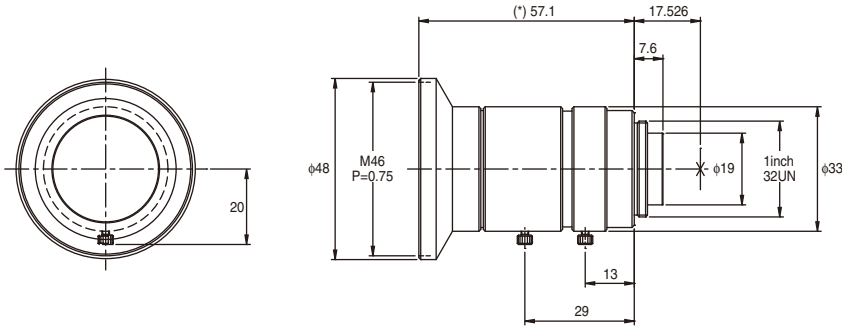
Specifications

Item	CA-LH4	CA-LH8	CA-LH12	CA-LH16	CA-LH25	CA-LH35	CA-LH50	CA-LH75
Focal Distance	4 mm	8 mm	12 mm	16 mm	25 mm	35 mm	50 mm	75 mm
Aperture	F1.6 - F16	F1.4 to F16	F1.4 to F16	F1.4 to F16	F1.4 to F16	F2.0 - F16	F2.8 to F22	F2.5 - F22
Minimum working distance	0.1 m	0.1 m	0.15 m	0.2 m	0.2 m	0.2 m	0.2 m	1.2 m
Mount	C-mount							
Filter thread diameter	43.0 mm P0.75	27.0 mm P0.5	27.0 mm P0.5	25.5 mm P0.5	27.0 mm P0.5	27.0 mm P0.5	27.0 mm P0.5	34.0 mm P0.5
Maximum CCD size	1/1.8 inch	2/3 inch						
TV distortion*	-0.2% (-0.13%)	-0.6% (-0.28%)	-0.07% (-0.04%)	-0.05% (-0.1%)	-0.04% (-0.02%)	-0.2% (-0.05%)	-0.03% (-0.01%)	-0.1% (-0.05%)
Operating temperature/humidity range	0 to +50°C, 35 to 80% RH (no condensation)							
Weight	Approx. 150 g	Approx. 83 g	Approx. 75 g	Approx. 81 g	Approx. 89 g	Approx. 89 g	Approx. 92 g	Approx. 105 g

* The indicated values are for a 2/3-inch CCD. The values for 1/3 inch are indicated in parenthesis ( ).

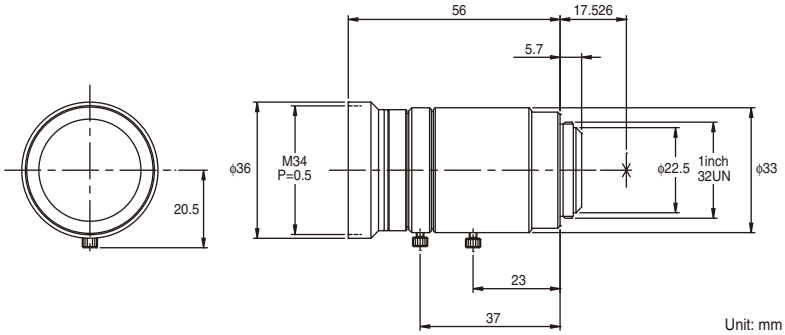
High-resolution, Low Distortion Lenses

5-mm lens (CA-LHR5)



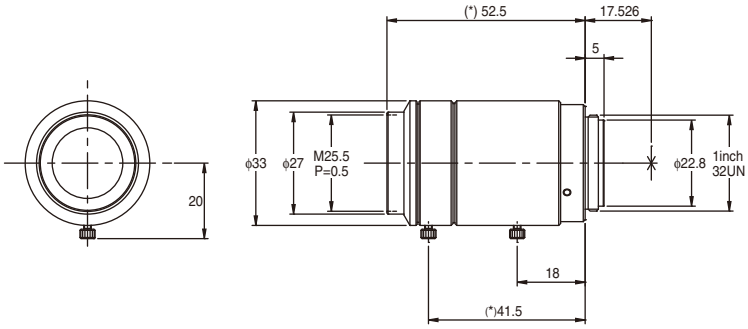
* Varies based on focal distance. 0 mm (infinite apofocus) to 2.3 mm (minimum apofocus) Unit: mm

8-mm lens (CA-LHR8)



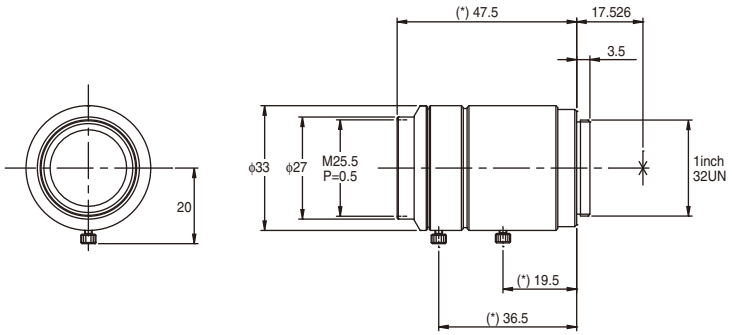
Unit: mm

12-mm lens (CA-LHR12)



* Varies based on focal distance. 0 mm (infinite apofocus) to 1 mm (minimum apofocus) Unit: mm

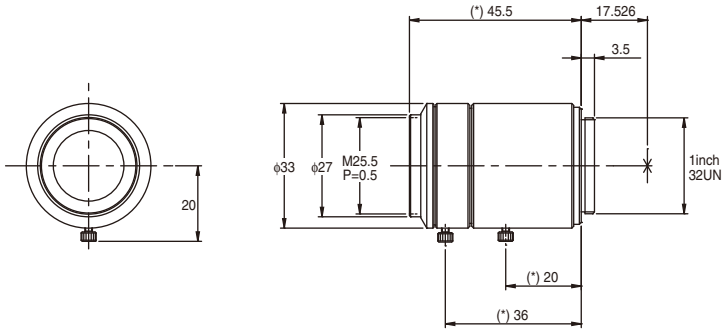
16-mm lens (CA-LHR16)



* Varies based on focal distance. 0 mm (infinite apofocus) to 2.5 mm (minimum apofocus)

Unit: mm

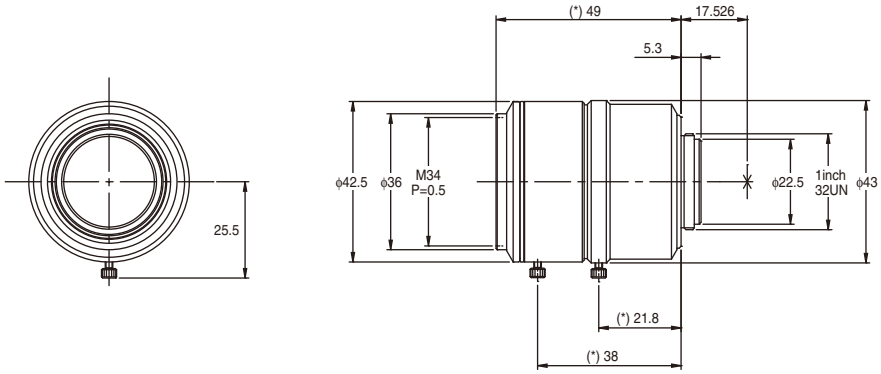
25-mm lens (CA-LHR25)



* Varies based on focal distance. 0 mm (infinite apofocus) to 5.7 mm (minimum apofocus)

Unit: mm

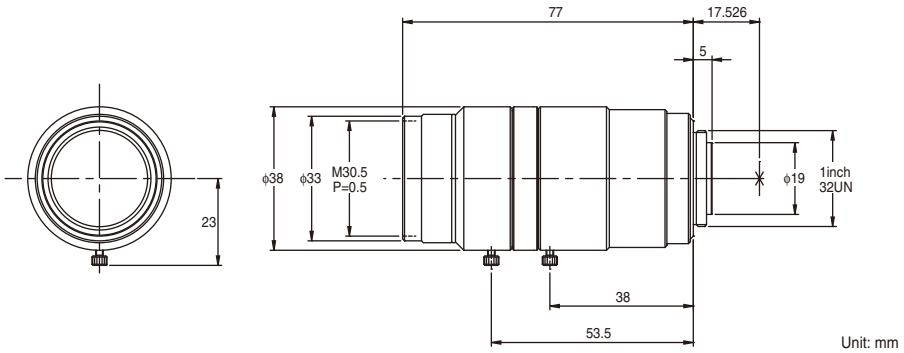
35-mm lens (CA-LHR35)



* Varies based on focal distance. 0 mm (infinite apofocus) to 19.2 mm (minimum apofocus)

Unit: mm

50-mm lens (CA-LHR50)

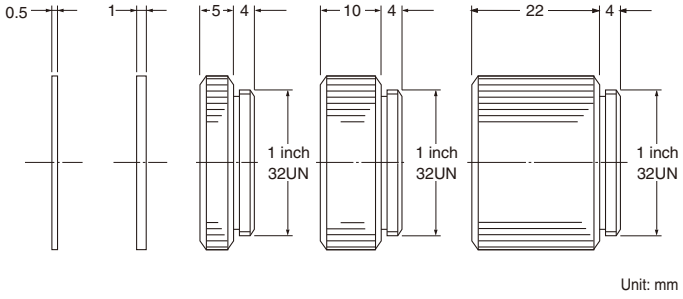


Specifications

Item	CA-LHR5	CA-LHR8	CA-LHR12	CA-LHR16	CA-LHR25	CA-LHR35	CA-LHR50
Focal Distance	5 mm	8.5 mm	12 mm	16 mm	25 mm	35 mm	50 mm
Aperture	F1.8 - CLOSE	F1.8 - F16	F1.8 - F11	F1.8 - F16	F1.8 - F16	F2.0 - F16	F2.8 - F16
Minimum working distance	0.1 m						
Mount	C-mount						
Filter thread diameter	46.0 mm P0.75	34.0 mm P0.5	25.5 mm P0.5	25.5 mm P0.5	25.5 mm P0.5	34.0 mm P0.5	30.5 mm P0.5
Maximum image size	2/3 inch						
TV distortion*	-0.33% (-0.11%)	-0.31% (-0.02%)	-0.12% (0.01%)	-0.20% (-0.11%)	-0.09% (-0.04%)	-0.05% (-0.01%)	-0.02% (0.02%)
Resolution	Center 200 lines/mm, periphery 140 lines/mm						
Lens coating	WIDE BAND MULTI COATING						
Operating temperature/humidity range	0 to +50°C, 35 to 80% RH (no condensation)						
Weight	Approx. 120 g	Approx. 115 g	Approx. 105 g	Approx. 90 g	Approx. 95 g	Approx. 160 g	Approx. 170 g

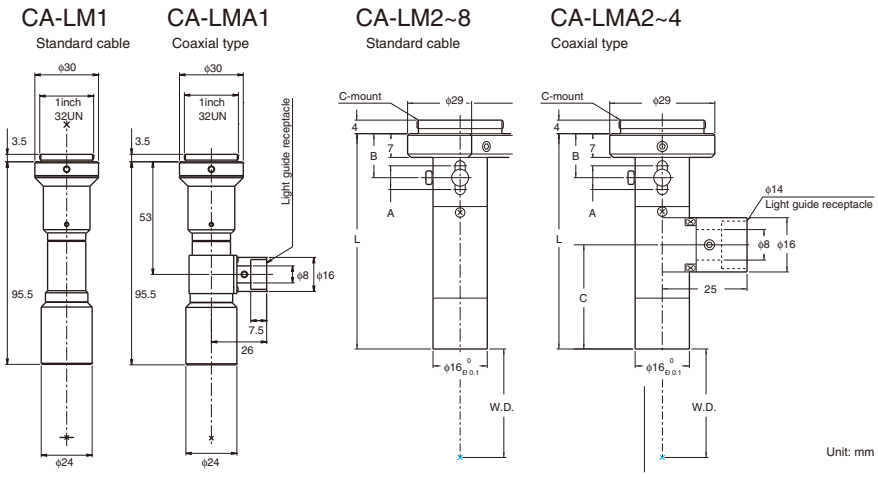
* The indicated values are for the applicable size CCD. The values for 1/3 inch are indicated in parenthesis ( ).

Close-up Spacer (OP-51612)



Macro Lenses

CA-LM1/LMA1/LM2/LMA2/LM4/LMA4/LM6/LM8



Item	CA-LM(A)2	CA-LM(A)4	CA-LM6	CA-LM8
L (length)	63.5 mm	69.3 mm	80.6 mm	95.0 mm
A (adjustment range)	7.0 mm	9.3 mm	7.7 mm	7.6 mm
B (adjustment position)	13.0 mm	15.1 mm	20.5 mm	34.9 mm
C (coaxial position)	30.7 mm	31.8 mm	—	—

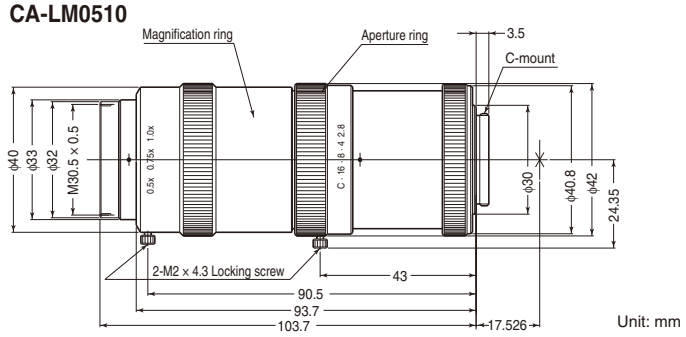
► Note

All the values in the specifications below are based on the optical design value. Individual differences can occur depending on the accuracy of the assembled lens.

Item		CA-LM1	CA-LM2	CA-LM4	CA-LM6	CA-LM8	CA-LMA1	CA-LMA2	CA-LMA4
Shape		Straight					Coaxial		
Optical magnification		x1	x2	x4	x6	x8	x1	x2	x4
Magnification range		—	Approx. ±5% relative to the reference magnification				—	Approx. ±5% relative to the reference magnification	
Working distance (mm, at standard magnification)[1)]		66.9	66.9	70.3	64.4	64.5	66.9	66.9	70.3
Compatible image / CCD size		2/3 inch	1/2 inch	1/2 inch	1/2 inch	1/2 inch	2/3 inch	1/2 inch	1/2 inch
Field of view[2)] (mm, at standard magnification)	1/3 inch	3.6 x 4.8	1.8 x 2.4	0.9 x 1.2	0.6 x 0.8	0.45 x 0.6	3.6 x 4.8	1.8 x 2.4	0.9 x 1.2
	1/2 inch	4.8 x 6.4	2.4 x 3.2	1.2 x 1.6	0.8 x 1.07	0.6 x 0.8	4.8 x 6.4	2.4 x 3.2	1.2 x 1.6
Valid F value		11.5	15.4	26.5	39.3	52.4	11.5	15.4	26.5
Depth of field (μm) [3)4)]		920	400	172	111	79	920	400	172
TV distortion (Max)		0.02%	-0.04%	-0.22%	-0.10%	-0.04%	0.02%	-0.04%	-0.22%
Resolution (μm) [5)]		7.7	5.1	4.5	4.4	4.4	7.7	5.1	4.5
Mount		C-mount							
Operating temperature and humidity		0 to +50°C, 80% RH (no condensation)							
Weight		Approx. 66 g	Approx. 57 g	Approx. 58 g	Approx. 64 g	Approx. 67 g	Approx. 75 g	Approx. 62 g	Approx. 66 g

1) WD indicates the working distance when each lens is used at reference magnification. Working distance will vary depending on the magnification adjustment.
2) Field of view indicates the standard field of view for each CCD size. The field of view can be changed by approximately 75% by adjusting the magnification.
3) The indicated depth of field is a theoretical value that assumes 1/2" or 2/3" image / CCD size and a horizontal resolution of 320 TV lines. (Circle of least confusion is 40 m in the image)
4) Depth of field varies depending on the F value.
5) The smallest resolvable feature able to be detected under 550 nm wavelength light.

CA-LM0510



► Note

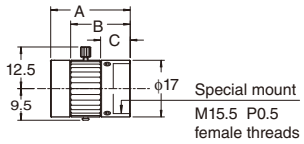
All the values in the specifications below are based on the optical design value. Individual differences can occur depending on the accuracy of the assembled lens.

Item		CA-LM0510
Shape		Straight
Optical magnification		x0.5to x1
Magnification range		—
WD [1] (mm, at standard magnification)		111(x0.5), 78 (x1.0)
Maximum CCD size		2/3 inch
Field of view [2] (mm, at standard magnification)	1/3 inch	3.6 x 4.8 to 7.2 x 9.6
	1/2 inch	4.8 x 6.4 to 9.6 x 12.8
Valid F value		2.8 - CLOSE
Depth of field [3] [4] (μm)		2560 (x0.5), 1280 (x1.0)
TV distortion (Max)		-0.4% (x0.5), -0.1% (x1.0)
Resolution [5] (μm)		3.8 (x0.5), 3.4 (x1.0)
Mount		C-mount
Operating temperature and humidity		0 to +50°C, 80% RH (no condensation)
Weight		Approx. 220 g

1) WD indicates the working distance when each lens is used at reference magnification. Working distance will vary depending on the magnification adjustment.
2) Field of view indicates the standard field of view for each CCD size. The field of view can changed by adjusting the magnification.
3) The indicated depth of field is a theoretical value that assumes 1/2" or 2/3" image / CCD size and a horizontal resolution of 320 TV lines. (Circle of least confusion is 40 ‡m in the image)
4) The CA-LM0510 depth of field is for an effective F value of 32. Depth of field varies depending on the F value.
5) The smallest resolvable feature able to be detected under 550 nm wavelength light.

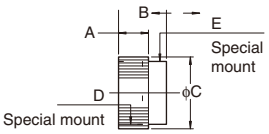
High Resolution Ultra Small Camera (XG-S200C/S200M) Options

Lens CA-LHS*



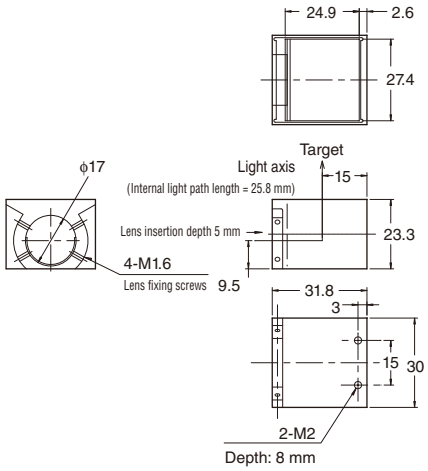
	CA-LHS8	CA-LHS16	CA-LHS25	CA-LHS50
A	40.4	23.9	24.9	40.4
B	28.6	17.9	18.6	27.1
C	19.6	8.9	9.6	18.1

Close-up ring OP-66830 (5 mm)/OP-66831 (10 mm)

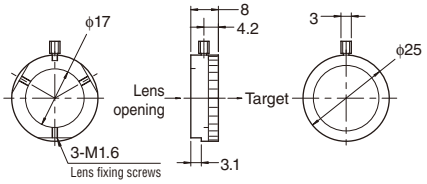


	OP-66830	OP-66831
A	5	10
B	8	13
C	17	17
D	M15.5 P=0.5 female threads	
E	M15.5 P=0.5 male threads	

Side view attachment OP-66833

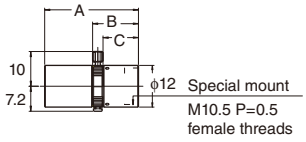


Polarizing filter OP-66832



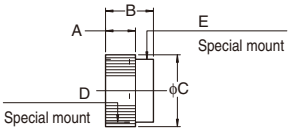
Ultra Small Camera (XG-S035C/S035M) Options

Lens CA-LS*



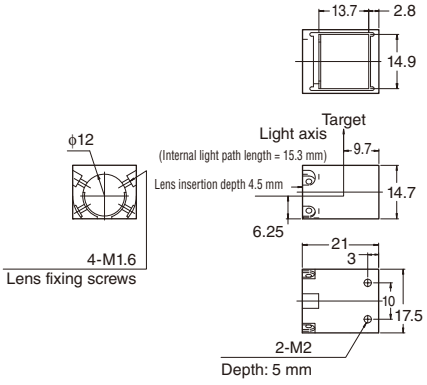
	CA-LS4	CA-LS6	CA-LS16	CA-LS30
A	16.7	21.3	20.4	27
B	11.5	15.9	10.2	13.2
C	8.5	12.9	7.2	10.2

Close-up ring OP-51500 (5 mm)/OP-51501 (10 mm)

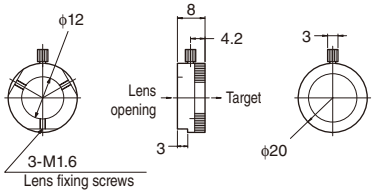


	OP-51500	OP-51501
A	5	10
B	8	13
C	12	12
D	M10.5 P=0.5 female threads	
E	M10.5 P=0.5 male threads	

Side view attachment OP-51503



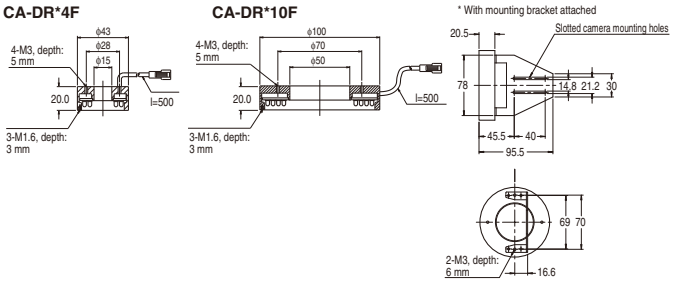
Polarizing filter OP-51502



LED Lights

Direct-ring lights (CA-DR)

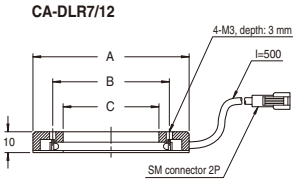
Item	LED color	Weight	Current consumption
CA-DRR4F	Red	Approx. 20 g	1.5 W
CA-DRW4F	White	Approx. 20 g	2.9 W
CA-DRB4F	Blue	Approx. 20 g	2.9 W
CA-DRR10F	Red	Approx. 90 g	8.3 W
CA-DRW10F	White	Approx. 80 g	7.9 W
CA-DRB10F	Blue	Approx. 80 g	7.9 W



Unit: mm

Low-angle lights (CA-DL)

Item	LED color	Weight	Current consumption
CA-DLR7	Red	Approx. 40 g	2 W
CA-DLR12	Red	Approx. 85 g	3.3 W

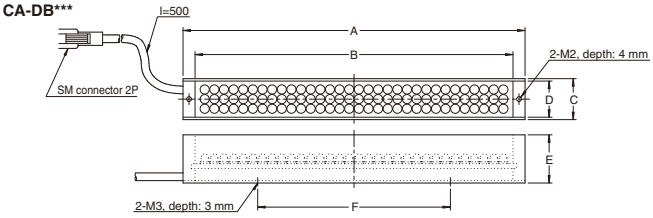


Model	Dimensions		
	A	B	C
CA-DLR7	ϕ75	ϕ56	ϕ46
CA-DLR12	ϕ125	ϕ110	ϕ95

Unit: mm

Bar lights (CA-DB)

Item	LED color	Weight	Current consumption
CA-DBR5	Red	Approx. 35 g	1.7 W
CA-DBW5	White	Approx. 40 g	2.9 W
CA-DBB5	Blue	Approx. 40 g	2.9 W
CA-DBR8	Red	Approx. 60 g	3.6 W
CA-DBW8	White	Approx. 60 g	4.8 W
CA-DBB8	Blue	Approx. 60 g	4.8 W
CA-DBR13	Red	Approx. 80 g	4.2 W
CA-DBW13	White	Approx. 90 g	7.3 W
CA-DBB13	Blue	Approx. 90 g	7.3 W



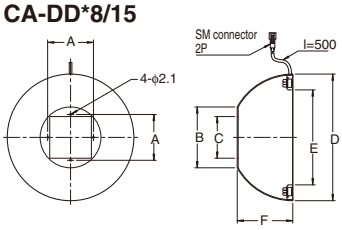
Unit: mm

Model	Dimensions					
	A	B	C	D	E	F
CA-DB*5	60	50	17	15	20	30
CA-DB*8	92	82	17	15	20	50
CA-DB*13	142	132	17	15	20	80

Dome lights (CA-DD)

Item	LED color	Weight	Current consumption
CA-DDR8	Red	Approx. 70 g	5.8 W
CA-DDW8	White	Approx. 70 g	5.8 W
CA-DDB8	Blue	Approx. 70 g	5.8 W
CA-DDR15	Red	Approx. 130 g	11 W
CA-DDW15	White	Approx. 170 g	18.8 W
CA-DDB15	Blue	Approx. 170 g	18.8 W

CA-DD*8/15



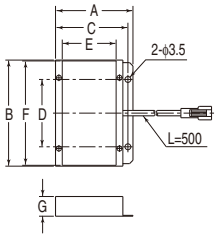
Model	Dimensions					
	A	B	C	D	E	F
CA-DD*8	26	ϕ30	20	ϕ87	ϕ54	40
CA-DD*15	55	ϕ73	50	ϕ154.5	ϕ114	66

Unit: mm

Back lights (CA-DS)

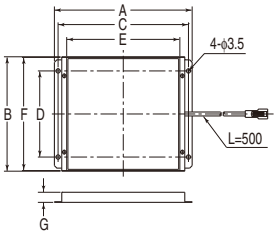
Item	LED color	Weight	Current consumption
CA-DSR2	Red	Approx. 30 g	2.2 W
CA-DSW2	White	Approx. 30 g	2.9 W
CA-DSB2	Blue	Approx. 30 g	2.9 W
CA-DSR3	Red	Approx. 40 g	3.6 W
CA-DSW3	White	Approx. 40 g	5.8 W
CA-DSB3	Blue	Approx. 40 g	5.8 W
CA-DSR9	Red	Approx. 110 g	14 W
CA-DSW7	White	Approx. 90 g	18 W
CA-DSB7	Blue	Approx. 90 g	18 W
CA-DSR15	Red	Approx. 320 g	27.4 W
CA-DSW15	White	Approx. 320 g	27.4 W
CA-DSB15	Blue	Approx. 320 g	27.4 W

CA-DS*2/3



Model	Dimensions						
	A	B	C	D	E	F	G
CA-DSR2	46	33	43	15	32	32	8.2
CA-DSW/B2	46	33	43	40	32	62	11.7
CA-DSR3	46	63	43	40	32	62	8.2
CA-DSW/B3	46	63	43	40	32	62	11.7

CA-DS*7/9/15



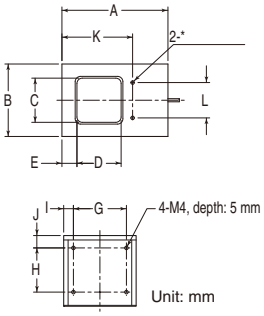
Model	Dimensions						
	A	B	C	D	E	F	G
CA-DSR9	112	93	106	70	92	92	8.2
CA-DSW/B7	97	78	91	60	77	77	11.7
CA-DS*15	170	151	164	120	150	150	17.2

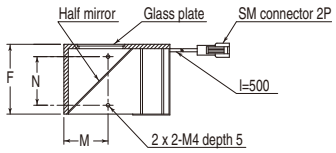
E and F are the dimensions of the light emitting surface. Unit: mm

Coaxial lights (CA-DX)

Item	LED color	Weight	Current consumption
CA-DXR3	Red	Approx. 60 g	1.8 W
CA-DXW3	White	Approx. 60 g	1.9 W
CA-DXB3	Blue	Approx. 60 g	1.9 W
CA-DXR5	Red	Approx. 230 g	5 W
CA-DXW5	White	Approx. 230 g	4.9 W
CA-DXB5	Blue	Approx. 230 g	4.9 W
CA-DXR7	Red	Approx. 380 g	6.7 W
CA-DXW7	White	Approx. 380 g	10.1 W
CA-DXB7	Blue	Approx. 380 g	10.1 W

CA-DX**





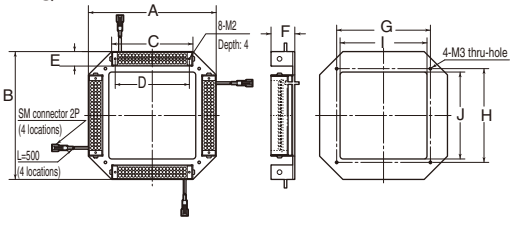
Model	Dimensions						
	A	B	C	D	E	F	G
CA-DX*3	58.5	30	20	18	6	27	12
CA-DX*7	97	60	36	32	16	59	40
CA-DX*7	120	82	50	50	17	79	60

Model	Dimensions							
	H	I	J	K	L	M	N	*
CA-DX*3	10	9	10	41	12	-	-	M3 depth 3
CA-DX*5	32	10	15	80	40	-	-	M4 depth 5
CA-DX*7	50	11	14	-	-	50	55	M4 depth 5

Square lights (CA-DQ)

Item	LED color	Weight	Current consumption
CA-DQR10	Red	Approx. 370 g	8.6 W
CA-DQW10	White	Approx. 370 g	11.5 W
CA-DQB10	Blue	Approx. 370 g	11.5 W
CA-DQR15	Red	Approx. 520 g	14.4 W
CA-DQW15	White	Approx. 520 g	19.2 W
CA-DQB15	Blue	Approx. 520 g	19.2 W

CA-DQ**



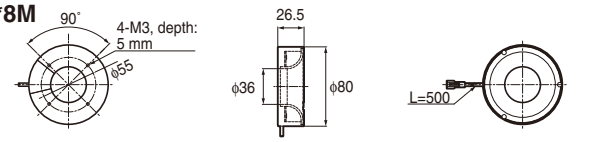
Model	Dimensions									
	A	B	C	D	E	F	G	H	I	J
CA-DQ*10	109	109	63.4	55	17	27.9	70	70	60	60
CA-DQ*15	150	150	95.4	87	17	27.9	110	110	102	102

Unit: mm

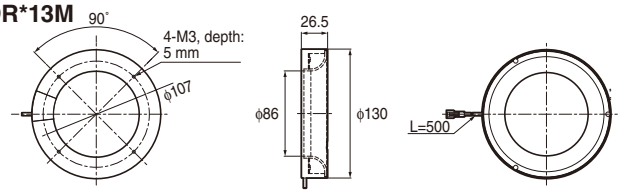
Multi-angle ring lights (CA-DR**M)

Item	LED color	Weight	Current consumption
CA-DRR8M	Red	Approx. 150 g	6.6 W
CA-DRW8M	White	Approx. 150 g	10.6 W
CA-DRB8M	Blue	Approx. 150 g	10.6 W
CA-DRR13M	Red	Approx. 260 g	12.5 W
CA-DRW13M	White	Approx. 260 g	19.8 W
CA-DRB13M	Blue	Approx. 260 g	19.8 W

CA-DR*8M



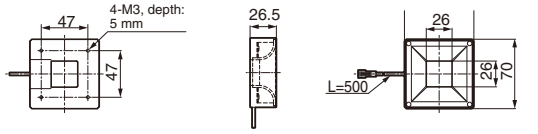
CA-DR*13M



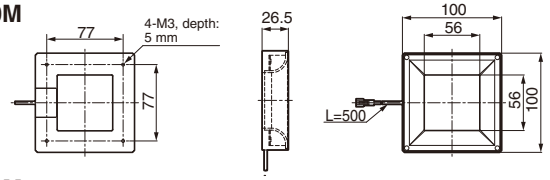
Multi-angle square lights (CA-DQ**M)

Item	LED color	Weight	Current consumption
CA-DQR7M	Red	Approx. 160 g	5.9 W
CA-DQW7M	White	Approx. 160 g	11.3 W
CA-DQB7M	Blue	Approx. 160 g	11.3 W
CA-DQR10M	Red	Approx. 250 g	11.7 W
CA-DQW10M	White	Approx. 250 g	16.9 W
CA-DQB10M	Blue	Approx. 250 g	16.9 W
CA-DQR12M	Red	Approx. 310 g	14.7 W
CA-DQW12M	White	Approx. 310 g	19.9 W
CA-DQB12M	Blue	Approx. 310 g	19.9 W

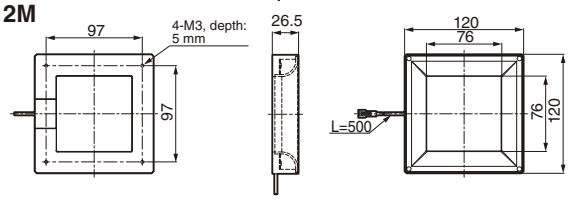
CA-DQ*7M



CA-DQ*10M



CA-DQ*12M



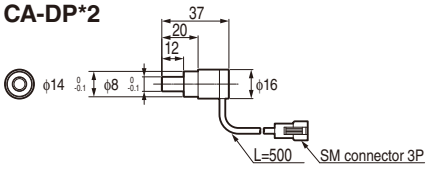
Spot lights (CA-DP)

Item	LED color	Weight	Current consumption*
CA-DPR2	Red	Approx. 20 g	8.4 W (2.0 W)
CA-DPW2	White	Approx. 20 g	8.4 W (2.0 W)
CA-DPB2	Blue	Approx. 20 g	8.4 W (2.0 W)

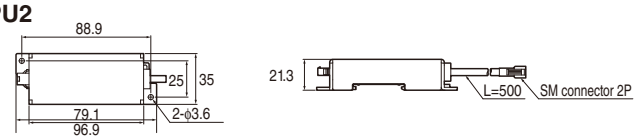
* Current consumption indicates the total power consumed by both the spot light and the power adapter. Figures in parenthesis ( ) indicate the power consumption of the spot light.

Item	Compatible lights	Weight
CA-DPU2	• CA-DPR2 • CA-DPW2 • CA-DPB2	Approx. 120 g

CA-DP*2

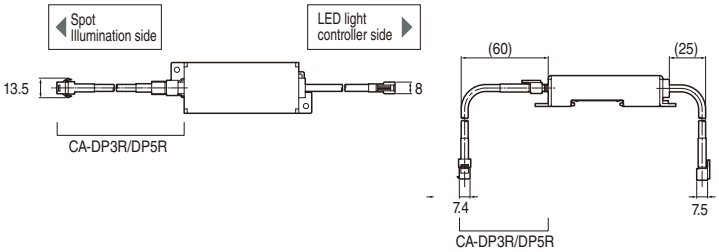


CA-DPU2



CA-DP3R/DP5R

(With spot light cable (3 m/5 m) connected)



Compatible spot light cables

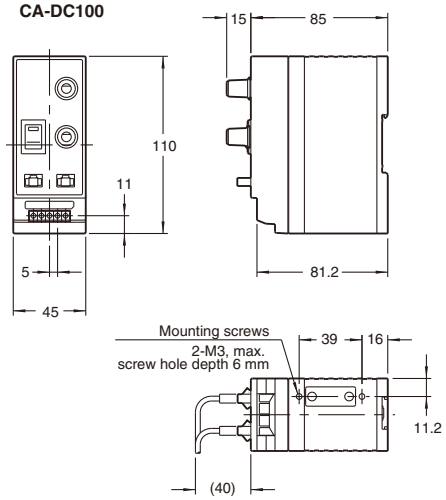
Extension cable (high flex robotic)

Cable length	Item
3 m	CA-DP3R
5 m	CA-DP5R

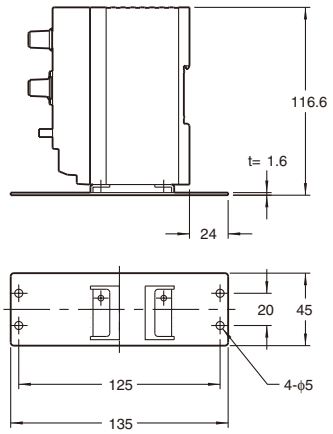
LED Light Controller (CA-DC100)

Outside dimensions

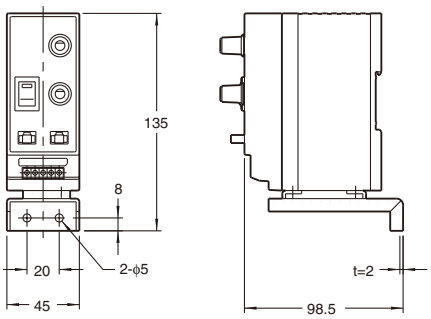
CA-DC100



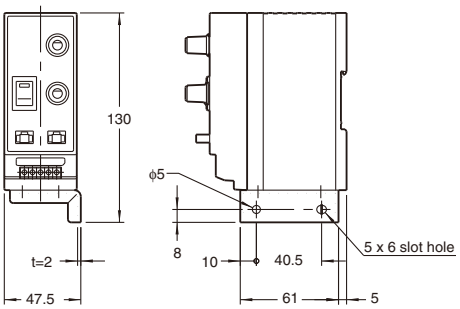
Mounted on the bottom (OP-42169)



Mounted facing forward (OP-42168)



Mounted from the side (OP-42170)



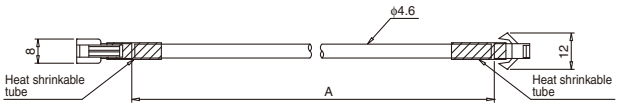
Specifications

Output	Light control: Light emission frequency 100 kHz, pulse width modulation method
	Lighting connections: 2 channels
	Voltage: 12 V
	Capacity: Maximum 30 W (but 20 W/1 CH)
Inputs	2 external control non-voltage contact inputs (EXT).
Rating	Power supply voltage: 24 V DC x ±10%
	Power consumption: 1.8 A (at maximum load)
Environmental resistance [1)]	Operating ambient temperature: 0 to +45°C
	Operating ambient humidity: 35 to 85% RH (no condensation)
Weight	Approx. 220 g

1) The environmental resistance characteristics of the LED light section assume an ambient operating temperature of 0 to +40°C, and an ambient operating humidity of 35 to 65% RH (no condensation).

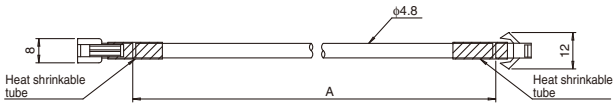
LED Light Cable

Standard cable



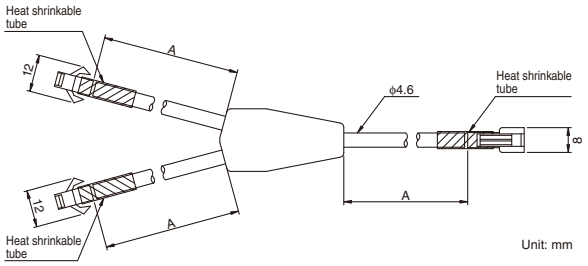
Item	Cable length (A)	Weight
CA-D2	2 m	60 g
CA-D5	5 m	130 g

High flex robotic cable



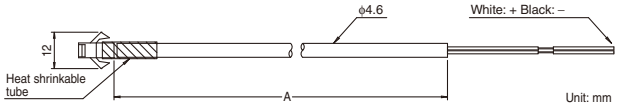
Item	Cable length (A)	Weight
CA-D3R	3 m	80 g
CA-D5R	5 m	140 g
CA-D10R	10 m	270 g
CA-D17R	17 m	450 g

Y-split type



Item	Cable length (A)	Weight
CA-D1W	0.5 m	50 g

Bare wire to connector cable

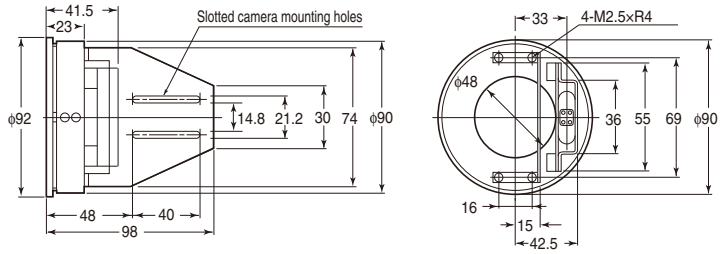


Item	Cable length (A)	Weight
OP-84457	1 m	30 g

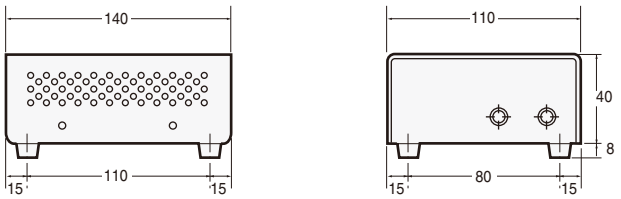
Fluorescent Ring Light (CV-R11/CA-R20)

CV-R11

Light section (When mounting bracket (large) is attached)

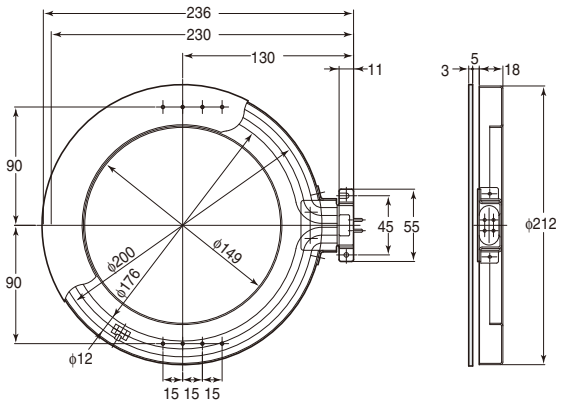


Controller

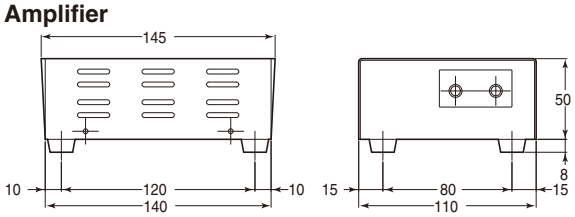


CA-R20

Lamp unit



Amplifier



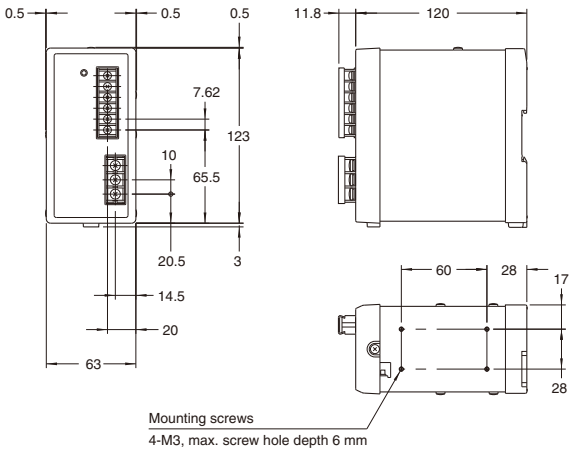
Specifications

Model name		CV-R11	CA-R20
Lighting method		High-frequency inverted power supply (25 to 35 kHz)	
Light color		N-EX (neutral white color)	
Lamp shape		Outer diameter : ϕ80 mm, internal diameter :ϕ56 mm	Outer diameter ϕ200 mm, nternal diameter ϕ176 mm
Lamp life [1)]		Approx. 2,000 hours	Approx. 1500 hours
Rating	Power supply voltage	24 V DC±10%	
	Current consumption	0.7A	1.5 A
Environmental resistance	Ambient operating temperature	+5 to +50°C	+5 to +40°C
	Ambient operating humidity	35 to 90% RH (no condensation)	
Weight	Lamp unit	Approx. 150 g	Approx. 300 g
	Amplifier	Approx. 650 g (including the cable)	Approx. 950 g (including the cable)
Replacement lamp type		OP-25526	OP-51495

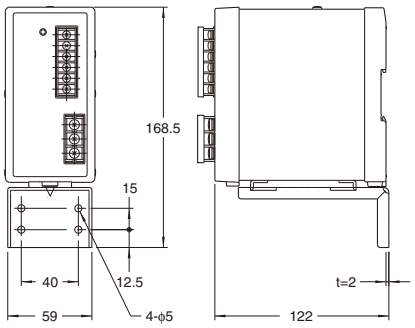
[1)] Lamp life indicates the average time it takes for the initial luminance [2)] to drop to 70% when the lamp is lit continuously under the environment with no vibration at about 25°C of ambient temperature. The lamp life may be shorter depending on the operating condition.

[2)] Initial luminance is the luminance when a new, unused lamp is lit for the first time.

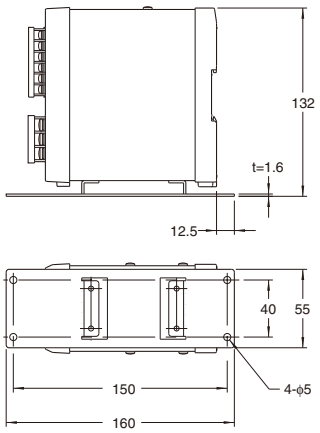
DC 24 V power (CA-U3)



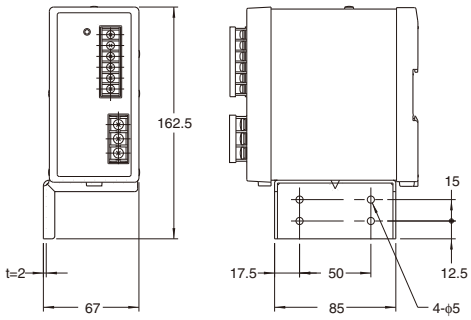
Mounted facing forward (using OP-42174)



Mounted on the bottom (using OP-42175)



Mounted from the side (using OP-42176)



Specifications

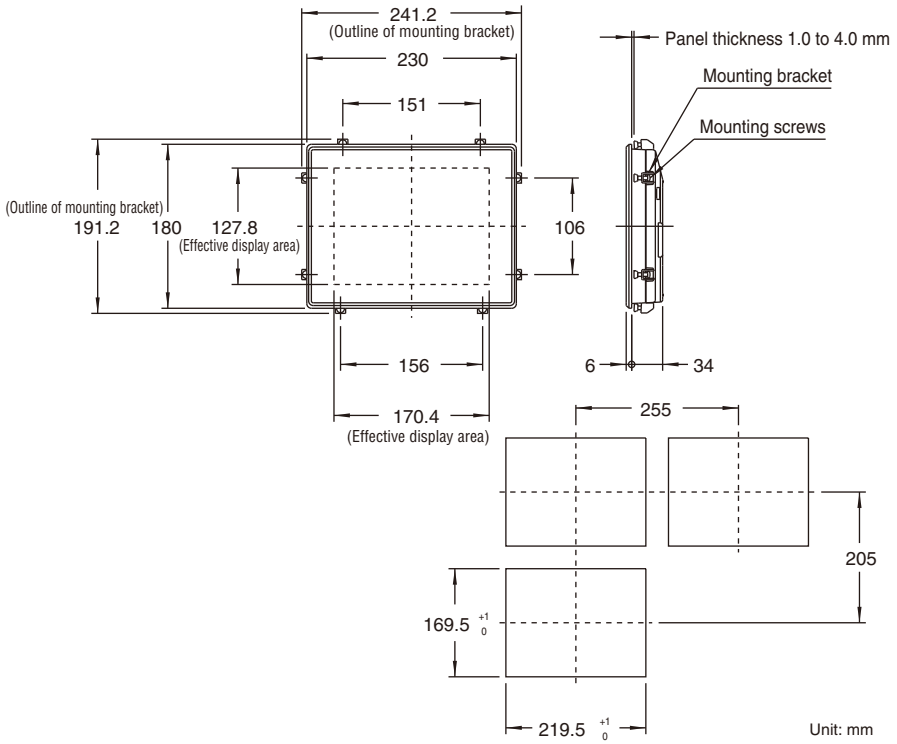
Input condition	Rated input voltage	100 to 240 V AC (±10%), 50/60 Hz
	Duty	76 - 81%TYP
	Rated input current	2.1 A or less (at AC 100 V)
	Power factor (100/200 V AC)	0.99/0.95 typ. at max. load
	Leak current (100/200 V AC)	0.4/0.75 mA or less
	Rush current (100/200 V AC)	18/36 A or less (25°C cold start)
	Overvoltage category	II
Output condition	Rated output voltage	24 V
	Rated output current	6.0 A (total of three output terminals)
	Ripple noise voltage	1% (P-P) or less
	Input fluctuation	0.4% or less
	Load fluctuation	0.7% or less
	Startup time (100/200 V AC) [1)]	1300/700 ms or less
	Output holding time	20 ms or more (100 to 240 V AC)
Protection	Overcurrent protection [2)]	6.0 A or more, fixed current drop or output block
	Overvoltage protection [3)]	Available
Environmental resistance	Ambient temperature	-10 to 55°C (No freezing)
	Relative humidity	25 to 85% RH (No condensation)
	Ambient storage temperature	-20 to 70°C (No freezing)
	Pollution degree	2
	Withstanding voltage	3.0 KV AC 50/60 Hz, 1 min (between input and output) 2.0 KV AC 50/60 Hz, 1 min (between input and GND) 500 V DC, 1 min (between output and GND)
	Impact resistance	300 m/s^2, twice each in 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 500 V DC (between input and output) (between input and GND) (between output and GND)
Applicable Standard	Safety Standards	UL: UL508, UL60950-1 C-UL: CSA C22.2 No.14, CSA C22.2 No.60950-1 EN: EN60950-1, EN50178 IEC: IEC60950-1
	EMC Standard	FCC Part 15B, Class A Digital Device EN55011, Class A EN61000-6-2
	Limits for harmonic current emissions	EN61000-3-2
Weight		Approx. 700 g

1) Under 100% load with specified voltage (100 to 200 VAC)

2) An automatic reset is activated when overcurrent occurs. When overcurrent protection is activated, wait for 1 minute or longer after the input is turned off / disconnected and then turn on / reconnect the input to reset power.

3) The output circuit is disconnected and reset when overvoltage occurs. When overvoltage protection is activated, wait for 1 minute or longer after the input is turned off / disconnected and then turn on / reconnect the input to reset power.

Monitor (CA-MP81)

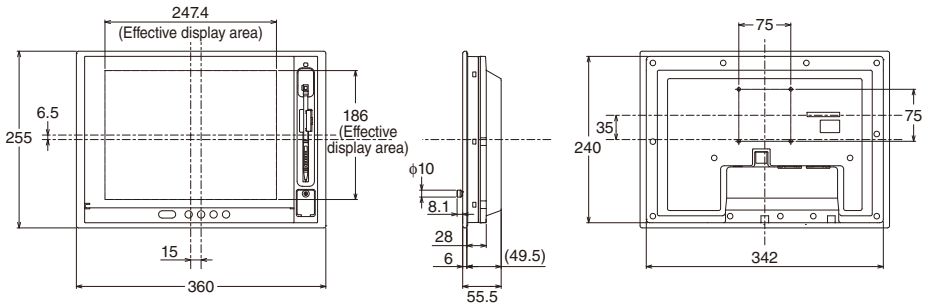


Specifications

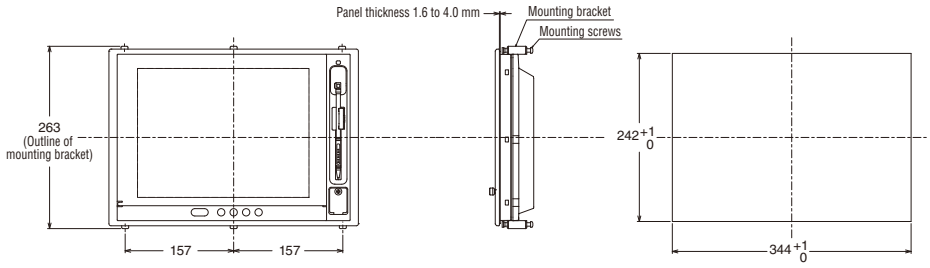
Liquid crystal panel	Display element	a-Si TFT Active Matrix
	Effective display area	170.4 (W) x 127.8 (H) mm
	Number of display dots	800 (W) x 600 (H) dots
	Display color	262,144 colors
Backlight	Life	Average life: approx. 50,000 hours (25°C vertical installation)
Input/Output	Input signal	Analog RGB signal (0.7 Vp-p, 75Ω) horizontal, vertical period signal
	Input signal mode	800 (W) x 600 (H) vertical frequency 60 Hz
	Connector	Mini D-sub 15-pin, female (3WAY, inch screw), input only
Rating	Power supply voltage	24 V DC ±10%
	Current consumption	1 A or less
	Ambient temperature	0 to +40°C
	Relative humidity	35 to 85% RH
Structure		Panel embedded type, dust-proof, drop-proof structure equivalent to IP65f at front only
Weight		Approx. 1250 g

Touch panel LCD monitor (CA-MP120T)

Panel installation diagram



Panel cut dimensions



Specifications

Liquid crystal panel	Display element	a-Si TFT Active Matrix
	Effective display area	245 (W) x 184 (H) mm
	Number of display dots	1024 (W) x 768 (H) dots or 800 (W) x 600 (H) dots
	Display color	262,144 colors
Backlight	Life	Average life: approx. 100,000 hours (25°C vertical installation)
Input/Output	Input signal	Analog RGB signal (0.7 Vp-p, 75Ω) horizontal, vertical period signal
	Input signal mode	1024 (W) x 768 (H), vertical frequency 60 Hz, or 800 (W) x 600 (H), vertical frequency 60 Hz
	Input signal connector	High-density mini D-sub 15-pin, female (3WAY, inch screw)
	Touch panel connector	D-sub 9-pin, male (2WAY, inch screw)
	Handheld controller connector	RJ45 connector
Rating	Power supply voltage	24 V DC ±10%
	Current consumption	1.5 A or less
	Ambient temperature	0 to +40°C
	Relative humidity	35 to 85% RH
Structure		Panel embedded type, dust-proof, drop-proof structure equivalent to IP65f at front only
Weight		Approx. 2.3 kg

Chapter 10

Appendix

Using Standard Built-In Menus

Some programs may have menu interfaces built into them for allowing configuration of the program. This section explains the operations for the following settings menus, which are known as the standard menus,

- Inspection Region menu (Page 3-20)
- Register Image menu (Page 3-28)
- Color menu (Page 10-2)
- Library menu (Page 4-250)
- Edit Unit Menu (Page 10-9)

► Note

- Changing the settings via the built in menus during inspection may impact the inspection results. It is recommended to stop the inspection before changing any settings via the menus.
- As the XG-7000 Series allows for the restriction of operations and functions available via the menus, some or all of the functions described here may not be available or their operation and behavior may differ from these descriptions.

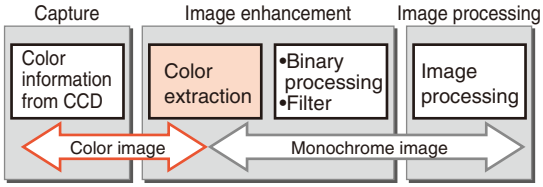
Reference

For more details on how to display and customize menu, refer to "Screen Editor" in the XG VisionEditor Reference Manual.

Working with Color Images (Color Extraction)

What is Color Extraction?

The color extraction process converts the captured raw color image to a monochrome (grayscale or binary) image. All the image processing (excluding HSB and RGB measurement) is performed on the converted monochrome image.



Color extraction is performed by using the color extraction operation in the vision, image operation and C Plug In units.

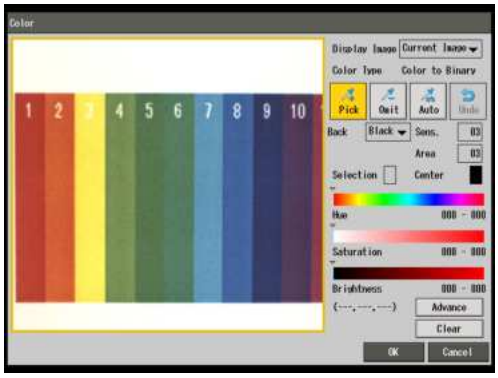
Some functions in the Color Extraction menu and the sub menu [Color] of the Edit Unit menu work and behave differently. Refer to "Difference between sub menus of the Edit Unit menu and other built-in menus" (Page 4-10) for further details.

Color Extraction Methods

The following three processes are available for the extraction or conversion of color information.

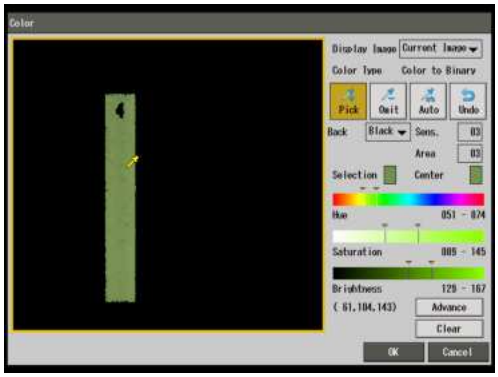
► Note

When using the Color Extraction menu, the settings defined via the XG VisionEditor software determine which color type to use. They cannot be changed from the menu. The color extraction process cannot be performed unless variables have been assigned. Additionally, variables have to be assigned to the color extract values, for values to be changed via the [Advance] menu.

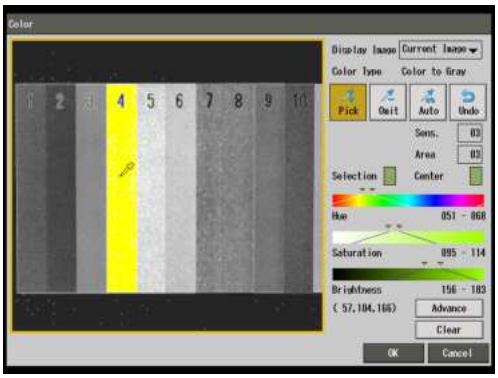


(Example of an image before color extraction)

- **Conversion to a binary image by selecting the color range (Color to Binary)**: This process creates a binary image by setting the pixels that fall within the selected color range to "white" (grayscale value 255). All pixels that fall out of the selected color range will be set to "black" (grayscale value 0). This binary image can then be used for operations such as pixel counting of a specified color (Area tool) or blob analysis of a grouping of pixels of a specified color (Blob tool).



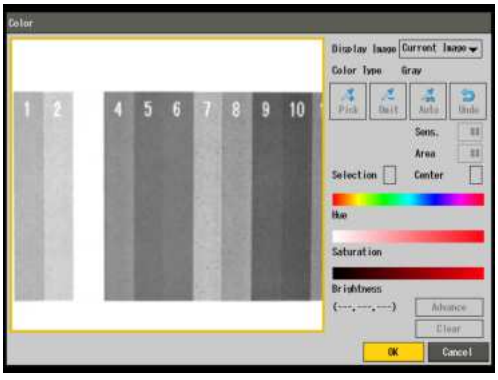
- **Conversion to a grayscale image with the focus on the selected color range (Color to Gray)**: The pixels that fall within the selected color range are set to "white" (grayscale value 255) while other colors are grayed respectively (grayscale values 0 to 254). This type of image processing is used for inspections that require high accuracy such as measurement or defect detection, as slight color variations can be accounted and adjusted for.



- **Conversion to a grayscale image (Gray, RGB Gray)**: This process creates a traditional grayscale image by extracting only the brightness from the color image. This option can be used to treat a color image as a monochrome image.

► Note

No additional settings are available when using Gray or RGB Gray.



Reference

Color extraction settings can be copied within the same image operation unit if the operation is set to [Source Image 1 and 2] by selecting [Copy to Source 1] or [Copy to Source 2].

Conversion to a Binary Image by Selecting the Color Range

Reference

The color extraction menu supports the selection of the unit for the color extraction process if enabled. If the menu allows selection, first select the unit to set in the [Unit] field.

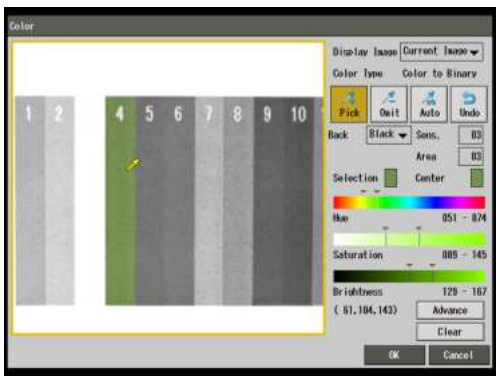
1 Select the image type from the [Display Image] drop down menu.

- **Current Image**: Displays the latest captured image from the set measurement unit.
- **Registered Image**: Displays the registered image from the set measurement unit.
- **Archived Img.**: Displays an image from the image archive (only displayed in the Color Extraction Menu). Toggle through the image archive by using the No.1 (FUNCTION) or No.7 (BACK) button and left or right.

2 Select the Pick button.

3 Use the 8-way key and No.0 (ENTER) button to select the color to be white (255).

Only the color that has been extracted is displayed in color.



4 Enlarge the range of extraction color as required.

- If the No.0 (ENTER) button is pressed consecutively, the neighboring colors of the first selected color are incrementally selected.
- If Auto is selected, the range of colors can be automatically enlarged, on the [Sens.] value.

To omit colors from the extraction:

Press the No.2 (ESCAPE) button to exit the color extraction and select Omit. Here colors to be omitted can be selected using the 8-way key and the No.0 (ENTER) button.

5 To finish the selection / omission process, press the No.2 (ESCAPE) button.

6 Click [OK].

Reference

- During the color extraction process the image can be changed using the View toolbar (Page 3-10).
- During color extraction the selection / omission functions can be toggled between by using the No.1 (FUNCTION) button.

Viewing the extracted color

To view the extracted color press the No.4 (SCREEN) button.
Each time the button is pressed the screen cycles through raw image → extracted color only → extracted color in the region → raw image ...

► Note

While the controller is running, all the extracted colors are displayed in white on the process screen.

Clearing color extraction

Choose [Clear] in the [Color] menu.

► Note

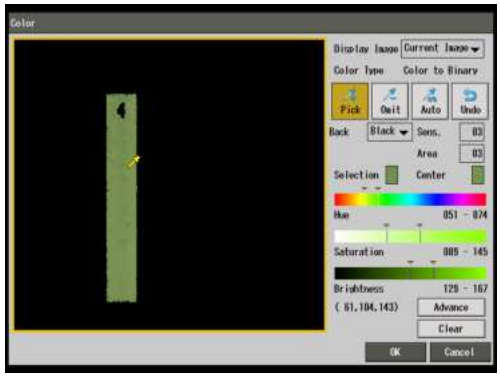
Once the color extraction has been cleared the [OK] button is disabled and the menu cannot be closed until color extraction has been performed.

Changing the color extraction settings

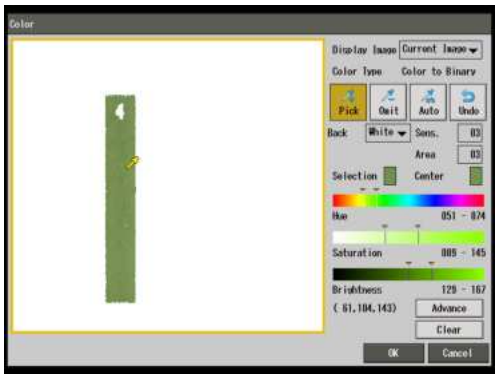
Changing the background color

To properly see the extraction of colors it is useful to change the background color.
The background color for the extracted image after color extraction can be selected from either white or black via [Back] in the [Color] menu.

Background color [Black]



Background color [White]



Adjusting the extraction sensitivity of neighboring colors

The sensitivity of the color extraction can be adjusted via [Sens.] in the [Color] menu.

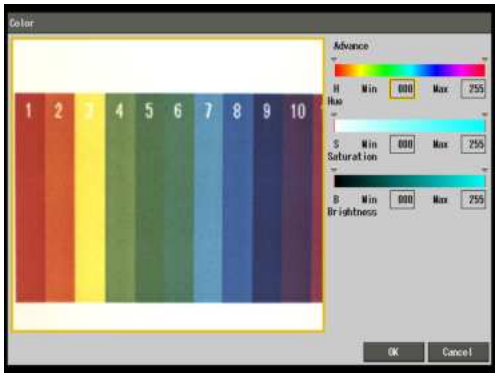
Adjusting the size of the color extraction selection region

The size of the color extraction area when selecting / omitting colors can be adjusted via [Area] in the [Color] menu. All colors that fall within the area will be extracted when the No.0 (ENTER) button is clicked.

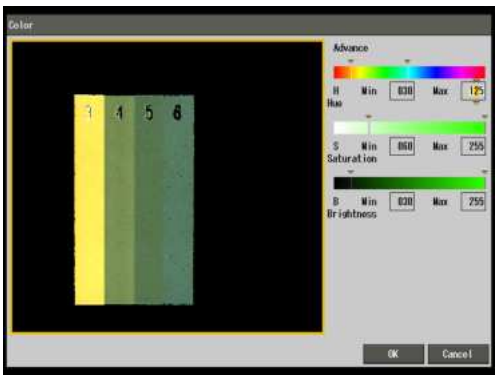
Specifying the color range to be extracted with numerical values

The extracted color range can also be set by inputting numerical values for the Hue, Saturation and Brightness ranges.

1 **From the [Color] menu select [Advance].**
The right side of the [Color] menu changes to the advanced settings screen.



2 **Specify the color range by setting minimum and maximum values for H, S, and B, respectively.**



Color is controlled by the following three elements.

- H (Hue): Indicating the color.
- S (Saturation): Indicating the saturation of the color.
- B (Brightness): Indicating the brightness of the color.

When the maximum and minimum values are specified, the color extraction range on the screen changes accordingly, and the position of the ▼ mark shifts on the color bar.

Reference

H (Hue) is a clockwise hue circle starting from red. As a result, the lower limit value may exceed the upper limit value.

3 **Click [OK].**
The right side of the [Color] menu reverts to normal.

Conversion to a Grayscale Image with the focus on the selected color range (Color to Gray)

Reference

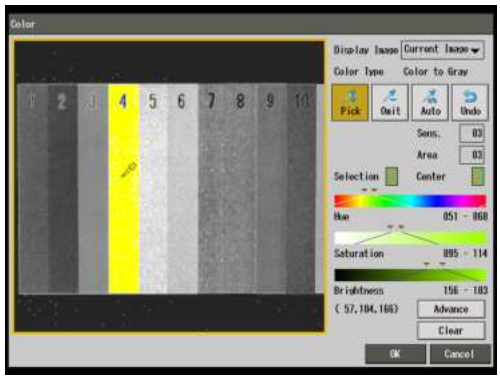
The color extraction menu supports the selection of the unit for the color extraction process if enabled. If the menu allows selection, first select the unit to set in the [Unit] field.

1 **Select the image type from the [Display Image] drop down menu.**

- **Captured Image**: Displays the latest captured image from the set measurement unit.
- **Registered Image**: Displays the registered image from the set measurement unit.
- **Archived Img.**: Displays an image from the image archive (only displayed in the Color Extraction Menu). Toggle through the image archive by using the No.1 (FUNCTION) or No.7 (BACK) button and left or right.

2 **Select the [Pick] button.**

3 **Use the 8-way key and No.0 (ENTER) button to select the color to be white (255).**
The displayed image is converted to grayscale with the selected color as white (255). The pixels that represent the level of 255 are displayed in yellow.



4 **Enlarge the range of extraction color as required.**

- If the No.0 (ENTER) button is pressed consecutively, the neighboring colors of the first selected color are gradually converted to a color approaching full white (255).
- If [Auto] is selected, the range of colors can be automatically enlarged, on the [Sens.] value.

To omit colors from the extraction:

Press the No.2 (ESCAPE) button to exit the color extraction and select . Here colors to be omitted can be selected using the 8-way key and the No.0 (ENTER) button.

► Note

If too many omissions are applied, the levels of contrast change across the image will be lost resulting in a binary like image. In such a case the results from tools which use contrast information (such as edge or pattern search) may deteriorate.

5 To finish the selection / omission process, press the No.2 (ESCAPE) button.

6 Click [OK].

Reference

- During the color extraction process the image can be changed using the View toolbar (Page 3-10).
- During color extraction the selection / omission functions can be toggled between by using the No.1 (FUNCTION) button. The  on the right side of the screen is selected while color exclusion is in progress. Press the No.1 (FUNCTION) button again to return to the color selection operation.

Viewing the extracted color

To view the extracted color press the No.4 (SCREEN) button.

Each time the button is pressed the screen cycles through raw image → grayscale image after conversion (with white highlighted as yellow) → grayscale image after conversion → raw image ...

Clearing color extraction

Choose [Clear] in the [Color] menu.

► Note

Once the color extraction has been cleared the [OK] button is disabled and the menu cannot be closed until color extraction has been performed.

Changing the color extraction settings

Adjusting the extraction sensitivity of neighboring colors

The sensitivity of the color extraction can be adjusted via [Sens.] in the [Color] menu.

Adjusting the size of the color extraction selection region

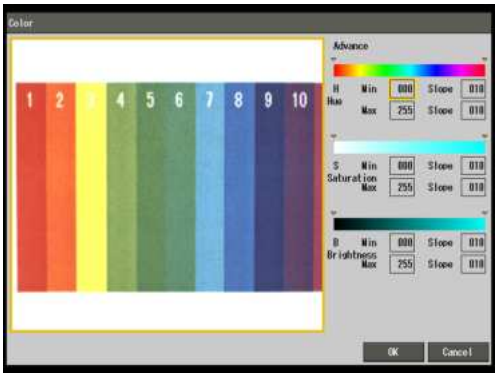
The size of the color extraction area when selecting / omitting colors can be adjusted via [Area] in the [Color] menu. All colors that fall within the area will be extracted when the No.0 (ENTER) button is clicked.

Specifying the color range to be extracted with numerical values

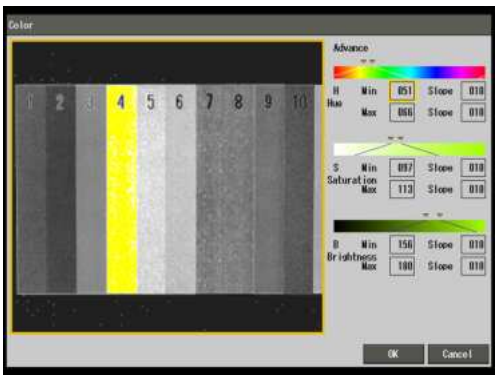
The extracted color range can also be set by inputting numerical values for the Hue, Saturation and Brightness ranges.

1 **From the [Color] menu select [Advance].**

The right side of the [Color] menu changes to the advanced settings screen.



2 **Specify the color range by setting minimum and maximum values for H, S, and B, respectively.**



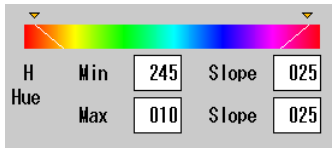
Color is controlled by the following three elements.

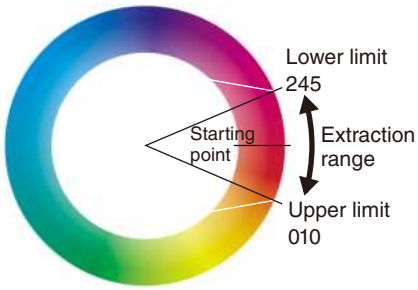
- H (Hue): Indicating the color.
- S (Saturation): Indicating the saturation of the color.
- B (Brightness): Indicating the brightness of the color.

When the maximum and minimum values are specified, the color extraction range on the screen changes accordingly, and the position of the ▼ mark shifts on the color bar.

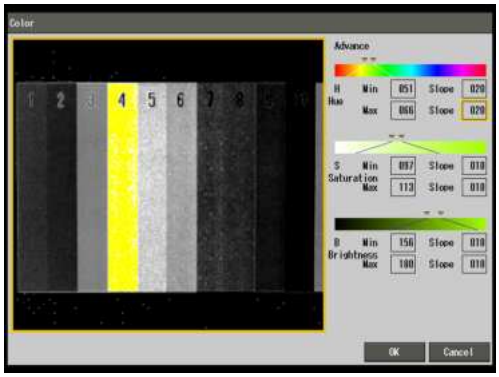
Reference

H (Hue) is a clockwise hue circle starting from red. As a result, the lower limit value may exceed the upper limit value.





3 **Specify the rate of contrast change for H, S, and B, on the grayscale image.**



The contrast slope can be individually set for the upper and lower limits. As the slope is changed so the contrast levels are changed on screen to assist with setting the desired range.

- **As the slope is increased (up to 100)**: The difference in contrast between the selected color range and non-color range increases, resulting in an image that is more focused on the exact color range and approaching a binary like image.
- **As the slope is decreased (min. 10)**: The image becomes more robust against lighting or color variation, as more contrast levels are allowed around the specified color range.

► Note

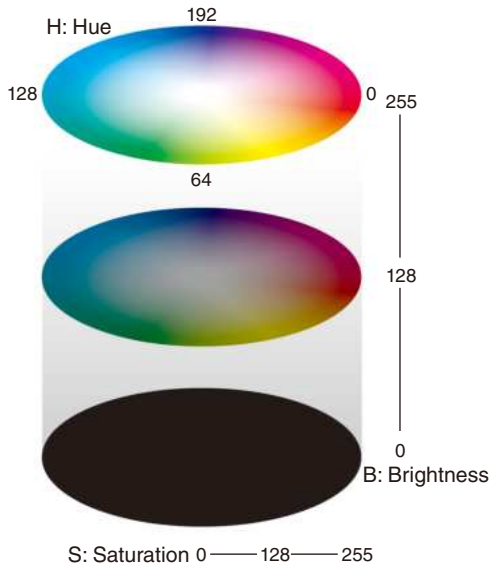
As with the case of exclusion, if the slope is increased, the contrast information outside the selected area decreases. Therefore, sharp slopes may impact the accuracy of measurements that reference the contrast information.

4 **Click [OK].**

The right side of the [Color] menu reverts to normal.

The HSB Color System

The HSB color system is a way of representing a color based on H (hue), S (saturation), and B (brightness). The ranges for the H, S, and B values are automatically determined when selecting the color via the color menu.



By specifying numerical values for the H, S, and B ranges via [Advance] menu, a more precise color extraction can be performed.

Tips for specifying numerical values

Consider the following points when specifying the color range to be extracted using numerical values.

- **H (Hue)**: The most important parameter to determine the color to be extracted. The other parameters (Saturation and Brightness) are applied to the same area specified for Hue. Be sure to specify the H value accurately.
- **S (Saturation)**: This is essentially the quantity of color contained in the color. Changing this value can be useful when trying to eliminate glare and hot spots from detection. By excluding the range with low saturation (little color and nearing white) from the color extraction, the white portions of the color caused by glare and hot spots can be excluded.
- **B (Brightness)**: This sets the level of black contained in the selected color. If the brightness level is enlarged, the color extraction and inspection will remain stable as lighting deteriorates.

Editing a Programmed Unit (Unit Properties Menu)

The Edit Unit menu can be used to change the settings of a unit that has been pre-programmed in the flowchart.

► Note

Changing the settings via the Edit Unit menu during inspection may greatly affect the inspection result. It is recommended that the inspection is stopped before changes are made. Refer to "Cautions on flowchart editing" (Page 4-4) for more details.

Reference

Refer to "What is the Edit Unit menu?" (Page 4-8) for more details on the Edit Unit menu and supported units.

1 From the Function menu (Page 4-3) select [Edit Unit].

A confirmation screen appears.

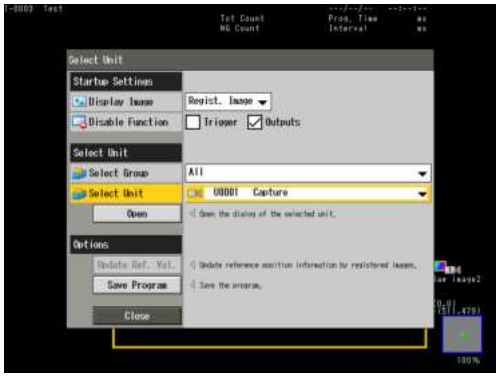


Reference

By default, [Edit Unit] does not appear on the [Function] menu. To show the [Edit Unit] menu, the system settings have to be changed via the XG VisionEditor software. Refer to the XG VisionEditor Reference Manual (Programming Edition) for more details.

2 Click [OK].

The Edit Unit menu appears.



3 Select the unit to be edited and select [Open]

The top menu for the selected unit appears.

Reference

Units can be filtered by selecting the group in the [Select Group] menu. Units not registered in the group will be filtered in the [All] and [Other] category.

4 Change appropriate settings of the unit.

See the explanation of each unit for more details.

5 Save the revised settings.

6 Click [OK].

Selecting the defaulted displayed image

The image used when editing a unit can be switched between.

- **Captured image**: Displays the latest image from the specified camera (image variable).
- **Registered image**: Displays the registered image specified under [Image Selection].

Disabling controller operation while editing units

Ignoring trigger inputs

Put a check mark in the [Trigger] option.

Disabling terminal and communication outputs

Put a check mark in the [Outputs] option.

Reference

- The [Trigger] and [Outputs] settings do not take effect until a unit is opened. This setting has no effect when all menus are closed. The disabling of controller operations does not occur when the Edit Unit menu is displayed.
- If the outputs are disabled, data currently being output will continue until finished (Page 5-21).

Updating the reference position for position adjustment with registered images

Use the [Update Ref. Val.] to update the reference points position adjustment unit based on the current registered image.

► Note

Using [Update Ref. Val.] under these circumstances may result in an inaccurate position adjustment when:

- the unit that serves as the position adjustment source references another position adjustment.
- the inspection region for a unit that affects position adjustment uses the current image.
- the unit that is referenced by a position adjustment has not been registered with an appropriate registered image. Make sure to save the settings before turning off the controller.

Saving settings

Use [Save Program] to save any changes made to the program.

► Note

Any changes in the settings that were not saved prior to turning off the controller will be lost.

Image Enhancement Filters

Details of the image enhancements available for vision tools are listed below. These filters can be applied via the [Image Enhance] menu.

► Note

- If a color image is use, the resultant image after the filter is applied is not displayed until color extraction has been performed.
- Filters can only be added or deleted through the [Image Enhance] menu.

Reference

- A filter can be skipped during execution by setting the [Count] to 0. However, the inspection time will still be longer than if no filter is used.
- Filters can be copied in the same image operation unit if the [Operation] is set to [Source Image 1 and 2] by selecting [Copy to Source 1] or [Copy to Source 2].

OFF

No filter is applied.



Binary

Converts the image to binary.



- Select [Detail] to adjust the Binary level and Count (1: ON, 0: OFF).
- Put a check mark in [Update histogram on the input image] option to update the histogram as the image changes.

Reference

Adjustments can also be made by manually entering Lower and Upper limit values on the histogram display.

Expand

Removes dark noise by adjusting pixels to the highest grayscale intensity from a group of pixels.



Select [Detail] to set the filter size (3 x 3: default, 5 x 5: stronger), direction (X, Y, XY), count (number of times to apply the filter, 0 to 9, where 0 turns the filter off), and borders.

Border processing

The way the filter uses pixel data outside of the region for pixels on the border can be selected between

- **ON** (default): Uses the pixel data outside of the region for pixels on the border.
- **OFF**: Extrapolates the pixels on the border for the pixel data.

Shrink

Removes light noise by adjusting pixels to the lowest grayscale intensity from a group of pixels.



Select [Detail] to set the filter size (3 x 3: default, 5 x 5: stronger), direction (X, Y, XY), count (number of times to apply the filter, 0 to 9, where 0 turns the filter off), and borders.

Border processing

The way the filter uses pixel data outside of the region for pixels on the border can be selected between

- **ON** (default): Uses the pixel data outside of the region for pixels on the border.
- **OFF**: Extrapolates the pixels on the border for the pixel data.

Average

Removes noise by taking the average intensity across a group of pixels.



Click [Detail] to set the Count (number of times (0 to 9) to apply the filter, where 0 turns the filter off).

Median

Removes noise yet maintains definition by taking the median (most common) intensity across a group of pixels.



Click [Detail] to set the Count (number of times (0 to 9) to apply the filter, where 0 turns the filter off).

Sharpen

Enhances regions where there is a change in intensity.



Click [Detail] to set the Count (number of times (0 to 9) to apply the filter, where 0 turns the filter off).

Sobel X

Applies a Sobel filter in the X horizontal direction, enhancing intensity changes.



Click [Detail] to set the Count (number of times (0 to 9) to apply the filter, where 0 turns the filter off).

Sobel Y

Applies a Sobel filter in the Y vertical direction, enhancing intensity changes.



Click [Detail] to set the Count (number of times (0 to 9) to apply the filter, where 0 turns the filter off).

Sobel

Applies a Sobel filter for extracting and enhancing changes in intensity based on a linear comparison.



Click [Detail] to set the Count (number of times (0 to 9) to apply the filter, where 0 turns the filter off).

Prewitt

Applies a Prewitt filter for extracting changes in intensity based on a linear comparison.



Click [Detail] to set the Count (number of times (0 to 9) to apply the filter, where 0 turns the filter off).

Roberts

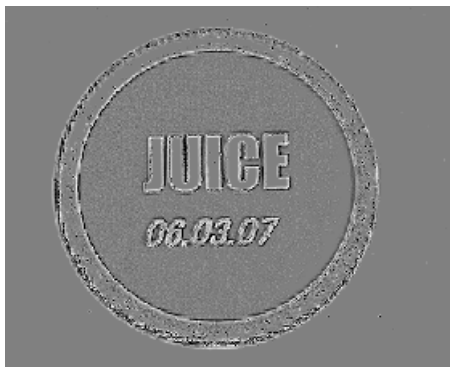
Applies a Roberts filter for extracting changes in intensity based on an angular comparison.



Click [Detail] to set the Count (number of times (0 to 9) to apply the filter, where 0 turns the filter off).

Laplacian

Applies a Laplacian filter for extracting changes in intensity.



Click [Detail] to set the Count (number of times (0 to 9) to apply the filter, where 0 turns the filter off).

Difference

Refer to "Extracting Defects" (Page 10-15).

Preserve intensity

Refer to "Reducing the Impact of Changes in Intensity" (Page 10-17).

Contrast conversion

Refer to "CCD Settings" (Page 4-20).

Image extraction

Refer to "Removing Background Information" (Page 10-18).

Shading correction

Refer to "Eliminating Shading and Gradation" (Page 10-19).

Blur

Applies a softening (blur) filter.



Select [Detail] to set the filter strength (1 to 99), direction (X, Y, XY), and count (1: ON, 0: OFF).

Custom

Refer to "Using Basic Custom Filters" (Page 10-20).

Custom (Advance)

Refer to "Using Advance Custom Filters" (Page 10-21).

Blob

Refer to "Extracting Desired Parts of the Image" (Page 10-24).

Extracting Defects

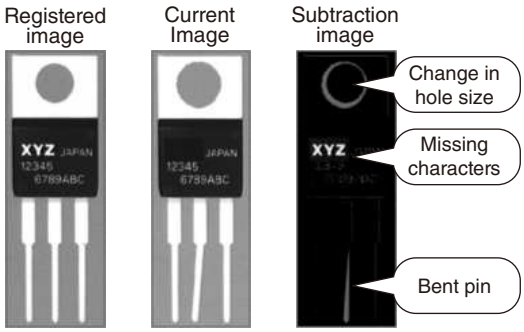
Subtraction Filter

Applying the subtraction filter results in an image which is the absolute difference between the current and registered image. This is useful for isolating differences such as dirt, cracks, and deformation, when comparing a target to a known standard. Using this filter with the defect (Page 4-115) and position adjustment tools makes it easy to find hard to recognize differences due to complex targets or regions.

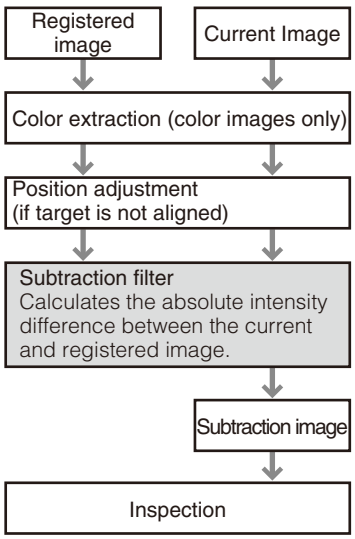
► Note

- The subtraction filter cannot be used with Pattern Search, OCR, 2D Code, Image Operation, or C Plug In units.
- If there is no registered image or the registered image is not set correctly then the filter will not be processed correctly.

Processing image



Subtraction filter process



Setting up the Subtraction Filter

1 Setup a unit for which the subtraction filter should be applied.

In this example, a defect unit is used.
For more details on how to setup a [Defect Unit], refer to "Defect" (Page 4-115).

2 Apply the [Subtract] filter.

From the [Image Enhance] menu select [Subtract].

Reference

When [Subtract] is selected, the currently displayed image is processed, which could cause the screen to go black.

3 Click [Detail].

Mask area

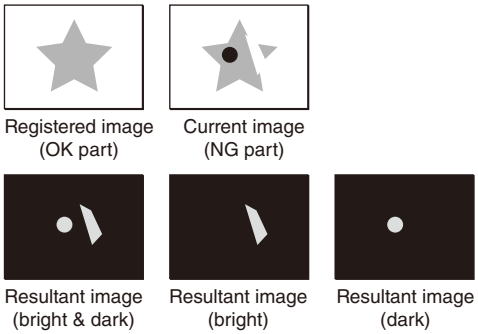
A mask area can be used to cancel noise around profiles that could occur due to differences in the registered image and the current image. Choose the number of repetitions (0 to 9, default 2). A larger number gives better noise suppression, yet reduces the sensitivity to smaller defects.

Extract color

Choose a method for extracting areas based on intensity.

- **Bright & Dark** (Default)**:** Displays areas that are either lighter or darker than the registered image.
- **Bright:** Displays areas that are lighter than the registered image.
- **Dark:** Displays areas that are darker than the registered image.

Changes in the subtraction image based on extraction settings.



Reference

- To exclude random shiny areas and extract only dark areas, chose the [Dark] setting.
- To view the results of the filter change the display image to [Current Img.].

High speed mode

Choose how to process the subtraction filter.

- **Constant (fast)** (default): Use the processing memory to speed up the processing. In this mode, you cannot reference variables for region settings, color extraction, or image enhancement.
- **Update every time (slow)**: Uses the image memory to re-calculate the image before subtraction, allowing for variables to be referenced for region, color extraction and image enhancement settings.
- **User updated (fast)**: Uses both the processing and image memory for the subtraction calculation allowing for variables to be referenced for region, color extraction and image enhancement settings. Any change in settings requiring the recalculation of image information needing to use the image memory is applied when the recalculation command (RU) is issued. Refer to the XG VisionEditor Reference Manual (Control/Data Edition) for more details.

Reference

If [User updated (fast)] is selected, changes in settings made via the Inspection Region menu (Page 3-20), Color menu (Page 10-2) and Edit Unit menu (Page 4-8) are applied without the need of the recalculation (RU) command. (The recalculation of the registered image information is done immediately when using the Edit Unit menu, and when [OK] is used with other menus.)

► Note

- If there is not enough memory for each operation, a setting error occurs.
- The [High Speed Mode] cannot be set to [Constant (fast)] if a variable is assigned to settings that affect the recalculation of image information such as region, color extraction or image enhancement settings. In such cases, remove the referenced variable and change the setting.
- If there are any cameras where the captured image size is 26214400 pixels or larger, it is not possible to set High Speed Mode to [OFF].

Wide range mode

Checking this box, which is displayed when any camera has a captured image size of 26214400 pixels or larger, will reduce the processing capacity consumed by the subtract filter by approximately half.

► Note

- Checking the box will increase the processing time.
- If the region size is larger than 33554432 pixels, it is necessary to check this box.

4 **To apply settings, click [OK].**

5 **Set a pattern search unit to use as the position adjustment unit.**

If there is a position change between the registered image and the current image, the subtraction filter will also show such differences. To ensure images align use position adjustment with a position tool (such as pattern search). For more details on how to setup the pattern search unit, refer to "Pattern search" (Page 4-40).

Example of error due to position mismatch



Reference

Other tools can be used for position adjustment such as edge position (Page 4-52).

6 **In the position adjustment unit, choose the pattern search unit set in step 5 as the reference.**

Refer to "Position Adjustment" (Page 4-274) for more details.

7 **In the [Inspection Region] menu set the [Position Adjustment ID] for the position adjustment unit set in step 6.**

Reference

In addition to position correction intensity correction can also be applied to fix changes in lighting and differences between the images. To reduce the effects of changes in intensity, use the preserve intensity filter before the subtraction filter. Refer to "Reducing the Impact of Changes in Intensity" (Page 10-17) for more details.

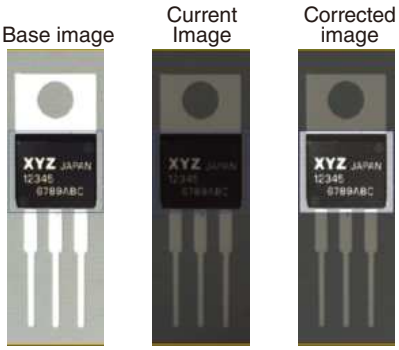
Reducing the Impact of Changes in Intensity

The impact of lighting fluctuations can be reduced by using the Preserve Intensity filter to correct the change in intensity from when the inspection was first configured. This is especially useful for inspections with a monochrome image where only contrast information is processed.

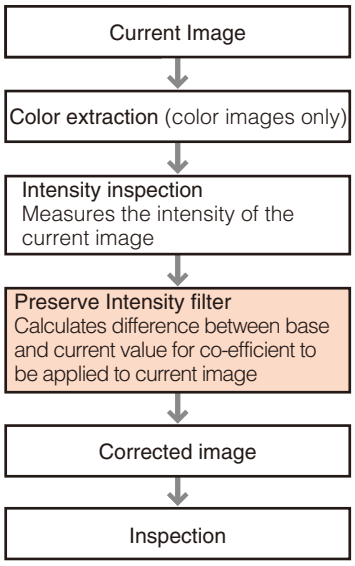
► Note

Preserve Intensity cannot be used for a color unit.

Processing image



Setting up the Preserve Intensity Filter



Setting up the Preserve Intensity Filter

► Note

- Be sure to arrange the order on the flow chart so that the Intensity unit is processed before the Preserve Intensity filter is used.
- The preserve intensity filter cannot process a completely black area.
- Set the intensity region in a location with an average intensity level. (around 128). If this region is set in a location that is too bright or too dark, adjustment may not be performed properly. Adjustment may be particularly unstable for images with high contrast through color extraction.

1 **Apply the [Preserve Intensity] filter.**

From the [Image Enhance] menu select [Preserve Intensity].

2 **Click [Detail].**

The [Preserve Intensity] menu appears.

3 **Choose the intensity unit in the [Reference Unit ID] and select [Refer unit results] under [Specify Base Value].**

To use the current intensity value as the base brightness

Click [Set Base Value].

This registers the current intensity value from the specified unit as the base value.

4 **To finish settings, click [OK].**

► Note

Adjustment is not performed (a co-efficient of 1 is used) in the following circumstances:

- The referenced intensity unit has an error,
- The execute condition of the referenced intensity unit is set to [Never Execute],
- The [Count] is set to 0.

Specifying a base value via [User set]

Specify an intensity (0.000 to 255.000) that will serve as the base value in the [Base Value].

Removing Background Information

The background of a target can be removed with the Image Extraction filter, by subtracting the current image from a processed version. This filter is very useful for extracting small points or thin lines from a fluctuating background.

1 **Apply the [Image Extraction] filter. From the [Image Enhance] menu select [Image Extraction].**

2 **Click [Detail].**

3 **Choose the aspect to extract ([Dark] or [Bright]), the extraction size (3 to 39 pixels) (2 pixel increments, default: 5), and the direction (X, Y, XY).**

4 **Use [Count] to set the number of times to apply the filter.**

5 **To apply settings click [OK].**

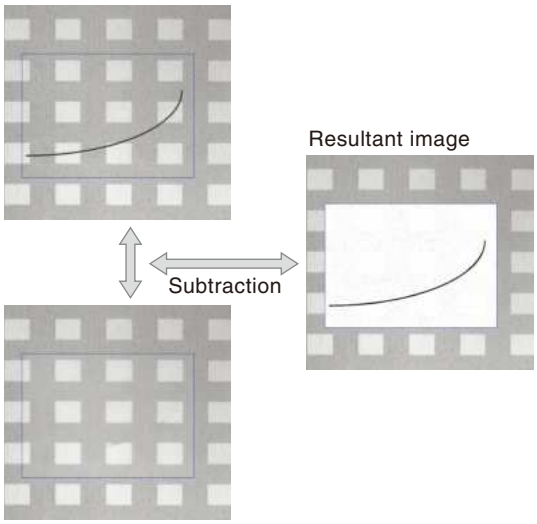
Reference

Unlike the subtraction filter which requires a registered image, the image for subtraction is automatically generated. Thus this filter works in real-time accounting for any changes in the target.

► Note

Increasing the extraction size will lengthen the processing time.

Processing image



Internally generated image
Image is automatically generated by using Expand and Shrink filters.

Border processing

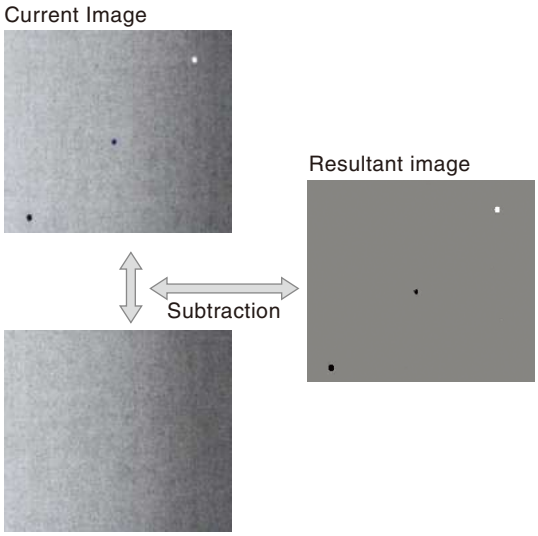
The way the filter uses pixel data outside of the region for pixels on the border can be selected.

- **ON**: Uses the pixel data outside of the region for pixels on the border.
- **OFF** (default): Extrapolates the pixels on the border for the pixel data.

Eliminating Shading and Gradation

The shading variation across an image can be neutralized with the Shading Correction filter by subtracting the current image from a processed version. Using this filter leaves areas where there is a sharp contrast while the rest of the background is set to a constant value. The background can be smoothed based on using shading, averaging or median filters across the region.
Correction method and correction conditions can be configured by selecting [Detail].

Processing image

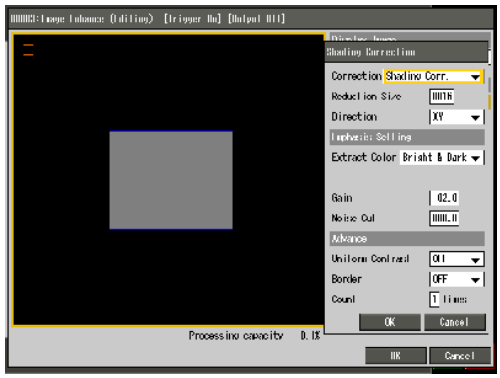


Internally generated image
Removes high contrast changes
in an image leaving the background.

Changing the filter settings

1 **Set the [Shading Correction] filter in the desired inspection unit.**
Select [Shading Correction] on the [Image Enhance] tab.

2 **Click [Detail].**
The [Shading Correction] menu appears.



3 **Change the settings as required.**

Correction method
The shading correction filter processes the current image against a corrected image to highlight areas of sharp contrast. This corrected image is created by removing sharp contrast changes, leaving the background to be processed against the current image.

- **Shading Correction** (default): This method extrapolates a shading curve based on the reduction size, and calculates the difference from the current image in order to correct the image..
- **Average Correction**: This method takes the average intensity from the entire inspection region and uses it as the reference to process with the current image.
- **Median Correction**: This method takes the median intensity from the entire inspection region and uses it as the reference to process with the current image.

Reduction size
If [Shading Correction] was selected for [Correction], specify the size (4 to 2000, default: 16) of the target to extract (black points, white points, defects, etc.) and the direction (X, Y, XY).

Reference
Reducing the reduction size will increase the precision of the shading correction but will also lengthen the processing time.

Direction
Select the filter direction (X, Y, XY) (default: XY).

Extract color

Choose the areas to extract based on intensity.

- **Bright**: Displays points that are brighter than their respective background.
- **Dark**: Displays points that are darker than their respective background.
- **Bright & Dark** (default): Displays points that are either darker or lighter than their respective background.
- **Individual**: Choose individually how darker and lighter points should be displayed.

Reference

- When [Bright] is selected, the background of the processed image becomes black (0). When [Dark] is selected, the background of the processed image becomes white (255).
- When [Bright & Dark] or [Individual] is selected, the background of the processed image becomes gray (128).

Gain

Set the gain used on the image after correction (0 to 10.0, default: 2.0). Increase the value to increase the contrast on the processed image.

Noise Cut

Eliminates slight noise components from the background (0 to 255, default: 0.0). This eliminates noise below the set level.

Uniform contrast

Use this option to compensate for backgrounds with large shading variations. This helps to keep the contrast in the image uniform and is useful for dealing with lighting fluctuations.

- **OFF** (default): Does not unify the contrast.
- **ON**: Unifies the contrast.

Border

Selects whether to reference the image outside of the inspection region for processing.

- **OFF** (default): Does not reference areas outside of the measurement area.
- **ON**: References areas outside of the measurement area.

4 Use [Count] to set the number of times to apply the filter.

- **1** (default): Use the shading correction filter (ON).
- **0**: Do not use the shading correction filter (OFF).

5 To apply settings, click [OK].

Using Basic Custom Filters

Custom filters can be created and applied to create effects not possible with the standard filters. The intensity of the current pixel is calculated from the coefficient sum of a 3 x 3 or 5 x 5 matrix of pixels (referred to as a kernel). This grayscale value can then be shifted accordingly to produce the desired intensity and image.

1 From the [Image Enhance] menu select [Custom].

2 Click [Detail].

The [Custom] menu appears.

3 Use [Size] to choose the filter size.

- **3 x 3** (default): Reference the intensity from a 3 x 3 matrix of pixels centered around the current pixel being processed.
- **5 x 5**: Reference the intensity from a 5 x 5 matrix of pixels centered around the current pixel being processed.

4 Use [Shift] to specify the shift value (-255 to 255).

Specify the shift in intensity (default 0).

Reference

If the calculation results in the grayscale value falling out of the 0 to 255 range the value will be capped at 0 or 255 respectively.

5 Enter the number of times to apply the filter (number of times to apply the filter, 0 to 9, where 0 turns the filter off) in the [Count] field as necessary.

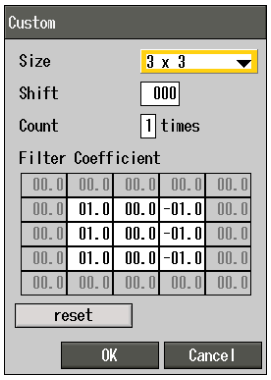
6 Specify the pixel coefficient to be used (-32.0 to 32.0) (default: 1.0 (center pixel) or 0.0).

Reference

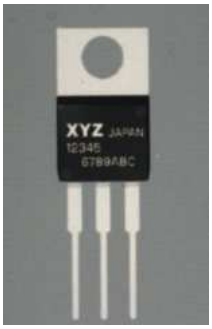
Click [Reset] to reset the kernel.

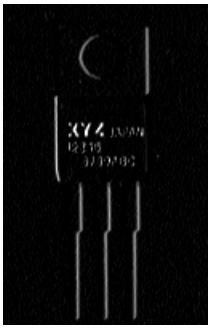
Basic Custom Filter example

The example below shows how a custom filter can be used to extract light to dark edges in the X direction.

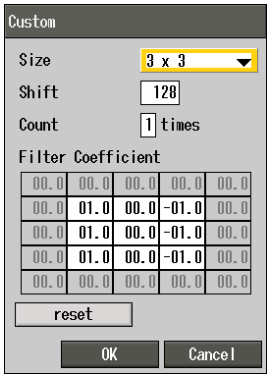


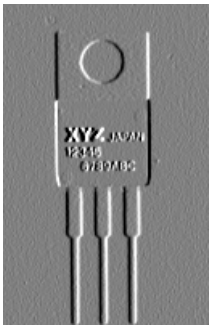
Raw image Processed image





By setting the shift to 128, the pixels whose intensity was originally capped at 0 due to a being a negative value are now adjusted with the rest of the image.





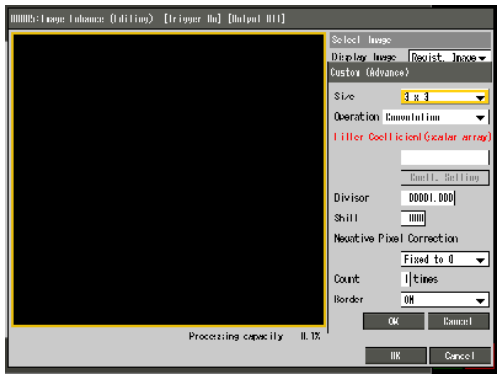
Using Advance Custom Filters

Custom filters can be created and applied to create effects not possible with the standard filters. The intensity of the current pixel is calculated based off of a matrix (3 x 3 to 21 x 21) of pixels (referred to as a kernel). You can chose an operation from expand, shrink, or convolution. This allows you to apply original filtering effects unlike normal filters.

1 From the [Image Enhance] menu select [Custom Advance].

2 Click [Detail].

The [Custom (Advance)] menu appears.



3 Use [Size] to choose the filter size.

- **3 x 3**: Reference the intensity from a 3 x 3 matrix of pixels centered around the current pixel being processed.
- **5 x 5**: Reference the intensity from a 5 x 5 matrix of pixels centered around the current pixel being processed.
- **7 x 7**: Reference the intensity from a 7 x 7 matrix of pixels centered around the current pixel being processed.
- **9 x 9**: Reference the intensity from a 9 x 9 matrix of pixels centered around the current pixel being processed.
- **11 x 11**: Reference the intensity from a 11 x 11 matrix of pixels centered around the current pixel being processed.
- **13 x 13**: Reference the intensity from a 13 x 13 matrix of pixels centered around the current pixel being processed.
- **15 x 15**: Reference the intensity from a 15 x 15 matrix of pixels centered around the current pixel being processed.
- **17 x 17**: Reference the intensity from a 17 x 17 matrix of pixels centered around the current pixel being processed.
- **19 x 19**: Reference the intensity from a 19 x 19 matrix of pixels centered around the current pixel being processed.
- **21 x 21**: Reference the intensity from a 21 x 21 matrix of pixels centered around the current pixel being processed.

► Note

If the filter size is changed after being set the kernel will be reset.

4 Use [Operation] to choose the kernel processing.

- **Convolution**: Performs the same operation as the custom filter (Page 10-20).
- **Expand**: Applies the expand filter (Page 10-12) by referencing intensity of pixels with a coefficient of 1 in the kernel.
- **Shrink**: Applies the shrink filter (Page 10-12) by referencing intensity of pixels with a coefficient of 1 in the kernel.

► Note

If the operation is changed after being set the kernel and any convolution settings will be reset.

5 Specify a numerical variable array in the [Filter Coefficient] field and use [Coeff. Setting] to set the kernel.

The [Coeff. Setting] menu appears.
Refer to "Specifying the pixel coefficients (kernel)" (Page 10-23) for more details about using the [Coeff. Setting] menu.

► Note

Make sure the numerical array has more elements than required by the kernel (example: 225 or more elements for a 15 x 15 filter).

6 Specify a divisor in [Divisor] as necessary (0.001 to 99999.999).

Specify the value to divide the calculation result by, before shifting the resultant value.

Reference

This option is only available if [Convolution] is selected for [Operation].

7 Use [Shift] to specify the shift value (-255 to 255).

Specify a value to add to the calculation result. This value is added to all pixels.

Reference

This option is only available if [Convolution] is set for [Operation].

8 Choose how negative values should be handled with [Negative Pixel Correction].

This specifies how pixel values that become negative after calculation are handled.

- **Fixed to 0**: Clips values less than 0 to 0.
- **Absolute Value**: Converts negative values to their absolute value.

Reference

This option is only available if [Convolution] is set for [Operation].

9 Enter the number of times to apply the filter (0 to 9) in the [Count] field as necessary.

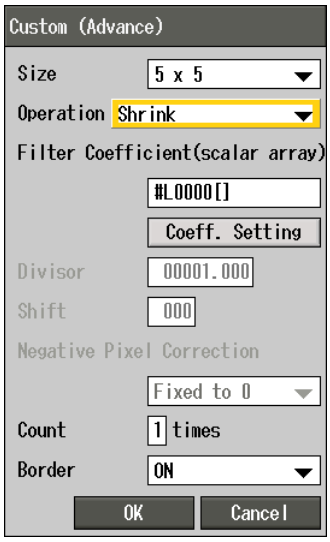
10 Specify the [Border] option as necessary.

Specify whether to apply the filter by referencing the image outside the inspection area.

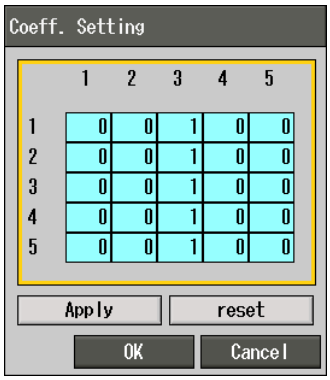
- **ON**: The image outside the area affects the filtering process.
- **OFF**: The image outside the area has no effect on the filtering process.

Advance Custom Filter Example

The example below shows how apply a shrink filter of a specified size only in the Y direction.



Use the [Coeff. Settings] menu to set the kernel.



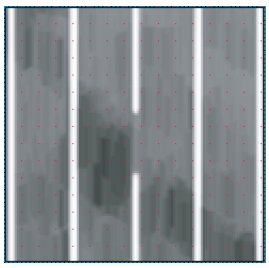
Processing result

The defect (gap) of the white line is widened in the Y direction but no change is made to the width in the X direction.

Current Image

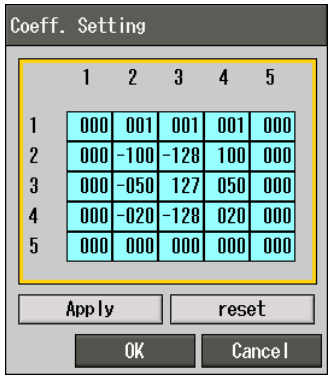


Resultant image



Specifying the pixel coefficients (kernel)

For the convolution operation

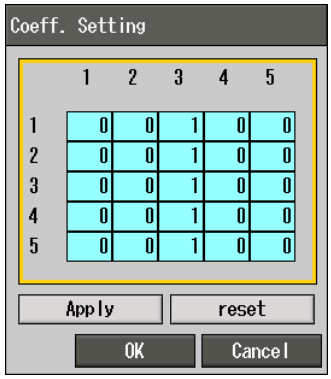


Available range is -128 to 127.

► Note

Values outside the range will result in an error.

Expand or shrink



Available range is 0 or 1

► Note

Values outside the range will result in an error.

Reset

Click [Reset] to rest the kernel.

Reference

The kernel is reset under the following conditions:

- Changes to the kernel [Size].
- Changes to the filter [Operation].
- [Reset] was selected on the [Coeff. Setting] screen.
- Changes to the scalar array used for the kernel.

Extracting Desired Parts of the Image

The blob filter enables the only the desired parts of a binary image to extracted based on size, shape and other characteristics. While at the same time filling in holes and allowing for the inclusion / exclusion of blobs on the border.

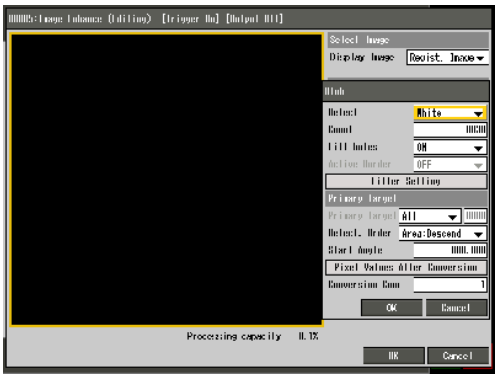
► Note

Convert the image to a binary image using the Binary filter before setting the blob filter. Otherwise, the blob filter will not function properly.

1 From the [Image Enhance] menu select [Blob].

2 Click [Detect].

The [Blob] menu appears.



3 Select extraction criteria.

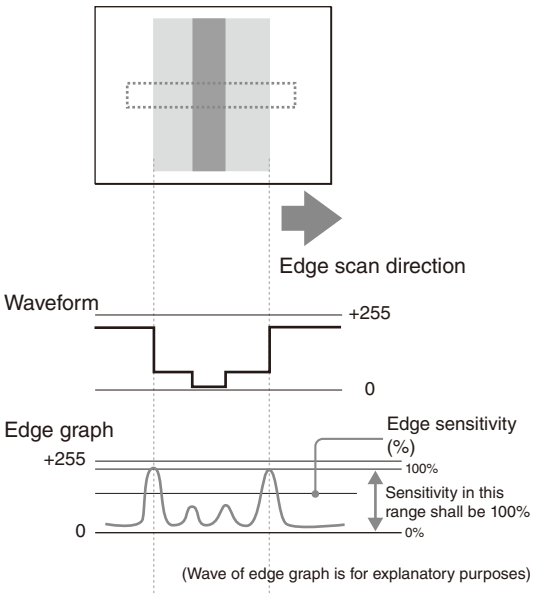
Change the parameters as required such as the blob color, count size and so on. The image enhancement blob filter functions the same way as the blob tool does. Refer to "(9) Blob" (Page 10-62) for more details.

What is an Edge?

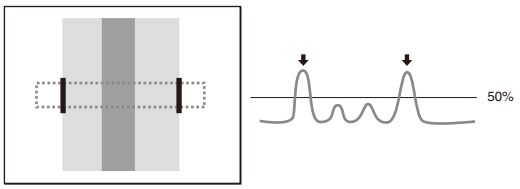
In the system edge processing is used to detect transitional changes of a target in an inspection region for positioning or measured. Edge detection is performed based on the change of intensity in the region perpendicular to the edge scan direction. The amount of change detected is known as the edge intensity.

Edge sensitivity

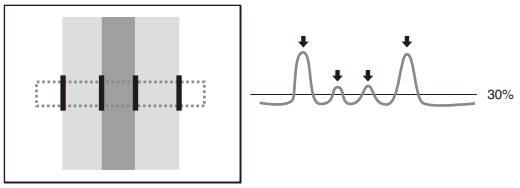
Edge sensitivity refers to the level of intensity that is detected as an edge, where 100% represents the maximum edge intensity in the region. By specifying the edge sensitivity in relation to the maximum edge intensity in the region edge detection is very stable and robust against fluctuations in illumination.



Edge sensitivity 50% (detects 2 edges)

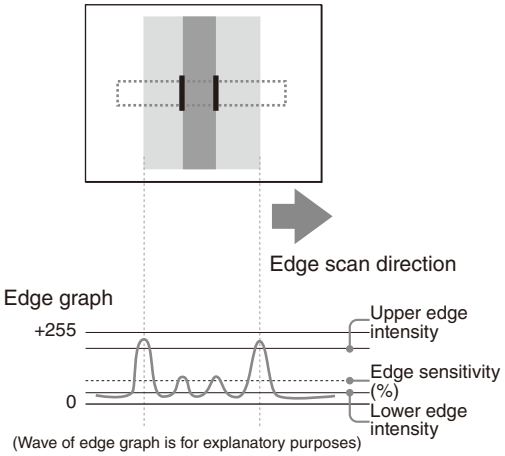


Edge sensitivity 30% (detects 4 edges)



Edge intensity upper and lower limit

For increased functionality edges can be filtered out based on their edge intensity value. The maximum edge intensity serves as an upper limit and the minimum edge intensity serves as a lower limit.
Only the edges that lie between the upper and lower limit will be detected. Any edge outside this range will be ignored.



Differences between edge sensitivity and edge intensity upper / lower limits

While the edge sensitivity is specified using a relative value with a maximum edge intensity of 100%, the upper limit and lower limit of edge intensity
are specified using an absolute value of the edge intensity.

Reference

Edges excluded from detection due to the edge intensity upper limit are also excluded from the edge sensitivity calculation. Thus, if the edge intensity upper limit is changed, the edge detection result may also change.

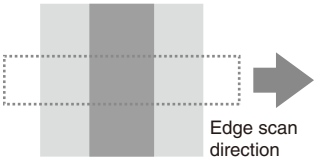
Checking edges

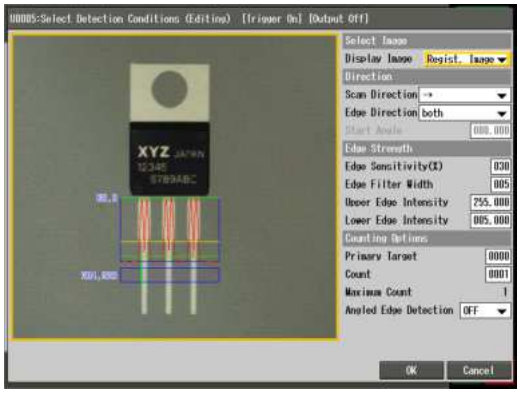
The maximum edge intensity within the inspection region is shown next to the edge graph on the screen.

Filter width

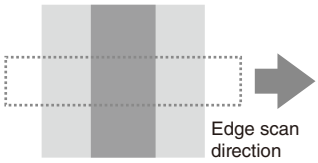
By changing the filter width, the edge graph can be averaged as desired helping eliminate noise. As the filter width is increased so more data is used and noise has less of an impact on the edge detection.
To avoid mis-detection for rounded or tilted targets where there is a gradual change in contrast the filter width can also be adjusted accordingly.

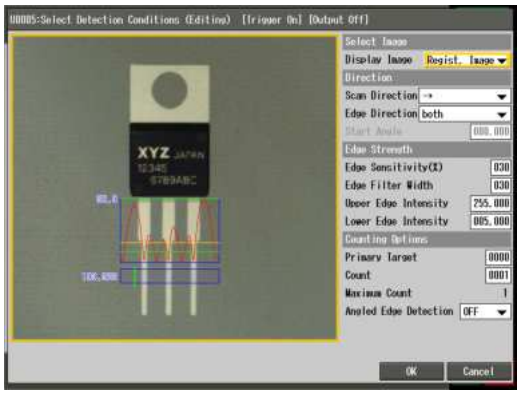
Filter width default setting (filter width = 5)





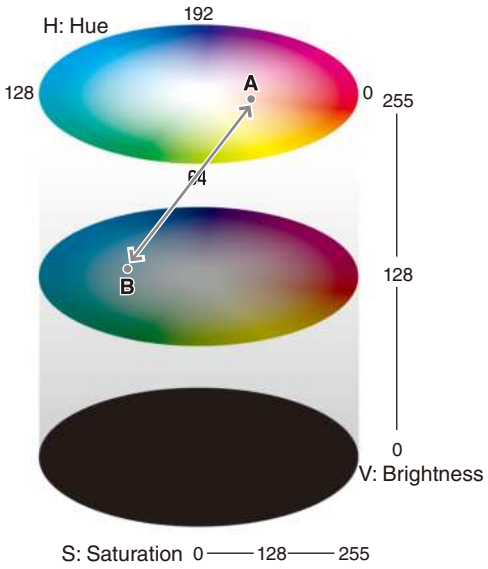
After the filter width setting is changed (filter width = 30)





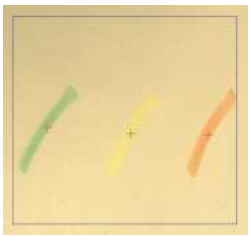
What is Fine Color Mode?

The Fine Color mode (only available in the defect tool) utilizes all the color information, H (Hue), S (Saturation), and B (Brightness) for detection. The HSB information of each segment is compared and is used for determining if there is a change differences in the color information then determine the defect level.
The calculated defect level is illustrated in the below graphic as the straight line between points A and B, which are two different colors in the HSB color space.

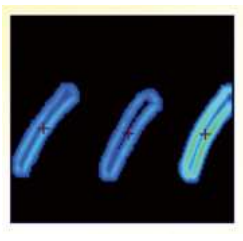


The Ignore Intensity function can be used so that B (Brightness) information can be excluded and only changes in H (Hue) and S (Saturation) are used for calculation of the defect level. In this situation, defects are only detected as color differences, without the influence of brightness that doesn't contain color components.

Detection image with fine color defect



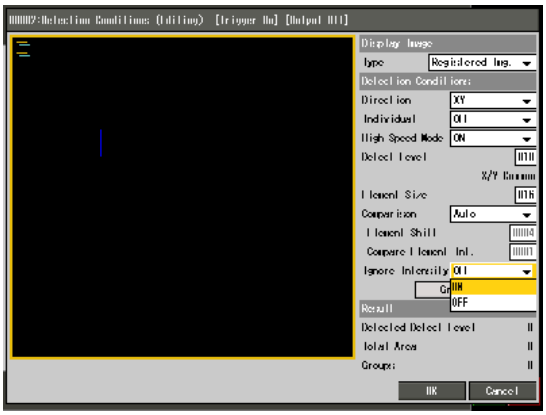
Captured image



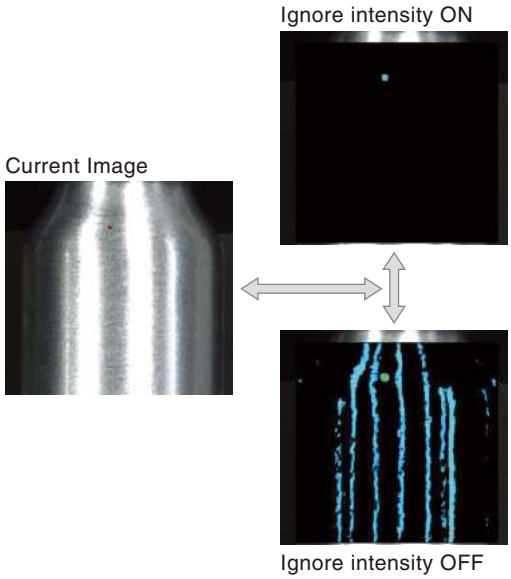
Contrast view of defect detection

Eliminating intensity (brightness) and detecting defects

The defect detection can be set to ignore intensity (brightness) information and use only the color differences for detection.
This allows the elimination of effects caused by glare or lighting changes for stable detection. To eliminate brightness information using the Edit Unit menu, set [Ignore Intensity] to [ON] in the Condition menu (Page 4-123).



- **OFF** (default): Applies brightness changes to the [Defect Level] as well.
- **ON**: Detects only changes in H (Hue) and S (Saturation).



► Note

When Ignore Intensity is enabled, black and white defects are also removed. To detect black and white defects use [Gray] for [Color Extraction] and use the Shading Correction filter for stable processing (Page 10-19).

Operator and Function List

Parts

Calculations and scripts can be made up of the following parts.

- Constants
- Variable (Page 10-29)
- Operators (Page 10-30)
- Expression (Page 10-30)
- Statement (Page 10-32)
- Functions
  - Mathematical functions (Page 10-35)
  - Trigonometric functions (Page 10-42)
  - Geometric functions (Page 10-43)
  - Calendar functions (Page 10-55)
  - BIT functions (Page 10-56)

Programming

Functions and lines

- Calculations and scripts are made up of multiple lines.
- Each line can contain a set of elements for defining a single function.
- A function is the smallest unit of execution in a calculation / script.

Comment

- Comments are indicated by a single quotation (') mark.
- Functions after a single quotation (') on the same line are ignored.

Example

```
@a = 100 'Set initial values
'Date created: May 23
```

Line continuation

To separate a long line into several lines, use a space and an underscore ("space" + "_").

Example 1 (Correct)

```
IF (@a > 100) AND (@a < 200) THEN ... ①
...
END IF
```

Example 2 (Correct)

```
IF (@a > 100) AND _ ... ②
(@a < 200) THEN
...
END IF
```

Example 3 (Error)

```
IF (@a > 100) AND ... ③
(@a < 200) THEN
...
END IF
```

Example 4 (Correct)

```
@max = Max (@a, @b, @c, _ ... ④
@d, @e, @f)
```

Example explanation

① Processed correctly because the function is written on a single line.

② Processed correctly because the line continuation syntax is used.

③ Results in an error because the line continuation syntax is missing.

④ Example of separating function elements over two lines.

Character set

Calculations and scripts can be created using the following characters.

Type	Character set
Space	<Space> <TAB>
Letters	ABCDEFGHIJKLMNOPQRSTUVWXYZ
	abcdefghijklmnopqrstuvwxyz
Numbers	0123456789
Symbols	,.()[]+-*/^=<>_@#$!':%

- Spaces and tabs are identified as token (language) separators.
- Letters are case-sensitive.

Scripts

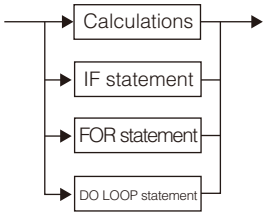
Scripts

Scripts are comprised of statements.



Statements

Statements are categorized into Functions, Calculations, IF, FOR, and DO LOOP statements.



Other

- The maximum number of characters that can be used is 5000.
- The levels of nesting allowed for parentheses, IF, FOR, and DO LOOP statements is subject to the amount of free memory. If the available memory space is exceeded, a programming error will occur when the calculation is applied, and the cursor moves to the beginning of the expression where the error occurs.

Variable

Temporary variables

- Temporary variables are defined with a @ sign.
- Temporary variables may only be used within the same calculation unit.
- Temporary variables may only be used for processing numbers.
- Temporary variables do not need to be defined in the variables menu.
- The default value for a temporary variable is 0.
- Temporary arrays cannot be defined or used.
- Variable names have to be 32 characters or less including the @ sign.

Example (Correct)

@a_10

Example (Error)

@a_10[10] ... ①

Example explanation

① : Arrays cannot be used.

Local variables

Global variables can be anywhere in the calculation / script. For other definitions, refer to "User variable" (Page 4-348) and "Defining and editing local variables" (Page 4-350).

Global variables

Global variables can be anywhere in the calculation / script. For other definitions, refer to "User variable" (Page 4-348) and "Defining and editing global variables" (Page 4-351).

System variable

System variables can only be used as a reference in a calculation / script.

Unit settings, Unit results

Unit settings and unit results are read only (and can only be used as a reference in a calculation / script). For more information about unit settings and unit results, refer to the XG VisionEditor Reference Manual (Control/Data Edition).

ANS

- ANS is numerical variable that is associated as the result of the calculation unit.
- ANS has to be referenced in uppercase letters.
- ANS on its own can only be populated in a calculation.

Example

ANS=MAX(#a1,#a2,#a3,#a4,#a5)

Reference

ANS is used as the reference value for limits set in a calculation unit.

Expressions and Operators

Mathematical Operators

Mathematical operators can be used for processing numerical values. The following operators are available.

Operator	Description	Syntax	Conditional expressions
^	Power	A^B	Raises A to the power of B.
+	Positive	+A	A
-	Negative	-A	Inverts the sign of A.
*	Multiply	A * B	Multiplies A by B.
/	Divide	A / B	Divides A by B.
MOD	Modulo	A MOD B	The remainder when A is divided by B.
+	Add	A + B	Adds A and B.
-	Subtract	A - B	Subtracts B from A.

Comparative Operators

Comparison operators compare numerical values and produce Boolean (true or false) results.
A true/false value of 1 indicates true and a value of 0 indicates false.

Operator	Description	Syntax	Conditional expressions
=	Equal to	A = B	A is equal to B.
<>	Not equal to	A <> B	A is not equal to B.
>	Greater than	A > B	A is greater than B.
<	Less than	A < B	A is less than B.
>=	Greater than or equal to	A >= B	A is greater than or equal to B.
<=	Less than or equal to	A <= B	A is less than or equal to B.

Reference

Comparative operators are executed as 64-bit floating point decimal numbers.

Examples

- If @a is equal to @b, the result of the statement is TRUE (1), otherwise it is FALSE (0):
  IF @a = @b THEN
  ...
  END IF
- If @a is not equal to @b, the result of the statement is TRUE (1), otherwise it is FALSE (0):
  IF @a <> @b THEN
  ...
  END IF

- If @a is greater than @b, the result of the statement is TRUE (1), otherwise it is FALSE (0):
  IF @a > @b THEN
  ...
  END IF
- If @a is less than @b, the result of the statement is TRUE (1), otherwise it is FALSE (0):
  IF @a < @b THEN
  ...
  END IF
- If @a is greater than or equal to @b, the result of the statement is TRUE (1), otherwise it is FALSE (0):
  IF @a >= @b THEN
  ...
  END IF
- If @a is less than or equal to @b, the result of the statement is TRUE (1), otherwise it is FALSE (0):
  IF @a <= @b THEN
  ...
  END IF

► Note

Comparison operators can only be used in conditional statements (such as IF and WHILE). They cannot be used for assignments. For example, if the syntax reads "@a=@b<>@c", then neither 0 nor 1 is stored for @a and a programming error occurs.
To define @a, the script must be written using the IF statement as shown.

```
IF @b<>@c THEN
  @a=1
ELSE
  @a=0
END IF
```

Logic Operators

Logic operators can be used in conditional functions for performing true / false operations.
The following logic operators are available.

Operator	Description	Syntax	Conditional expressions
NOT	Logical inverse	NOT A	Inverts A.
AND	Logical multiplication	A AND B	Multiplies A and B.
OR	Logical addition	A OR B	Adds A and B.
XOR	Exclusive OR	A XOR B	Exclusive OR of A and B

Examples

- If @a is a value other than 1, the result of the statement is TRUE (1), and if it is 1, the expression is FALSE (0):
  IF NOT(@a = 1) THEN
  ...
  END IF
- If @a is greater than -1 and less than +1, the result of the statement is TRUE (1), otherwise it is FALSE (0):
  IF (@a > -1) AND (@a < +1) THEN
  ...
  END IF
- If @a is greater than -1 and less than +1, the result of the statement is TRUE (1), otherwise it is FALSE (0):
  IF (@a < -1) OR (@a > +1) THEN
  ...
  END IF
- If one of @a or @b are 0 and the other value is not 0, the result of the statement is TRUE (1)
  If both @a and @b are 0 or both not 0, the result of the statement is FALSE (0):
  IF (@a = 0) XOR (@b = 0) THEN

► Note

- Comparison operators can only be used in conditional statements (such as IF and WHILE).
- To process bit / binary data, refer to "BIT Functions" (Page 10-56).

Processing Priority

If a statement contains more than one operator, the order of execution is based on the priority of the operators. Operators are evaluated in the following order.

(1) Mathematical operators
(2) Comparative operators
(3) Logic operators

The priority of operators is shown in the table below.

Operator		Description	Processing Priority
Mathematical Operators	^	Power	1
	+	Positive	2
	-	Negative	
	*	Multiply	3
	/	Divide	
	MOD	Modulo	4
	+	Add	5
	-	Subtract	
Comparative Operators	=	Equal to	6
	<>	Not equal to	
	>	Greater than	
	<	Less than	
	>=	Greater than or equal to	
	<=	Less than or equal to	
Logic Operators	NOT	Logical inverse	7
	AND	Logical multiplication	8
	OR	Logical addition	9
	XOR	Exclusive OR	10

Examples

- IF @a > -1 AND @a < +1 THEN ... ①
  ...
  END IF
- IF (@a > -1) AND (@a < +1) THEN ... ②
  ...
  END IF
- @a = 1 + 2 * 3 ... ③
- @a = 1 + (2 * 3) ... ④
- @a = (1 + 2) * 3 ... ⑤

Example explanation

- ① and ② result in being processed the same way.
- ③ and ④ result in being processed the same way.
- The result of ③ is 7.
- The result of ④ is 7.
- The result of ⑤ is 9.

Statements

Assign Values

An item (result, setting, value etc) can be defined to a variable.

- The item on the right of the expression is assigned to the variable on the left of the "=" sign.
- Only items of the same type can be assigned to each other.
- It is not possible to assign an entire array at once.

Syntax

variable = expression

Syntax



Example (Correct)

- Assignment of a numerical variable:
  @a = @a + 1
- Assignment of the X component (numerical value) of a circle to a numerical variable:
  @a = #circle.CX
- Assignment of the three numerical components of a circle (CX, CY, CR) to a circle type variable:
  #circl_A = #circle

Example (Error)

- Incorrect assignment of a circle value into a numerical variable:
  @a = #circle
- Incorrect assignment of a scalar value into a circle variable:
  #circle = @a
- Incorrect assignment of arrays:
  #A[]=#B[]

IF THEN Statements

Process a single set of functions as a block from multiple blocks based on the result of a conditional expression.

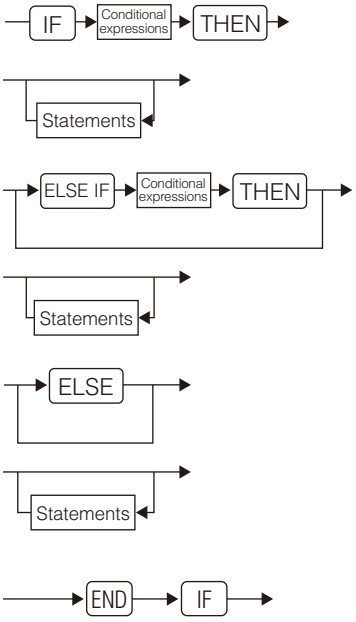
Syntax

If <conditional expressions> THEN
- functions -
[ELSE IF] conditional expressions THEN
- functions -
[ELSE]
- functions -
END IF

Reference

The [and] brackets in the syntax shown above can be omitted.

Syntax



Conditional expressions

- If the result of the IF statement condition is true, execute the block after THEN and branch to END IF.
  If false, branch to the next ELSE IF.
  If false and ELSE IF is omitted, branch to ELSE.
  If no ELSE IF or ELSE is programmed and the condition is FALSE, execution branches to END IF.
- If the result of the ELSE IF statement condition is true, execute the block after THEN and branch to END IF.
  If false, branch to the next ELSE IF.
  If false and ELSE IF is omitted, branch to ELSE.
  If no ELSE IF or ELSE is programmed and the condition is FALSE, execution branches to END IF.
- The ELSE IF statement can be used as many times as necessary.
- The ELSE statement can only be used as the last ELSE term before END IF.

Examples

```
@a = 4
IF @a < 3 THEN
  @b = 333
ELSE IF @a <4 THEN
  @b = 444
ELSE IF @a <5 THEN
  @b = 555
ELSE
  @b = 999
END IF
```

Example Explanation

In the above example, @b is assigned the value of 555.

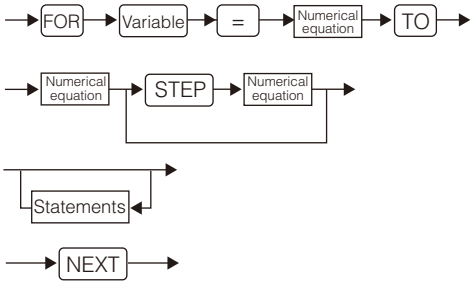
FOR NEXT Statements

Processing a set of functions multiple times in a loop fashion for a specified number of iterations.

Syntax

FOR <Variable> = <Initial value> TO <Final value> [STEP <increment>]
- functions -
NEXT

Syntax



Conditional expressions

- Before the loop is processed, an initial value is assigned to a variable, which is then incremented each time through the loop. This loop is repeated until the variable value exceeds the final value.
- STEP can be omitted (in which case the increment value is 1).
- A loop can be exited using the EXIT FOR statement. Processing resumes at the line following the NEXT statement.

Examples

```
@a = 0
FOR @i = 1 TO 10
  @a = @a + @i
  IF @a > 11 THEN
    EXIT FOR
  END IF
NEXT
```

Example explanation

In the above example, @a is assigned the value of 15.

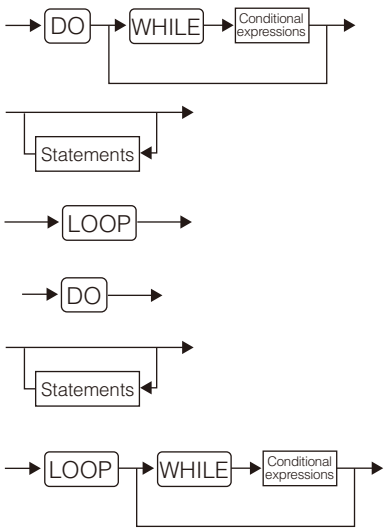
DO LOOP statement

Processing a set of functions multiple times in a loop fashion while a conditional statement is true.

Syntax

- Pre-loop evaluation:
  DO WHILE <conditional expressions> -functions- LOOP
- Post loop evaluation:
  DO -functions- LOOP WHILE <conditional expressions<

Syntax



Conditional expressions

The DO statement uses pre-loop evaluation when the condition is written after the DO statement and post-loop evaluation when the condition is written after the LOOP statement.

- In the pre-loop evaluation, the loop condition must be true in order to process the functions below. When processing reaches the LOOP statement, it returns to the DO statement. If the conditional expression is false, the loop is finished and processing resumes on the line after the LOOP statement.
- In the post loop evaluation, the functions in the loop are processed first and then the loop condition is checked. If true, processing returns to the DO statement, otherwise the loop is finished and processing resumes on the next line.
- The loop condition can be omitted (resulting in an endless loop).
- LOOP can be exited using the EXIT DO statement in the loop after the desired condition. Processing resumes on the next line after the LOOP statement LOOP. If WHILE is omitted the loop function must include EXIT DO.

Examples

```
(Pre-loop evaluation)
@a = 0
@i = 0
DO WHILE @i < 10
  @i = @i +10
  @a = @a + @i
LOOP ... ①
(Post loop evaluation)
@a = 0
@i = 10
DO
  @i = @i + 1
  @a = @a + @i
LOOP WHILE @i < 10... ②
```

Example explanation

① In the above example @a is assigned the value of 10.
② In the above example @a is assigned the value of 11.

Mathematical Functions

► Note

The sample calculations given in the following explanations may be not be precise due to computational errors inherent with processors.

Abs (P)

Calculates the absolute value of P.

Parameters

P: constant, numerical variable, or a function that results in a numerical value

Result type

Numerical value

Examples

@a = -128
@a = Abs (@a)

Example explanation

@a is set to a value of 128.

AsCircle (P1, P2, P3)

Assigns P1 as the X center coordinate of a circle, P2 to as Y center coordinate, and P3 as the radius R.

Parameters

- P1: X center coordinate (constant, numerical variable, or a function that results in a numerical value)
- P2: Y-coordinate value of center (constant, numerical variable, or a function that results in a numerical value)
- P3: radius value (constant, scalar variable, or a function that results in a numerical value)

Result type

Circle data

Examples

#C[0] = AsCircle(10, 20, 30)

Example explanation

This example produces the same results as these operations.
#C[0].CX = 10
#C[0].CY = 20
#C[0].CR = 30

AsLine (P,D)

Assigns P to ρ of a line, and D to θ.

Parameters

- P: value of ρ (constant, numerical variable, or a function that results in a numerical value)
- D: value of θ (expressed in degrees) (constant, numerical variable, or a function that results in a numerical value)

Result type

Line data

Examples

#L[0] = AsLine(10, 45)

Example explanation

This example produces the same results as these operations.
L[0].RH =10
L[0].T = 45

AsPoint (P1, P2)

Assigns P1 as the X coordinate of a position, and P2 as the Y coordinate.

Parameters

- P1: X-coordinate (constant, numerical variable, or a function that results in a numerical value)
- P2: Y-coordinate (constant, scalar variable, or a function that results in a numerical value)

Result type

Position data

Examples

#P[0] = AsPoint(10, 20)

Example explanation

This example produces the same results as these operations.
#P[0].X = 10
#P[0].Y = 20

Atoi (N, P[])

Converts each value in the scalar array P[] from ASCII decimal code (numbers only) to its correct integer.

- The conversion is carried out until a non-numerical ASCII code is reached or the number of variables (N) is processed).
- No error occurs if the array contains a non-numerical ASCII code.

Parameters

- N: number of variables (a constant that represents the number of digits in a number, numerical variable, or a function that results in a numerical value)
- P[]: numerical array variable

Result type

Numerical value

Causes of Errors

- An error occurs if N is set to a value of less than 1.
- An error occurs if there are fewer elements in the P[] array than N.

Examples

#P[0] = 50 ... ①
#P[1] = 48 ... ②
#P[2] = 48 ... ③
#P[3] = 54 ... ④
@YEAR = Atoi (4,#P[]) ... ⑤
#Q[0] = 50 ... ⑥
#Q[1] = 48 ... ⑦
#Q[2] = 65 ... ⑧
#Q[3] = 54 ... ⑨
@a = Atoi (4,#Q[]) ... ⑩
#P[0] = 50 ... ⑪
#P[1] = 48 ... ⑫
#P[2] = 48 ... ⑬
#P[3] = 54 ... ⑭
@a = Atoi (10,#P[]) ... ⑮

Example explanation

① ASCII '2'
② ASCII '0'
③ ASCII '0'
④ ASCII '6'
⑤ @YEAR=2006.
⑥ ASCII '2'
⑦ ASCII '0'
⑧ ASCII 'A'
⑨ ASCII '6'
⑩ a is set to a value of 20 (no error generated).
⑪ ASCII '2'
⑫ ASCII '0'
⑬ ASCII '0'
⑭ ASCII '6'
⑮ Function execution error (Value not guaranteed)

Ave (P0, P1, ...,Pn)

Calculates the average value of P0-Pn (Maximum of 40 parameters).

Parameters

P0 - Pn: constant, numerical variable, or a function that results in a numerical value

Result type

Numerical value

Causes of Errors

- An error occurs if none of the parameters P0 - Pn are specified.
- An error occurs if P0 - Pn is more than 40 parameters.

Examples

@a = 8
@b = 9
@c = 2
@d = 3
@ave = Ave(@a, @b, @c, @d)

Example explanation

@ave is set to a value of 5.5.

Ave2 (N, P[])

Calculates the average of an array P[0] - P[N-1].

Parameters

- N: constant, numerical variable, or a function that results in a numerical value
- P[]: numerical array variable

Result type

Numerical value

Causes of Errors

- An error occurs if N is set to a value of less than 1.
- An error occurs if there are fewer elements in the P[] array than N.

Examples

#a[0] = 8
#a[1] = 9
#a[2] = 2
#a[3] = 3
@ave2 = Ave2(4, #a[])

Example explanation

@ave2 is set to a value of 5.5.

AveR (Max, Min, P0, P1, ...,Pn)

Calculates the average value of parameters that fall between a specified Min-to-Max range from P0-Pn (Maximum of 40 parameters).

- The function will still calculate the average if the Min and Max are reversed.
- Results in 0 if none of parameters P0 to Pn fall between the Min-to-Max range.

Parameters

- Max: maximum value. constant, numerical variable, or a function that results in a numerical value
- Min: minimum value. constant, numerical variable, or a function that results in a numerical value
- P0 - Pn: constant, numerical variable, or a function that results in a numerical value

Result type

Numerical value

Causes of Errors

- An error occurs if none of the parameters from P0 - Pn are specified.
- An error occurs if P0 - Pn is more than 40 parameters.

Examples

@max = 25
@min = 20
@a = 21
@b = 26
@c = 23
@aver = AveR(@max, @min, @a, @b, @c)

Example explanation

@aver is set to a value of 22.

AveR2 (Max, Min, N, P[])

Calculates the average value of parameters that fall between a specified Min-to-Max range from array P[0]-P[N-1].

- The function will still calculate the average if the Min and Max are reversed.
- Results in 0 if all the arguments P[] are outside the range.

Parameters

- Max: maximum value. constant, numerical variable, or a function that results in a numerical value
- Min: minimum value. constant, numerical variable, or a function that results in a numerical value
- N: constant, numerical variable, or a function that results in a numerical value
- P[]: numerical array variable

Result type

Numerical value

Causes of Errors

- An error occurs if N is set to a value of less than 1.
- An error occurs if there are fewer elements in the P[] array than N.

Examples

@max = 25
@min = 20
#a[0] = 21
#a[1] = 26
#a[2] = 23
@aver2 = AveR2(@max, @min, 3, #a[])

Example explanation

@aver2 is set to a value of 22.

Ceil (P)

Rounds P up to the nearest integer.

Parameters

P: constant, numerical variable, or a function that results in a numerical value

Result type

Numerical value

Comparison between rounding functions (Int, Floor, Round, and Ceil)

Value of P	Int (P)	Floor (P)	Round (P)	Ceil (P)
1.5	1	1	2	2
1.4	1	1	1	2
-1.4	-1	-2	-1	-1
-1.5	-1	-2	-2	-1

Deg (P)

Converts the angle P from radians into degrees.

Parameters

P: constant, scalar variable, or function that results a scalar value in radians

Result type

Scalar numerical (units: degrees (°))

Examples

@a = Deg (3.14)

Example explanation

@a is set to a value of 179.909.

Exp ()

Returns the exponential base value e (2.71828183...).

Parameters

OFF

Result type

Numerical value

Examples

@a = Exp( )

Example explanation

Results in @a=2.718.

Floor (P)

Returns the integer of P.

Parameters

P: constant, numerical variable, or a function that results in a numerical value

Result type

Numerical value

Reference

Refer to "Comparison between rounding functions (Int, Floor, Round, and Ceil)" (Page 10-37) for more details about the differences between Floor and Int.

Int (P)

Returns the integer of P.

Parameters

P: constant, numerical variable, or a function that results in a numerical value

Result type

Numerical value

Reference

Refer to "Comparison between rounding functions (Int, Floor, Round, and Ceil)" (Page 10-37) for more details about the differences between Floor and Int.

Ln (P)

Calculates the natural logarithm of P.

Parameters

P: constant, numerical variable, or a function that results in a numerical value

Result type

Numerical value

Causes of Errors

An error occurs if the value of P is less than 0.

Examples

@e = Exp()
@a = Ln(@e)

Example explanation

@a is set to a value of 1.

Log (P)

Calculates the common logarithm (base 10) of P.

Parameters

P: constant, numerical variable, or a function that results in a numerical value

Result type

Numerical value

Causes of Errors

An error occurs if the value of P is less than 0.

Examples

@a = Log(10)

Example explanation

@Results in a = 1.

Max (P0, P1, ...,Pn)

Calculates the largest value in P0 - Pn (Maximum of 40 items)

Parameters

P0 - Pn: constant, numerical variable, or a function that results in a numerical value

Result type

Numerical value

Causes of Errors

- An error occurs if none of the parameters from P0 - Pn are specified.
- An error occurs if P0 - Pn is more than 40 parameters.

Examples

@a = 8
@b = 9
@c = 2
@d = 3
@max = Max(@a, @b, @c, @d)

Example explanation

@max is set to a value of 9.

Max2 (N, P[])

Calculates the largest value of an array P[0] - P[N-1].

Parameters

- N: constant, numerical variable, or a function that results in a numerical value
- P[]: numerical array variable

Result type

Numerical value

Causes of Errors

- An error occurs if N is set to a value of less than 1.
- An error occurs if there are fewer elements in the P[] array than N.

Examples

#a[0] = 8
#a[1] = 9
#a[2] = 2
#a[3] = 3
@max2 = Max2(4, #a[])

Example explanation

@max2 is set to a value of 9.

MaxN (P0, P1, ...,Pn)

Returns the location (from 0 to n) of the largest value in P0-Pn (maximum of 40 parameters).

Parameters

P0 - Pn: constant, numerical variable, or a function that results in a numerical value

Result type

Numerical value

Causes of Errors

- An error occurs if none of the parameters from P0 - Pn are specified.
- An error occurs if P0 - Pn is more than 40 parameters.

Examples

@a = 8
@b = 9
@c = 2
@d = 3
@maxn = MaxN(@a, @b, @c, @d)

Example explanation

@maxn is set to a value of 1.

MaxN2 (N, P[])

Returns the location (from 0 to N-1) of the largest value in an array P[0] - P[N-1].

Parameters

- N: constant, numerical variable, or a function that results in a numerical value
- P[]: numerical array variable

Result type

Numerical value

Causes of Errors

- An error occurs if N is set to a value of less than 1.
- An error occurs if there are fewer elements in the P[] array than N.

Examples

#a[0] = 8
#a[1] = 9
#a[2] = 2
#a[3] = 3
@maxn2 = MaxN2(4, #a[])

Example explanation

@maxn2 is set to a value of 1.

Min (P0, P1, ...,Pn)

Calculates the smallest value in P0 - Pn (maximum of 40 parameters).

Parameters

P0 - Pn: constant, numerical variable, or a function that results in a numerical value

Result type

Numerical value

Causes of Errors

- An error occurs if none of the parameters from P0 - Pn are specified.
- An error occurs if P0 - Pn is more than 40 parameters.

Examples

@a = 8
@b = 9
@c = 2
@d = 3
@min = Min (@a, @b, @c, @d)

Example explanation

@min is set to a value of 2.

Min2 (N, P[])

Calculates the smallest value of an array P[0] - P[N-1].

Parameters

- N: constant, numerical variable, or a function that results in a numerical value
- P[]: numerical array variable

Result type

Numerical value

Causes of Errors

- An error occurs if N is set to a value of less than 1.
- An error occurs if there are fewer elements in the P[] array than N.

Examples

```
#a[0] = 8
#a[1] = 9
#a[2] = 2
#a[3] = 3
@min2 = Min2(4, #a[])
```

Example explanation

@min is set to a value of 2.

MinN (P0, P1, ...,Pn)

Returns the location (from 0 to n) of the smallest value in P0-Pn (maximum of 40 parameters).

Parameters

P0 - Pn: constant, numerical variable, or a function that results in a numerical value

Result type

Numerical value

Causes of Errors

- An error occurs if none of the parameters from P0 - Pn are specified.
- An error occurs if P0 - Pn is more than 40 parameters.

Examples

```
@a = 8
@b = 9
@c = 2
@d = 3
@minn = MinN(@a, @b, @c, @d)
```

Example explanation

@minn is set to a value of 2.

MinN2 (N, P[])

Returns the location (from 0 to N-1) of the smallest value in an array P[0] - P[N-1].

Parameters

- N: constant, numerical variable, or a function that results in a numerical value
- P[]: numerical array variable

Result type

Numerical value

Causes of Errors

- An error occurs if N is set to a value of less than 1.
- An error occurs if there are fewer elements in the P[] array than N.

Examples

```
#a[0] = 8
#a[1] = 9
#a[2] = 2
#a[3] = 3
@minn2 = MinN2(4, #a[])
```

Example explanation

@min2 is set to a value of 2.

Pi ()

Returns the value of π (3.141592654).

Parameters

None

Result type

Numerical value

Reference

180 (deg) = π (radian).

Rad (D)

Converts the angle P from degrees to radians.

Parameters

D: constant, numerical variable, or function that results in a numerical value in degrees (°)

Result type

Numerical value in radians

Examples

```
@a = Rad(30)
```

Example explanation

@a is set to a value of 0.523.

Round (P)

Rounds P up or down to the nearest integer.

Parameters

P: constant, numerical variable, or a function that results in a numerical value

Result type

Numerical value

Sort (N, P[], P1)

Sorts an array P[0] - P[N-1] in descending order. Then returns the value at location P1 from the newly sorted array P[0] - P[N-1].

Parameters

- N: number of variables
- P[]: numerical array variable
- P1: location (0-n in descending order)

Result type

Numerical value

Causes of Errors

- An error occurs if N is set to a value of less than 1.
- An error occurs if there are fewer elements in the P[] array than N.
- If I%InDataFieldbus[] is used as the array variable P[] an error occurs as the system variable cannot be rewritten.
- An error occurs if the value of P1 is less than 0 or greater than or equal to N.
- An error occurs if there is not enough memory to process the function.

Examples

#P[0] = 5
#P[1] = 10
#P[2] = 0
#P[3] = 9
#P[4] = 1
@a = Sort(5,#P[],2)

Example explanation

Sorting the elements in #P[] produces [10, 9, 5, 1, 0]. An index location of 2 returns the 3rd element from the largest value, so @a is set to a value of 5.

Reference

To return a value based on ascending order use the function below using Q as the location of the value:
Sort(N, P[], N-Q-1).

Sqr (P)

Calculates P to the power of 2.

Parameters

P: constant, numerical variable, or a function that results in a numerical value

Result type

Numerical value

Examples

@a = 2
@a = Sqr(@a)

Example explanation

@a is set to a value of 4.

Sqrt (P)

Calculates the square root of P.

Parameters

P: constant, numerical variable, or a function that results in a numerical value

Result type

Numerical value

Causes of Errors

An error occurs if the value of P is negative.

Examples

@a = 256
@a = Sqrt(@a)

Example explanation

@a is set to a value of 16.

Sum (N, P[])

Calculates the total sum of items in a numerical array P[0] - P[N-1].

Parameters

- N: number of variables
- P[]: numerical array variable

Result type

Numerical value

Causes of Errors

- An error occurs if N is set to a value of less than 1.
- An error occurs if there are fewer elements in the P[] array than N.

Examples

#P[0] = 1
#P[0] = 2
#P[1] = 3
#P[2] = 4
#P[4] = 5
@a = Sum(5,#P[])

Example explanation

@Results in a = 15.

Trigonometric Functions

Acos (P)

Calculates angle of an arc of a right angled triangle based on (P) (adjacent / hypotenuse).

Parameters

P: constant, numerical variable, or a function that results in a numerical value within the range of -1 to 1

Result type

Numerical value (0 - 180) (units: degrees (°))

Causes of Errors

An error occurs if the value of P1 falls outside of -1.0 to +1.0.

Examples

@d = Acos(0.5)

Example explanation

@d is set to a value of 60 (°).

Asin (P)

Calculates the angle of an arc of a right angled triangle based on (P) (opposite / hypotenuse).

Parameters

P: constant, numerical variable, or a function that results in a numerical value within the range of -1 to 1

Result type

Numerical value (-90 - 90) (units: degrees (°))

Causes of Errors

An error occurs if the value of P falls outside of -1.0 to +1.0.

Examples

@d = Asin (0.5)

Example explanation

@d is set to a value of 30 (°).

Atan (P)

Calculates the angle of an arc for a right angled triangle based on (P) (opposite / adjacent).

Parameters

P: constant, numerical variable, or a function that results in a numerical value

Result type

Numerical value (-90 - 90) (units: degrees (°))

Examples

@d = Atan(1)

Example explanation

@d is set to a value of 45 (°).

Atan2 (P1, P2)

Calculates the arctangent value of P1/P2. If P2 = 0, the function processes as follows.

- P1>0 → 90
- P1<0 → -90
- P1=0 → Error

Parameters

P1, P2: constant, numerical variable, or function that returns a numerical value

Result type

Numerical value (-180 - 180) (units: degrees (°))

Causes of Errors

An error occurs if both P1 and P2 are 0.

Examples

@d = Atan2 (1, 1)

Example explanation

@d is set to a value of 45 (°).

Cos (D)

Calculates adjacent, hypotenuse ratio for a right angled triangle based on an arc (D) (°).

Parameters

D: constant, numerical variable, or function that results in a numerical value in degrees (°)

Result type

Numerical value

Examples

@a = Cos (60)

Example explanation

@a is set to a value of 0.5.

Sin (D)

Calculates opposite, hypotenuse ratio for a right angled triangle based on an arc (D) (°).

Parameters

D: constant, numerical variable, or function that results in a numerical value in degrees (°)

Result type

Numerical value

Examples

@a = Sin (30)

Example explanation

@a is set to a value of 0.5.

Tan (D)

Calculates opposite, adjacent ratio for a right angled triangle based on an arc (D) (°).

Parameters

D: constant, numerical variable, or function that results in a numerical value in degrees (°)

Result type

Numerical value

Examples

@d = Tan(45)

Example explanation

@a is set to a value of 1.

Geometric Functions

AddVector (Q1, Q2)

Calculates the sum of two X, Y positions.

Parameters

Q1, Q2: position variable or a function that results in position data

Result type

Position data

Examples

#P1=AsPoint(1,1)
#P2=AsPoint(2,2)
#p = AddVector(#P1, #P2)

Example explanation

#p is set to a value of (3.3).

AngC (D1, D2)

Calculates the center angle between D1 (°) and D2 (°) as calculated from the angle D1 in the clockwise direction.

Parameters

D1, D2: constant, numerical variable, or a function that results in a numerical value in degrees (°)

Result type

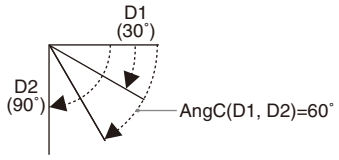
Numerical value (units: degrees (°))

Examples

@a = AngC (30, 90)

Example explanation

@a is set to a value of 60 (°).



Angle (Q1, Q2)

Calculates the angle formed by the horizontal axis and the line through positions Q1 to Q2.

- Calculates the angle with Q1 as the point of rotation.
- The angle is calculated in a clockwise direction.

Parameters

Q1, Q2: position variable or a function that results in position data

Result type

Scalar numerical (units: degrees (°))

Causes of Errors

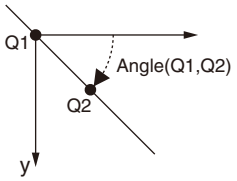
An error occurs if Q1 and Q2 are the same value.

Examples

```
#Q1.X = 0
#Q1.Y = 0
#Q2.X = 1
#Q2.Y = 1
#ang = Angle(#Q1, #Q2)
```

Example explanation

#ang is set to a value of 45 (°).



AngW (D1, D2)

Calculates the arc between D1 (°) and D2 (°) as calculated from the angle D1 in the clockwise direction.

Parameters

D1, D2: constant, numerical variable, or a function that results in a numerical value in degrees (°)

Result type

Scalar numerical (units: degrees (°))

Example 1

@a = AngW(30, 90)

Explanation of example 1

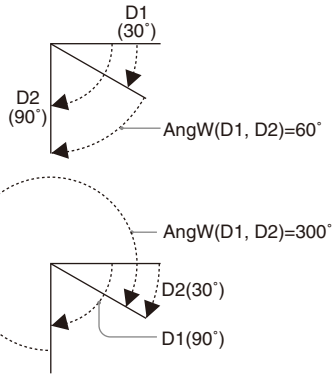
@a is set to a value of 60(°).

Example 2

@a = AngW(90, 30)

Explanation of example 2

@a is set to a value of 300 (°).



Circle3 (Q1, Q2, Q3)

Calculates the circle that passes through three X, Y positions (Q1, Q2, Q3).

Parameters

Q1, Q2, Q3: position variable or a function that returns in position data

Result type

Circle data

Causes of Errors

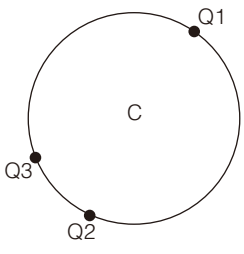
An error occurs if two or more points are the same coordinate, or if all three points are in a single line.

Examples

```
#P[0].X = 10
#P[0].Y = 0
#P[1].X = 0
#P[1].Y = 10
#P[2].X = 10
#P[2].Y = 20
#c = Circle3(#P[0], #P[1], #P[2])
```

Example explanation

The values are set as follows: #c.CX = 10, #c.CY = 10, and #c.CR = 10.



CircleLs (N, Q[], P)

Calculates a circle based on a group of X, Y positions Q[0] to Q[N-1] using the least-squares method.

Parameters

- N: number of points
- Q[]: Position array
- P: Specify whether or not to use correction (0: no correction, 1: correction)

Result type

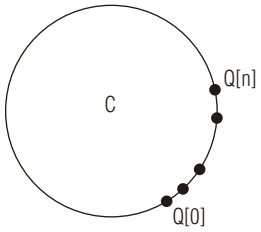
Circle data

Causes of Errors

- An error occurs if the number of points N exceeds 10,000.
- An error occurs if there are fewer than 3 points N.
- An error occurs if the value of P is neither 0 nor 1.
- An error occurs if there are fewer elements in the Q[] array than N.
- An error occurs if the function cannot find a circle from the group of points.

Examples

#C = Circles(5, #Q[], 1)



CircleTangent (C, Q, P)

Calculates two points on circle (C) based on tangent lines connecting position (Q) and circle (C).

Parameters

- C: circle variable or a function that results in circle data
- Q: position variable or a function that results in position data
- P: constant, numerical variable, or a function that results in a numerical value
  0: returns the left intersect point (Q0) on the circle (C) when looking at position (Q) from the circle (C).
  1: returns the left intersect point (Q1) on the circle (C) when looking at position (Q) from the circle (C).

Result type

Position data (units: pixels)

Causes of Errors

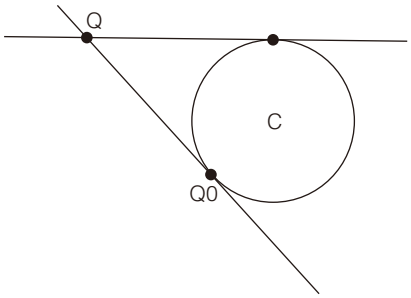
- An error occurs if point Q is inside the circle.
- An error occurs if the value of P is neither 0 nor 1.

Examples

#circle.CX = 10
#circle.CY = 10
#circle.CR = 10
#P[0].X = -10
#P[0].Y = 10
#p0 = CircleTangent(#circle, #P[0], 0) ... ①
#p1 = CircleTangent(#circle, #P[0], 1) ... ②

Example explanation

① Intersect position (5, 18.660).
② Intersect position (5, 1.329).



ConvCrd (Q1, Q2, D, P)

Converts the X, Y position Q1 in parameters of the origin set at Q2, rotated D degrees and scaled by P (Q1, Q2: position variable or a function that results in position data).

Parameters

- Q1, Q2: position variable or a function that results in position data
- D: constant, numerical variable, or function that results in a numerical value in degrees (°)
- P: constant, numerical variable, or a numerical value

Result type

Position data (units: pixels)

Causes of Errors

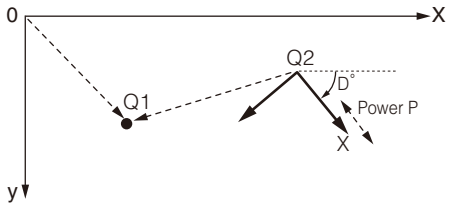
An error occurs if the value of P is zero.

Examples

```
#P[1].X = 10
#P[1].Y = 10 + 10 * Sqrt(2)
#P[2].X = 10
#P[2].Y = 10
#p =  ConvCrd(#P[1], #P[2], 45, 1)
```

Example explanation

#p is set with a value of (10, 10).



ConvCrd2(Q1, Q2, D, P1, P2)

Converts the X, Y position of Q1 in parameters of the origin set at Q2, rotated D degrees, scaled by P1 and axis system P2.

- Outputs the position of Q1 in parameters of an origin at Q2, rotated D degrees and measured in parameters of P1.

Parameters

- Q1: position variable or a function that results in position data
- Q2: origin in the destination coordinate system (coordinates expressed in parameters of the source coordinate system) position variable or function that returns a position value.
- D: rotation angle of X axis in the destination coordinate system (coordinates expressed in parameters of the source coordinate system) constant, scalar variable, or function that returns a scalar value.
- P1: Magnification power in the destination coordinate system (coordinates expressed in parameters of the source coordinate system) constant, scalar type variable, or function that returns a scalar value.
- P2: constant, numerical variable, or a numerical value
  0: if the positive side of the Y axis faces the same way in the source and destination
  1: If the positive side of the Y axis faces in the opposite direction between the source and destination.

Result type

Position data

Causes of Errors

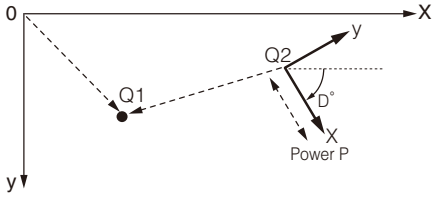
- An error occurs if the value of P is zero.
- An error occurs if the value of P2 is neither 0 nor 1.

Examples

```
Examples #Q1.X = 10
#Q1.Y = 10 + 10 * Sqrt(2)
Examples #Q2.X = 10
#Q2.Y = 10
#Q3 = ConvCrd2(#Q1, #Q2, 45, 1, 0) ... ①
#Q3 = ConvCrd2(#Q1, #Q2, 45, 1, 1) ... ②
```

Example explanation

① #Q3 is set with a value of (10, 10).
② #Q3 is set with a value of (10, -10).



ConvPixToWld (Q, CALIB[])

Converts an X, Y position on a pixel coordinate system to an X, Y position on a world coordinate system.

Parameters

- Q: position variable or a function that results in position data
- CALIB[]: numerical array variable with 28 elements, or result data from a calibration unit [Model Param.] (RSLT.CALIB[])

Result type

Position data

Causes of Errors

- An error occurs if CALIB[] has more or fewer than 28 elements.
- An error occurs if the values in the CALIB[] cannot be converted, i.e., when the elements contain illegal values.

Examples

#P=ConvPixToWld(#p, #CALIB[])

Example explanation

Pixel coordinates #p are converted to world coordinates #P using the calibration model parameters (#CALIB[]).

► Note

- When using the calibration model parameters (RSLT.CALIB[]) where the calibration unit is configured to generate a calibrated image, the conversion is done between the pixel and world coordinates of the calibrated image. If the calibration unit is not configured to generate a calibrated image, the conversion is done between the pixel and world coordinates of the current image.
- Positions converted using ConvPixToWld may not match exactly with the original positions when converted back (or vice versa) using ConvWldToPix.
- Positions that have been adjusted using position adjustment or scaling may not convert properly. Positions should be specified using an absolute value (AB).

ConvWldToPix (Q, CALIB[])

Converts an X, Y position on a world coordinate system to an X, Y position on a pixel coordinate system.

Parameters

- Q: position variable or a function that results in position data
- CALIB[]: numerical array variable with 28 elements, or result data from a calibration unit [Model Param.] (RSLT.CALIB[])

Result type

Position data

Causes of Errors

- An error occurs if CALIB[] has more or fewer than 28 elements.
- An error occurs if the values in the CALIB[] cannot be converted, i.e., when the elements contain illegal values.

Examples

#P=ConvWldToPix(#p, #CALIB[])

Example explanation

World coordinates #p are converted to pixel coordinates #P using the calibration model parameters (#CALIB[]).

► Note

- When using the calibration model parameters (RSLT.CALIB[]) where the calibration unit is configured to generate a calibrated image, the conversion is done between the pixel and world coordinates of the calibrated image. If the calibration unit is not configured to generate a calibrated image, the conversion is done between the pixel and world coordinates of the current image.
- Positions converted using ConvWldToPix may not match exactly with the original positions when converted back (or vice versa) using ConvPixToWld.

Dist (Q1, Q2)

Calculates the distance between two X, Y positions Q1 and Q2.

Parameters

Q1, Q2: position variable or a function that results in position data

Result type

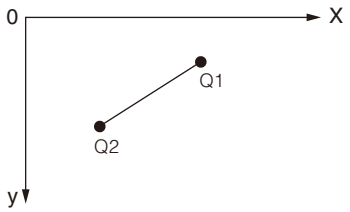
Numerical value (units: pixels)

Examples

#Q1.X = 70
#Q1.Y = 20
#Q2.X = 30
#Q2.Y = 50
#distance = Dist(#Q1, #Q2)

Example explanation

#distance is set to a value of 50.



I2Circle (C1,C2,P)

Calculates two intersecting points of two circles (C1 andC2). The points will be the same value if the circles are touching but not passing through each other.

Parameters

- C1, C2: circle variable or a function that results in a circle data
- P: constant, numerical variable, or a function that results in a numerical value
  0: returns the left intersect point when looking at the line passing through the intersecting points (Q0, Q1) from the center of circle (C1).1:
  returns the right intersect point when looking at the line passing through the intersecting points (Q0, Q1) from the center of circle (C1).

Result type

Position data (units: pixels)

Causes of Errors

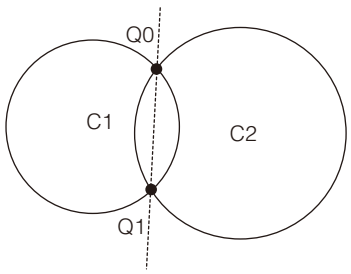
- An error occurs if the circles do not intersect.
- An error occurs if the value of P is neither 0 nor 1.

Examples

#Circle[0].CX = 10
#Circle[0].CY = 10
#Circle[0].CR = 10
#Circle[1].CX = 20
#Circle[1].CY = 20
#Circle[1].CR = 10
#point0 = I2Circle(#Circle[0], #Circle[1], 0) ... ①
#point1 = I2Circle(#Circle[0], #Circle[1], 1) ... ②

Example explanation

① Intersect position is (20,10).
② Intersect position is (10,20).



ILineCircle (C,L,P)

Calculates the two intersecting points of circle C and line L. The points will be the same value if the circles and line are touching but not passing through each other.

Parameters

- C: circle variable or a function that results in circle data
- L: line variable or a function that results in line data
- P: constant, numerical variable, or a function that results in a numerical value
  0: returns the left intersect point when looking at the line (L) from the center of circle (C).
  1: returns the right intersect point when looking at the line (L) from the center of circle (C).

Result type

Position data (units: pixels)

Causes of Errors

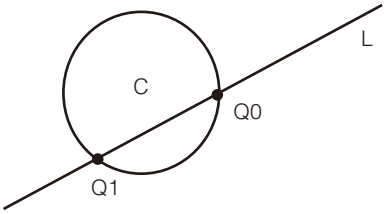
- An error occurs if the circle and line do not intersect.
- An error occurs if the value of P is neither 0 nor 1.

Examples

```
#circle.CX = 10
#circle.CY = 10
#circle.CR = 10
#line.RH = 15 * Sqrt(2) ... ①
#line.T = 45
#point0 = ILineCircle(#circle, #line, 0) ... ②
#point1 = ILineCircle(#circle, #line, 1) ... ③
```

Example explanation

① Represents line y = -x + 30.
② Intersect position is (20,10).
③ Intersect position is (10, 20).



InnerProd (Q1, Q2)

Calculates the inner product of two X, Y positions Q1 and Q2.

Parameters

Q1, Q2: position variable or a function that results in position data

Result type

Numerical value

Examples

```
#P1=AsPoint(1,1)
#P2=AsPoint(2,2)
@a = InnerProd( #P1, #P2 )
```

Example explanation

@a is set to a value of 4 (#P1.X * #P2.X + #P1.Y * #P2.Y).

ISect (L1, L2)

Calculates the intersecting point of line L1 and line L2.

Parameters

L1, L2: line variable or a function that results in line data

Result type

Position data (units: pixels)

Causes of Errors

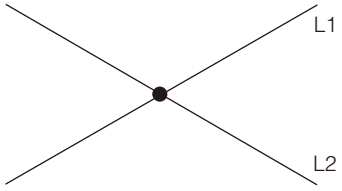
An error occurs if L1 and L2 are parallel.

Examples

```
#Point[0].X = 20
#Point[0].Y = 0
#Point[1].X = 0
#Point[1].Y = 10
#Point[2].X = 0
#Point[2].Y = 0
#Point[3].X = 20
#Point[3].Y = 10
#point = ISect(Line(#Point[0],#Point[1]), Line
_(#Point[2],#Point[3]))
```

Example explanation

Intersecting position is (5,5).



Line (Q1, Q2)

Calculates the line between X, Y positions Q1 and Q2.

Parameters

Q1, Q2: position variable or a function that results in position data

Result type

Line data

Causes of Errors

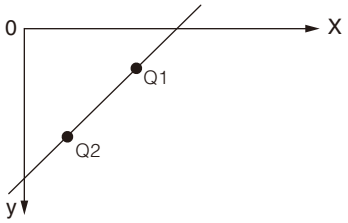
An error occurs if Q1 and Q2 are the same value.

Examples

```
Examples #Q1.X = 50
#Q1.Y = 20
Examples #Q2.X = 20
#Q2.Y = 50
#line = Line(#Q1, #Q2)
```

Example explanation

#line.T is set to a value of 45°, #line.RH to 49.497.



LineLs (N,Q[],P)

Calculates a line based on a group of X, Y positions Q[0] to Q[N-1] using the least-squares method.

Parameters

- N: number of points
- Q[]: Position array
- P: Specify whether or not to use correction (0: no correction, 1: correction)

Result type

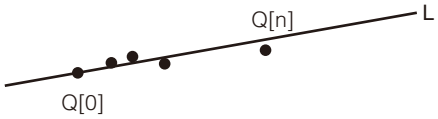
Line data

Causes of Errors

- An error occurs if the number of points N exceeds 10,000.
- An error occurs if there are fewer than 2 points N.
- An error occurs if the value of P is neither 0 nor 1.
- An error occurs if there are fewer elements in the Q[] array than N.
- An error occurs if the function cannot find a line from the group of points.

Examples

#L=LineLs(6, #Q[], 1)



LLAngle (L1, L2)

Calculates the angle (0° θ < 180°) formed by lines L1 and L2 where the angle is the sum of the absolute values of the angles formed by L1 and L2 with a horizontal line measured in the same direction (clockwise/anti-clockwise).

Parameters

L1, L2: line variable or a function that results in line data

Result type

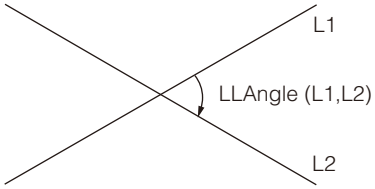
Scalar numerical (units: degrees (°))

Examples

#Line[0].T = 60
#Line[0].RH = Sqrt(3) / 2
#Line[1].T = 120
#Line[1].RH = 0
#angle = LLAngle(#Line[0], #Line[1])

Example explanation

#ang is set to a value of 60(°).



LnAngle (L)

Calculates the angle (-90° < θ 90°) formed by line L and a horizontal line with the horizontal line being 0 degrees and positive values calculated in the clockwise direction.

Parameters

L: line variable or a function that results in line data

Result type

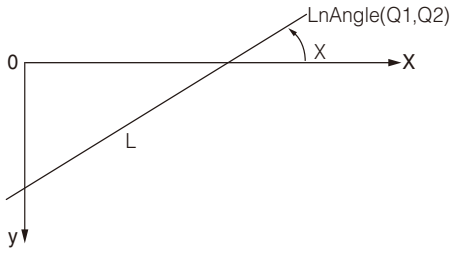
Scalar numerical (units: degrees (°))

Examples

#line.T = 60
#line.RH = Sqrt(3) / 2
#ang = LnAngle(#line)

Example explanation

#ang is set to a value of -30(°).



LnDist (L, Q)

Calculates the perpendicular distance between line L and X, Y position Q.

Parameters

- L: line variable or a function that results in line data
- Q: position variable or a function that results in position data

Result type

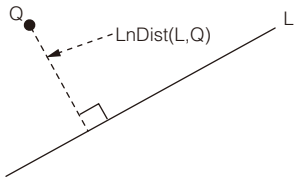
Numerical value (units: pixels)

Examples

```
#p0.X = 0
#p0.Y = 0
#line.T = 60
#line.RH  = 1.5
#distance = LnDist(#line, #p0)
```

Example explanation

#distance is set to a value of 1.5.



LnDistP (L, Q)

Calculates the signed perpendicular distance between line L and X, Y position Q.

Parameters

- L: line variable or a function that results in line data
- Q: position variable or a function that results in position data

Result type

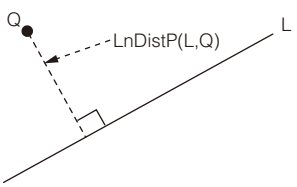
Numerical value (units: pixels)

Examples

```
#p0.X = 0
#p0.Y = 0
#line.T = 60
#line.RH  = 1.5
#distance = LnDistP(#line, #p0)
```

Example explanation

#distance is set to a value of -1.5.



LnDistXY (L, Q)

Calculates the intersecting point between the line L and the perpendicular line from X, Y position Q.

Parameters

- L: line variable or a function that results in line data
- Q: position variable or a function that results in position data

Result type

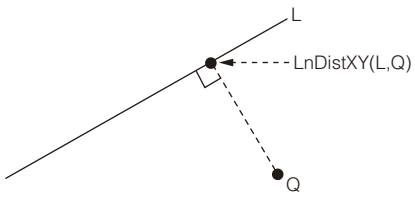
Position data (units: pixels)

Examples

```
#P[0].X = 10
#P[0].Y = 10
#line.T = 45
#line.RH  = 5 * Sqrt(2)
#pointXY = LnDistXY(#line, #P[0])
```

Example explanation

Intersect position is (5,5).



MidLine (L1,L2,P)

Calculates two bisecting lines based on the intersection of two straight lines L1 and L2.

Parameters

- L1, L2: line variable or a function that results in line data
- P: constant, numerical variable, or a function that results in a numerical value
  0: returns the line bisecting the angle between L1 and L2
  1: Returns the line perpendicular to the line bisecting the angle between L1 and L2 when 0 was specified.

Result type

Line data

Causes of Errors

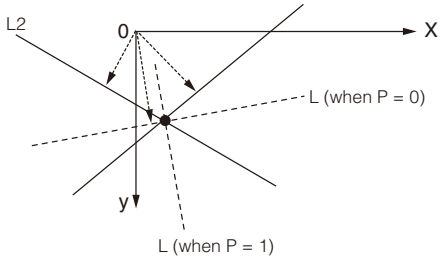
- An error occurs if L1 and L2 are parallel.
- An error occurs if the value of P is neither 0 nor 1.

Examples

```
#Line[0].T = 60
#Line[0].RH = 10
#Line[1].T = 120
#Line[1].RH = 0
#line = MidLine(#Line[0], #Line[1], 0) ... ①
#line = MidLine(#Line[0], #Line[1], 1) ... ②
```

Example explanation

① θ= 90°, ρ = 5.7735 (10/√3).
② θ = 0°, ρ = 10.



MidXY (Q1, Q2)

Calculates the point Q halfway between X, Y positions Q1 and Q2.

Parameters

Q1, Q2: position variable or a function that results in position data

Result type

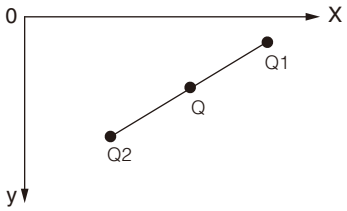
Position data (units: pixels)

Examples

```
#P[0].X = 90
#P[0].Y = 20
#P[1].X = 10
#P[1].Y = 80
#p =MidXY(#P[0], #P[1])
```

Example explanation

#p is set to a value of (50, 50).



MultiPtCalib (N,Q1[], Q2[], CALIB[])

Calculates calibration model (CALIB[]) from multiple pixel X, Y positions (Q1[]) and world X, Y positions (Q2[]). The CALIB[] model obtained from this function can be used in ConvPixToWld and ConvWldToPix as a parameter for the following conversions.

- ConvPixToWld (Q, CALIB[]): converts X, Y position Q from pixel coordinates (Q1 coordinates) to world coordinates (Q2 coordinates).
- ConvWldToPix (Q, CALIB[]): converts X, Y position Q from world coordinates (Q2 coordinates) to pixel coordinates (Q1 coordinates)

Parameters

- N: number of points (1 - 16)
- Q1[]: position array (coordinates in a pixel coordinate system)
- Q2[]: position array (coordinates in a world coordinate system)
- CALIB[]: scalar array variable with 28 elements (where the calibration information is to be stored)

Result type

Numerical value (0 = success, -1 = fail)
The function returns -1 if it fails to find the calibration information. (If the error conditions are met, the function ends on an error and the result type cannot be confirmed.)

Causes of Errors

- An error occurs if the number of elements is outside the range of 1 to 16.
- An error occurs if there are fewer elements in the Q1[] array than N.
- An error occurs if there are fewer elements in the Q2[] array than N.
- An error occurs if CALIB[] has more or fewer than 28 elements.

Example 1

Single point calibration

```
@a = MultiPtCalib(1, #P1[], #P2[], #CALIB[])
```



Example 1 explanation

@a = 0 (success) or @a = -1 (fail)
This function creates the calibration model (#CALIB[]) based on #P1 (pixel coordinates) being #P2 (world coordinates).

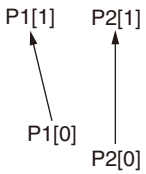
► Note

Used in this manner the function cannot change the axis direction.

Example 2

Two-point calibration

@a = MultiPtCalib(2, #P1[], #P2[], #CALIB[])



Example 2 explanation

@a = 0 (success) or @a = -1 (fail)

This function creates the calibration model (#CALIB[]) based on conversion (X/Y translation, rotation, and shrink & expand) of vector #P1 (pixel coordinates) so that it correctly superimposes on vector #P2 (world coordinates).

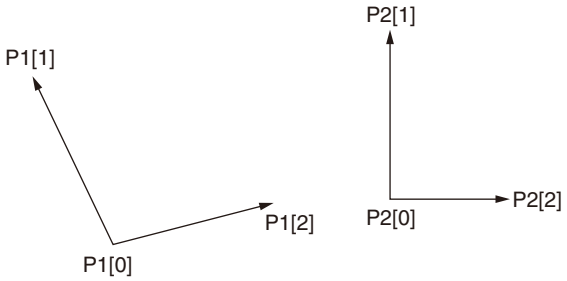
► Note

Used in this manner the function cannot change the axis direction.

Example 3

Three-point calibration

@a = MultiPtCalib(3, #P1[], #P2[], #CALIB[])



Example 3 explanation

@a = 0 (success) or @a = -1 (fail)

This function creates the calibration model (#CALIB[]) based on (X/Y translation, rotation, shrink & expand, aspect ratio, and shearing) on axis #P1 (pixel coordinates) so that it superimposes on axis #P2 (world coordinates).

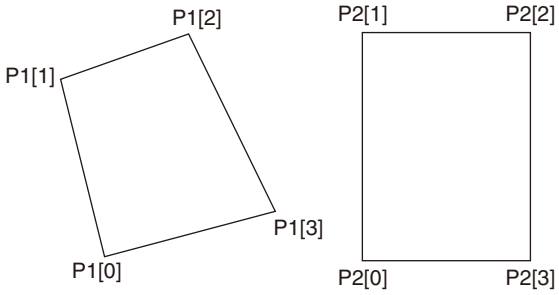
Reference

Used in this manner the function can be used to change the axis direction.

Example 4

Four-point calibration

@a = MultiPtCalib(4, #P1[], #P2[], #CALIB[])



Example 4 explanation

@a = 0 (success) or @a = -1 (fail)

This function creates the calibration model (#CALIB[]) based on projection conversion of square #P1 (pixel coordinates) so that it superimposes on the square #P2 (world coordinates) (eg trapezoid correction).

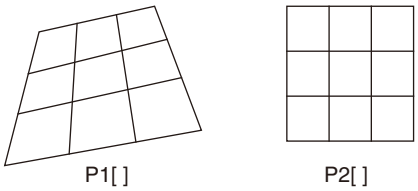
Reference

Used in this manner the function can be used to change the axis direction.

Example 5

Five-point calibration

@a = MultiPtCalib(#N, #P1[], #P2[], #CALIB[])



Example 5 explanation

@a = 0 (success) or @a = -1 (fail)

This function creates the calibration model (#CALIB[]) based on projection conversion of multiple points #P1 (pixel coordinates) so that they superimpose as closely as possible (using the least-squares method) on the multiple points #P2 (world coordinates).

Reference

- Used in this manner the function can be used to change the axis direction.
- Points need not exist on the same line.

► Note

This cannot be used to correct lens distortion.

OuterProd (Q1, Q2)

Calculates the outer product of two X, Y positions Q1 and Q2.

Parameters

Q1, Q2: position variable or a function that results in position data

Result type

Numerical value

Examples

#P1=AsPoint(1,1)

#P2=AsPoint(2,2)

@a = OuterProd(#P1, #P2)

Example explanation

@a is set to a value of 2 (#P1.X * #P2.Y + #P1.Y * #P2.X).

Rotate (Q1,Q2,D,P)

Rotates X, Y position Q1 about center Q2 for D degrees and scaled by P.

Parameters

- Q1, Q2: position variable or a function that results in position data
- D: constant, numerical variable, or a function that results in a numerical value in degrees (°).
- P: power. Constant, numerical variable, or a function that results in a numerical value

Result type

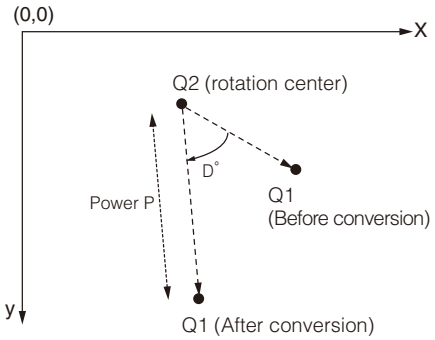
Position data (units: pixels)

Examples

#Q1.X = 15
#Q1.Y = 15
#Q2.X = 10
#Q2.Y = 10
#Q3 = Rotate(#Q1, #Q2, 90, 2)

Example explanation

Q3 is set to a value of (0, 20).



RotCenter (Q1,Q2,D)

Calculates the X, Y position rotation center when Q1 is rotated to Q2 by D degrees.

Parameters

- Q1, Q2: position variable or a function that results in position data
- D: constant, numerical variable, or a function that results in a numerical value in degrees (°)

Result type

Position data

Causes of Errors

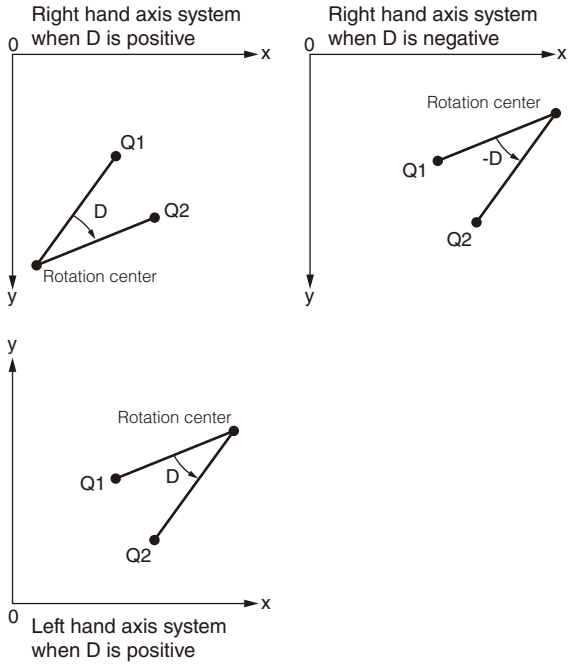
- An error occurs if Q1 and Q2 are the same value.
- An error occurs if D is a multiple of 360 degrees (-360, 0, 360, 720, ..., etc.).

Examples

#P=RotCenter (#Q1, #Q2, 30)

Example explanation

This function calculates the rotation center when point Q1 is rotated 30 degrees to point Q2.



Reference

When using the right hand axis system and a positive angle the rotation will be clockwise with the rotation center being nearer the Y axis. When using the right hand axis system and a positive angle the rotation will be clockwise with the rotation center being nearer the Y axis.

SubVector (Q1, Q2)

Calculates the difference between two X, Y positions Q1 and Q2.

Parameters

Q1, Q2: position variable or a function that results in position data

Result type

Position data

Examples

#P1=AsPoint(1,1)
#P2=AsPoint(2,2)
#p = SubVector(#P1, #P2)

Example explanation

#p is set to a value of (1,1).

VMidLine (Q1, Q2)

Calculates the vertical line that bisects the line passing through X, Y positions Q1 and Q2.

Parameters

Q1, Q2: position variable or a function that results in position data

Result type

Line data

Causes of Errors

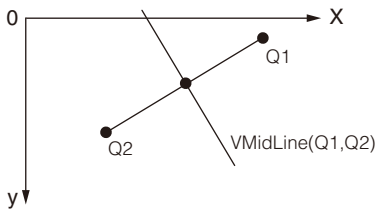
An error occurs if Q1 and Q2 are the same coordinates.

Examples

#P[0].X =10*Sqrt(3)
#P[0].Y = 0
#P[1].X = 0
#P[1].Y = 10
#l =VMidLine(#P[0], #P[1])

Example explanation

#1.T is set to -30°, #1.RH is set to 5.



Calendar Functions

ShiftDay (P)

Adds or subtracts the number of days (P) to the current month, date, year, and returns the day.

Parameters

P: constant, numerical variable, or a function that results in a numerical value

Result type

Numerical value

Causes of Errors

An error occurs if the number of days P exceeds 9,999.

Examples

ShiftDay(-1)

Example explanation

Returns the day one day prior to the current date set.

ShiftMonth (P)

Adds or subtracts the number of days (P) to the current month, date, year, and returns the month.

Parameters

P: constant, numerical variable, or a function that results in a numerical value

Result type

Numerical value

Causes of Errors

An error occurs if the number of days P exceeds 9,999.

Examples

#month = ShiftMonth(10)

Example explanation

Returns the month 10 days after the current date.

ShiftYear (P)

Adds or subtracts the number of days (P) to the current month, date, year, and returns the month.

Parameters

P: constant, numerical variable, or a function that results in a numerical value

Result type

Numerical value

Causes of Errors

An error occurs if the number of days P exceeds 9,999.

Examples

#year = ShiftYear(-365)

Example explanation

Returns the year 365 days prior to the current set date.

BIT Functions

B_And (P1, P2)

Calculates the logical product of the BIT's of P1 and P2.

- The function converts P1 and P2 from a numerical value to a 4-byte integer (32 BIT's) and returns the calculated result as a numerical value.
- If the value specified exceeds the maximum for an unsigned 4-byte integer, the lower 4-bytes are used and all bits above that are ignored.

Parameters

P1, P2: constant, numerical variable, or function that returns a numerical value

Result type

Numerical value

Examples

@p1 = 10.1
@p2 = 3.14
@p3 = B_And(@p1, @p2) ... ①

Example explanation

@p3 is set to a value of 2.

B_Not (P)

Calculates the logical inverse of the BIT's of P.

- The function converts P from a numerical value to a 4-byte integer (32 BIT's) and returns the calculated result as a numerical value.
- If the value specified exceeds the maximum for an unsigned 4-byte integer, the lower 4-bytes are used and all bits above that are ignored.

Parameters

P: constant, numerical variable, or a function that results in a numerical value

Result type

Numerical value

Examples

@p1 = 10.1
@p2 = B_And(B_Not(@p1), 15)

Example explanation

@p2 is set to a value of 5.

B_Or (P1, P2)

Calculates the logical sum of the BIT's of P1 and P2.

- The function converts P1 and P2 from a numerical value to a 4-byte integer (32 BIT's) and returns the calculated result as a numerical value.
- If the value specified exceeds the maximum for an unsigned 4-byte integer, the lower 4-bytes are used and all bits above that are ignored.

Parameters

P1, P2: constant, numerical variable, or function that returns a numerical value

Result type

Numerical value

Examples

@p1 = 10.1
@p2 = 3.14
@p3 = B_Or (@p1, @p2)

Example explanation

@p3 is set to a value of 11.

B_XOr (P1, P2)

Calculates the exclusive logical OR of the BIT's of P1 and P2.

- The function converts P1 and P2 from a numerical value to a 4-byte integer (32 BIT's) and returns the calculated result as a numerical value.
- If the value specified exceeds the maximum for an unsigned 4-byte integer, the lower 4-bytes are used and all bits above that are ignored.

Parameters

P1, P2: constant, numerical variable, or function that returns a numerical value

Result type

Numerical value

Examples

@p1 = 10.1
@p2 = 3.14
@p3 = B_XOr (@p1, @p2)

Example explanation

@p3 is set to a value of 9.

Bind (P0, P1, P2, P3, P4, P5, P6, P7)

Binds the bits from P0 to P7 into an 8-bit value (P0: MSB, P7: LSB).

Parameters

P0 - P7: constant, numerical variable, or function that returns a numerical value

Result type

Numerical value

Causes of Errors

An error occurs if the value of P0 to P7 is neither a 0 nor a 1.

Examples

@p3 = Bind(0,1,0,1,0,1,0,1)

Example explanation

@p3 is set to a value of 85.

Image Operation

Image operation creates and stores a resultant image in a user specified image variable. This image is the result of a process or calculation being performed on a single source image or across multiple source images.
This section explains the types of processing that can be used in an image operation unit, and the flow used to combine two images.

► Note

- Both source images 1 and 2 used in an image operation must be of the same type (resolution).
- The image variable used to store the resultant image must be the same type (resolution) as image variables used by both source images 1 or 2.

Image Combinations

Processing options using multiple images

: Available, X: Not Available

Combination	Processing images		Conversion	Operation type	Image array operation
	Source 1	Source 2	Source 1/2		
1	1	0	O/×	×	×
2	1	1	O/O	O	×
3	n	0	O/×	O*1	×
4	n	1	O/O	O*2	O*3
5	n	n	O/O	O*2	O*3

*1 Any operation other than Subtract and AbsoluteDifference may be used.
*2 Only the Subtract and AbsoluteDifference operations may be used.
*3 Image array operation must be used otherwise an error will occur.

Reference

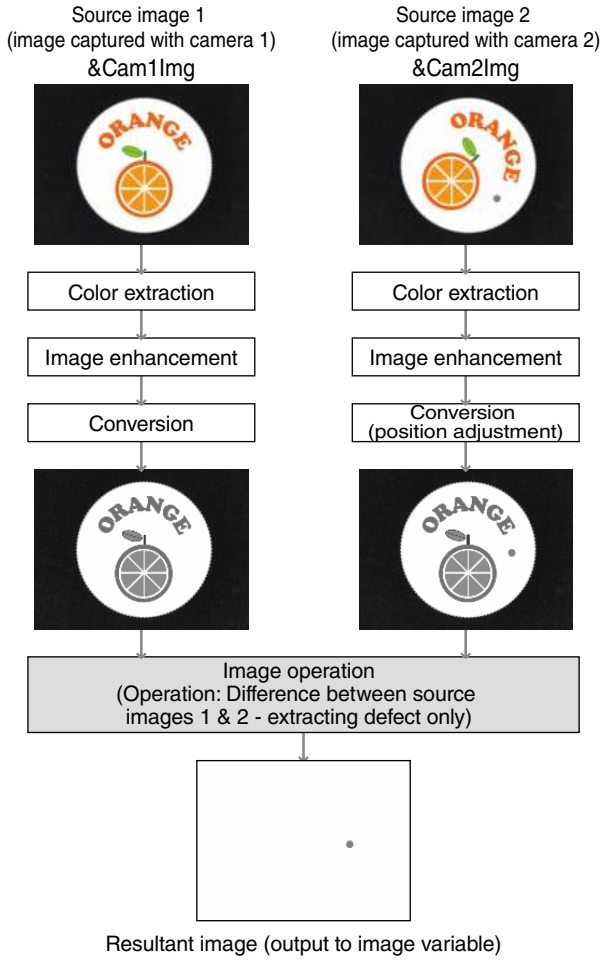
The number of images "n" can be set from 2 - 32.

► Note

- A settings error will occur if [None] is selected for the operation type of patterns 2 - 5.
- If the captured image size from any camera exceeds 26214400 pixels, it is not possible to use an image array.

Image Operation Flow

This example will follow pattern 2 in the chart "Processing patterns that use image operation units".



Functional Explanation of Conversions

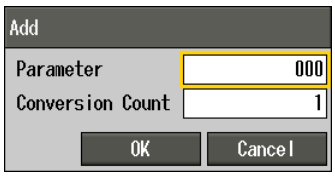
Conversions apply parametric image processing, such as image composition and correction, to color extracted and or image enhanced images.

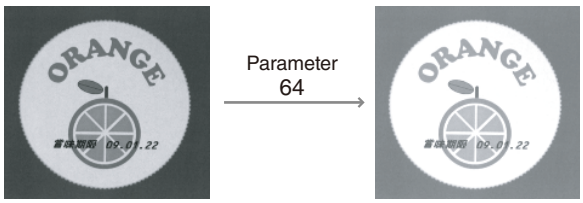
Reference

The screens shots shown in these explanations are from the Edit Unit menu.

(1) Add

Adds the specified parameter (grayscale level) to every pixel in the source image.





200	50	150		255	114	214
45	80	65		109	144	129
0	215	100		64	255	164

Forces pixel values greater than 255 to 255

Parameter

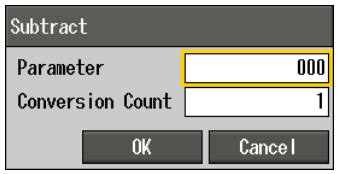
Specify a value for the conversion (0 to 255).

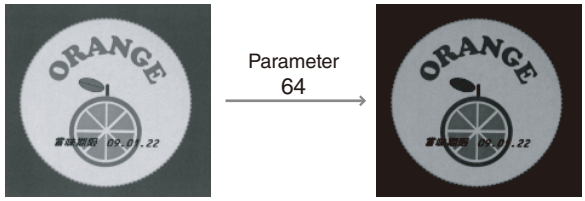
Conversion Count

Choose to execute (1) or not to execute (0) the conversion.

(2) Subtract

Subtracts the specified parameter (grayscale level) from every pixel in the source image.





200	50	150		136	0	86
45	80	65		0	16	1
0	215	100		0	151	36

Forces pixel values less than 0 to 0

Parameter

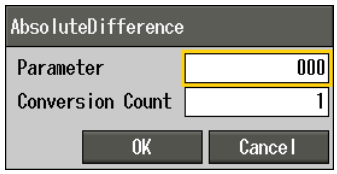
Specify a value for the conversion (0 to 255).

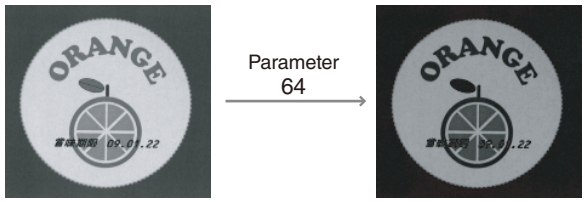
Conversion Count

Choose to execute (1) or not to execute (0) the conversion.

(3) AbsoluteDifference

Subtracts the specified parameter (grayscale level) from every pixel in the source image and outputs the absolute result.





200	50	150		136	14	86
45	80	65		19	16	1
0	215	100		64	151	36

Outputs values less than 0 as an absolute value

Parameter

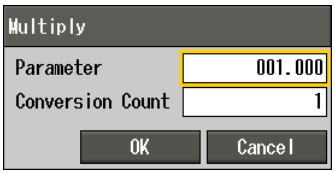
Specify a value for the conversion (0 to 255).

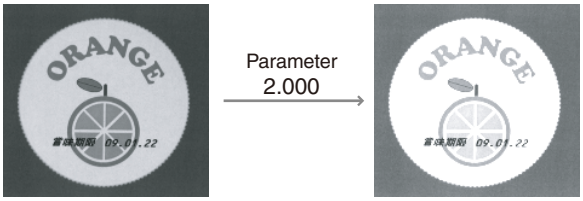
Conversion Count

Choose to execute (1) or not to execute (0) the conversion.

(4) Multiply

Multiplies every pixel in the source image by the specified parameter (grayscale level).





200	50	150	255	100	255
45	80	65	90	160	130
0	215	100	0	255	200

Forces pixel values greater than 255 to 255

Parameter

Specify a value for the conversion (0 to 255).

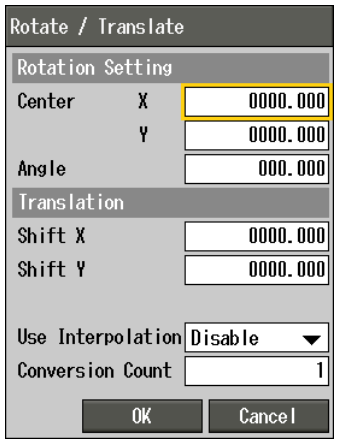
- 0.000 Parameter < 1.000: darkens the pixel.
- 1.000 <Parameter 255.000: brightens the pixel.

Conversion Count

Choose to execute (1) or not to execute (0) the conversion.

(5) Rotate, Translate

Rotate the image about a set of co-ordinates and shift it in the X and Y direction (translation). Interpolation can be used for improving image quality / processing speed.





Rotation center
X: 100,000
Y: 100,000
Rotation angle: 300.000
Translation
X: 000.000
Y: 150.000

Rotation center

Specify the X, Y rotation center.

- **X**: -16383 to 16383
- **Y**: -16383 to 16383

Rotation angle

Specify the angle of rotation from 0.000 to 359.999.

Translation

Specify the X and Y shift (in pixels).

- **Shift X**: -9600.000 to 9600.000
- **Shift Y**: -7200.000 to 7200.000

Use interpolation

Choose whether to use interpolation.

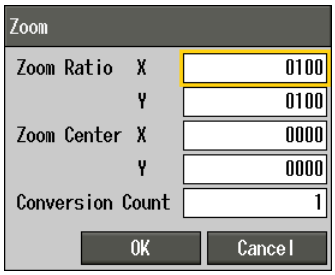
- **ON**: Use interpolation.
- **OFF**: Do not use interpolation.

Conversion Count

Choose to execute (1) or not to execute (0) the conversion.

(8) Zoom

Enlarge or shrink the image about an X Y center point and X Y zoom ratio.





Zoom ratio X: 100%
Zoom ratio Y: 150%
Zoom center
X: 256.000
Y: 240.000

Zoom ratio X

Specify the zoom ratio in the X direction from 16 to 2500 %.

Zoom ratio Y

Specify the zoom ratio in the Y direction from 16 to 2500 %.

Zoom Center

Specify X, Y zoom center.

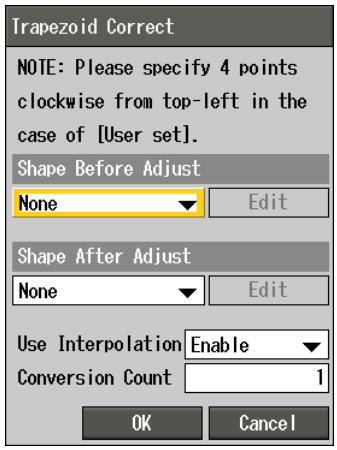
- **X**: -9600.000 to 9600.000
- **Y**: -7200.000 to 7200.000

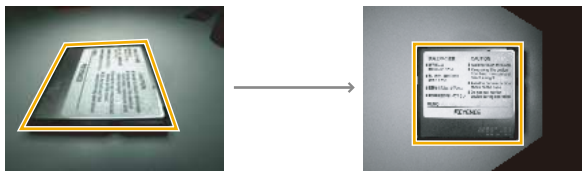
Conversion Count

Choose to execute (1) or not to execute (0) the conversion.

(7) Trapezoid Correct

Correct the trapezoidal distortion of an image based on matching up four specified points before and after.





Shape Before Adjust: square

Shape After Adjust: rectangle

Shape before adjustment

Specify the shape / points before correction.

- **None**: No shape.
- **User Set**: Manually select the four points to correct from in a clockwise fashion (starting at what should be the upper left). Refer to "Drawing a Polygon" (Page 3-24) for more details on this setting method.

Shape after adjustment

Specify the matching shape / points after correction.

- **None**: No target
- **User Set**: Manually select the four points for the correction to adjust to in a clockwise fashion (starting at what should be the upper left). Refer to "Drawing a Polygon" (Page 3-24) for more details on this setting method.
- **Rectangle**: Set the target area as a rectangle. The first point being the upper left corner of the rectangle.

Use interpolation

Choose whether to use interpolation.

- **ON**: Use interpolation.
- **OFF**: Do not use interpolation.

Conversion Count

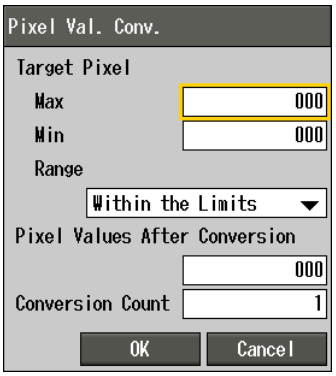
Choose to execute (1) or not to execute (0) the conversion.

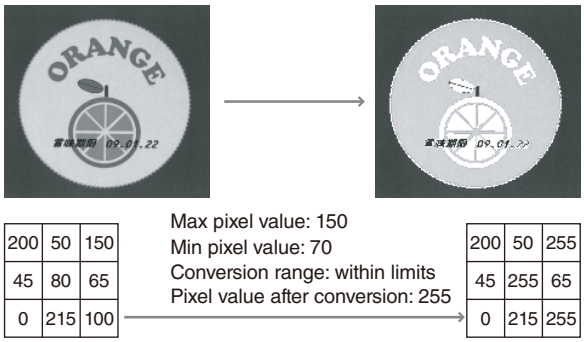
► Note

- This adjustment may not be able to completely correct severely warped images.
- If the shape is defined in the opposite order for either image the resultant image will be inverted.

(8) Pixel Value Conversion

Replace pixel values with a specified value for pixels that fall within or beyond a user-specified range.





Target Pixel

- Max: Specify the upper value (grayscale level) of the range (0 to 255).
- Min: Specify the lower value (grayscale level) of the range (0 to 255).
- Range: Choose whether to convert the pixels that fall within or outside of the range.

Pixel value after conversion

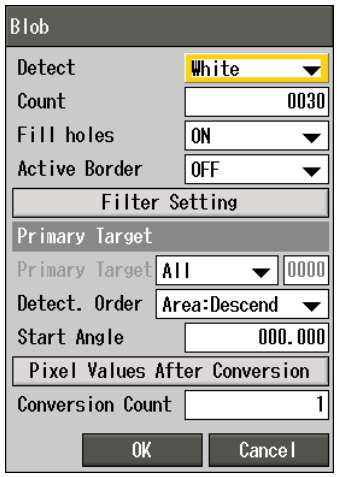
Specify the value (grayscale level) to use after the conversion (0 to 255).

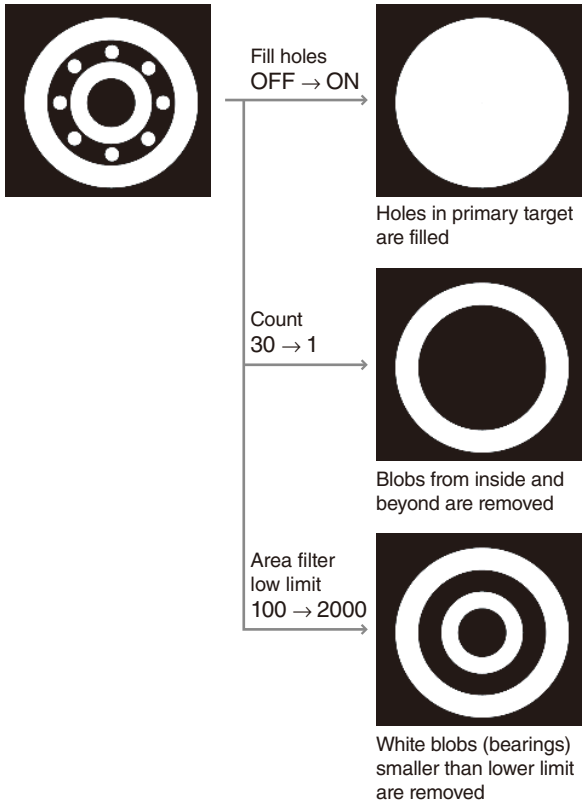
Conversion Count

Choose to execute (1) or not to execute (0) the conversion.

(9) Blob

The blob filter produces a monochrome image (binary image), after filling holes and removing border noises. The filter converts the pixels in the image to the specified detection and background colors.





Detect

Specify the color of pixels (black/white) to be detected in the binary (monochrome) image.

- **White**: Set white blobs to be the target of detection.
- **Black**: Set black blobs to be the target of detection.

Count

Specify the maximum number of blobs to be detected from 1 to 9999. The number of blobs cannot exceed the [Maximum Count] value.

Fill holes

Specify whether to fill the inside of blobs with the color specified in [Detect].

If the inside of a blob contains an area different in color to the [Detect] color, the area, center of gravity, or roundness referenced by the blob filter may be affected. In order to prevent this, the inside of blobs can be filled using the [Detect] color as follows.

Fill holes: OFF Fill holes: ON

- **OFF**: Do not fill the inside of blobs.
- **ON**: Fill the inside of blobs.

Active Border

Specify whether to detect blobs located on the border of the inspection region.

- **OFF**: Detect blobs located on the border of the inspection region.
- **ON**: Exclude blobs located on the border of the inspection region from detection.

► Note

The active border ON/OFF setting can only be specified if the inspection region is a rectangle and no mask or image regions have been set. If any other inspection region is selected, the active border will be processed as if set to OFF.

Filter Setting

Specify whether to enable or disable each filter and change the maximum and minimum values for it.

- **Area**: This filter ignores blobs that are larger than the specified maximum value or smaller than the specified minimum value (Area filter).
- **Roundness**: This filter ignores blobs that have roundness values higher than the specified maximum value (their shapes are closer to a perfect circle) or the blobs that have roundness values lower than the specified minimum value (Roundness filter).
- **Min Bounding Box Width**: This filter ignores blobs that have minimum bounding box width values higher than the specified maximum value or the blobs that have values lower than the specified minimum value (Min bounding box width filter).
- **Aspect Ratio**: This filter ignores blobs that have aspect ratios higher than the specified maximum value (thin-shaped blobs) or the blobs that have aspect ratios lower than the specified minimum value (Aspect ratio filter).
- **Major Axis**: This filter ignores blobs that have major axis values higher than the specified maximum value or the blobs that have major axis values lower than the specified minimum value (Major axis filter).
- **Axes Ratio**: This filter ignores blobs that have axes ratios higher than the specified maximum value (thin-shaped blobs) or the blobs that have axes ratios lower than the specified minimum value (Axes ratio filter).

► Note

Each filter enabled adds to the total processing time.

Primary target

- This specifies which blobs are to be converted.
  - All: Converts all blobs detected from all primary targets.
  - Specified: Converts only specified blob number (0 to 9998). Conversion is only done on the blob specified here.
- Order: Select the blob numbering order. The following 12 sorting methods are available for assigning numbers to blobs.
  - Y>X:Ascend: Sorts blobs in ascending Y order. When Y values are the same, reorders in ascending X order.
  - X>Y:Ascend: Sorts blobs in ascending X order. When X values are the same, reorders in ascending Y order.
  - X:Ascend: Sorts blobs in ascending X order.
  - X:Descend: Sorts blobs in descending X order.
  - Y:Ascend: Sorts blobs in ascending Y order.
  - Y:Descend: Sorts defects in descending Y order.
  - Area:Ascend: Sorts blobs from smallest area to largest.
  - Area:Descend: Sorts blobs from largest area to smallest.

- Round.:Asc.: Sorts blobs from lowest roundness value to highest.
- Round.:Desc.: Sorts blobs from highest roundness value to lowest.
- Clockwise: Sorts blobs clockwise from the start angle.
- Counter CW: Sorts blobs counter-clockwise from the start angle.

- Start Angle: Specify the start angle to begin assigning numbers to blobs when [Detect. Order] is set to [Clockwise] or [Counter CW]

► Note

- This setting is ignored when [Detect. Order] is not [Clockwise] or [Counter CW].
- Targets cannot be specified if [Primary Target] is set to [All].

Pixel value after conversion

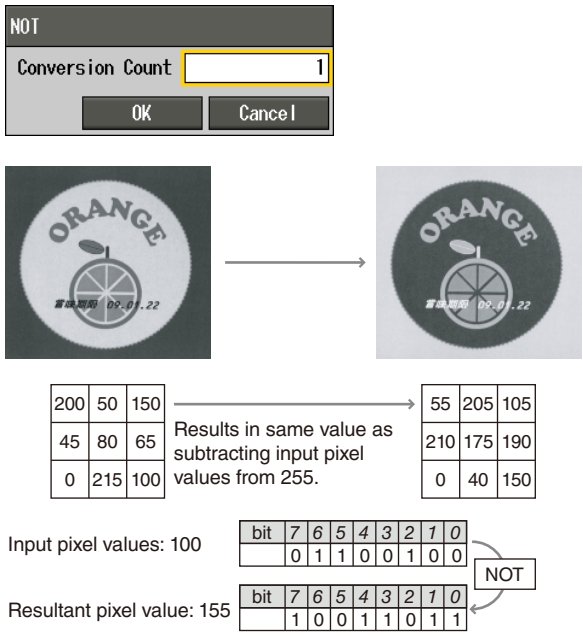
- Detected color: Specify the value (grayscale level) for the target pixels after filtering (0 to 255).
- Background color: Specify the value (grayscale level) for the background pixels after filtering (0 to 255).

Conversion Count

Choose to execute (1) or not to execute (0) the conversion.

(10) NOT

Inverts (grayscale level) every pixel in the source image.

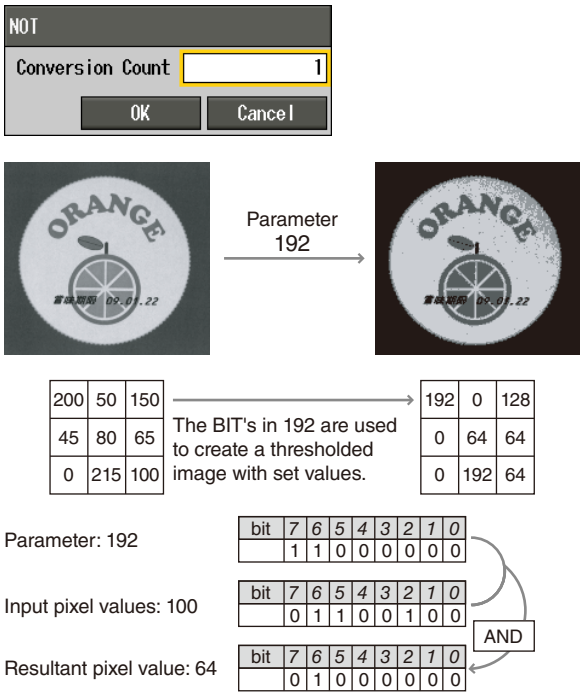


Conversion Count

Choose to execute (1) or not to execute (0) the conversion.

(11) AND

Performs a logical AND function on the BIT's of every pixel in the source image and the BIT's of the value specified in [Parameter].



Parameter

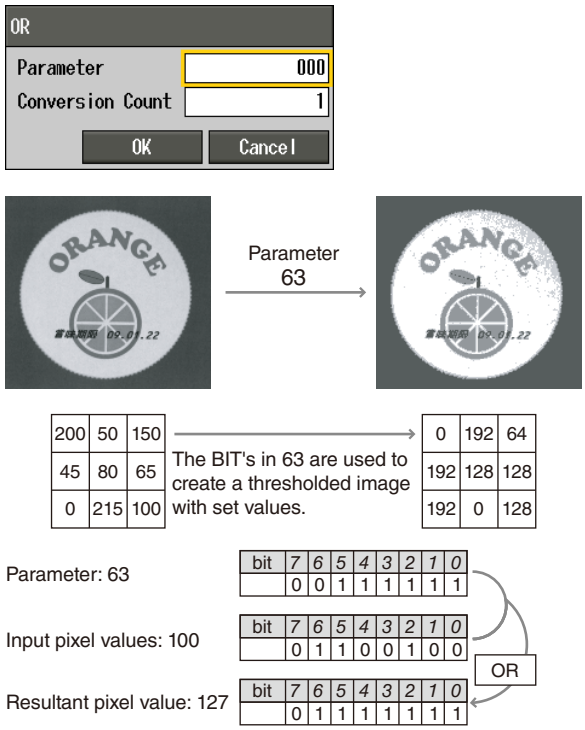
Specify a value for the conversion (0 to 255).

Conversion Count

Choose to execute (1) or not to execute (0) the conversion.

(12) OR

Performs a logical OR function on the BIT's of every pixel in the source image and the BIT's of the value specified in [Parameter].



Parameter

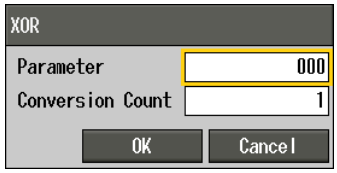
Specify a value for the conversion (0 to 255).

Conversion Count

Choose to execute (1) or not to execute (0) the conversion.

(13) XOR

Performs a logical XOR function on the BIT's of every pixel in the source image and the BIT's of the value specified in [Parameter]. Applying XOR against 255 inverts the pixel value.



Parameter

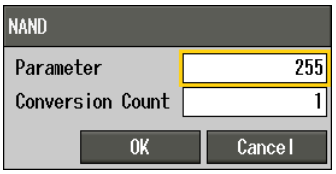
Specify a value for the conversion (0 to 255).

Conversion Count

Choose to execute (1) or not to execute (0) the conversion.

(14) NAND

Performs a logical NAND function on the BIT's of every pixel in the source image and the BIT's of the value specified in [Parameter].

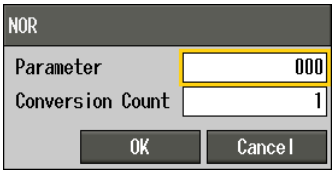


Parameter
Specify a value for the conversion (0 to 255).

Conversion Count
Choose to execute (1) or not to execute (0) the conversion.

(15) NOR

Performs a logical NOR function on the BIT's of every pixel in the source image and the BIT's of the value specified in [Parameter].

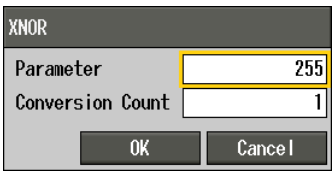


Parameter
Specify a value for the conversion (0 to 255).

Conversion Count
Choose to execute (1) or not to execute (0) the conversion.

(16) XNOR

Performs a logical XNOR function on the BIT's of every pixel in the source image and the BIT's of the value specified in [Parameter]. Applying XNOR against 0 inverts the pixel value.

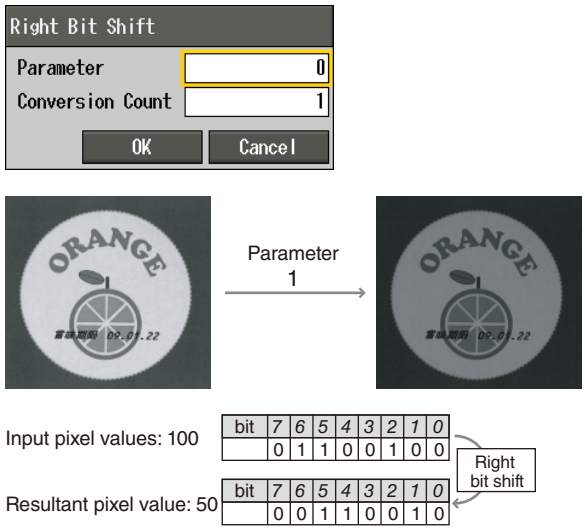


Parameter
Specify a value for the conversion (0 to 255).

Conversion Count
Choose to execute (1) or not to execute (0) the conversion.

(17) Right Bit Shift

Shifts each pixel in the source image to the right by the number of bits specified by [Value]. This darkens the image. Each bit-wise shift halves the image brightness (or, darkens it by two times).

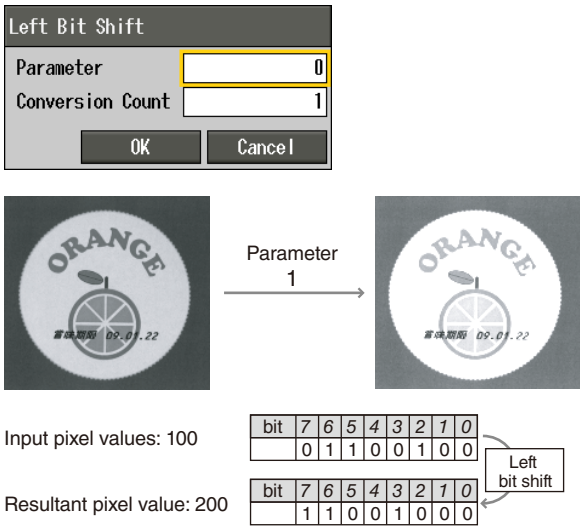


Parameter
Specify the number of bits to shift (0 to 8).

Conversion Count
Choose to execute (1) or not to execute (0) the conversion.

(18) Left Bit Shift

Shifts the BIT's of every pixel in the image to the left by the number of bits specified in [Parameter]. This lightens the image, and with each shift the image brightness is doubled.



Parameter

Specify the number of bits to shift (0 to 8).

Conversion Count

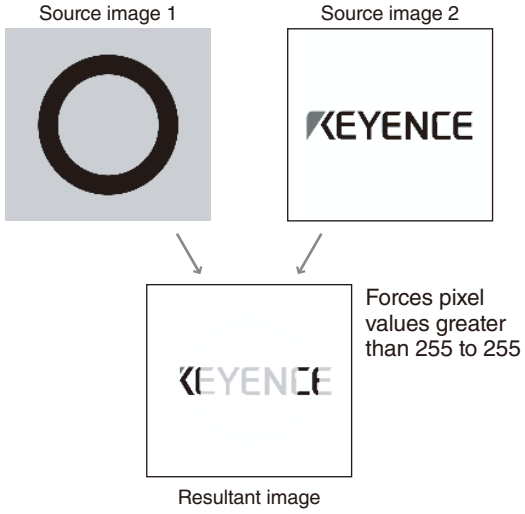
Choose to execute (1) or not to execute (0) the conversion.

Functional Explanation of Operations

Operations are used to decide how to combine images together.

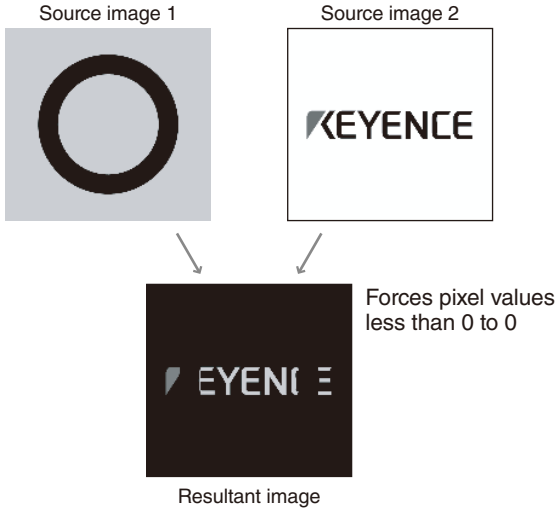
(1) Add

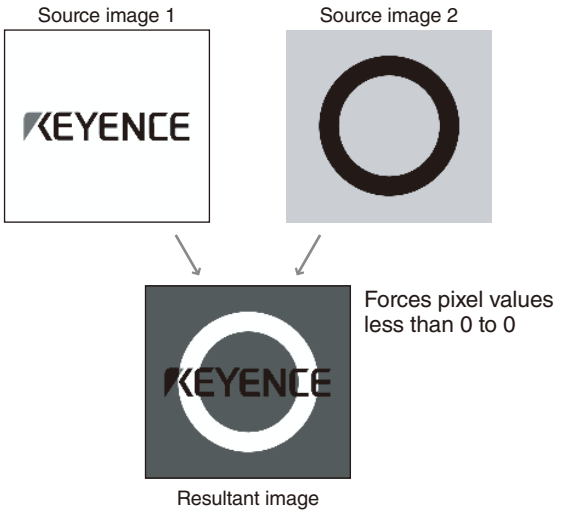
Adds the corresponding pixels of the source images together.
Compared to the source image, the results of adding dark pixel values is unnoticeable (2 + 2 = 4), but bright pixel values result in brighter images (127 + 128 = 255).



(2) Subtract

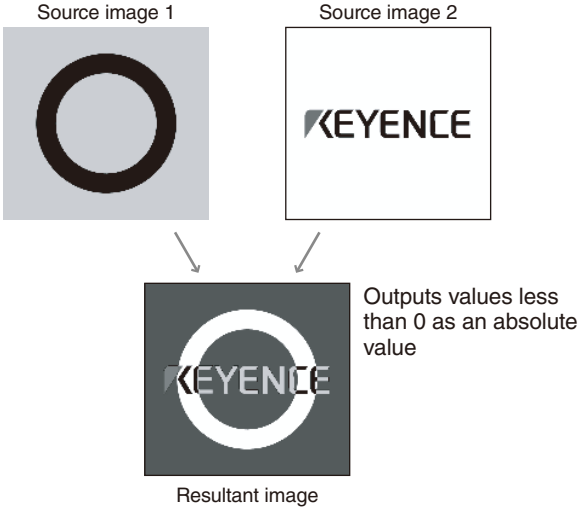
Subtracts the corresponding pixels of source image 2 from those in source image 1. Because resulting values that are less than 0 are considered to be 0, this produces different results depending on the order the images are input.





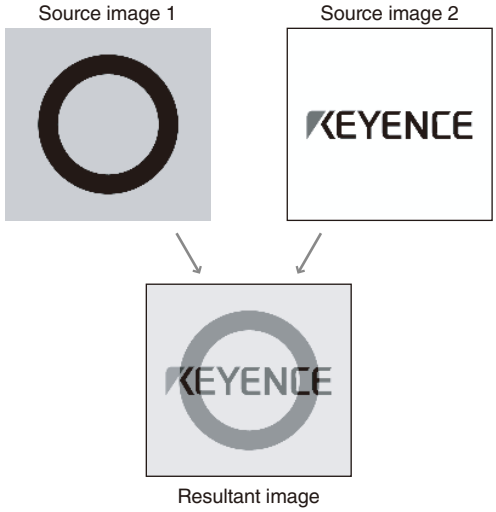
(3) AbsoluteDifference

Subtracts the corresponding pixels of source image 2 from those in source image 1 and outputs the absolute result.



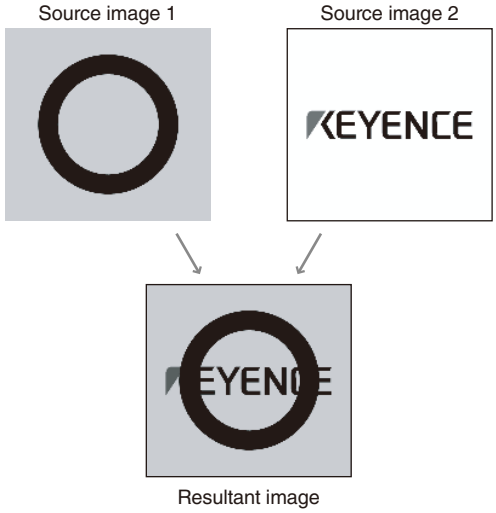
(4) Average

Takes the average of the corresponding pixels of the source images.



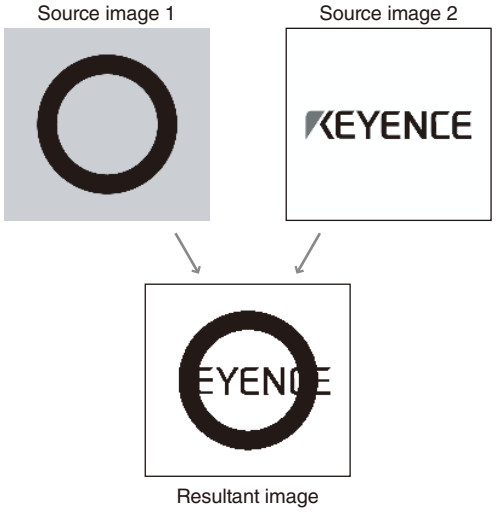
(5) Multiply (normalize)

Multiply the corresponding pixels of source 1 and source 2, then divide by 256. Dividing by 256 eliminates the problem of grayscale saturation at 255 after the operation.



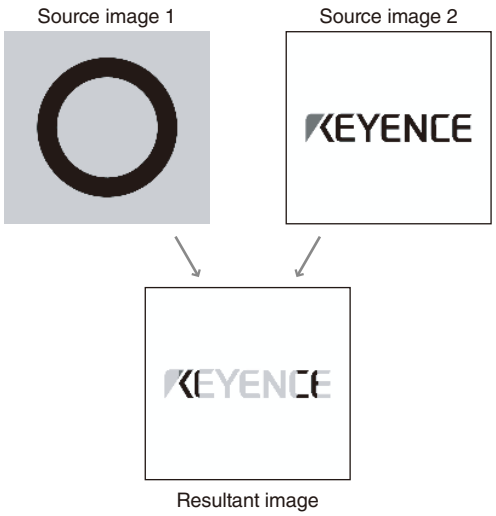
(6) Multiply

Multiplies the corresponding pixels of the source images together.



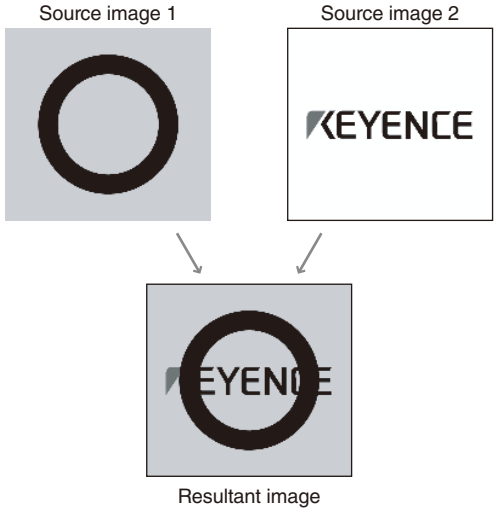
(7) Max

Takes the maximum (brighter) of the corresponding pixels of the source images.



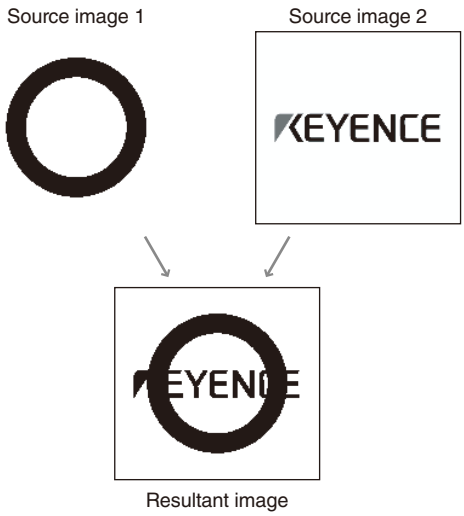
(8) Min

Takes the minimum (darker) of the corresponding pixels of the source images together.



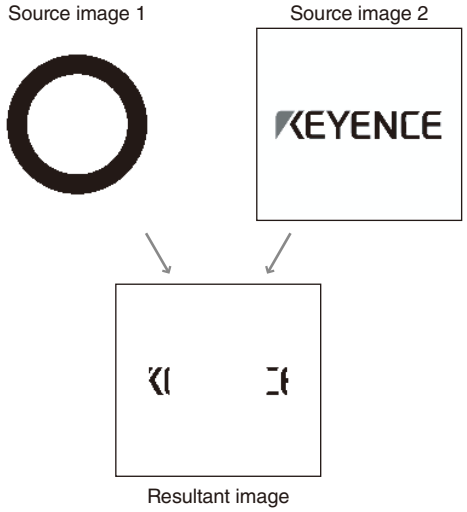
(9) AND

Performs a logical AND function on the BIT's for the corresponding pixels of the source images.



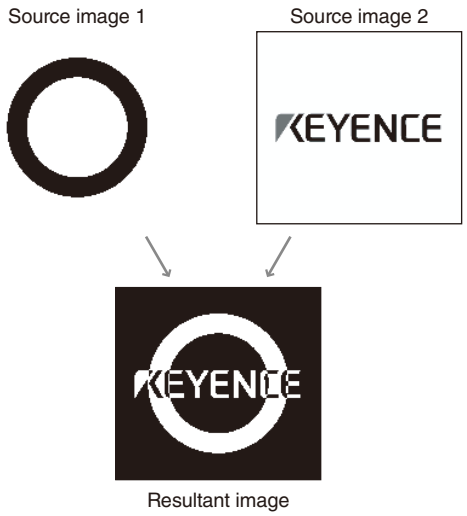
(10) OR

Performs a logical OR function on the BIT's for the corresponding pixels of the source images.



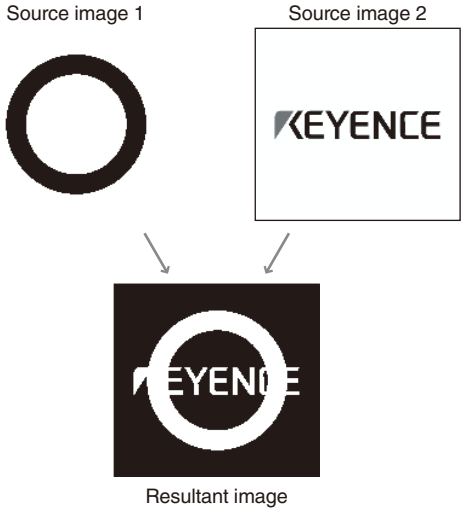
(11) XOR

Performs a logical XOR function on the BIT's for the corresponding pixels of the source images.



(12) NAND

Performs a logical NAND function on the BIT's for the corresponding pixels of the source images.

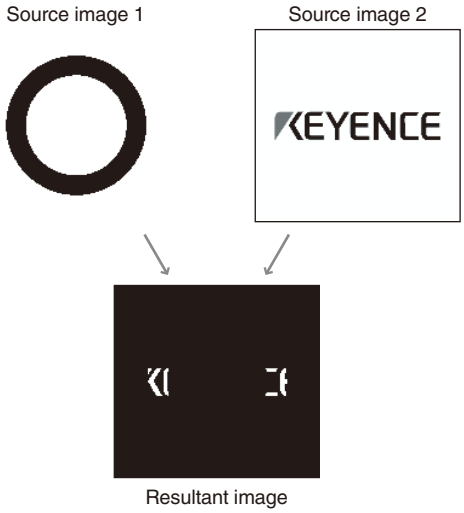


Reference

If the operation uses only image array variables for source 1, the operation is performed on a pair of images.

(13) NOR

Performs a logical NOR function on the BIT's for the corresponding pixels of the source images.

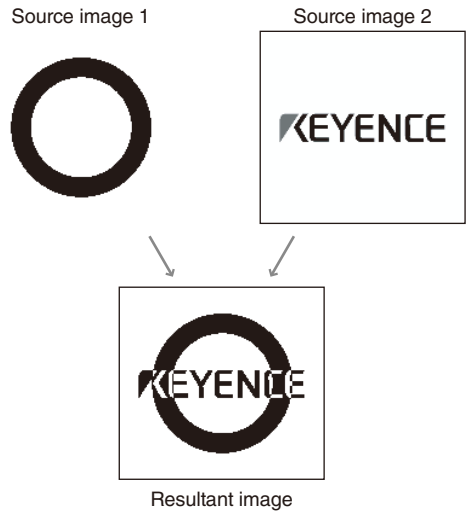


Reference

If the operation uses only image array variables for source 1, the operation is performed on a pair of images.

(14) XNOR

Performs a logical XNOR function on the BIT's for the corresponding pixels of the source images.



Reference

If the operation uses only image array variables for source 1, the operation is performed on a pair of images.

Troubleshooting

Symptom	Cause	Corrective Action
The controller does not power-up.	The power cable is not connected properly.	Connect the power cable properly.
The monitor screen is blank.	The power used is outside of the specified range.	Supply power within the specified range (Page 4-21).
	The monitor cable is not connected.	Connect the monitor cable properly (Page 4-21).
	A signal is not being received from the controller.	Turn on the controller. (Page 4-21). The monitor is not adjusted properly.
	Adjust the brightness and the color of the monitor.	Only camera images are blank/abnormal (fuzzy, blurry, out of focus, blank).
The lens focus or aperture is not adjusted.	Adjust the focus or the aperture of the lens (Page 4-32).	The shutter speed is not correct for the speed of the target.
	Set the shutter speed properly (Page 7-9).	The lens or part of the CCD is dirty.
	Clean with an air duster.	Do not use anything that will scratch or chemically damage the CCD.
	The camera cable is not connected properly.	• Turn off the controller, and then connect the camera cable (Page 4-21). • Make sure to use the proper camera cable for the controller / camera being used.
	The lens cap is on.	Remove the lens cap.
	The lens aperture is closed too far.	Adjust the aperture to allow more light into the camera (Page 4-32).
	The camera cable is broken.	Check to refer to if the lock ring on the cable connector is over-tightened, if the cable is under stress, or there are no other problems (kinks, breaks etc) with the camera cable.
Cannot operate the handheld controller.	The handheld controller is not connected properly.	Connect the handheld controller properly.
Communication failure.	The communication cable is not connected properly.	Check the cable type and connect the communication cable correctly.
	The proper communication cable is not being used.	Check the cable type and connect the communication cable correctly.
	The communication settings on the Controller / PLC / PC are not configured properly.	Change the communication settings (IP address, network settings, baud rate etc) of the controller / PLC / PC.
	A voltage potential difference exists between the SG (signal - ground) on the controller and the other device being communicated with.	If a different power supply unit is being used for the controller and the other device, check that the frame ground on both units is grounded properly.
Results and measured values are not being output.	The output circuit is not connected properly.	• Connect the output circuit properly referring to the output circuit diagram. • Use the I/O Monitor & Diagnostics feature (Page 5-41) to check the signal terminal assignments and I/O status.
	The controller is not in RUN mode.	Switch the controller to RUN mode either through the Function menu or with the slide switch on the handheld controller (Page 5-2).
	The TEST terminal is ON.	• Turn OFF the %Test terminal. • Use the I/O Monitor & Diagnostics feature (Page 5-41) to check the signal terminal assignments and I/O status.

Symptom	Cause	Corrective Action
Trigger inputs not recognized.	The trigger input signal is not connected properly.	• Connect the input circuit properly referring to the circuit diagram. • Use the I/O Monitor & Diagnostics feature (Page 5-41) to check the signal terminal assignments and I/O status.
	The EXT terminal is ON.	• Turn OFF the %Ext terminal. • Use the I/O Monitor & Diagnostics feature (Page 5-41) to check the signal terminal assignments and I/O status.
The screen is not being updated.	The image display is set to show image archive or registered images.	Choose a screen that has an image display set for showing camera images.
Screen updates and the handheld controller operations show slow response.	XG Vision Editor or XG Vision Terminal are connected and using the remote connection function.	This is normal behavior as the screen display is transmitted to the PC Programs. As separate processors are used for inspections and the control of the screen so processing performance is not affected.
Inspections are being performed but the display results are not updating.	The focus is on a image display showing images from the image archive.	Move the focus to an image display set for showing camera images.
The desired items do not appear on the function menu (Page 5-4).	The function menu has been restricted for the logged in user.	Use [Change Login User] (Page 5-43) on the function menu to change the login user to an account with the desired access privileges (Example: Administrator).
	The system settings file is an older version.	From the Offline mode select [System Information] (Page 7-53) in the System Configuration menu, and make sure the systems settings are the latest version by checking the [Version Information] section.
A long time is required for inspections in Retest mode (Online).	Online retest mode uses the screen display processor for image processing, and therefore takes longer to complete.	Consider performing retesting in Retest mode (Offline).

Error Messages

Errors that occur within the controller can either be hardware, (camera connection errors, etc.), or software related (illegal settings, etc.). When an error occurs at the controller, the error is detected when the system variable %Error0 (or %Error1) is turned ON (1). This section explains the errors, causes and corrective actions associated with each system variable.

Reference

The assigned relationship between each error and the system variable can be changed in the settings. As necessary, it is also possible to output the error cause No. as %Error0Code or %Error1Code. For more details, refer to "Controller System Settings" in the XG VisionEditor Reference Manual.

Error Messages Assigned to System Variable %Error0.

The errors messages below are assigned to %Error0 by default.
The errors assigned to %Error0 can be removed or switched to %Error1 as desired.

Error Message	Cause	Corrective Action	Error Code
Inspection settings are referring to an unconnected camera.	The camera connected does not match the camera specified in the camera settings for the program. (Example: a 2-megapixel camera is connected when the settings refer to a 320,000-pixel camera.)	Confirm the camera type connected matches the settings.	16
	The capture unit specifies a camera that is not connected. (Example: no camera is connected on port 2 but Camera2 is specified in capture unit U0001.)	Turn off the controller and connect the specified camera.	
Camera (1 to 4) has been disconnected. Turn off the controller and check the camera connection.	An error occurred in the connection with the camera.	• Turn on the controller and make sure the camera has not been disconnected. • Make sure the camera is properly connected. • Turn on the controller and make sure the camera has not been disconnected.	17
	The camera is being used beyond its ratings. (Example: the ambient temperature of the camera is beyond the specification, or a non-supported camera cable is being used.)	• Check the ambient temperature. • Use a camera cable that supports the camera.	
The camera is not supported. Turn off the controller and check the camera model.	The controller does not support the connected camera. (Example: an XG-200C cannot be used with the XG-7002 controller.)	• Confirm the model of the connected camera. • Specify the correct connected camera in the camera settings.	18
Unable to load previously selected program.	The program file that corresponds to the program specified in the startup settings under system settings does not exist.	• Before powering up the controller, make sure the program file that corresponds to this program number exists on the SD card. • Change the program number to a working program.	32
	The last saved program that corresponds to the program (or the program selected from the handheld controller) does not exist.		
	The program file for the specified program could not be found when changing or reloading programs.	Change the program number to a working program.	
Program memory or image memory is full.	Program memory or image memory is full.	• Change the program to a different working program. • Correct the program in XG VisionEditor so it does not exceed the available program or image memory.	33
	The program being loaded exceeds the available program memory or image memory.		

Error Message	Cause	Corrective Action	Error Code
Incorrect program version.	The program loaded at startup is an incompatible version.	• Change the program to a different working program. • Use XG VisionEditor to create a compatible version of the program.	34
	The program being loaded is an incompatible version.		
Unable to load program due to checksum errors.	The program loaded at startup has a checksum error.	• Change the program to a different working program. • Use XG VisionEditor to recreate the program.	35
	The program being loaded has a checksum error.		
Unable to load program due to damaged file.	The program loaded at startup is damaged.	• Change the program to a different working program. • Use XG VisionEditor to recreate the program.	36
	The program being loaded is damaged.		
Unable to load system settings.	The system settings file used at startup cannot be found on SD Card 1.	Before powering up the controller, make sure the system settings file exists on the SD card.	40
	The system settings loaded at startup is from a incompatible version.	• Use a different system settings file. • Use XG VisionEditor to create a compatible version of the system settings file.	
	The system settings file has a checksum error.		
	The system settings file is startup is damaged.		
Unable to load global variables.	Could not find the global variables file.	Make sure the global variables file exists on the SD card.	41
	The global variables file exceeds the available resource memory.	• Use a different global variables file. • Change the global variables in XG VisionEditor so they do not exceed the available resource memory.	
	The global variables file is from an incompatible version.	• Use a different global variables file. • Use XG VisionEditor to create a compatible version of the global variables file.	
	The global variables file has a checksum error.	• Use a different global variables file. • Use XG VisionEditor to recreate the global variables file.	
	The global variables file is damaged.		
A unit error has occurred.	An error occurred with a unit specified in the total error setting in the program (system variable %UnitError changed to 1).	Review the settings of the unit where the error has occurred.	48
Please insert SD Card 1.	No SD card in SD card slot 1.	Properly insert an SD card into the SD1 slot.	64
	An unsupported SD card is being used.	The functionality and performance when using commercially available (non-industrial rated) SD cards is not guaranteed	
Failed to access SD Card 1.	A problem occurred while trying to access SD Card 1. SD Card 1 could be faulty.	• Run the [Check] utility on SD Card 1. • The SD Card check utility can be found in the [View Files] menu. (Note, this will erase all contents on SD Card 1.) • If the problem cannot be resolved by any of these remedies, the SD card may be damaged.	65
	The controller could not recognize the format of SD Card 1.		
	An unsupported SD card is being used.	The functionality and performance when using commercially available (non-industrial rated) SD cards is not guaranteed	
	The destination file is set to read-only.	Disable the read-only setting on the destination file, or delete it.	
SD Card 1 is full.	There is not enough free space on SD Card 1.	Make space available by deleting or moving unnecessary files.	69

Error Message	Cause	Corrective Action	Error Code
SD Card 1 is write-protected.	The write-protection switch on SD Card 1 is enabled.	Disable the write-protection switch on SD Card 1.	70
Cannot find SD Card 1. Please check SD Card 1 and keep inserted at all times while the controller is ON.	SD Card 1 was removed while the power was ON.	Do not remove SD Card 1 while the power is ON. To check the SD Card for errors and broken files run the [Check] function in the [View Files] menu.	71
Please insert SD Card 2.	No SD card in SD2 slot.	Properly insert an SD card into the SD2 slot.	80
	Run the [Stop SD2 Operation], then re-insert the SD card into SD card	If the SD card is already inserted, remove it first, and then insert it again.	
	An unsupported SD card is being used.	The functionality and performance when using commercially available (non-industrial rated) SD cards is not guaranteed	
Failed to access SD Card 2.	A problem occurred while trying to access SD Card 2. SD Card 2 could be faulty.	• Run the [Check] utility on SD Card 2. • If the error persists, format the SD Card. (Note, this will erase all contents on SD Card 2.) • If the problem cannot be resolved by any of these remedies, the SD card may be damaged.	81
	The controller could not recognize the format of SD Card 2.		
	An unsupported SD card is being used.	The functionality and performance when using commercially available (non-industrial rated) SD cards is not guaranteed	
	The destination file is set to read-only.	Disable the read-only setting on the destination file, or delete it.	
SD Card 2 is full.	There is not enough free space on SD Card 2.	Make space available by deleting or moving unnecessary files.	85
SD Card 2 is write-protected.	The write-protection switch on SD Card 2 is enabled.	Disable the write-protection switch on SD Card 2.	86
PC program communication has failed.	A communication error occurred in either the Ethernet or USB connection when outputting data to the PC program specified as the destination for a data output unit, image output unit, or as the output location for the image archive.	• Make sure the Ethernet cable or USB cable is connected to the controller and the PC. • Make sure there are no problems (kinks, breaks etc) with the Ethernet or USB cable. • Check the Ethernet cable type (cross, straight). • Check whether the PC at the other end of the connection is ready to transmit/receive data. • Check that the correct PC program is running on the PC and that the PC is connected to the controller.	97
PLC-Link communication has failed.	An error occurred in the connection with the PLC when the [PLC-Link (RS-232C)] or [PLC-Link (Ethernet)] function was enabled.	• Check the connection with the PLC and the settings of the PLC. • If PLC link is not used, change communication mode to [Disable]. • If the error message displayed after a trigger input, check that the data memory destination specified is in the range that meets the PLC format.	112
Ethernet cable is not connected.	An error occurred with the LAN cable when using Ethernet as the destination for a data output unit.	• Make sure the LAN cable is connected to the controller and the PC. • Make sure the LAN cable is not disconnected. • Check the LAN cable type (cross, straight). • Make sure the orange LED indicator (connection) of the Ethernet connector is lit.	144

Error Message	Cause	Corrective Action	Error Code
Ethernet communication has failed.	An error occurred in the Ethernet connection when using Ethernet as the destination for a data output unit.	• Check whether the PC / PLC at the other end of the connection is ready to transmit/receive data. • Check that the communication software for Ethernet is running on the PC / PLC and that the PC / PLC is connected with the controller.	145
An Ethernet communication time out error has occurred.	Ethernet communication has been down for 10 or more seconds when using Ethernet as the destination for a data output unit.	• Check whether the PC / PLC at the other end of the connection is ready to transmit/receive data. • Check that the communication software for Ethernet is running on the PC / PLC and that the PC / PLC is connected with the controller.	146
An RS-232C communication time out error has occurred.	RS-232C communication has been down for 60 or more seconds when using RS-232C as the destination for a data output unit.	• Make sure flow control is not set to [Enable] in the RS-232C settings. • Make sure hardware flow control is not enabled on the PC / PLC. • Make sure the serial cable is not disconnected.	162
CC-Link communication has failed.	An error has occured while starting communication or during communication, and communication cannot be performed correctly.	• Check whether the CC-Link cable is connected correctly. • Check whether the terminating resistor is attached properly. • Make sure the cable complies with the specified standards. • Check whether the baud rate is set correctly according to the cable length specifications. • Make sure the settings on the master side have not been changed during the communication session. • Check whether the controller and master were restarted after updating the communication settings.	177
CC-Link module (CA-NCL10E) disconnected.	The CC-Link module is not recognized and the controller cannot use CC-Link communication.	• Make sure the CC-Link module is attached correctly. • Make sure the CC-Link module is not damaged. • Do not disconnect the CC-Link module while the controller and module are powered on.	181
Illumination expansion module (CA-DC20E) disconnected. The illumination expansion module specified is not recognized, connected or has no power supplied to it.	Make sure the illumination expansion module is attached correctly. Make sure the illumination expansion module is not damaged.	Make sure the illumination expansion module is attached correctly. Make sure the illumination expansion module is not damaged.	208
Illumination expansion module (CA-DC20E) has been reset.	The power to a known connected illumination expansion module has been cycled while the controller has remained on. Resulting in the resetting of the settings written to the illumination expansion module.	Check the power supply to the controller and the illumination expansion module. Make sure the illumination expansion module is attached correctly.	209
An error occurred in the internal memory of the illumination expansion module (module number). Illumination expansion module settings have been reset.	has occurred with the EEPROM Of the illumination expansion module and the settings have been reset.	• If using the DC illumination mode, perform linearization again and save the settings after restoring power. • If errors continue to occur after restoring power, the module maybe damaged. Contact your local KEYENCE office.	210
Failed to initialize the illumination expansion module (module number).	Failed to perform initialization within the illumination expansion unit after starting up.	If errors continue to occur after restoring power, the module maybe damaged. Contact your local KEYENCE office.	211

Error Message	Cause	Corrective Action	Error Code
Failed to connect to FTP server.	The FTP server is not operating.	Make sure the PC and FTP server on the NAS device (network archived storage) are configured and operating correctly.	224
	An error occurred in the LAN connection with the FTP server.	• Make sure the LAN cable is connected to the controller and the PC or the NAS device (network archived storage) running the FTP server. • Make sure the LAN cable is not disconnected. • Check the LAN cable type (cross, straight). • Make sure the orange LED indicator (connection) of the Ethernet connector is lit.	
	The IP address for the FTP server is incorrect.	Check the server IP address settings in the FTP server (Page 4-359).	
Failed to login to FTP server.	The user ID and/or password for logging in to the FTP server is incorrect.	Make sure the user ID and password specified in the FTP server settings match the same settings defined in the FTP server (Page 4-359).	225
FTP data output time out error has occurred.	The controller logged in and began writing a file but was unable to complete the process with a specified time.	• Check the connection between the controller and the NAS device (network archived storage) running the FTP server software. • Make sure the FTP server is operating correctly.	226
Failed to create file / folder on FTP server.	The controller was able to log into the FTP server, but was not able to create a file.	• Make sure the user account has write privileges on the FTP server. • Check the remaining capacity of the FTP server. • Check the connection between the controller and the NAS device (network archived storage) running the FTP server software. • Make sure the FTP server is operating correctly.	227
	Failed to output a 5-megapixel color camera image to the FTP server because the server does not support APPE commands.	An FTP server which supports APPE commands is necessary in order to output 5-megapixel color camera images. With an FTP server that does not support APPE commands, it is still possible to output the image by selecting BMP (1/2 resolution) or JPG to reduce the file size.	

Error Messages Assigned to System Variable %Error1.

The errors messages below are assigned to %Error1 by default.
The errors messages below are assigned to %Error1 by default, however %Error1 is not assigned to an output terminal by default.
The errors assigned to %Error1 can be removed or switched to %Error0 as desired.

Error Message	Cause	Corrective Action	Error Code
Please select "Stop SD2 Operation" before removing the SD card. The card and files may be damaged.	The SD card was removed without using the [Stop SD2 Operation].	Use the [Stop SD2 Operation], to safely remove SD Card 2. Removing an SD card while it is being accessed may damage the SD card and the data saved on it. To check the SD Card for errors and broken files run the [Check] function in the [View Files] menu.	87

Errors Messages not Assigned to System Variables %Error0 or %Error1

These errors by default are not assigned to %Error0 or %Error1 but can be assigned through the XG Vision Editor software.

Error Message	Cause	Corrective Action	Error Code
Image archive data was overwritten before being output.	The image archive data in the buffer was overwritten before it could be output.	• Correct the number of items to archive to allow enough time to output the stored data before the next item overwrites it. • To ensure output of all items in the archive, set the buffer mode to [Process until buffer full]. Note, the image archive stops when the number of items is reached. If this happens, the data must be cleared to resume archiving.	49
Failed to save.	SD Card 1 or 2 has the following errors: connection error, access error, card full error, or write protect error.	Check the SD card which you are saving files to.	50
	No data found available to save when using the Statistics or Image Archive functions.	Try saving after data has been stored.	
Unable to write to SD Card 1 output buffer.	SD Card 1 output buffer is full.	Reduce the amount of data to be output to the SD1 card, so the data is output at a faster rate than it builds up. Or extend the time between triggers / processing to allow for data to be output.	67
SD Card 1 output buffer is full.	SD Card 1 output buffer is full.	Reduce the amount of data to be output to the SD1 card, so the data is output at a faster rate than it builds up. Or extend the time between triggers / processing to allow for data to be output. Note: Inspections processing can be put on hold until the buffer becomes free.	68
Unable to write to SD Card 2 output buffer.	SD Card 2 output buffer is full.	Reduce the amount of data to be output to the SD2 card, so the data is output at a faster rate than it builds up. Or extend the time between triggers / processing to allow for data to be output. Note: Results data are not written when the buffer is full.	83
SD Card 2 output buffer is full.	SD Card 2 output buffer is full.	Reduce the amount of data to be output to the SD2 card, so the data is output at a faster rate than it builds up. Or extend the time between triggers / processing to allow for data to be output. Note: Inspections processing can be put on hold until the buffer becomes free.	84
Unable to write to PC Program output buffer.	The controller output buffer for outputting to PC Programs is full.	Reduce the amount of data to be output to a PC Program, so the data is output at a faster rate than it builds up. Or extend the time between triggers / processing to allow for data to be output. Note: Results data are not written when the buffer is full.	99
PC Program output buffer is full.	The controller output buffer for outputting to PC Programs is full.	Reduce the amount of data to be output to a PC Program, so the data is output at a faster rate than it builds up. Or extend the time between triggers / processing to allow for data to be output. Note: Inspections processing can be put on hold until the buffer becomes free. Unable to write to PLC-Link output buffer.	100
The controller output buffer for outputting via PLC-Link is full.	The controller output buffer for outputting via PLC-Link is full.	Or extend the time between triggers / processing to allow for data to be output. Note: Results data are not written when the buffer is full.	115

Error Message	Cause	Corrective Action	Error Code
PLC Link output buffer is full.	The controller output buffer for outputting via PLC-Link is full.	Reduce the amount of data to be output via PLC-Link, so the data is output at a faster rate than it builds up. Or extend the time between triggers / processing to allow for data to be output. Note: Inspections processing can be put on hold until the buffer becomes free.	116
External command error has occurred.	An error occurred when executing a command from one of these devices: • PC Program • PLC-Link • Ethernet • RS-232C • CC-Link • External terminals • EtherNet/IP	Review the command being sent, the program settings or the device status.	128
Internal command error has occurred.	An error occurred when executing a command via one of these internal methods: • Command Unit • Timer command • Buttons on the handheld controller • Menu button	Review the command being issued and the program settings.	129
Unable to write to Ethernet output buffer.	The controller output buffer for outputting via the Ethernet port is full.	Reduce the amount of data to be output via Ethernet, so the data is output at a faster rate than it builds up. Or extend the time between triggers / processing to allow for data to be output. Note: Results data are not written when the buffer is full.	147
Ethernet output buffer is full.	The controller output buffer for outputting via the Ethernet port is full.	Reduce the amount of data to be output via Ethernet, so the data is output at a faster rate than it builds up. Or extend the time between triggers / processing to allow for data to be output. Note: Inspections processing can be put on hold until the buffer becomes free.	148
Unable to write to RS-232C output buffer.	The controller output buffer for outputting via the RS-232C port is full.	Reduce the amount of data to be output via RS-232C, so the data is output at a faster rate than it builds up. Or extend the time between triggers / processing to allow for data to be output. Note: Results data are not written when the buffer is full.	163
RS-232C output buffer is full.	The controller output buffer for outputting via the RS-232C port is full.	Reduce the amount of data to be output via RS-232C, so the data is output at a faster rate than it builds up. Or extend the time between triggers / processing to allow for data to be output. Note: Inspections processing can be put on hold until the buffer becomes free.	164
Unable to write to CC-Link output buffer.	The controller output buffer for outputting via the CC-Link is full.	Reduce the amount of data to be output via CC-Link, so the data is output at a faster rate than it builds up. Or extend the time between triggers / processing to allow for data to be output. Note: Results data are not written when the buffer is full.	179
CC-Link output buffer is full.	The controller output buffer for outputting via the CC-Link is full.	Reduce the amount of data to be output via CC-Link, so the data is output at a faster rate than it builds up. Or extend the time between triggers / processing to allow for data to be output. Note: Inspections processing can be put on hold until the buffer becomes free.	180

Error Message	Cause	Corrective Action	Error Code
Unable to write to the parallel / terminal I/O output buffer.	The controller output buffer for outputting using the parallel / terminal outputs is full.	Reduce the amount of data to be output through the parallel / terminal outputs, so the data is output at a faster rate than it builds up. Or extend the time between triggers / processing to allow for data to be output. Note: Results data are not written when the buffer is full.	195
Parallel / terminal I/O output buffer is full.	The controller output buffer for outputting using the parallel / terminal outputs is full.	Reduce the amount of data to be output through the parallel / terminal outputs, so the data is output at a faster rate than it builds up. Or extend the time between triggers / processing to allow for data to be output. Note: Inspections processing can be put on hold until the buffer becomes free.	196
EtherNet/IP communication has failed.	Disconnection of the cyclic communication has occurred. (It is automatically restored, if restoration is possible.)	• Check whether the Ethernet cable is connected correctly. • Check whether the controller and master were restarted after updating the communication settings. • Review the cyclic communication cycle or time-out time at the PLC. • Change [Processing Priority] (Page 7-41) in the EtherNet/IP system settings from [Image processing] (default) to [Communication]. If [Image processing] is used as is, review the flowchart details or the trigger intervals.	241
Unable to write to EtherNet/IP output buffer.	The controller output buffer for outputting via the EtherNet/IP port is full.	Reset RPI to be output through the EtherNet/IP outputs, so the data is output faster than it accumulates. Alternatively, extend the time between triggers / processing to allow for data to be output. Note: Results data are not written when the buffer is full.	243
EtherNet/IP output buffer is full.	The controller output buffer for outputting via the EtherNet/IP port is full.	Reset RPI to be output through the EtherNet/IP outputs, so the data is output at a faster rate than it builds up. Or extend the time between triggers / processing to allow for data to be output. Note: Inspections processing can be put on hold until the buffer becomes free.	244

Errors Messages not Assigned to System Variables %Error0 or %Error1

The following errors / error messages cannot be assigned to system variables.

Error Message	Cause	Corrective Action	Error Code
Broken files were found and converted to [FILEXXX.CHK].	A check error was found and corrected by the memory utility.	No corrective action is necessary.	-
• SD Card 1 check failed. • SD Card 2 check failed.	The memory utility found broken files during the check process but was unable to restore the files. If the error persists after repeating the check process, contact your local Keyence office.	• In some cases, the error may be resolved by formatting the SD card and running the check again. • However, all the data stored on the card will be lost.	-
Failed to add new program.	The target location (SD Card 1 or SD Card 2) is full.	Make space available by deleting files.	-
Load failed.	The source location (SD Card 1 or SD Card 2) is full.	Make space available by deleting files.	-
Save failed.	The destination location (SD Card 1 or SD Card 2) is full.	Make space available by deleting files.	
Failed to change program.	The data in the specified program file is corrupted and cannot be used.	Change the program to a different working program. Create a compatible version of the program file.	-
	The data in the specified program is from an incompatible version.		
• Failed to copy file(s) due to write protection. • Failed to move file(s) due to write protection. • Failed to delete file(s) due to write protection. • Failed to rename file or folder due to write protection. • Failed to create folder due to write protection. • Failed to copy file(s) due to write protection on the source SD card. • Failed to copy file(s) due to write protection on the destination SD card. • SD Card 1 is write-protected. • SD Card 2 is write-protected.	The write-protection switch on the SD card is enabled.	Disable the write-protection switch on the SD card.	-
Failed to save the image.	The SD card is not inserted.	Properly insert the SD card into the SD slot.	-
	The SD card is full.	Make space available by deleting or moving unnecessary files.	
	The write-protection switch on the SD card is enabled.	Disable the write-protection switch on the SD card.	
Set the difference of light output ON-delays to 500ms or less.	Multiple flash terminals are assigned to the same camera and the difference between smallest and largest delay times is 500µs or more.	Set the ON-Delay so that the difference between the smallest and largest ON-Delays is 500µs.	-

Error Message	Cause	Corrective Action	Error Code
No more menus can be opened until others are closed.	There are 16 menus open.	Close any unnecessary menus.	-
	There are numerous menus open with too many elements to handle.		
Failed to access statistics / image archive data. If the image archive is open in the PC please close and try again.	The Image Archive viewer in XG VisionEditor is open.	Close the Image Archive viewer in XG VisionEditor.	-
	An ActiveX control is currently reading the image archive data.	Wait for the ActiveX control to finish reading statistics / image archive data before using the following menus:	
	A non-protocol image archive related command is being executed.	Wait for the non-protocol archive related command to finish before using the following menus:	
An error occurred during linearization. Please check the light settings.	Linearization failed because the light was not connected.	Connect the light correctly, check settings and rerun linearization.	-
Please verify the power supply and connectivity of the illumination expansion module.	Either the illumination expansion module corresponding to the linearized channel has been disconnected or the power is not turned on.	Make sure the illumination expansion module is attached correctly. Make sure the illumination expansion module is not damaged.	-
Failed to save illumination voltage & linearization settings.	Either the illumination expansion module corresponding to the linearized channel has been disconnected or the power is not turned on.	Make sure the illumination expansion module is attached correctly. Rerun linearization after checking the illumination expansion module and save the settings.	-
The number of characters exceeds the library file capacity. The characters cannot be registered.	The number of registered characters in the library has reached the 200-character limit.	The maximum number of characters which can be registered in a single library is 200. Delete any unnecessary characters.	-
Library file not found.	Access to the library failed when trying to select a library index or during editing.	Check the SD card and verify the location and existence of the library file.	-
This menu cannot be accessed as there is a setting error in this unit.	In a version 2.1 or higher program the unit being selected for editing via the Edit Unit menu has errors (except the ones listed below). • Non-specific errors: (Region, Pattern Region, Color Extraction, Light Intensity Source Unit, Image Operation operations, Image array operations). • Processing capacity full errors: (Failed to register reference image, failed to set inspection region, failed to register image for subtraction filter, failed to register a character in the library). • Others: Library file does not exist, library file format is illegal.	Use XG Vision Editor to run a check on the program data. Fix unit errors either through the Edit mode or by using XG Vision Editor.	-
An error exists in the calculation / script.	The warning message detailing errors in the calculation unit was closed by clicking on the [OK] button.	Correct errors in the expression, function or script in the calculation unit.	-

Error Message	Cause	Corrective Action	Error Code
The calculation / script has reached the maximum number of characters per line (1000), or number of lines (2000) that can edited via the controller. Please change accordingly or edit with XG Vision Editor software.	Either the expression, function or script in the calculation unit exceeds 1000 characters per line or is over 2000 lines.	Use XG VisionEditor to modify the unit so the expression, function or script fits within the limits.	-
To use HDR, select just one camera.	User attempted to select multiple cameras for capturing at the Capture unit, however the one or more of the corresponding cameras is set for HDR capture.	Enable only one camera in [Camera], or else disable HDR capture.	–
HDR cannot be used with a linescan camera in continuous capture.	User attempted to enable HDR capture for a Capture unit in which a linescan camera and continuous capture were set in [Camera Selection].	To enable HDR capture, change the linescan capture to sheet-fed.	–
The image capture buffer cannot be changed due to HDR usage.	User attempted to enable [Custom] for the image capture buffer settings when a Capture unit where HDR capture is enabled exists.	In order to enable [Custom], disable HDR capture at all Capture units.	–
An IP address conflict has occurred between the controller and another device on the network.	An IP address conflict has occurred between the controller and another device on the network.	Change the controller IP address.	-

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Revision history

Date printed	Revision number	Revision contents
October 2011	1st	Official release
July 2012	3rd edition	Revisions to the field of view/clerical errors

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