F300 Visual Inspection System Menu Mode

Operation Manual

Revised March 1994

Notice:

OMRON products are manufactured for use according to proper procedures by a qualified operator and only for the purposes described in this manual.

The following conventions are used to indicate and classify precautions in this manual. Always heed the information provided with them. Failure to head precautions can result in injury to people or damage to the product.

DANGER! Indicates information that, if not heeded, is likely to result in loss of life or serious injury.

WARNING Indicates information that, if not heeded, could possibly result in loss of life or serious injury.

Caution Indicates information that, if not heeded, could result in relative serious or minor injury, damage to the product, or faulty operation.

OMRON Product References

All OMRON products are capitalized in this manual. The word “Unit” is also capitalized when it refers to an OMRON product, regardless of whether or not it appears in the proper name of the product.

The abbreviation “PLC” means Programmable Controller (Programmable Logic Controller) and is not used as an abbreviation for anything else.

Visual Aids

The following headings appear in the left column of the manual to help you locate different types of information.

Note Indicates information of particular interest for efficient and convenient operation of the product.

1, 2, 3... 1. Indicates lists of one sort or another, such as procedures, checklists, etc.

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PART II, Version 2.00

SECTION 1

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About this Manual:

This manual describes the operation of the F300 Visual Inspection System Menu Mode and includes the sections described below.

Please read this manual completely and be sure you understand the information provide before attempting to operate the F300 Visual Inspection System Menu Mode.

PART I
Version 1.00

Section 1 provides the basic information needed before performing detailed F300 operations.

Section 2 provides the procedures required to set scene numbers and edit scene data.

Section 3 provides the procedures required to set screen displays.

Section 4 provides the procedures required to make the settings for taking and processing images.

Section 5 provides the procedures required for setting the binary level.

Section 6 provides the procedures and information required to perform window operations.

Section 7 provides the procedures required to set measurement conditions.

Section 8 provides the procedures and information required to perform measurements.

Section 9 provides the procedures for making the system settings.

Section 10 provides procedures and information on the auxiliary functions which take full advantage of the F300's features.

PART II
Version 2.00

Section 1 introduces the new Version 2.00, and describes its added features and its relationship with the earlier Version 1.00.

Section 2 explains in detail the operations that have been either added or changed for Version 2.00.

WARNING	Failure to read and understand the information provided in this manual may result in personal injury or death, damage to the product, or product failure. Please read each section in its entirety and be sure you understand the information provided in the section and related sections before attempting any of the procedures or operations given.

PART I
Version 1.00

SECTION 1
Basic Operation

This section provides the basic information needed before performing detailed F300 operations.

1-1 Using this Manual

Terminology

Scenes

A scene is a program area for saving contents and methods of measurement. The F300 has 16 scenes (numbered from 00 to 15), so that switching among 16 ways of measuring can be made simply by saving a measurement method for each scene and then switching among the different scene numbers.

Scene Parameters

For each scene, parameters such as the following can be set:

- Which cameras will be used (selecting camera numbers).
- Which part will be measured (window settings)
- How it will be displayed on the video monitor (display settings)
- Which input timing will be used for measurement (measurement condition settings)
- Which output devices will be used for measurement and determination results.

Windows

An image output to the video monitor cannot have measurements carried out on it just as it is. The range that is set for the part of the image to be measured is called a window.

Window Planes

A memory area where windows can be created is called a window plane. The F300 has eight window planes, numbered from 0 to 7. Multiple windows can be drawn within a single window plane. In this manual, window planes are sometimes simply referred to as “windows.”

Binary

The image signals received from the cameras are output to the monitor as raw (monochrome) images. With binary, these images are converted to black and white. In the black and white case, it will be the white pixels within a window that the F300 will take as objects for measurement.

Binary Levels

When raw images are converted to binary, all of the intermediate pixels must be converted to either black or white. The value at which the determination is made is called the binary level. A separate binary level can be set for each window plane.

Cameras

All of the cameras used with the F300 are monochrome CCD video cameras. The cameras include both ordinary video cameras and shutter video cameras for taking still images. Up to two cameras can be connected to a dedicated Camera I/F Unit, and a maximum of eight cameras can be used per system.

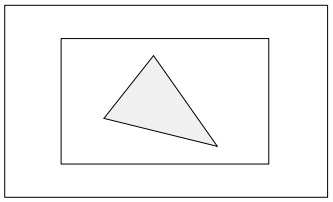
Measurements

In the F300, it is the white pixels that are taken as objects for measurement when binary has been selected for a window. The following items can be measured.

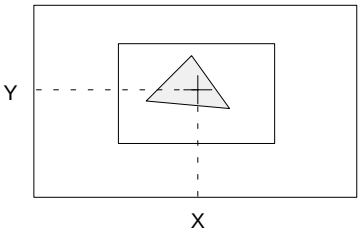
Area:	Counts the number of white pixels. The result of the count can be output in terms of the number of pixels, or else in terms of the actual dimensions (μm^2, mm^2, cm^2, m^2).
Center of Gravity:	Finds the two-dimensional coordinates (X axis, Y axis) for the center-of-gravity position for a set of white pixels. The coordinates can be output in terms of the number of pixels, or else in terms of the actual dimensions (μm, mm, cm, m).
Axis Angle:	Finds the axis angle for a set of white pixels.
Edge Angle:	Finds the edge inclination for the object of measurement.
Middle Point:	Finds the middle point coordinates for the centers of gravity of two windows.
Inclination:	Finds the inclination of the line that connects the centers of gravity of two windows.

Cross Point: Finds the cross-point coordinates for edges measured in two windows.

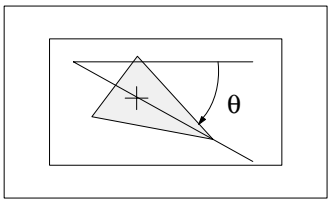
Area



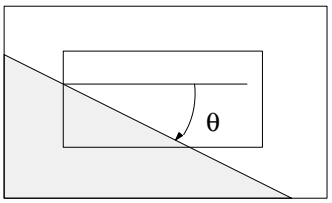
Center of gravity



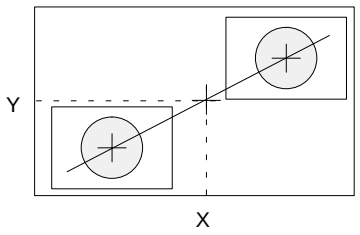
Axis



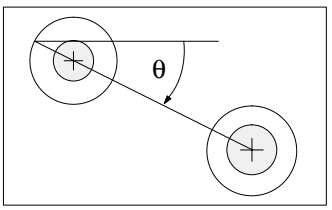
Edge angle



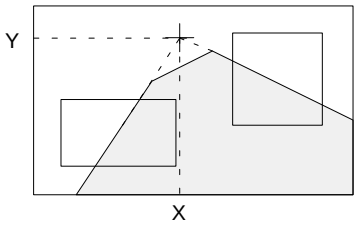
Middle point



Inclination



Cross point



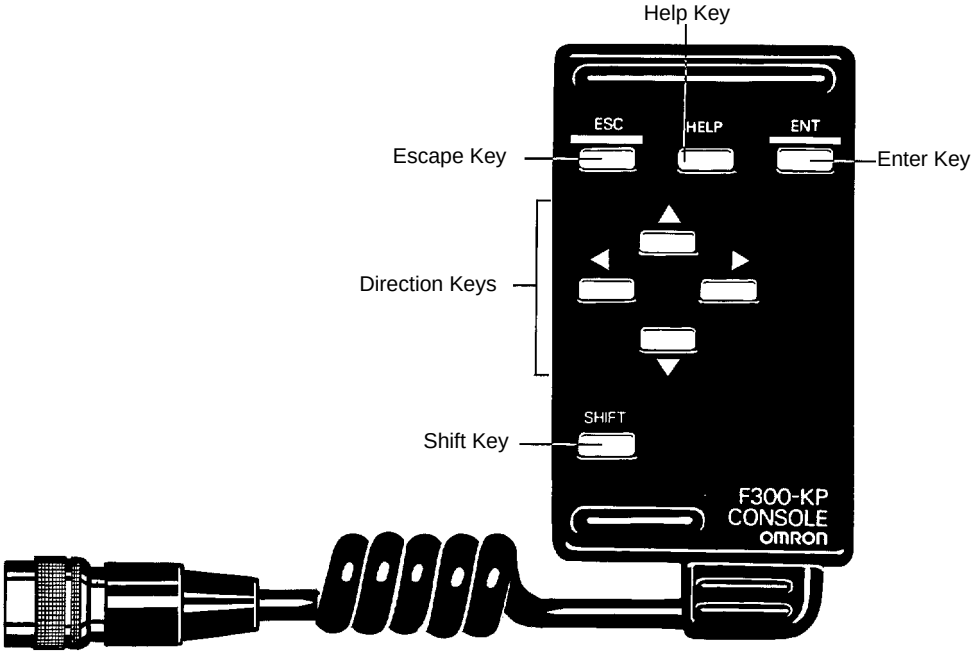
OVL (OMRON Vision Language)

There are two methods for creating a measurement program with the F300. One is to use the console to set the scene parameters on the main menu, and the other is to mount an OVL Unit and create a program with OVL, which is a dedicated language similar to BASIC.

More complex measurements can be performed by using the OVL mode than by using the main menu.

1-2 Basic Console Operation

1-2-1 Names and Functions of Console Keys

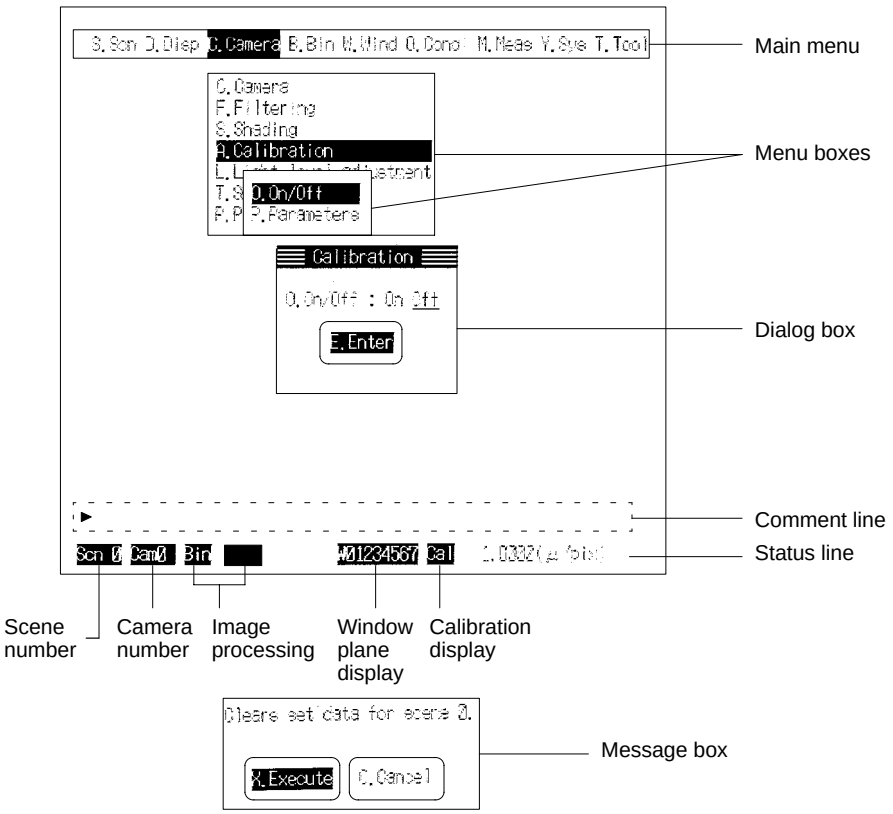


F300-KP Console

Display	Name	Function
SHIFT	Shift Key	Displays the extended menu box when pressed simultaneously with the Escape Key. When creating graphics, it can also be pressed simultaneously with any of the four direction keys to move the cursor at high speed.
HELP	Help Key	Displays help messages.
ESC	Escape Key	Returns the user to the previous menu display.
ENT	Enter Key	Sets data and opens menu boxes.
▲	Up Key	These two keys move the cursor up and down. When creating comments and making numeric settings, these keys scroll through characters and numbers.
▼	Down Key	
▶	Right Key	These two keys move the cursor to the right and left. When creating comments and making numeric settings, these keys move the cursor between digits.
◀	Left Key	

1-2-2 Basic Operation

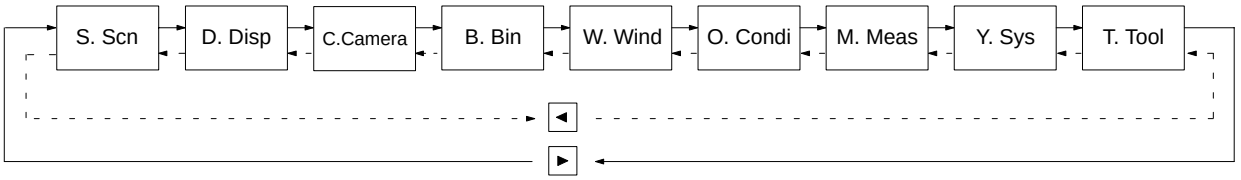
Display



Moving the Cursor

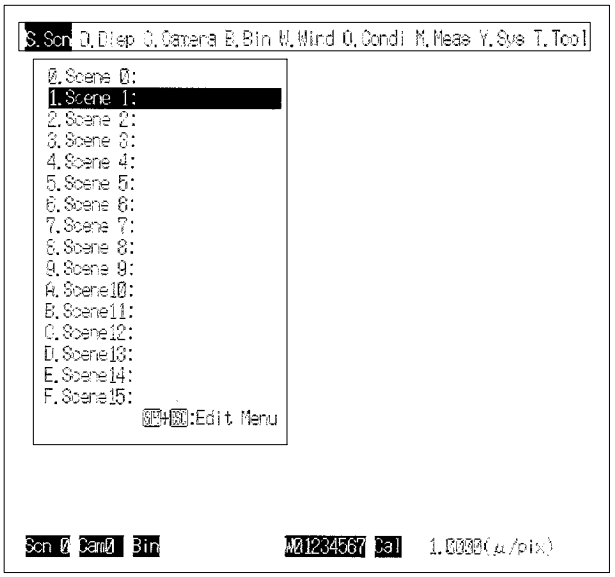
1, 2, 3... 1. Left/Right Movement

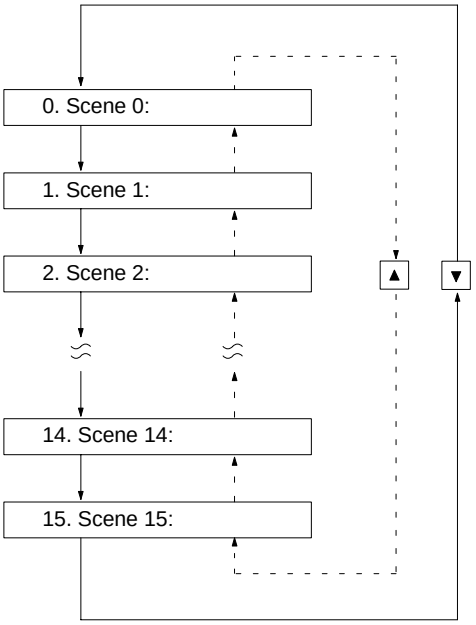
The following example shows left/right movement within the main menu display.



2. Up/Down Movement

The following example shows up/down movement within the scene menu box display.



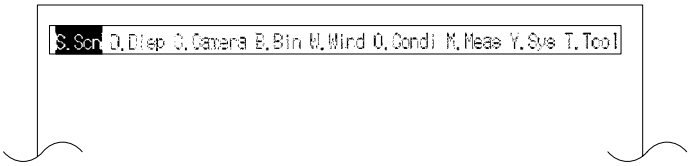


Note Use the direction keys to move the cursor in any of the four directions. Scrolling in any direction is possible by holding down the respective key continuously.

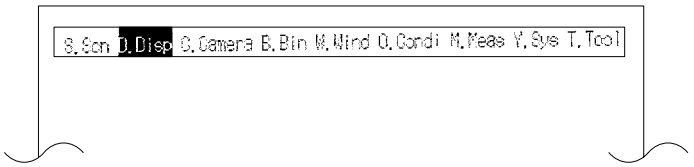
Menu Selections and Settings

To select from a menu, move the cursor and then press the Enter Key.

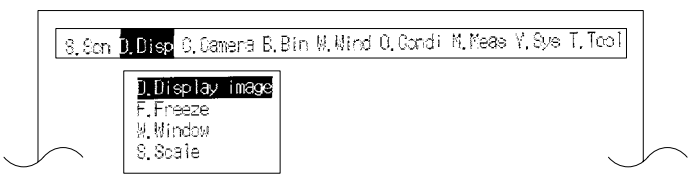
The following example shows menu selections and settings for “D. Display”.



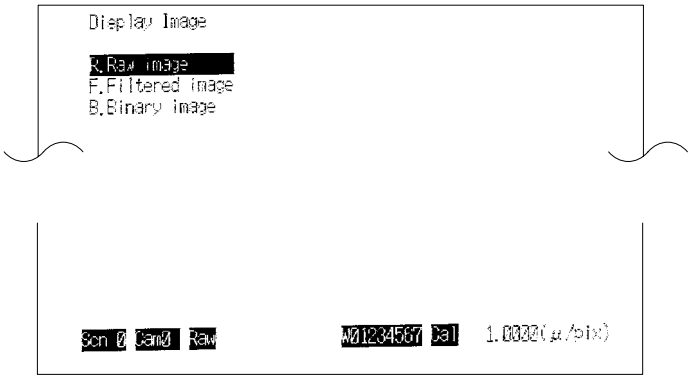
1, 2, 3... 1. When the Right Key is pressed one time, the cursor will move one place to the right.



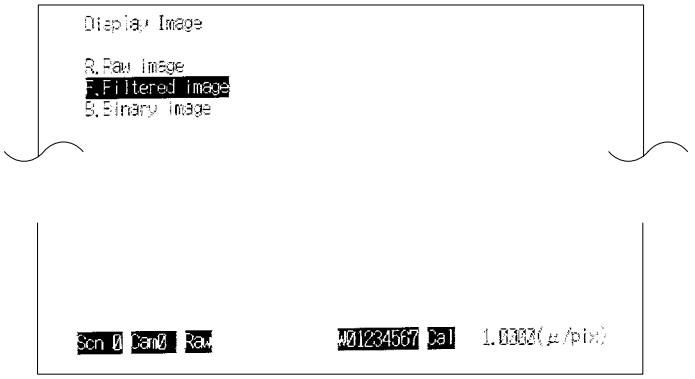
2. When the Enter Key is pressed, the “D. Display” menu will be displayed.



3. When the cursor is in the desired position, press only the Enter Key. To abort the operation in progress and return to the display shown in step 1, press the Escape Key.



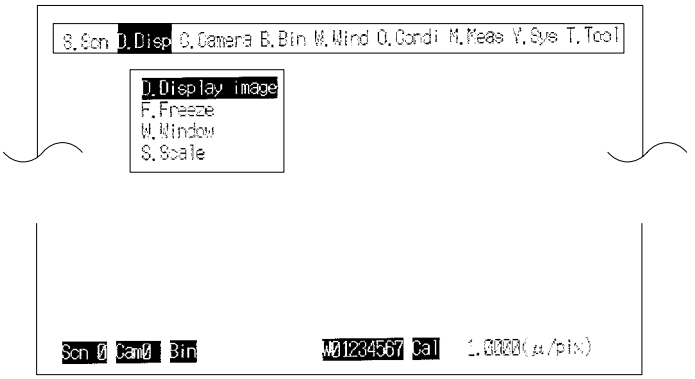
4. When the Down Key is pressed one time, the cursor will move one place down.



To abort the operation in progress and return to the display shown in step 2, press the Escape Key. To return to the display shown in step 1, press the Escape Key again.

5. Press the Enter Key to enter the settings that have been made and to return to the display shown in step 2.

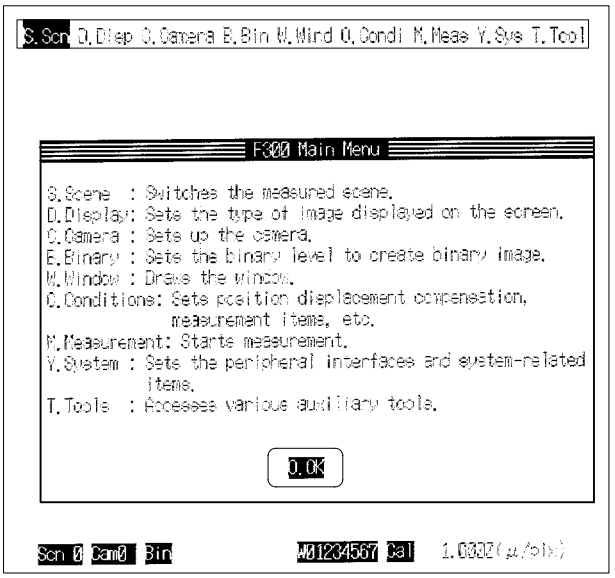
If the Escape Key is pressed before pressing the Enter Key, the display will return to that shown in (2), except Display Image will have been set to Filtered Image.



Help Message Displays

If unsure of the functions in the main menu bar or menu box, pressing the Help Key will display a help message.

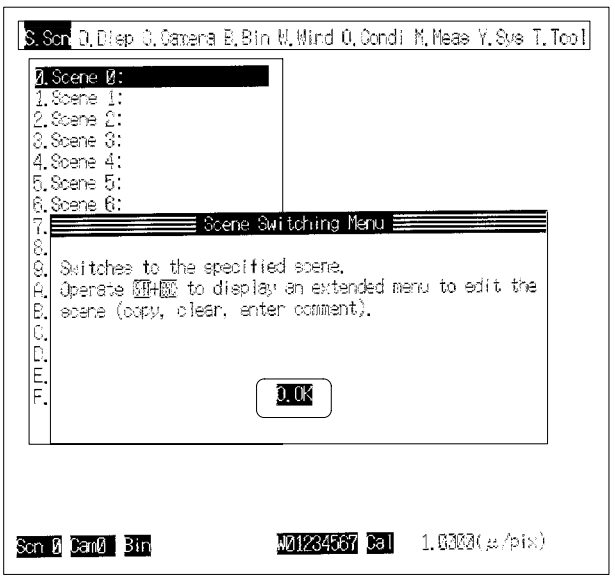
1, 2, 3... 1. If the Help Key is pressed while only the main menu bar is displayed, a help message for the main menu bar will appear.



To clear the help message and return to the previous display, press either the Enter Key or the Escape Key once.

While a help message is being displayed, no key other than the Enter Key or the Escape Key can be input.

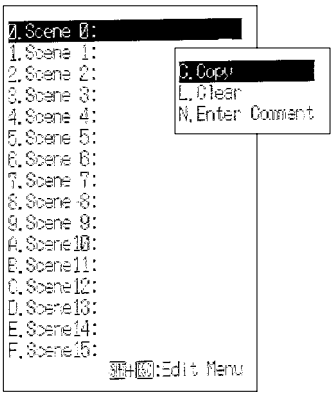
2. If the Help Key is pressed while a menu box is being displayed, the items within the message box will be explained. As before, press either the Enter Key or the Escape Key once to clear the help message and return to the previous display.



Comments and Numeric Data The console can be used to input letters from A to Z or numbers from 0 to 9. The following example shows how to input comments for scene data.

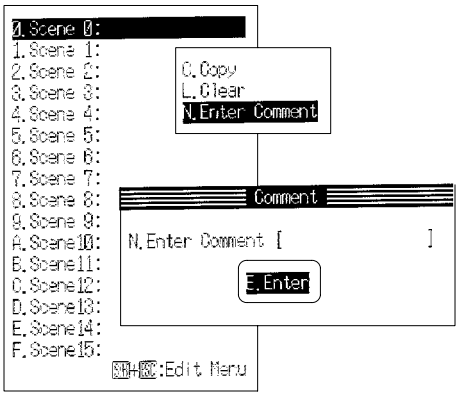
1, 2, 3... 1. Select “S. Scene”.

2. Display the extended menu by pressing the Shift Key and Escape Key at the same time.



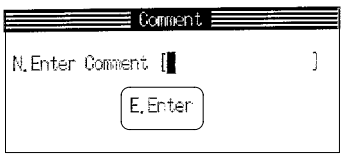
3. Select “N. Enter Comment” by pressing the Down Key twice or the Up Key once.
4. Display the Enter Comment dialog box by pressing the Enter Key.

   Within the Enter Comment dialog box, the cursor will be on “E. Enter”.



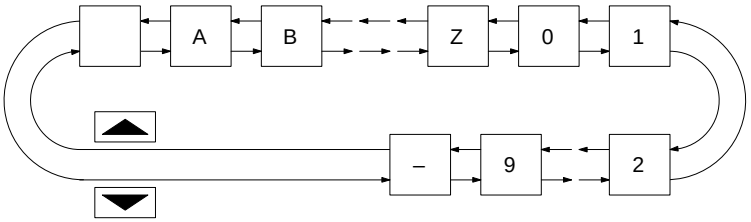
5. Use the Up Key or the Down Key to move the cursor to the Enter Comment blank space. At this point, however, the comment cannot be input.

6. When the Enter Key is pressed, the cursor in the blank space will change to the size of a single character. The comment can now be input.



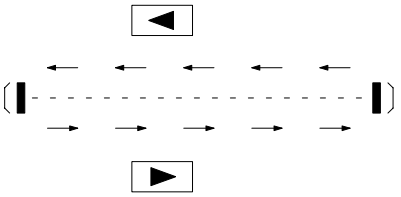
7. Use the Up and Down Keys to input characters, and use the Right and Left Keys for moving between digits.

a) Inputting Characters:



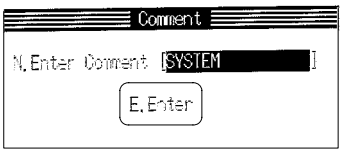
Note In the menu for setting numbers, only numbers, "–" marks, or decimal points will be displayed. Letters cannot be displayed.

b) Moving Between Digits:



Note For moving between digits, the cursor cannot scroll.

8. Press the Enter Key to complete the comment input.



9. Press the Down Key.

10. Press the Enter Key. Setting is complete.

Using the Extended Menu Box to Enter Comments

With the Enter Comment display, open the extended menu and use keys to enter numbers, symbols, and letters.

1, 2, 3...

1. Move the cursor to the comment space, and press the Enter Key.
2. Press the Shift and Escape Keys simultaneously to open the extended menu.

3. Within the extended menu, select the letters or symbols to be keyed in. Then press the Enter Key to input one character at a time into the comment space.

   DEL: Deletes one character at a time from a string to the right of the cursor position.

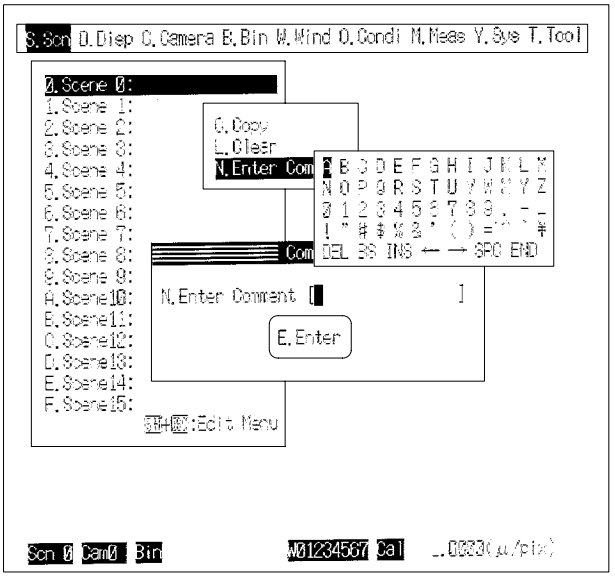
   BS: Backspaces the cursor one character at a time.

   INS: Toggles between Insert Mode and Overwrite Mode.

   A/Q: Moves the cursor in the comment space.

   SPC: Overwrites a space at the cursor position.

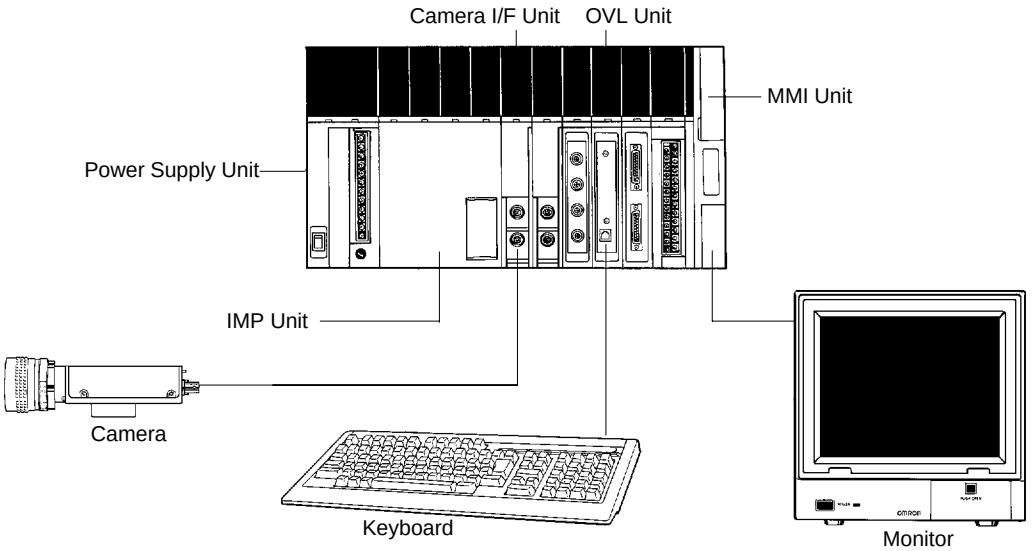
   END: Exits the extended menu.



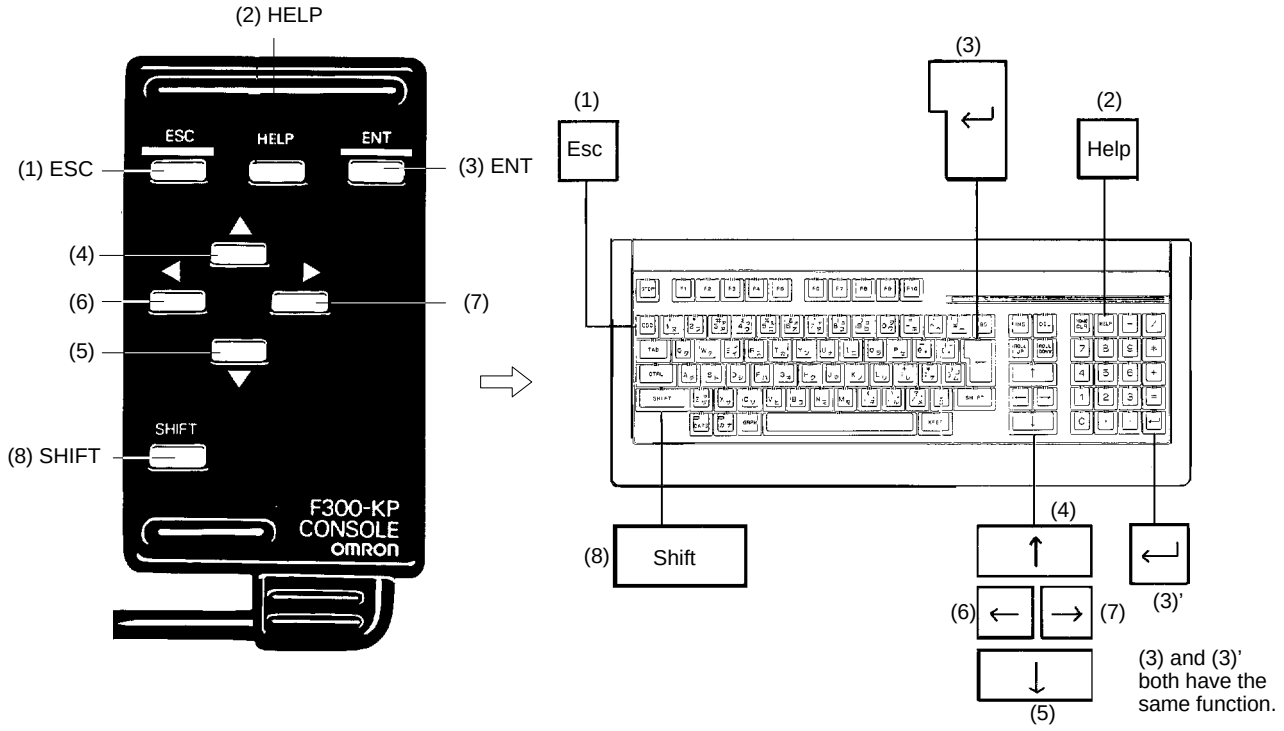
1-2-3 Inputting from the Keyboard

When an OVL Unit has been mounted to the system, settings can be made from the keyboard instead of the console.

System Configuration



How Keys Correspond to Console



Inputs can be made in the main menu mode by means of console operations as well as from the keyboard.

1-2-4 Inputting Comments from the Keyboard

When inputting comments from the keyboard, not only upper-case letters and numbers can be input but also lower-case letters and a wide selection of symbols. It is not possible, however, to input Japanese kana and kanji characters.

Available Letters

A to Z, a to z

Available Symbols

* / + = – , . < > [ ] ( ) ! ” # $ % & ¥ @ { } ’ ^ ? ; : ¦

Valid Keys

Ins Key: Inserts characters.

Del Key: Deletes characters.

Home Key: Clears all menu boxes. Pressing this key one time returns the user to the main menu, whereas the Escape Key must be pressed several times to perform the same operation.

Settings from the Keyboard

To make settings with the console, move the cursor to select items from the menu, and then press the Enter Key. With the keyboard, however, alphanumeric keys can be used to make the settings directly. If One-touch Key Display (in the “O. Option” menu under the “Y. System” menu) is set to OFF, then all of the one-touch key displays will be deleted from all of the operation menus, and one-touch key inputs will not be accepted.

Example: Setting Scene No. 8

With the console, use the Down Key to make the selection, and then press the Enter Key.

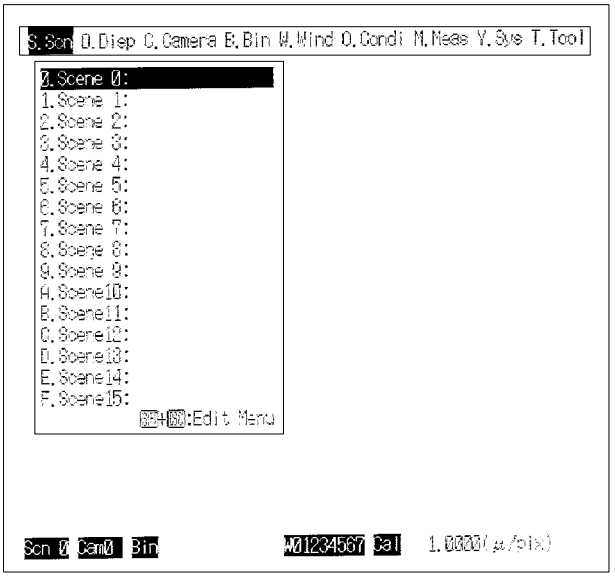
or With the keyboard, input “8” directly or use the Down Key, and then press the Enter Key.

SECTION 2
Setting Scene Numbers and Editing Scene Data

This section provides the procedures required to set scene numbers and edit scene data.

2-1 Scene Data

In order to set scene data, it is first necessary to select the scene number. Once the scene data has been created, it will also be possible to copy scene data, clear scene data, and input comments.



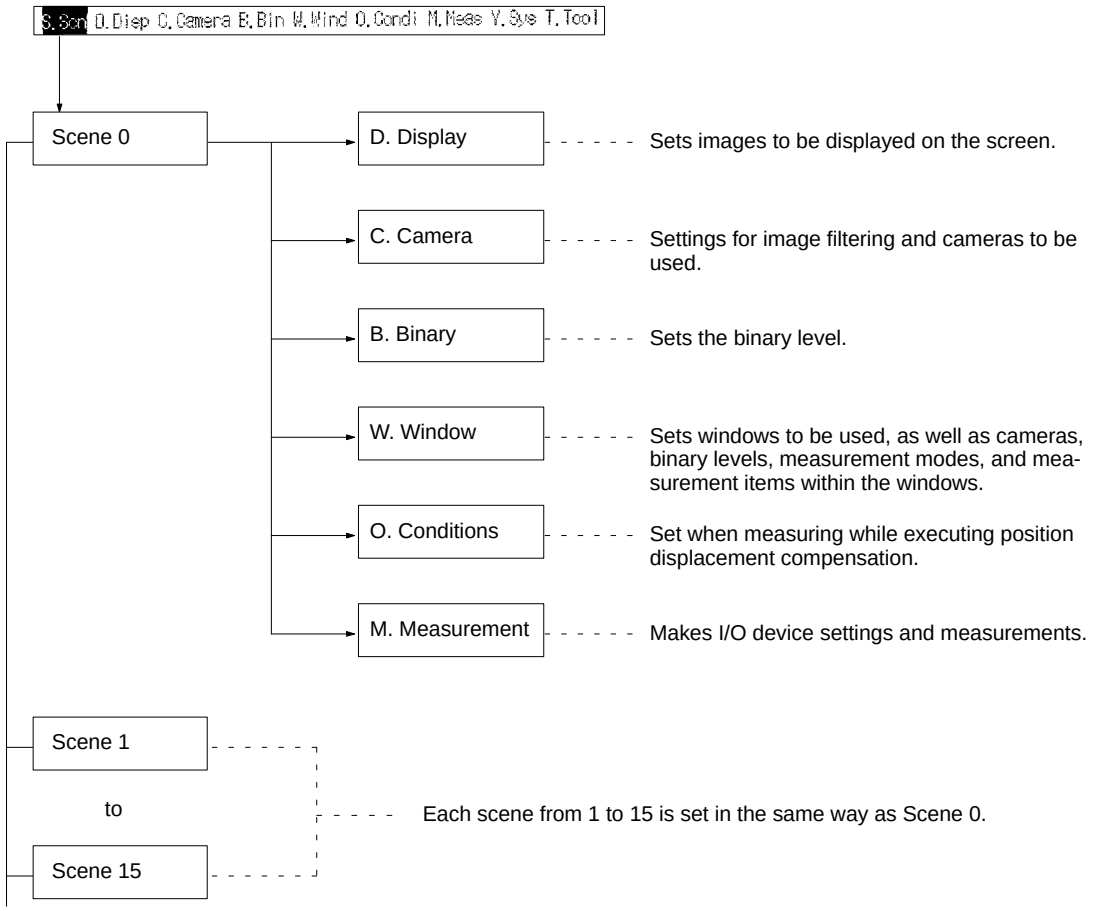
Menu Items

Item	Settings		Reference
0. Scene 0: to F. Scene 15:	Selection of scene number.		Refer to 2-2
Shift+Escape Keys: (see note)	C. Copy	Copies scene data.	Refer to 2-3
	L. Clear	Clears scene data.	Refer to 2-4
	N. Enter Comment	Enters a name for the scene.	Refer to 2-5

Note While the menu is being displayed, press the Shift and Escape Keys simultaneously to display the extended menu.

Scene Data

In the F300, the scene is the unit for setting measurement data. For the items on the main menu bar, such as “D. Display”, “C. Camera”, “B. Binary”, and so on, the various settings related to measurements are all saved as data for selected scene numbers.



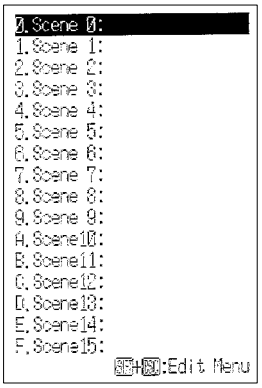
2-2 Selecting Scene Numbers

Select the scene numbers for setting measurement criteria.

1, 2, 3... 1. To display a list of scene numbers, select “S. Scene” from the menu bar.

The initial value is Scene 0, so it will be highlighted (i.e., displayed in reverse video). If comments have been entered for scene data, then those comments will be displayed. (Refer to page 8 when entering scene comments.)

2. Select the scene number using the Up or Down Keys and then press the Enter Key.



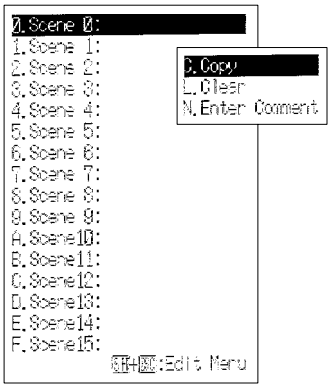
When the scene number is switched, the scene number display in the status line at the bottom of the screen will change to show the current screen number, and then the menu box will disappear.

2-3 Copying Scene Data

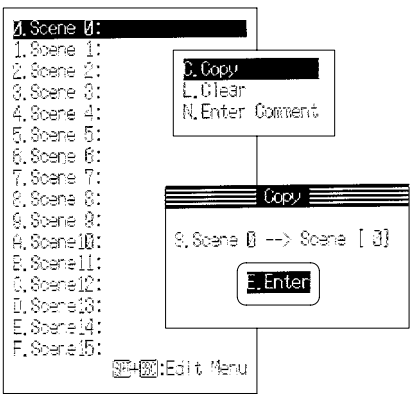
All of the data in the scene currently being displayed can be copied to another scene.

1, 2, 3... 1. To display the Edit menu, press the Shift and Escape Keys simultaneously while the list of scene numbers is being displayed.

The Edit menu will then be displayed.

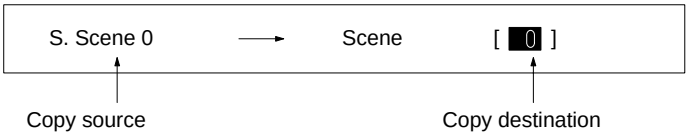


2. To display the scene data copy dialog box, select “C. Copy”. Press the Enter Key.



3. Specify the copy destination for the scene data by moving the cursor to the scene number space for the copy destination and then setting the number.

a) Press the Up Key to move the cursor to the scene number space.
b) Press the Left and Right Keys to select the copy destination number.
c) Press the Down Key and Enter Key to copy.



When the copying operation is complete, the procedure will return to step 1. To abort the copying operation, press the Escape Key. Copying is complete.

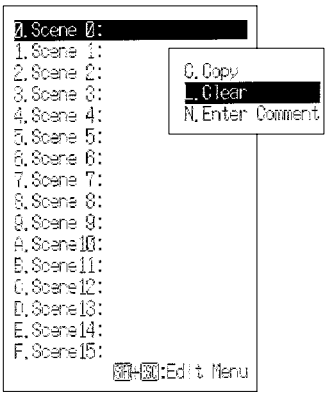
Note When scene data is copied, all of the set data will be copied to the copy destination scene.

2-4 Clearing Scene Data

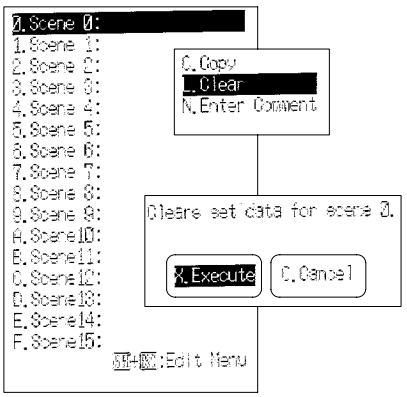
All of the scene data can be cleared and returned to the initial values in the scene currently being displayed.

1, 2, 3...

1. Select the number of the scene to be cleared, and press the Shift and Escape Keys simultaneously to display the Edit menu.
2. Select “L. Clear” from the Edit menu. Press the Enter Key.



3. When “L. Clear” is selected, a message will be displayed asking for confirmation to clear the scene data. To clear the data, select “X. Execute”. If you do not want to clear the data, then either select “C. Clear” or press the Escape Key.



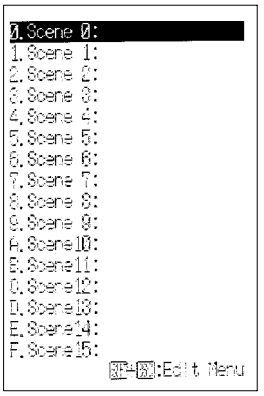
4. Select using the Left or Right Keys and then press the Enter Key. Clearing is complete.

   When the data clearing operation is complete, the procedure will return step 1.

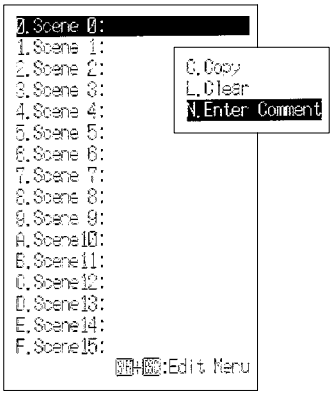
2-5 Entering Scene Comments

For each scene, a comment (e.g., a name or title) of up to 16 letters or numbers can be attached. Entering names of manufacturing processes, and so on, can be helpful in managing scene data.

1, 2, 3... 1. Select the scene number to which a comment is to be attached.

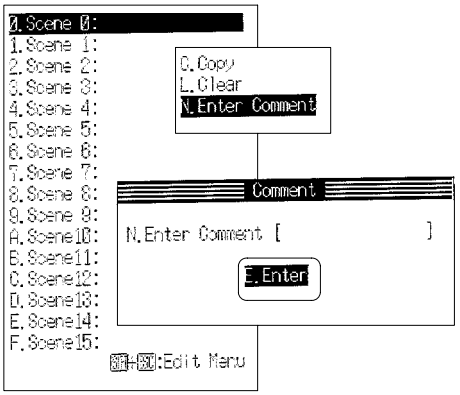


2. Display the Edit menu and select “N. Enter Comment” from the Edit menu.



3. Press the Enter Key.

   When “N. Enter Comment” is selected, the Enter Comment dialog box will be displayed.



4. Move the cursor to the space reserved for the comment, or name.

5. Press the Enter Key. It will then be possible to enter the name using the following keys.

Right Key	Cursor shifts to the right.
Left Key	Cursor shifts to the left.
Up Key	Changes the character. → A to Z A 0 to 9 A – A _
Down Key	Changes the character. A to Z Q 0 to 9 Q – Q _ ←

6. Press the Enter Key to set the name. Once the name has been set, it will be displayed on the list of scene numbers. Before entering the name, the Shift and Escape Keys can be pressed simultaneously to display a chart showing the letters, numbers, and symbols that can be input.
7. Press the Down Key and then the Enter Key to complete the input.

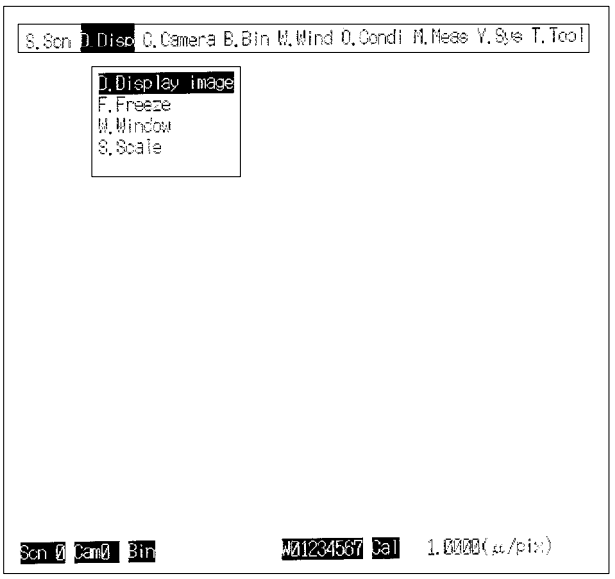
Note The space reserved for a comment cannot be left blank.

SECTION 3
Screen Display Settings

This section provides the procedures required to set screen displays.

3-1 Screen Display

The types of images that will be displayed on the video monitor can be set, as well as the methods for displaying them.



Menu Items

Item	Settings	Reference
D. Display image	Selects the type of image to be displayed (raw image, filtered image, or binary image).	Refer to 3-2
F. Freeze	Selects whether the image will be displayed as frozen or unfrozen.	Refer to 3-3
W. Window	Selects the windows to be displayed.	Refer to 3-4
S. Scale	Sets whether or not scale is to be displayed.	Refer to 3-5

Note

1. When “D. Display” is used to simply set the type of image to be displayed and the setting method, it will have no effect on the actual method of measurement.
2. Settings for screen displays are saved as scene data, so that separate settings for each scene number can be made.

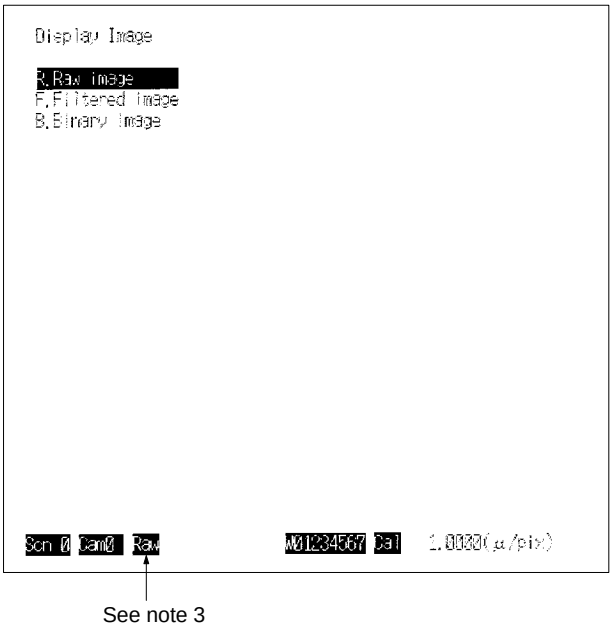
3-2 Selecting the Display Image

The type of display image that will be displayed on the video monitor can be selected.

1, 2, 3...

1. Select “D. Display image”.

2. From among the three types of images, choose the one desired for display.



As the cursor moves, the display on the video monitor will also change.

3. To save one of the image types as scene data, press the Enter Key. The display will return to that shown in step 1. Setting is complete.

Types of Images

Item	Settings
R. Raw image	Displays the unaltered image from the camera.
F. Filtered image (note 1)	Displays the image from the camera after executing processes such as edge enhancement.
B. Binary Image (note 2)	Displays the image from the camera in binary.

Note

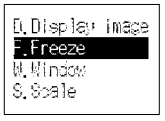
1. "Filtering" refers to smoothing, edge enhancement, and shading compensation. Filter settings are made with "C. Camera". For details, refer to *4-3 Image Filtering*.
2. Binary settings are made with "B. Binary". For details, refer to *Section 5 Setting the Binary Level*.
3. When either raw image or filtered image is selected, the status line display will show "Raw," and when binary image is selected it will show "Bin."

3-3 Selecting Freeze or Unfreeze

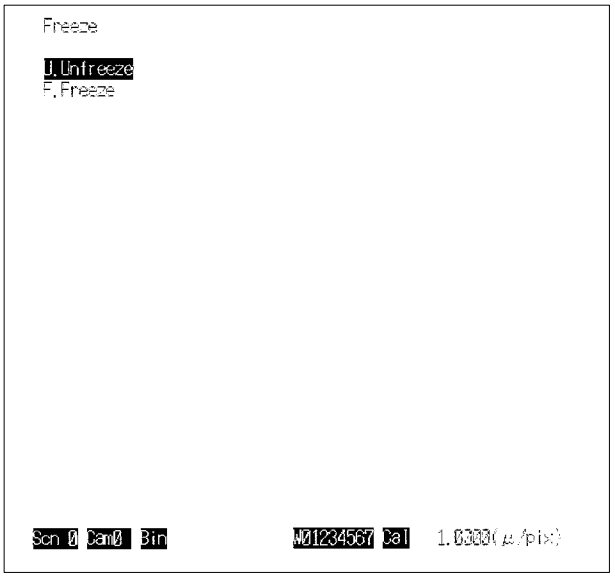
The image to be displayed on the video monitor can be set as either frozen (stopped) or unfrozen (moving).

1, 2, 3...

1. Select "F. Freeze" from the menu.



2. From within “F. Freeze”, select either “U. Unfreeze” or “F. Freeze”.



As the cursor is moves with the Up and Down Keys, the display on the video monitor will also change.

3. To save one of the image types as scene data, press the Enter Key. The display will return to that shown in step 1. Setting is complete.

Freeze/Unfreeze

Item	Settings
U. Unfreeze	Displays continuous images from the camera.
F. Freeze (see note)	Displays still images from the image memory.

Note As for the timing for storing in the frame memory, the image will be placed in the image memory when the cursor is moved from “U. Unfreeze” to “F. Freeze”.

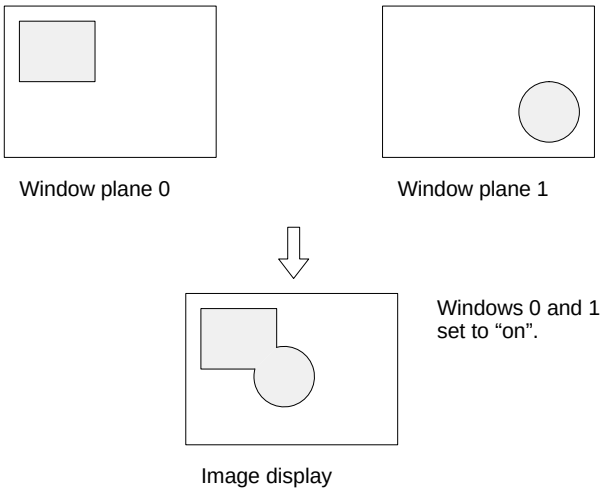
3-4 Display Window

Set whether or not windows will be displayed.

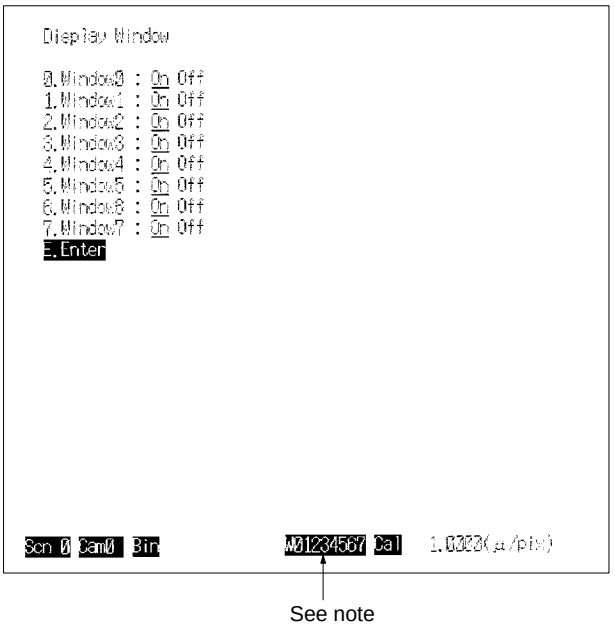
1, 2, 3... 1. Select “W. Window” from the menu.

2. From among windows 0 to 7, set to “On” those that are to be displayed, and to “Off” those that are not to be displayed.

As the initial value all of the windows are set to “On,” just set to “Off” those that are not to be displayed. Use the Up and Down Keys to select a window, and then use the Right and Left Keys to set it “On” on or “Off.”



3. When the settings are complete, be sure to select “E. Enter”. You will then be returned to the display shown in step 1. If the Escape Key is pressed, the display will return to that shown in step 1 but the settings will not be saved. Setting is complete.



Note The numbers of the windows that are set to “On” will be displayed in reverse video in the status line.

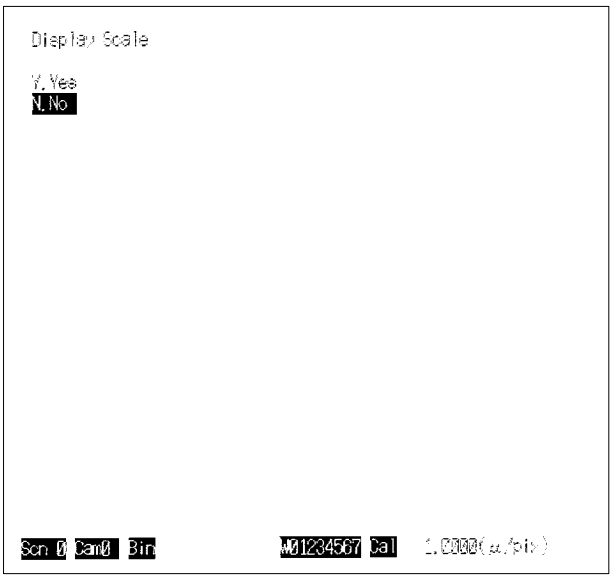
3-5 Display Scale

Select whether or not the scale will be displayed on the screen at the time of measurement tests or execution. If calibration is set, the scale can be displayed in the actual unit.

1, 2, 3... 1. Select “S. Scale” from the menu.

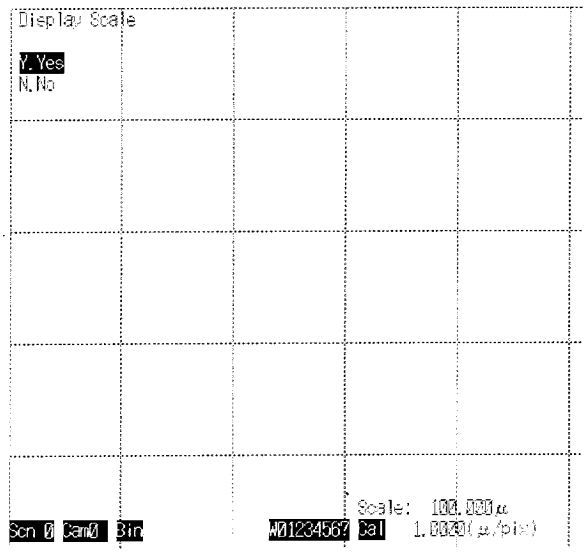
2. Select whether or not the scale is to be displayed.

   The initial value is “N. No”. If the scale is to be displayed, then select “Y. Yes”.



3. To save the selection as scene data, press the Enter Key. The display will return to that shown in step 1.

or If “Y. Yes” is selected, the scale will be displayed.



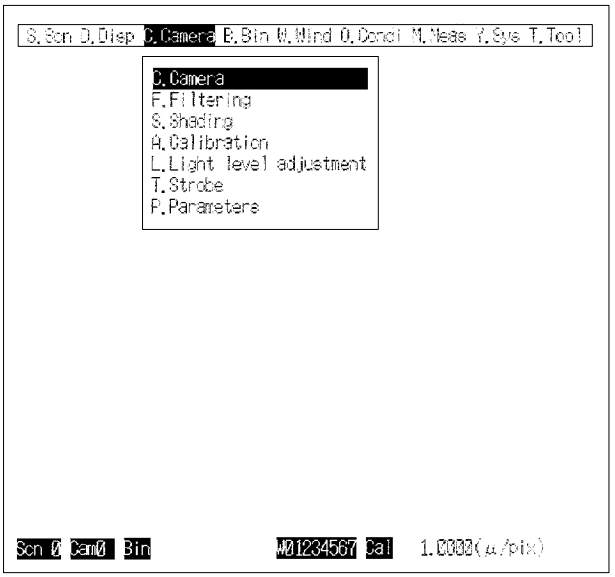
If calibration has not been set, a scale will be displayed with 100-pixel intervals.

SECTION 4
Settings for Taking and Processing Images

This section provides the procedures required to make the settings for taking and processing images.

4-1 Taking and Processing Images

Filtering and compensation functions can be set for each camera.

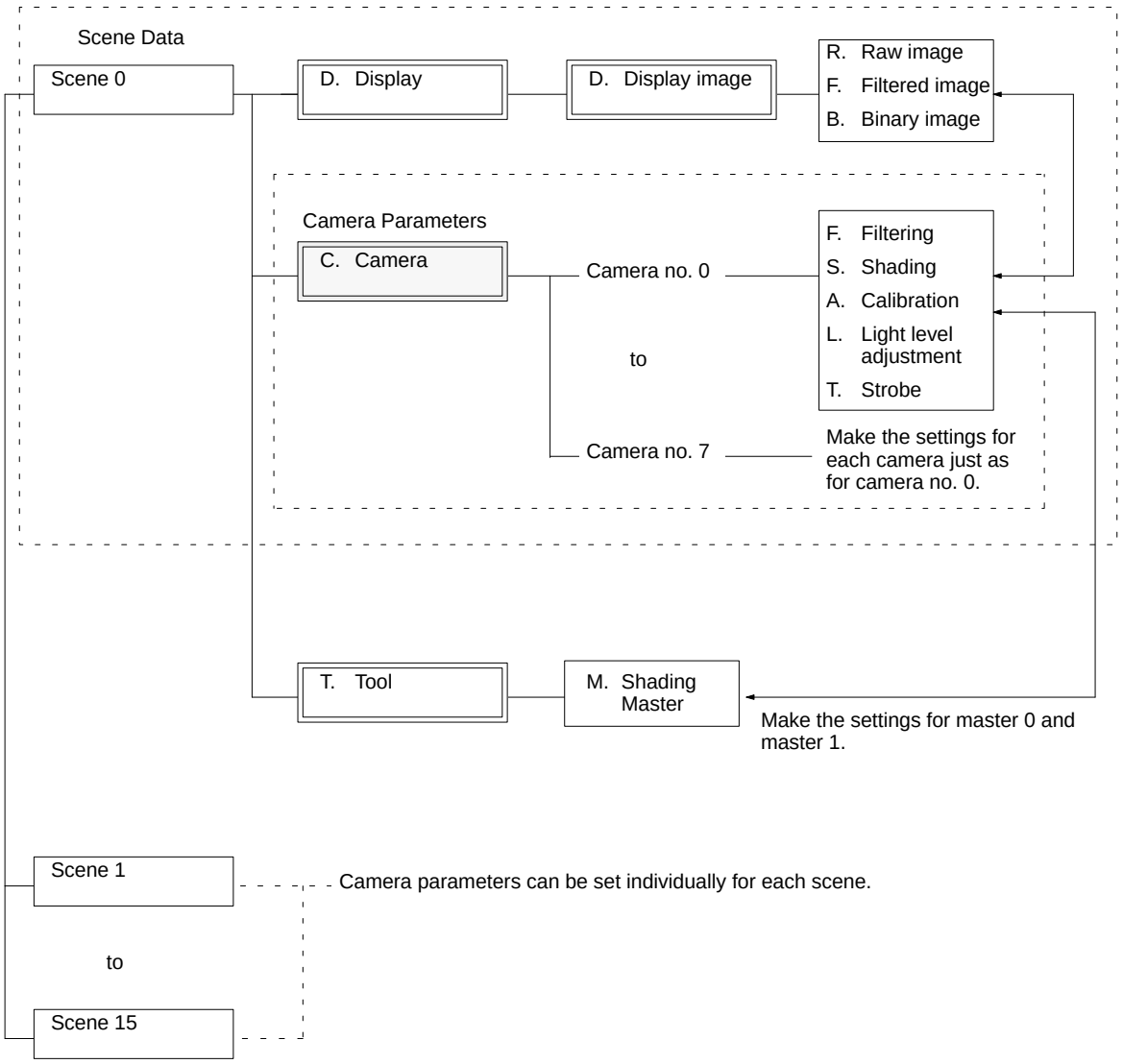


Menu Items

Item	Settings	Reference
C. Camera	Selects the cameras to be used for all of the functions from “F. Filtering” to “T. Strobe”.	Refer to 4-2
F. Filtering	Sets processes such as smoothing and edge enhancement in order to make measurement of input images easier.	Refer to 4-3
S. Shading	Select shading master 0 or 1 when compensation for measurement errors due to lighting irregularities is desired. Master settings for compensation are made with “T. Tool”.	Refer to 4-4
A. Calibration	Converts camera coordinates to actual coordinates. Measurement results can be found in actual units.	Refer to 4-5
L. Light level adjustment	Prevents measurement errors by compensating for light level fluctuations.	Refer to 4-6
T. Strobe	Specifies the strobe for the camera by selecting the number of the strobe to be used.	Refer to 4-7
P. Parameters	Displays a list of parameters for the camera.	Refer to 4-8

Camera Parameters

When a camera number is selected from the “C. Camera” menu, the settings for all of the functions from “F. Filtering” to “T. Strobe” will be saved as set values for the selected camera number. These camera parameters can be set individually for each scene.

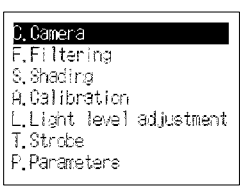


If “F. Filtered Image” is selected from the dialog box under the “D. Display” menu, the image set by “F. Filtering” under the “C. Camera” menu will be displayed.

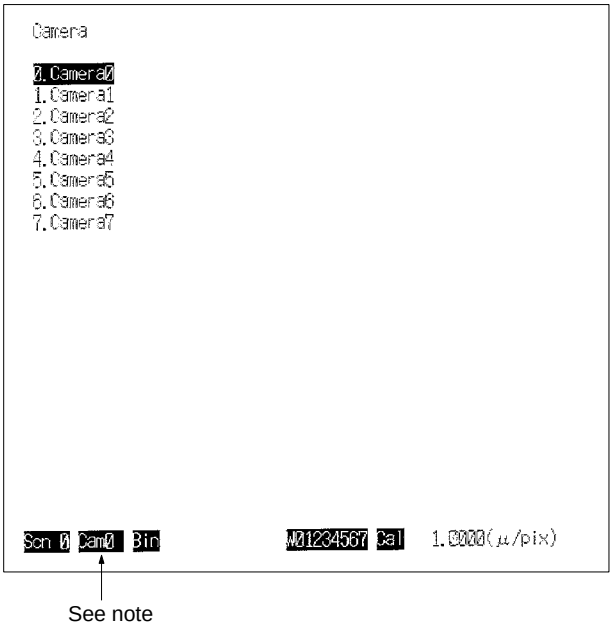
4-2 Cameras

The cameras for filtering and compensation settings can be selected.

1, 2, 3... 1. Select “C. Camera” from the menu.



2. Select the number of the camera for setting camera parameters.



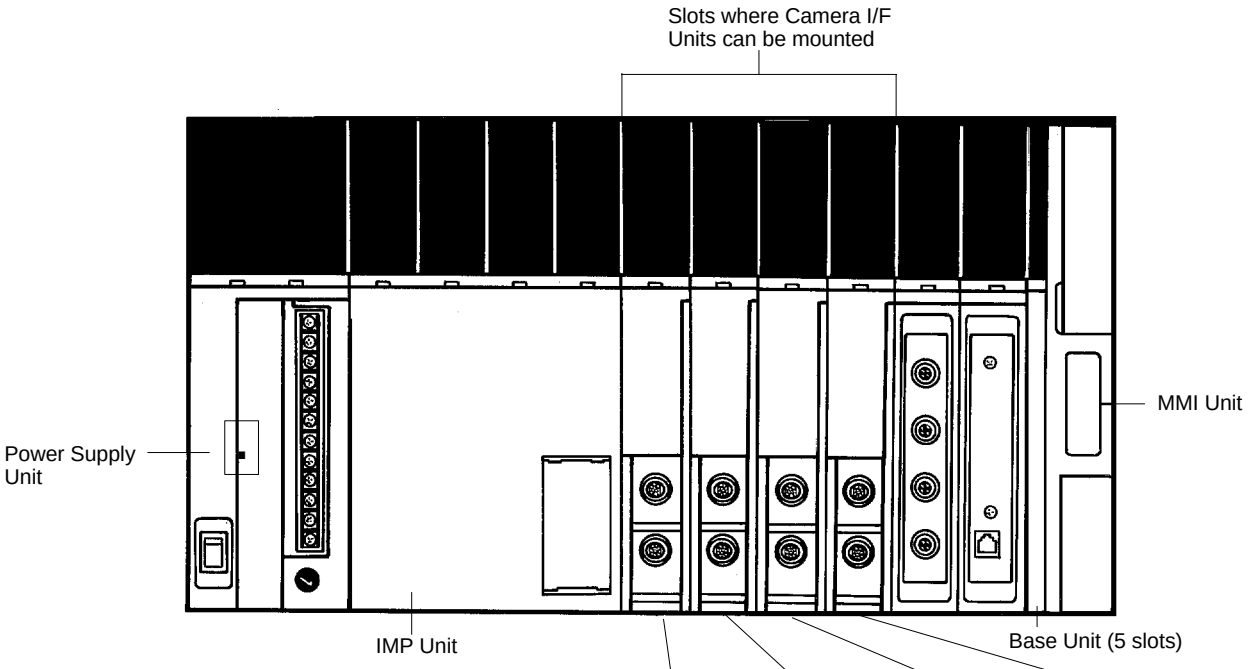
Use the Up and Down Keys to switch between cameras.

If the number of a camera that is not connected is selected, nothing will be displayed. When switching between cameras, the camera number displayed at the bottom of the screen will also change.

Note The selected camera number will be displayed in the status line.

Camera Numbers

Camera numbers will be determined automatically according to the order in which the Camera I/F Units are mounted. Beginning with the upper connector closest to the IMP Unit, camera numbers will be allocated from 0 to 7, as shown in the following illustration, regardless of the type of Camera I/F Unit.



Upper connector	Camera 0	Camera 2	Camera 4	Camera 6
Lower connector	Camera 1	Camera 3	Camera 5	Camera 7

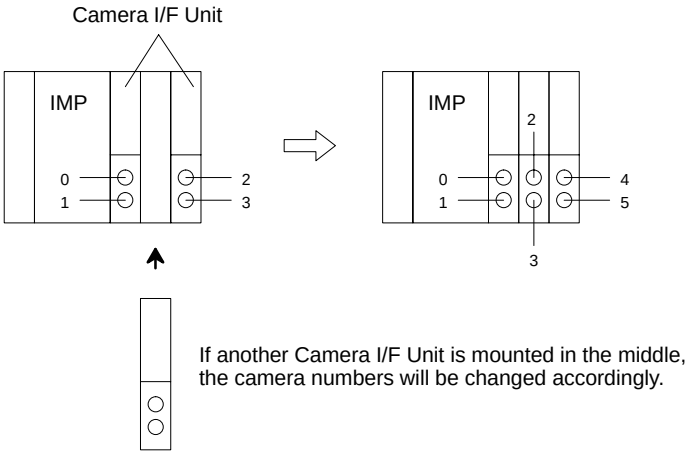
A maximum total of four Camera I/F Units may be mounted to the Base Unit (F300-B5/B3). These four Camera Units may include normal, normal simultaneously, shutter, and shutter simultaneously types.

Camera numbers bear no relationship to the type of Camera I/F Unit, but are simply allocated in order from the camera nearest the IMP Unit.

Even if another type of unit is mounted between Camera I/F Units, the camera numbers will still be allocated in order beginning with the upper camera nearest the IMP Unit. When mounting multiple Camera I/F Units, however, it is best to mount only Camera I/F Units to the left.

Note

1. If an additional Camera I/F Unit is mounted between two Camera I/F Units that have already been mounted, the camera numbers farthest from the IMP Unit will be changed as shown in the illustration below. To prevent this from happening, it is best to move the rightmost Camera I/F Unit to the left (i.e., closer to the IMP Unit), and then mount the new Camera I/F Unit in the slot farthest from the IMP Unit.

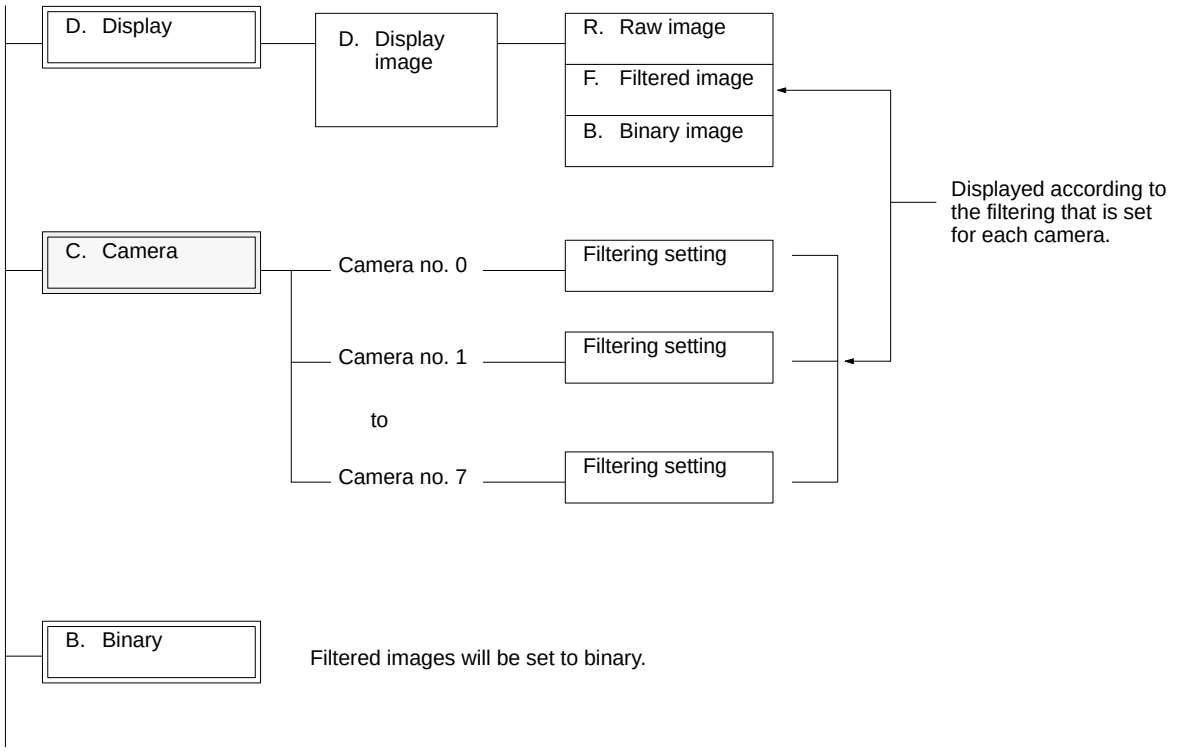


2. Do not use Normal-type Camera I/F Units and Shutter-type Camera I/F Units together.

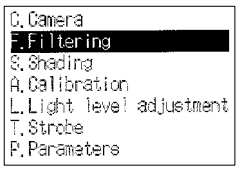
4-3 Image Filtering

In order to make it easier to measure images that are input, enhancing the edges of measurement objects is possible. When selecting “F. Filtered Image” from “D. Display Image”, the filtered image will be displayed.

Related Menus

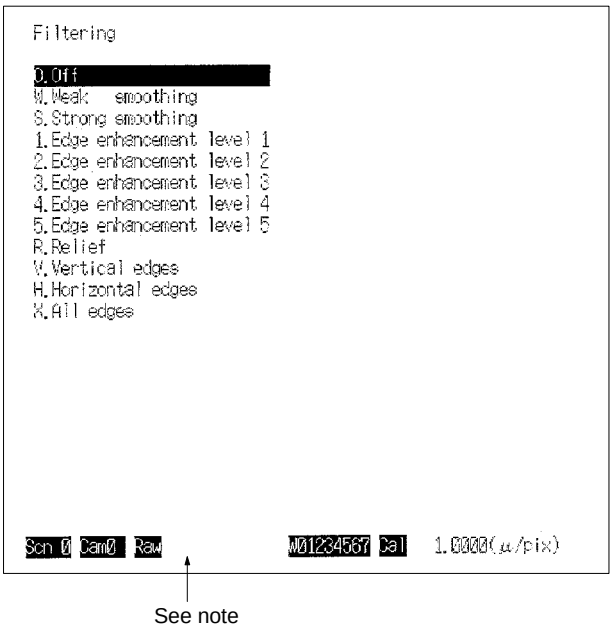


1, 2, 3... 1. Select “F. Filtering” from the “C. Camera menu”.



2. A selection from the “F. Filtering” menu can be made while observing the effects of the filtering processes on the image.

As each selection is made from the menu, the setting will be displayed in the status line at the bottom of the screen.



3. Select using the Up or Down Keys and then press the Enter Key. Setting complete.

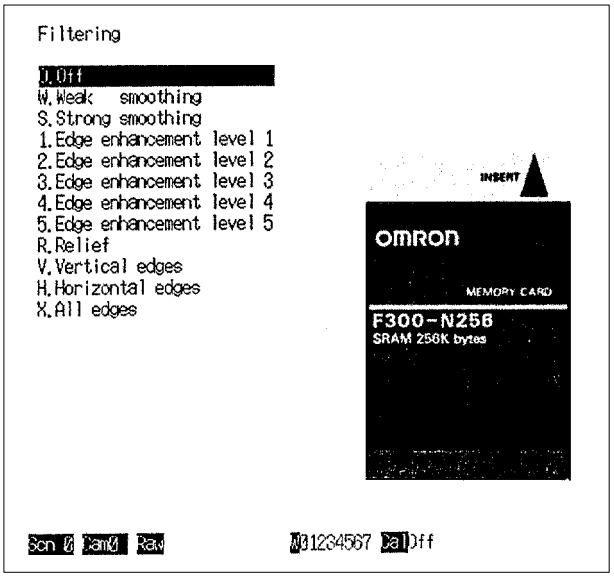
Note The selected filtering menu item will be displayed in the status line.

Filtering Menu Items

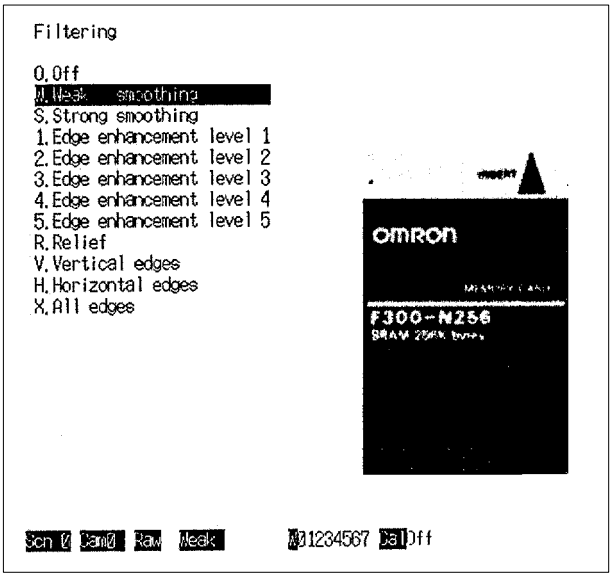
Item	Function
0. OFF	Image is not filtered.
W. Weak Smoothing	When measuring rough or patterned objects, surface irregularities can be ignored.
S. Strong Smoothing	
1. Edge enhancement level 1	Enhances edges to improve contrast. In cases where measurement is difficult due to the slight difference in brightness between the measurement object and the background, or when measuring objects with little contrast, this is effective in reducing measurement errors due to light fluctuation. There are five progressively stronger levels of edge enhancement.
2. Edge enhancement level 2	
3. Edge enhancement level 3	
4. Edge enhancement level 4	
5. Edge enhancement level 5	
R. Relief	Effective when measuring objects with surface irregularities.
V. Vertical edges	Extracts the object's vertical edges.
H. Horizontal edges	Extracts the object's horizontal edges.
X. All edges	Extracts all the object's edges.

Examples of Filtered Images

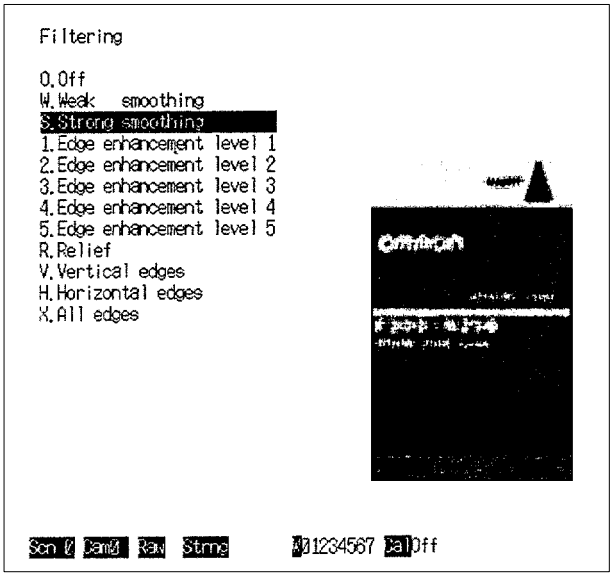
OFF



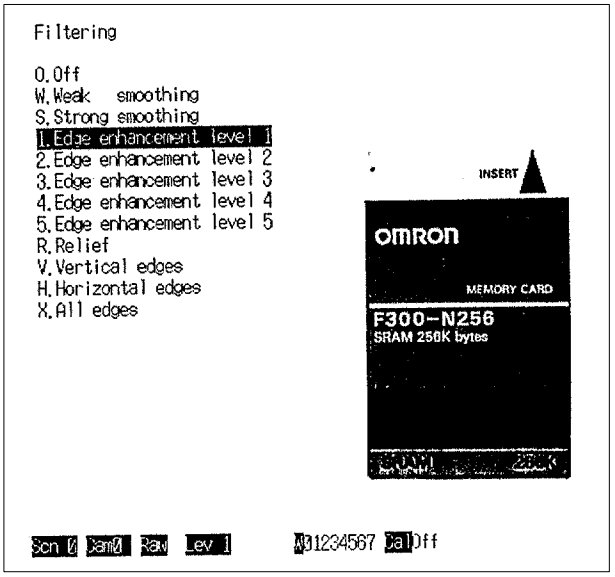
Weak Smoothing



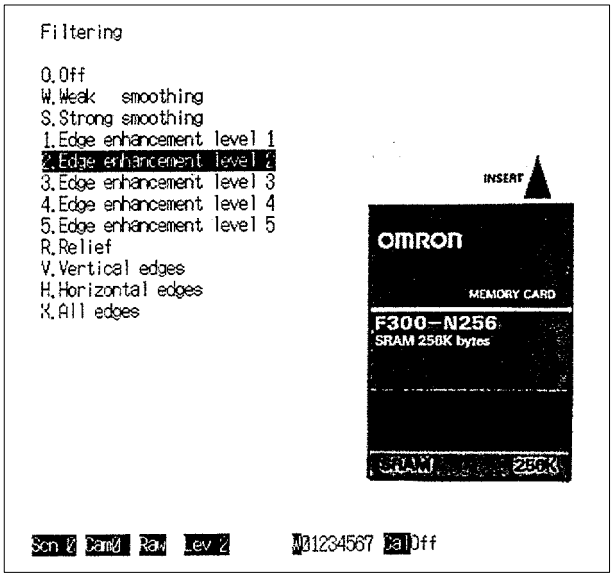
Strong Smoothing



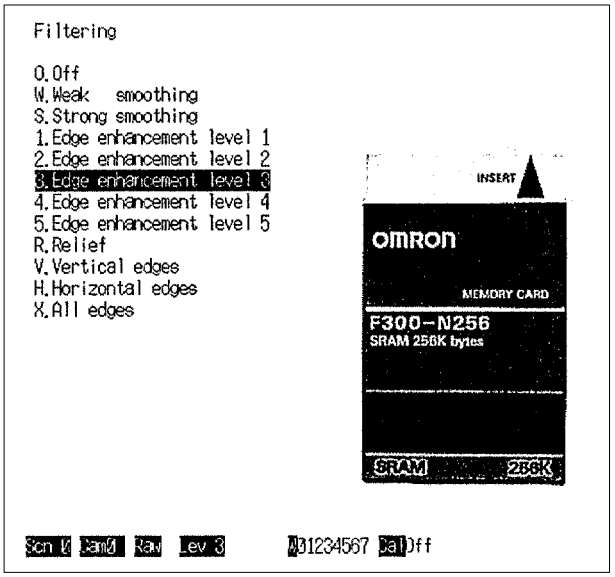
Edge Enhancement Level 1



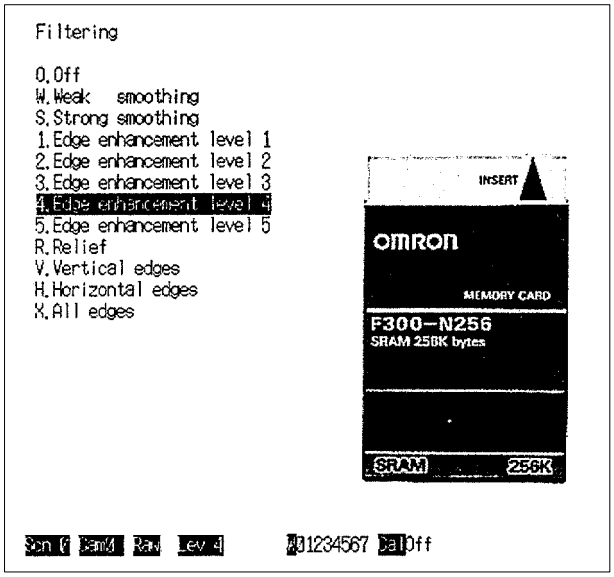
Edge Enhancement Level 2



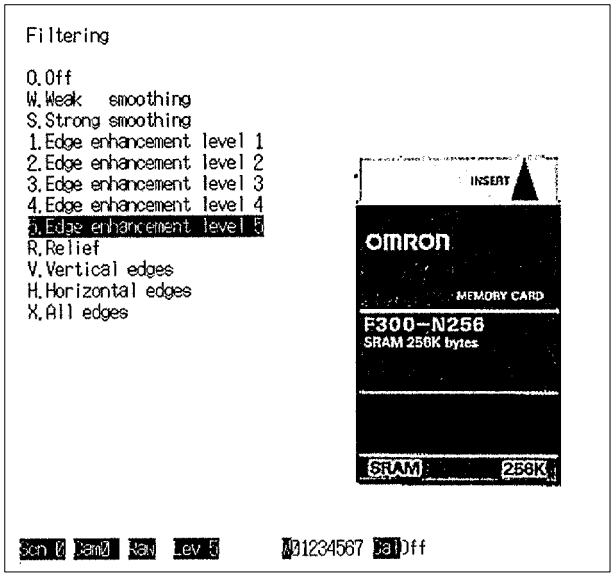
Edge Enhancement Level 3



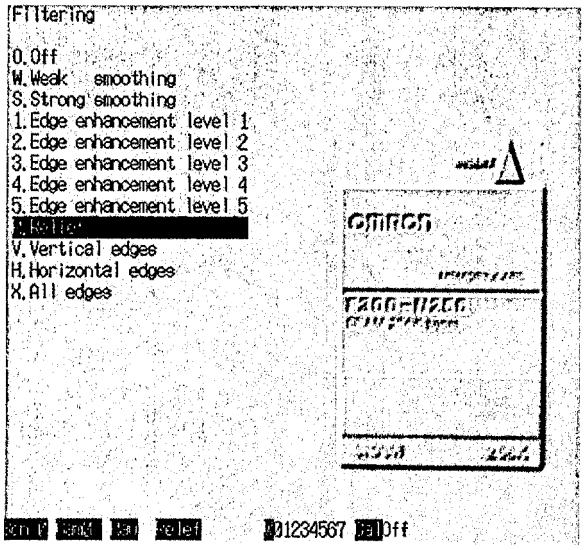
Edge Enhancement Level 4



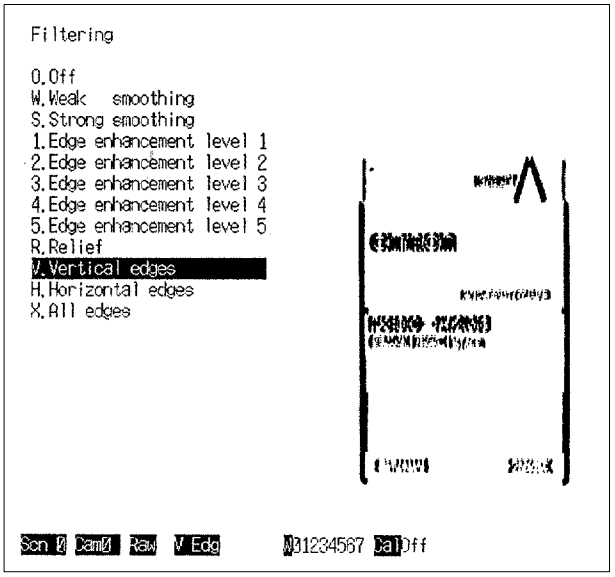
Edge Enhancement Level 5



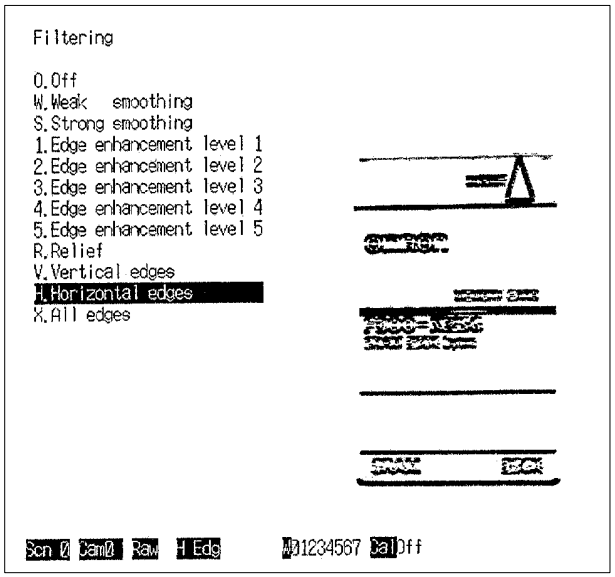
Relief



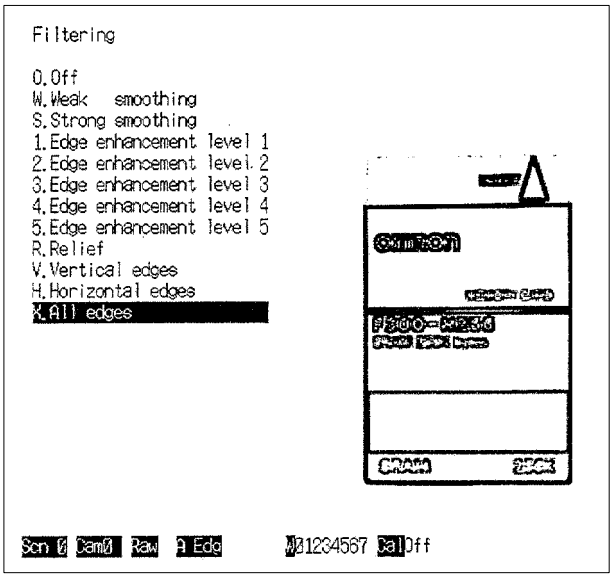
Vertical Edges



Horizontal Edges



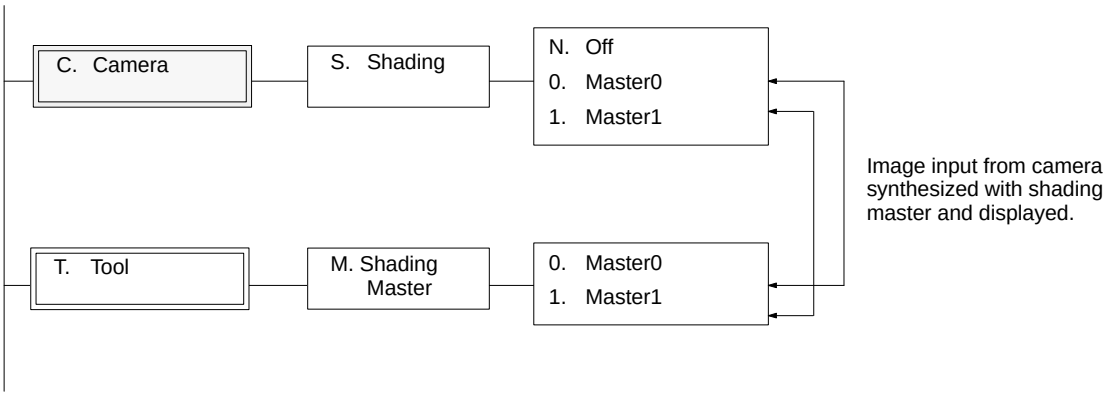
All Edges



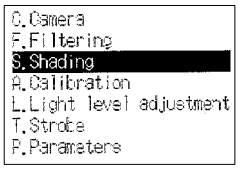
4-4 Shading Compensation

This feature can prevent measurement errors due to uneven lighting or shadows on objects with curved surfaces such as spheres or cylinders. With “S. Shading”, under the “C. Camera” menu, you can select whether or not a shading master is to be used for shading compensation for the image that is input from the camera. The shading master must be created in advance using the Shading Master menu, which can be found under the “T. Tool” menu.

Related Menus

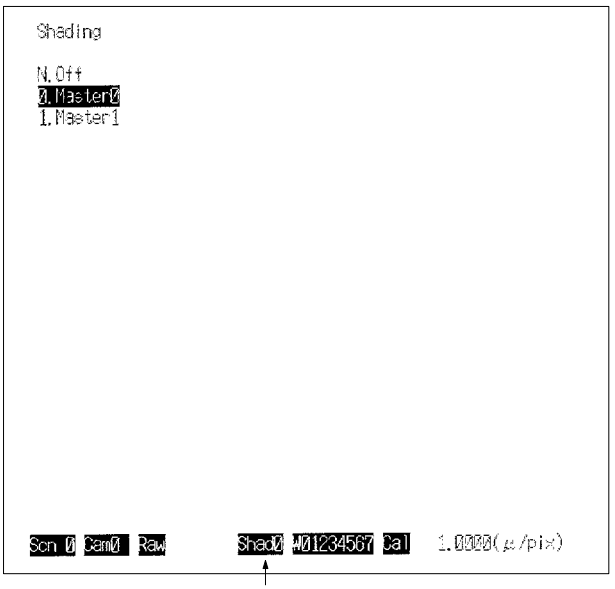


1, 2, 3... 1. Select “S. Shading” from the “C. Camera” menu.



2. Select either “0. Master 0” or “1. Master 1”. Master 1 will cause the image input from the camera to be synthesized with the shading master for display.

   If no shading master has been created, then the display will not change even if master 0 or master 1 is selected. It makes no difference whether shading master selection or creation is executed first.



Note If shading master 0 is selected, “Shad0” will be displayed in the status line.

3. Press the Enter Key. Setting is complete.

Menu Items

Item	Function
N. OFF	Image input from camera will not be synthesized with shading master.
0. Master 0	Selects shading master for synthesis with image input from camera.
1. Master 1	Shading master is created with “M. Shading Master” under the “T. Tool” menu.

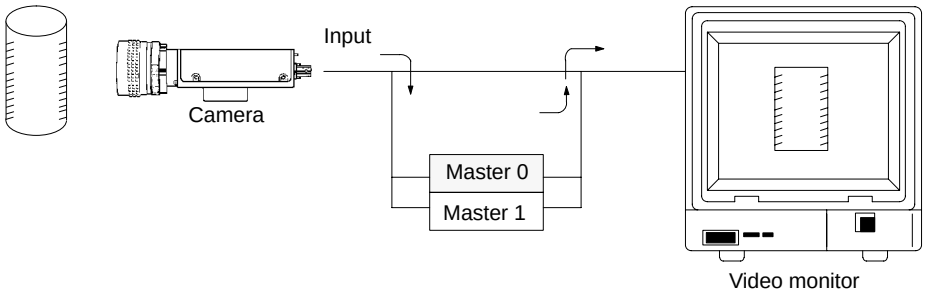
Input Image and Shading Master Image Integration

Creating a Shading Master:

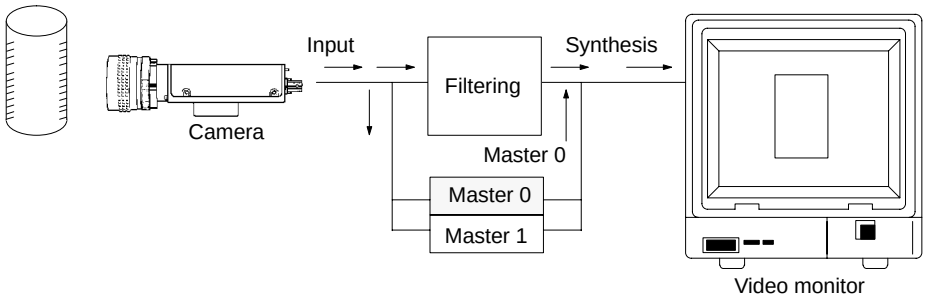
1. Use “M. Shading Master” under the “T. Tool menu” to create a shading master.

   The shading master can be created in two screens.

2. For each scene, set the shading master that is to be used.



Integration with Shading Master:



For shading compensation, the shading master is then integrated with the image input from the screen, including filtering.

Input image (including filtering) – Shading master 0 or 1 A (Binary processing)

If the object is cylindrical as in the above example, the shadows can be removed from both sides. The brightness will be changed, however, so set the binary level such that measurement will be easy.

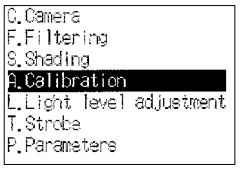
Note Shading compensation cannot be executed if filtering has been set for any of the following: strong or weak smoothing, relief, horizontal or vertical edges, or all edges.

4-5 Calibration

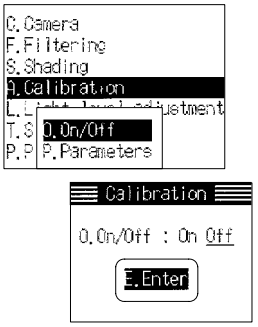
The F300 measures area, center-of-gravity coordinates, and so on, by pixels. “Calibration” is the function of converting measurement results from pixel units to actual units.

Calibration is set for each camera individually. There are two methods for setting calibration. One is to actually conduct a sampling measurement and then input the coordinates, and the other is based on numeric input.

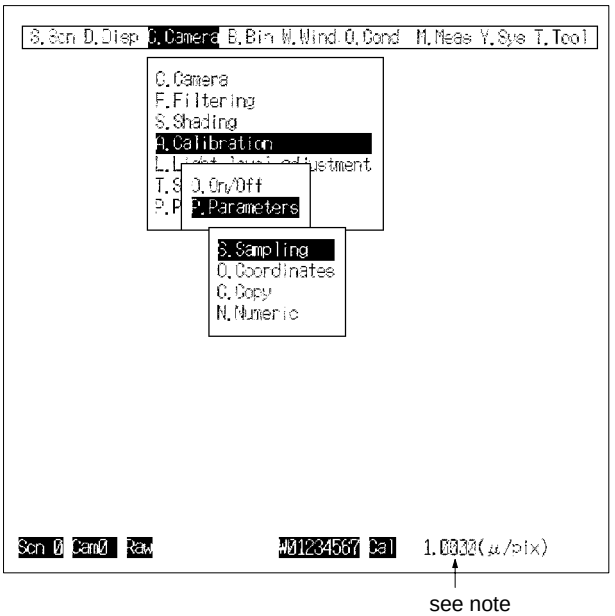
1, 2, 3... 1. Select “A. Calibration” from the “C. Camera” menu.



2. Select “O. On/Off”.
3. When calibration is to be used, set it to On, and when it is not being used, set it to Off. When you exit you will be returned to step 2.



4. Select using the Down Key and then press the Enter Key.
5. After setting calibration to On, select “P. Parameter”.

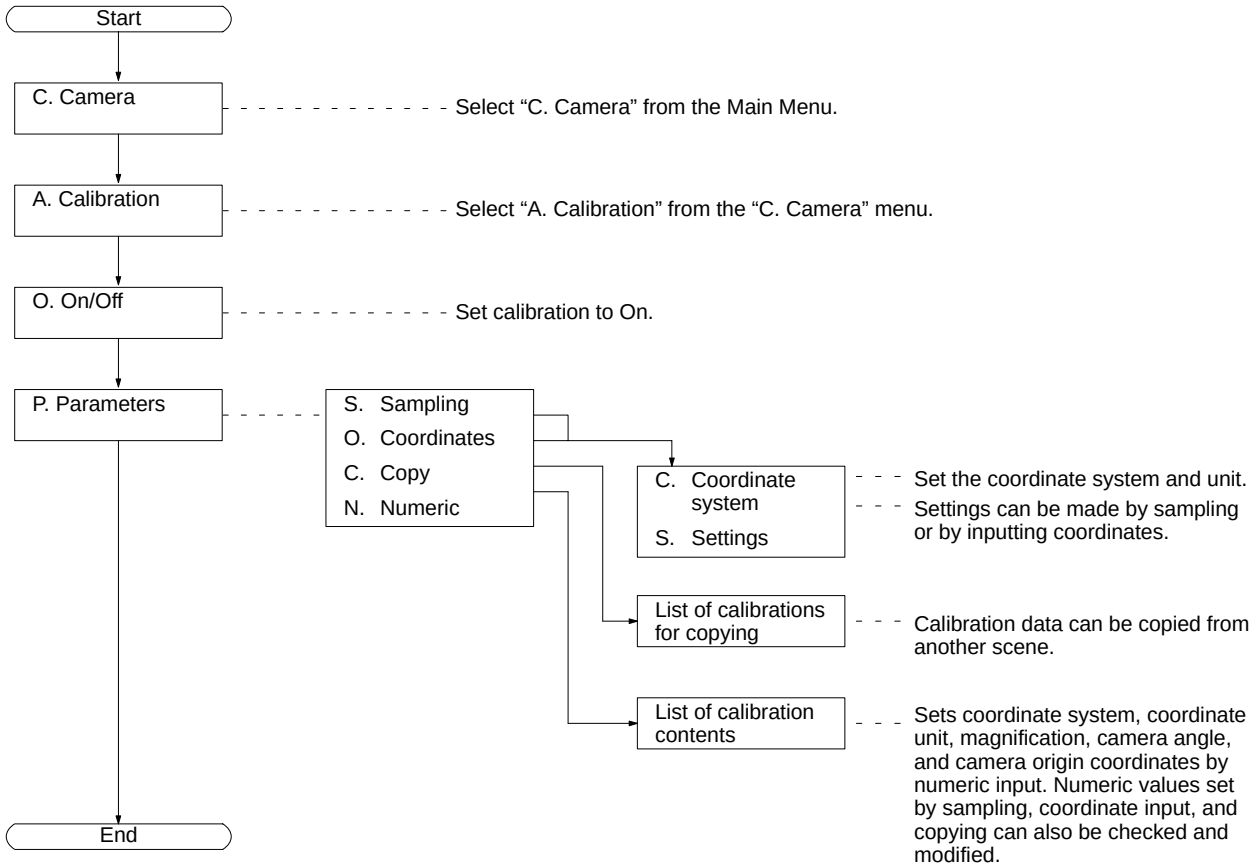


Note When calibration is set to On, the calibration data (the actual value per pixel) will be displayed.

Menu Items

Item	Settings	Reference
S. Sampling	Sets the calibration while conducting a sampling on an object for which the dimensions are already known. Settings can be highly precise, because a window can be drawn for each measurement point and sampling can be conducted while measuring the center-of-gravity coordinates by pixels.	Refer to 4-5-1
O. Coordinates	Settings can be made even more simply than with “S. Sampling”, because coordinates can be input directly while observing the image of an object for which the dimensions are already known.	Refer to 4-5-2
C. Copy	Copies calibration set values from another scene.	Refer to 4-5-3
N. Numeric Input	Sets calibration by only numeric input, without making a sampling measurement. Data set or copied by the above methods can also be checked or modified.	Refer to 4-5-4

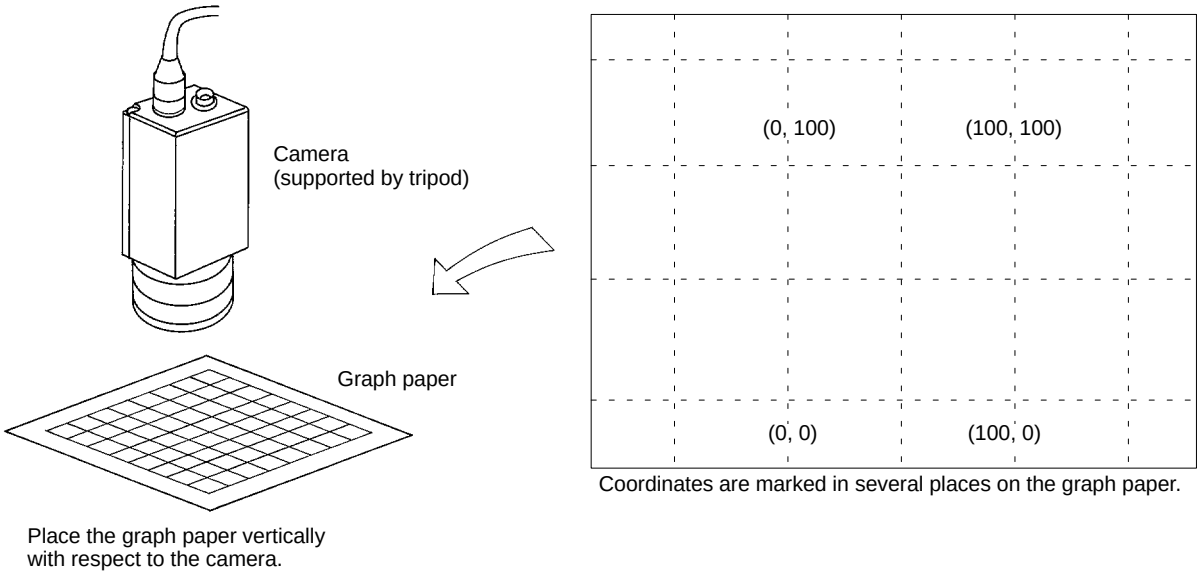
Setting Procedure



4-5-1 Calibration Setting by Sampling

A more precise set value can be obtained by setting the calibration by means of sampling. With this method, a window is set up for each position that is to be sampled, and then sampling is conducted by repeatedly measuring the center-of-gravity position inside of the window and inputting the actual coordinates.

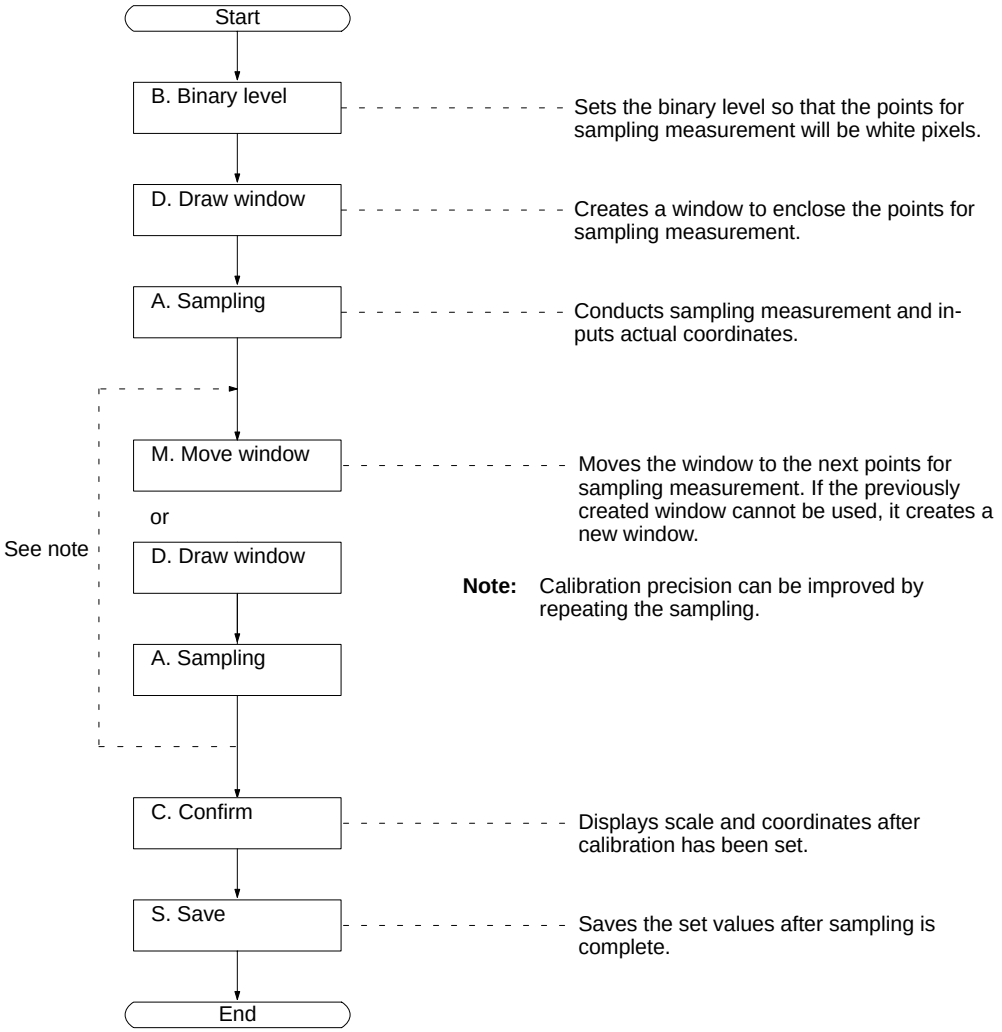
In the following example, a method using graph paper will demonstrate measurement by sampling.



Coordinates are marked in several places on the graph paper.

Place the graph paper vertically with respect to the camera.

Relationship Between Sampling Settings and Menus

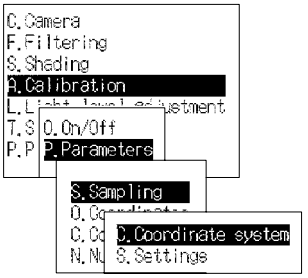


Note: Calibration precision can be improved by repeating the sampling.

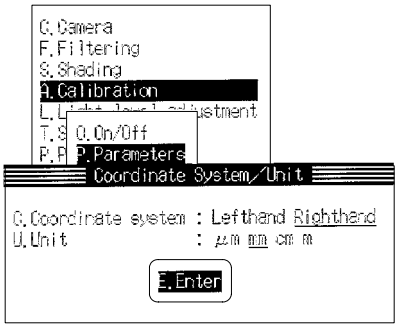
The following is an example based on the previous sampling measurement.

1, 2, 3... 1. Select “S. Sampling” under the “C. Camera” menu.

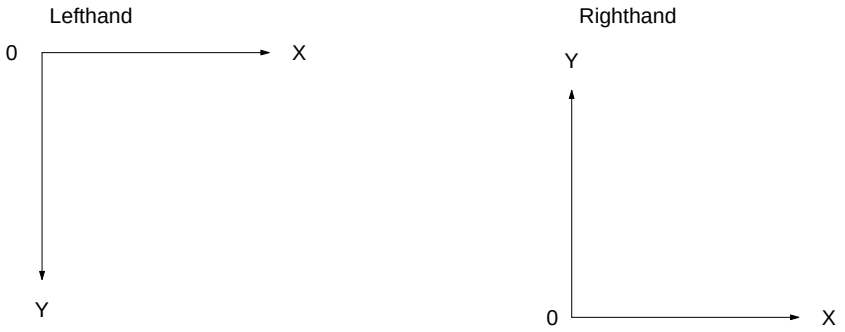
2. Display “C. Coordinate System” and “S. Settings”.



3. First select “C. Coordinate System”, and set the coordinate system and unit.

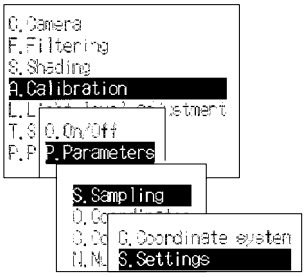


Coordinate system:

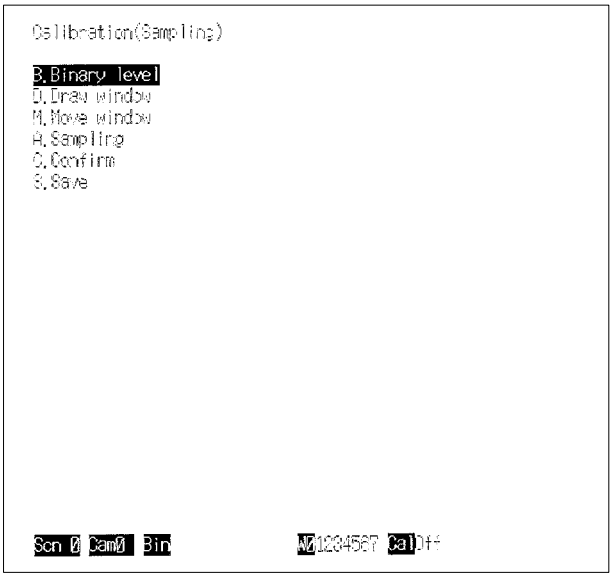


In this example, “righthand” is selected as the coordinate system and “mm” is selected as the unit.

4. Next select “S. Settings”.



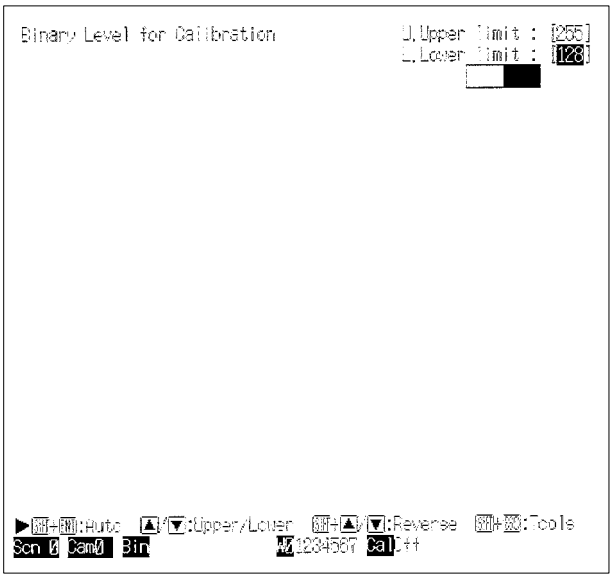
5. The Calibration Settings (Sampling) menu will be displayed.



A list of items and their functions are as follows.

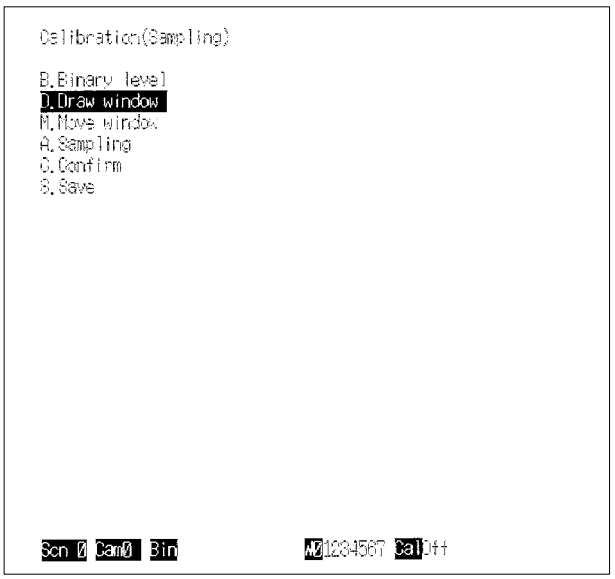
Item	Function
B. Binary level	Sets the binary level for sampling measurement. The initial value for the binary level is 128 for the lower limit and 255 for the upper limit.
D. Draw window	Creates a window (circular) for sampling measurement. This is only a provisional window for the purpose of sampling measurement. It is not related to the window for actual measurement and cannot be saved.
M. Move window	When several sampling measurements are made, the window created by “D. Draw Window” can be moved to another measurement position.
A. Sampling	Conducts sampling measurements for created windows.
C. Confirm	Checks calibration data created by sampling measurement.
S. Save	Saves sampling measurements. If a sampling measurement is not saved, the data will not be set.

6. The binary level for conducting a sampling measurement can be set by selecting “B. Binary Level”.

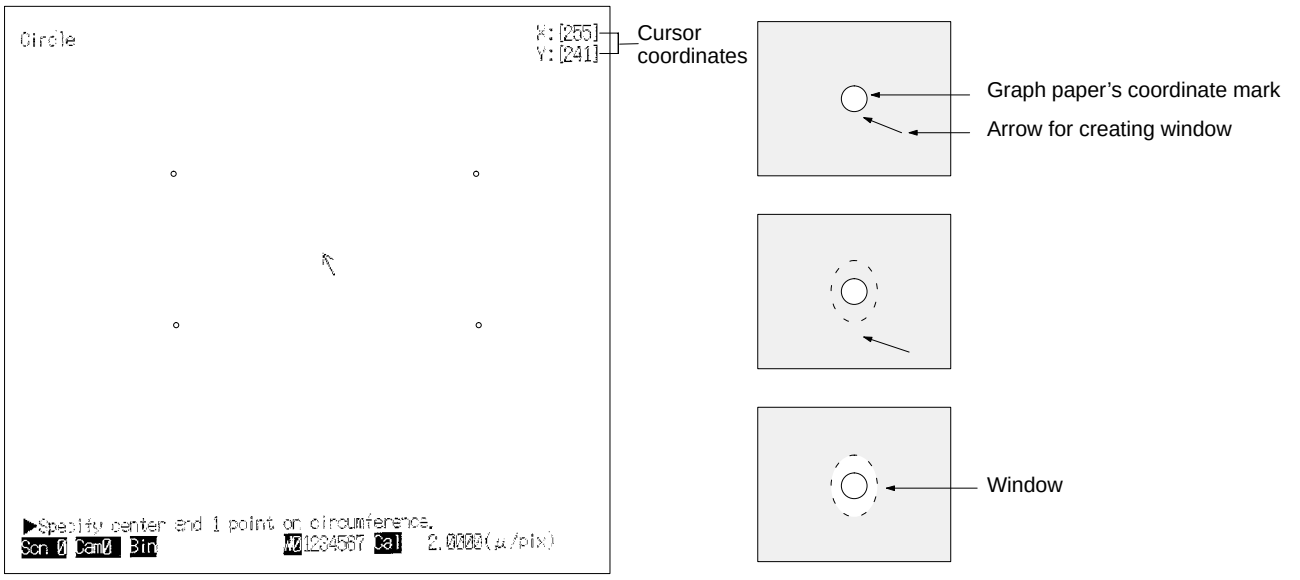


7. Use the Shift and Up Keys to display the screen in reverse video, and use the Right and Left Keys to modify the lower limit so that only the graph paper’s coordinate marks can be seen in white. Quicker execution of the process can be made by holding down the Shift Key along with the Right and Left Keys.

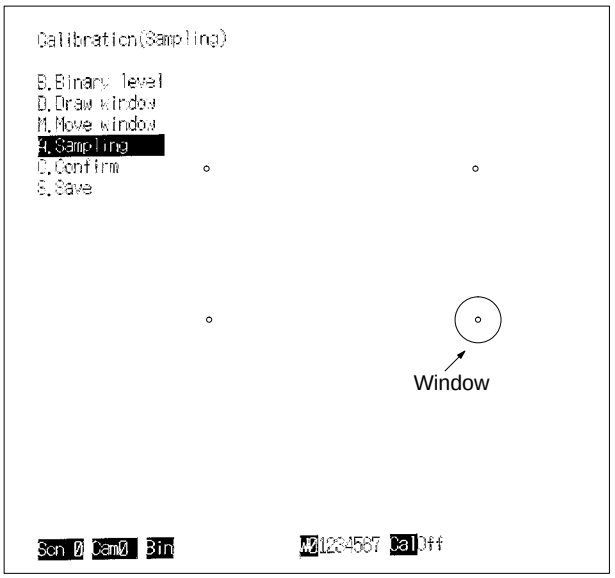
8. Once the binary level has been set, the next step is to create the window to be used for measurement. Select “D. Draw Window” from the menu.



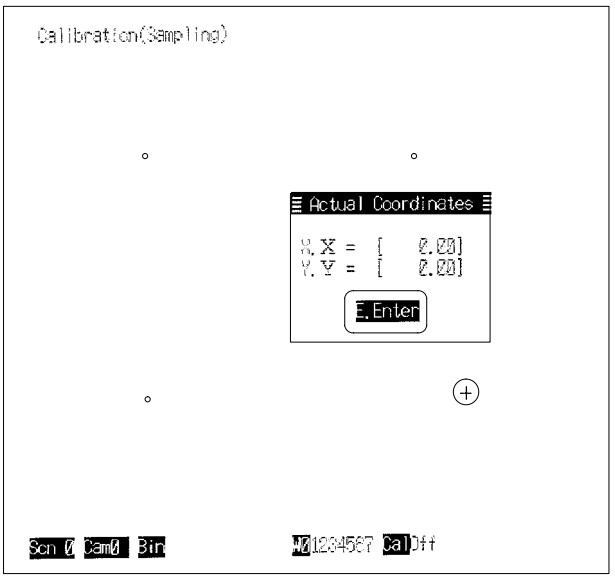
9. Move the cursor to the center of the position where the window is to be created, and then draw a circular window.



10. When the window has been created, you can begin the sampling. First select "A. Sampling".

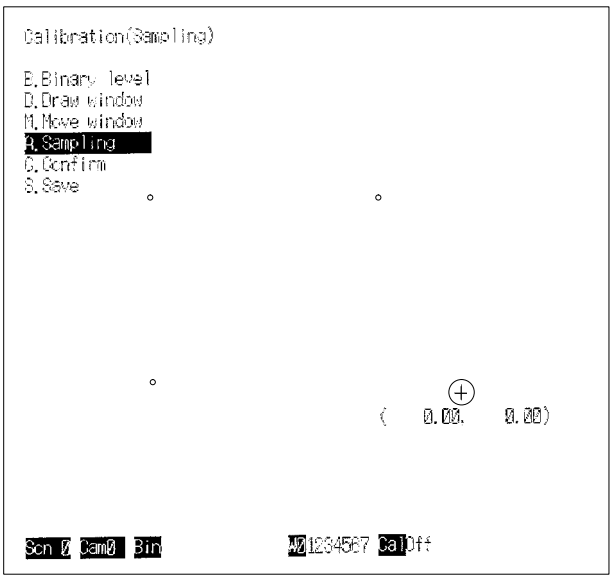


11. Press the Enter Key to execute the sampling measurement. The dialog box for actual coordinate input will be displayed.

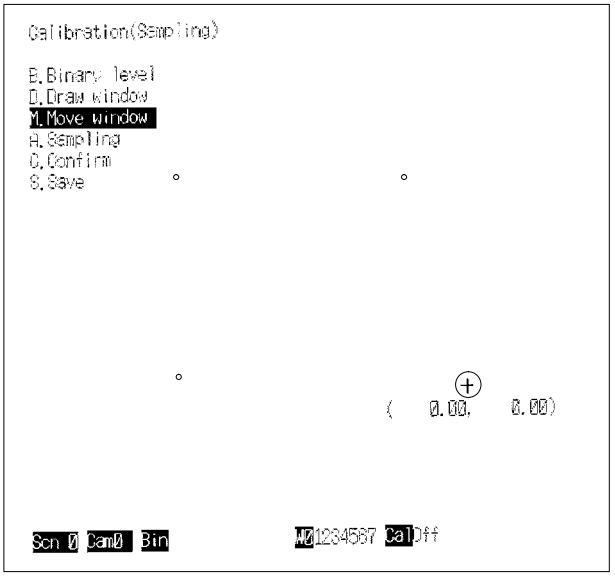


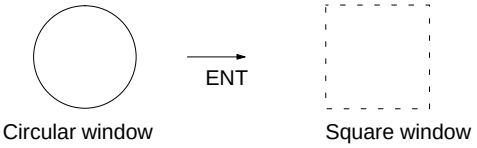
12. Input the actual coordinates for the X and Y axis. In the example, (0,0) is input.

    When the first sampling has been completed, the coordinates that have been input will be displayed on the screen. At that time the window that was created will remain as it is, so it can be moved to the next measurement position and used again.

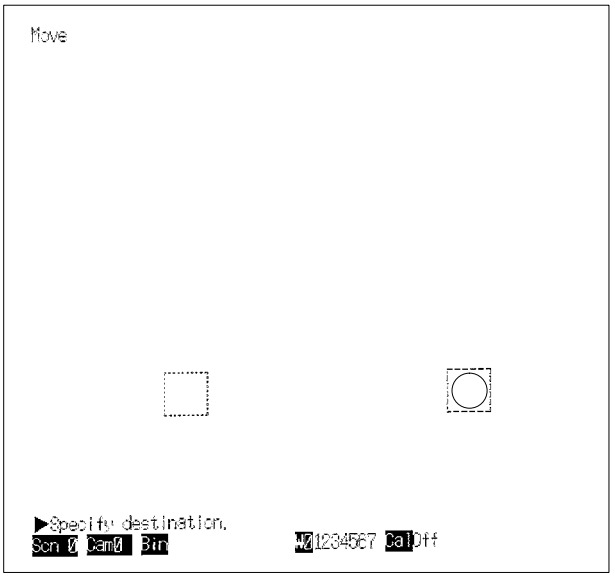


13. Move the window to the next measurement position to continue the sampling. First, select “M. Move Window”. Then, when the Enter Key is pressed, the circular window will appear as a circumscribed square.

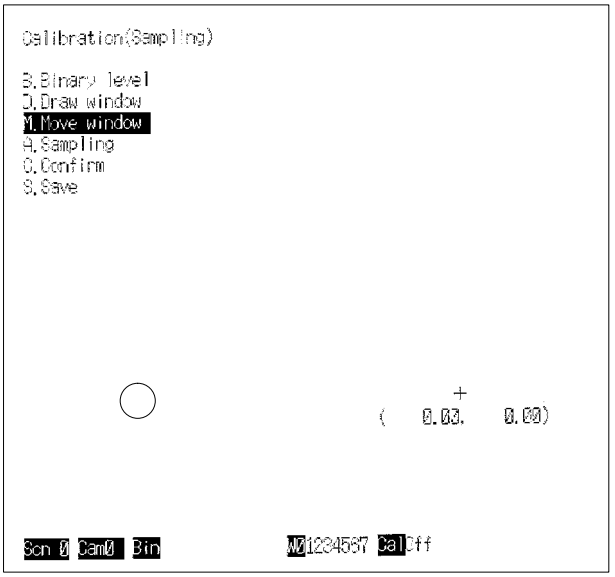




14. Use the direction keys to move the window to the next mark position to be measured. (The Shift Key can be pressed at the same time to move the window more rapidly.)



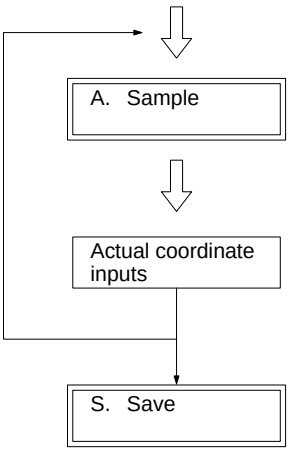
15. When the movement has been completed, press the Enter Key again. The circumscribed square will then change back to a circular window.



Sampling will be conducted at coordinate point (100, 0) of the graph paper, and coordinate 100 for the X axis and coordinate 0 for the Y axis will be input.

Sampling must be conducted at least twice. To improve precision, move the window also to the graph paper coordinates (0, 100) and (100, 100) and conduct sampling measurements there as well.

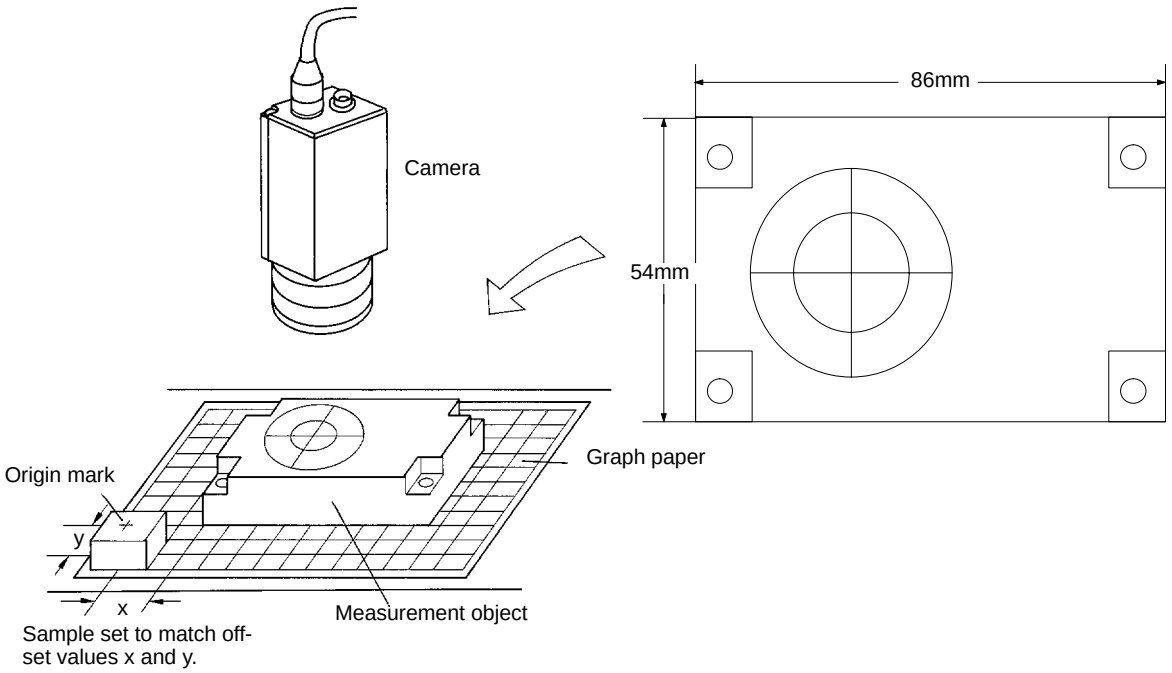
16. When the sampling is finished, be sure to execute “S. Save”. If the sample data is not saved in this way, it will be lost.



4-5-2 Calibration Setting by Inputting Coordinates

Settings can be made easily with this method, because coordinates can be input directly while observing the image of an object for which the dimensions are already known.

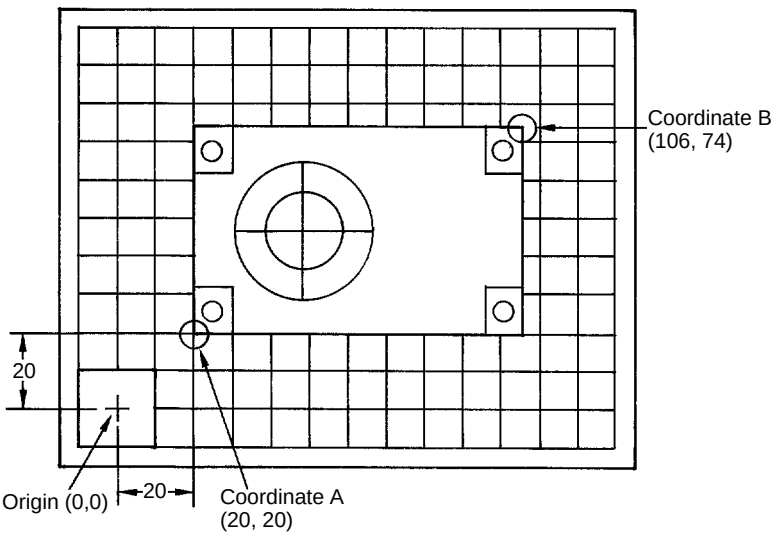
Example



Setting Procedure

1, 2, 3...

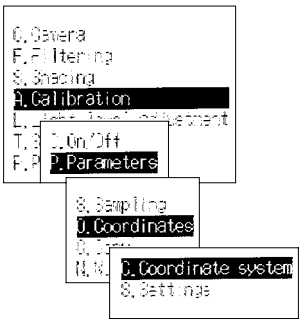
1. Measure the dimensions of the object in advance.
2. Put an origin mark on an object of the same height as the measurement object, and place that object within the field of vision.
3. Place the measurement object at the center of the field of vision. It is most effective to use graph paper and set the measurement object such that the offset value with respect to the origin is known.
4. Select from the menu to make the following settings.
   a) Unit system, coordinate unit.
   b) Origin specification, coordinate input.
   c) Coordinate A specification, coordinate input.
   d) Coordinate B specification, coordinate input.
5. Check the set values.
6. Save the settings.



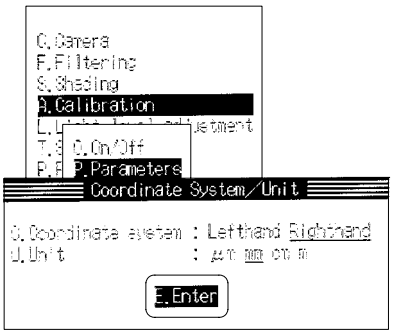
The following is an example based on the previous coordinate inputs.

1, 2, 3...

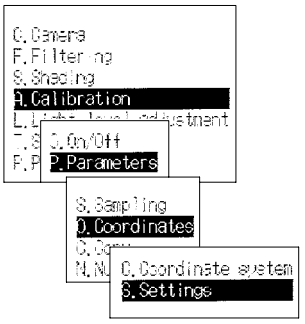
1. Select On from the “O. On/Off” menu, and then select “O. Coordinates” from the “P. Parameters” menu.
2. Select “C. Coordinate System” from the “O. Coordinates” menu.



3. Set the coordinate system and unit. In this example, “righthand” is selected as the coordinate system and “mm” is selected as the unit.

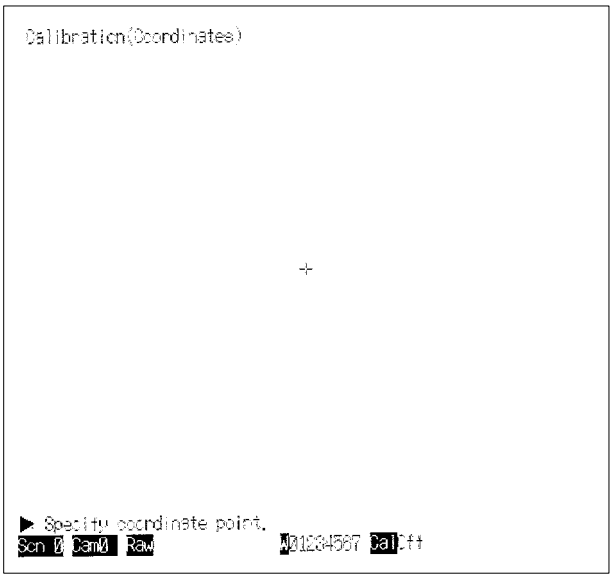


4. Select “S. Settings” from the “O. Coordinates” menu.



5. The menu for inputting coordinates will then be displayed. Select “O. Specifying Coordinates”.

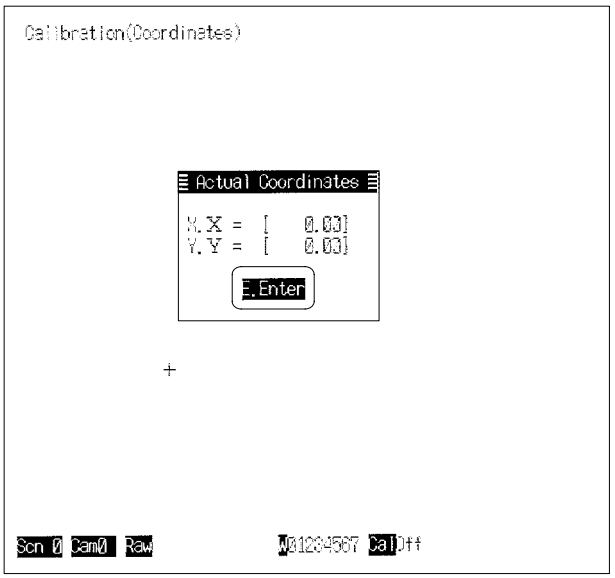
6. The cursor (+) will then appear in the center of the screen. Align the center of the cursor with the center of the origin mark on the screen.



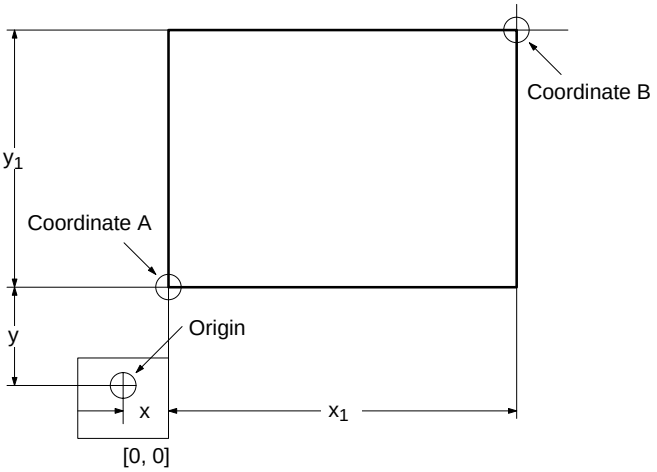
Once the coordinates have been specified, the dialog box for inputting the actual coordinates will be displayed.

7. Input the actual coordinates.

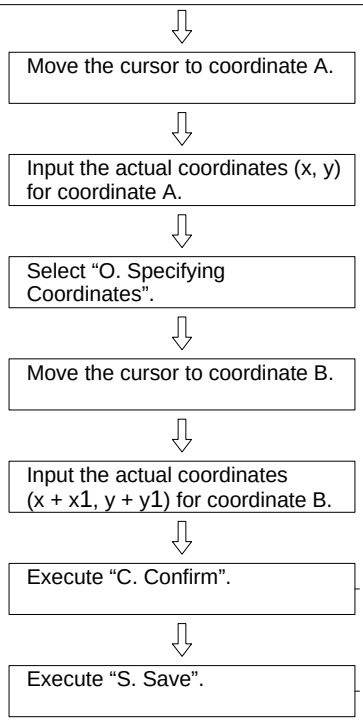
Because the initial value for the origin is (0, 0), it is not necessary to input the coordinates in this case.



8. Continue by inputting the other coordinates after the origin.



Coordinate A: [x, y]
Coordinate B: [x + x_1, y + y_1]



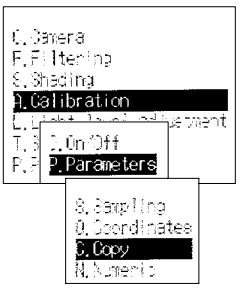
9. After setting the calibration, display the scale.

10. After the coordinates have been set, be sure to save the data by executing S. Save. If the data is not saved, it will not be set as calibration data.

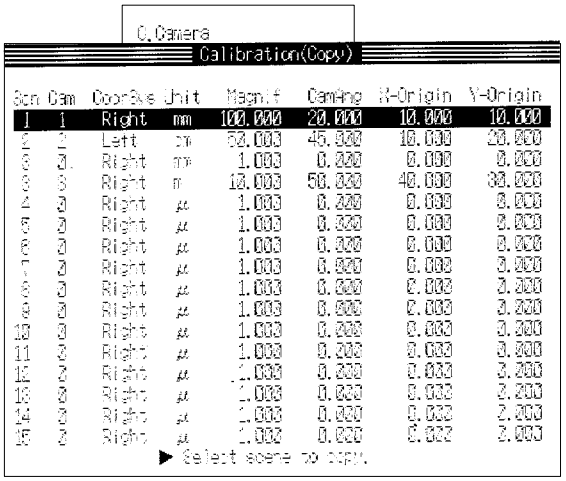
4-5-3 Copying Calibration Data

Calibration data set by the camera can be copied from other scenes.

1, 2, 3... 1. Select “C. Copy”.



2. When “C. Copy” is selected, a list will be displayed showing the calibration data that has already been set. Select the data to be copied.



3. Select using the Up or Down Keys and then press the Enter Key. Copying is complete.

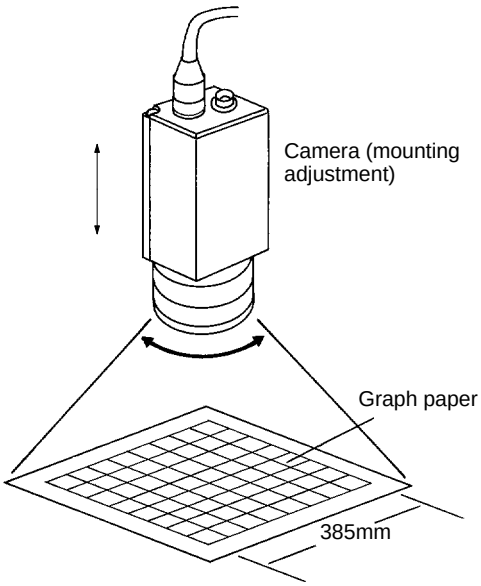
Note a) When scene data is copied, calibration data is copied along with it.

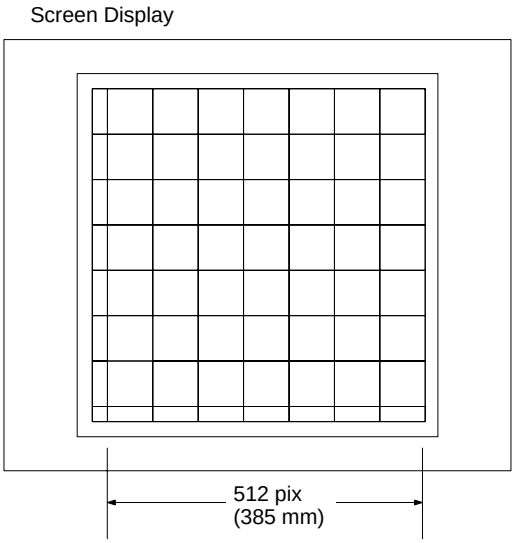
b) When copying calibration data, the On/Off status of the copy source will not be copied.

4-5-4 Calibration Setting by Numeric Input

Calibration can be set by numeric input, without making a sampling measurement, if the camera is set up with the field of vision determined in advance. In addition, even if the setting has been made by sampling measurement, numeric input can be used to check and modify the set values.

Example



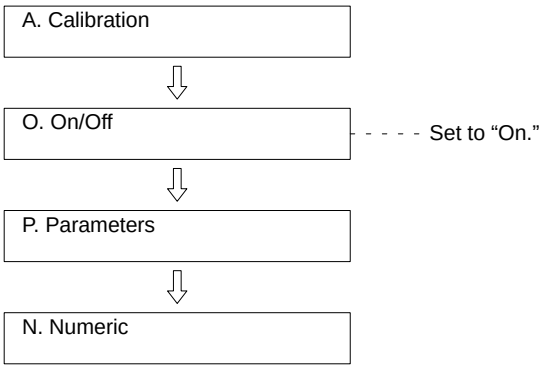


1, 2, 3... 1. Place graph paper over the measurement surface, and observe the image while adjusting the camera position so that it fits the field of vision.

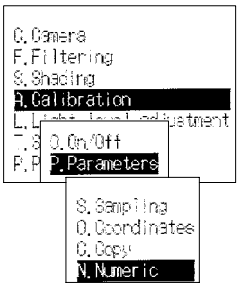
2. When the optimum field of vision is obtained, read the X-axis dimensions in the field of vision. This value divided by 512 (the number of pixels along the X axis) will be the magnification ratio.

   For example, when the X-axis dimension is 385 mm:
   Magnification ratio = 385 ÷ 512, which approximately equals 0.75195 mm/pix

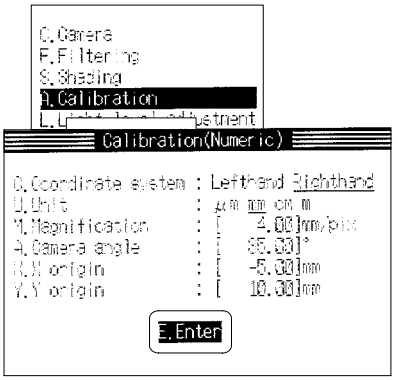
Setting Procedure



1, 2, 3... 1. Select “N. Numeric”.



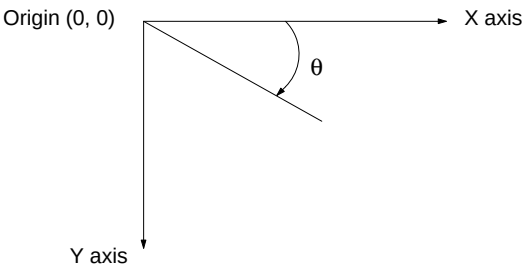
2. Input the respective calibration data.



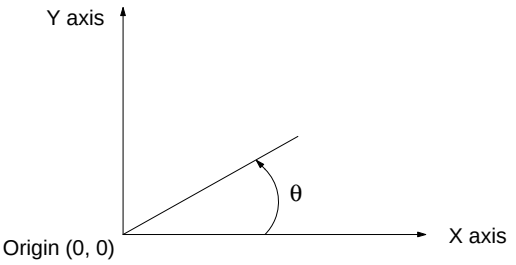
The calibration data to be entered is as follows.

a) Coordinate System:

- Lefthand



- Righthand

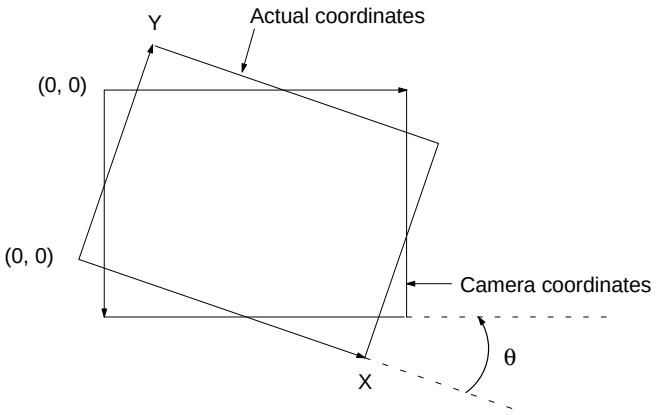


b) Coordinate Unit:
Select the coordinate unit from among μm, mm, cm, and m.

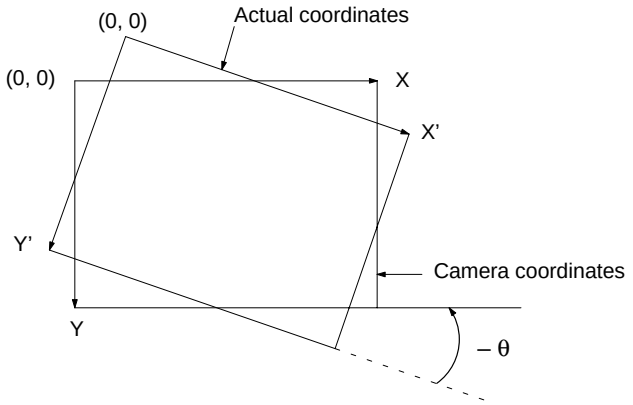
c) Magnification:
Set the actual measurement length per pixel.

d) Camera Angle:
The discrepancy between the coordinate axes for the camera coordinates and the actual coordinates can be displayed.

- Righthand

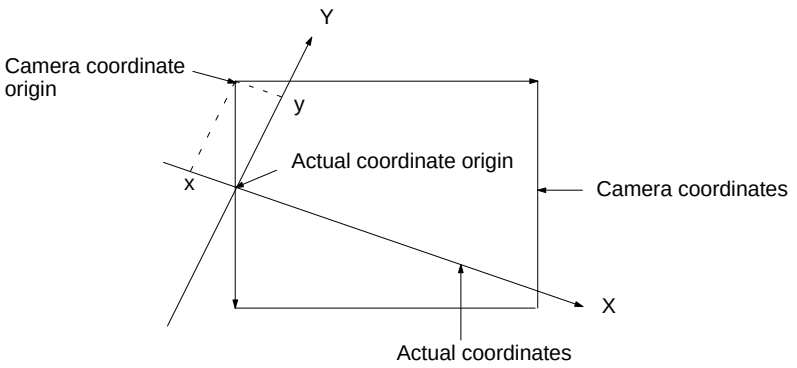


- Lefthand

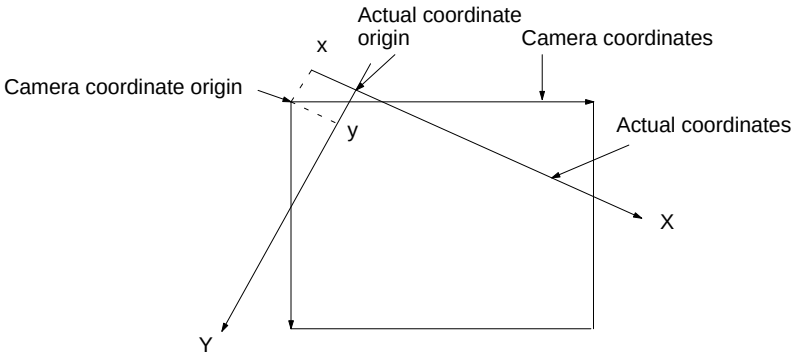


e) X Origin/Y Origin:
The coordinates for the camera coordinate origin as seen from the actual coordinates can be displayed.

- Righthand:
The values of the camera's X-axis origin and Y-axis origin (x and y, respectively) are displayed.



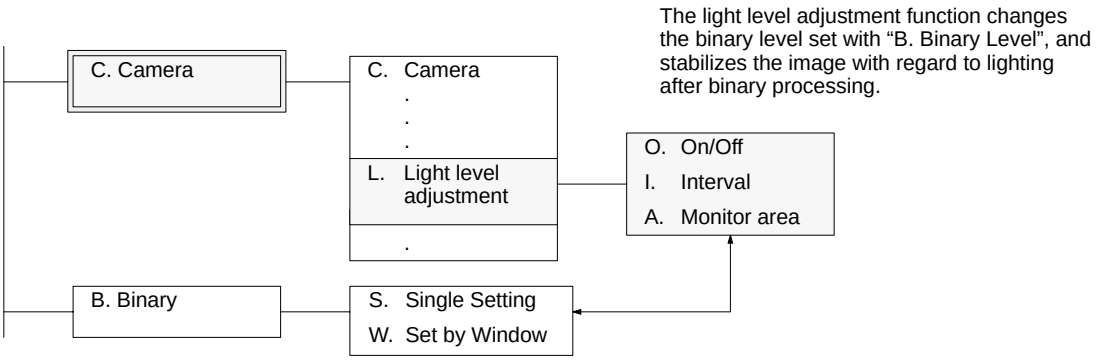
• Lefthand:



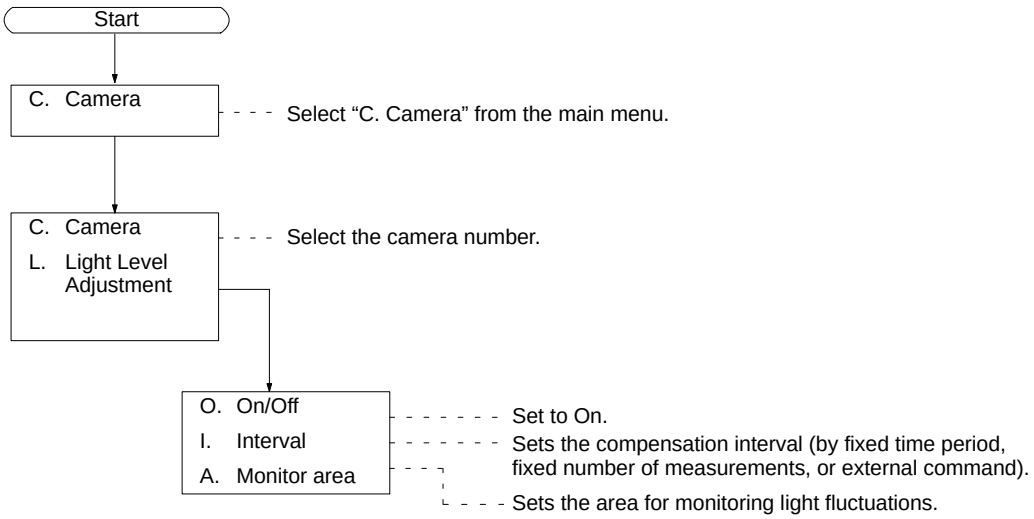
4-6 Light Level Adjustment

The light level adjustment function helps prevent measurement errors resulting from light level fluctuations due to factors such as voltage fluctuations in lighting fixtures or changes in the operating environment. When the light level adjustment is set, with each fixed interval or fixed number of measurements the binary level will be changed based on the results of brightness measurements at monitoring areas, and the binary image will be held steady.

Related Menus



Menus and Setting Procedure



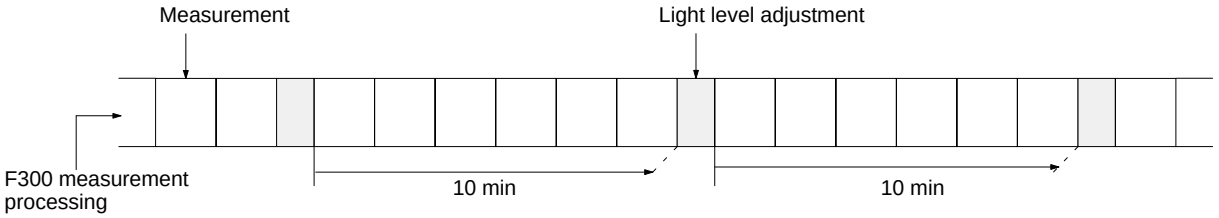
Menu Items

Item			Function
O. On/Off	O. ON/OFF		Select “On” to turn the light level adjustment on, and Off to leave it off. Even if this setting is “Off,” the set values below will not be cleared.
	E. Enter		
I. Interval	M. Execution Interval	Time	Revises the binary level at fixed time periods.
		Freq	Revises the binary level with each fixed number of measurements.
		Command	Revises the binary level based on external commands.
	I. Interval		Sets the time unit for the execution interval when the compensation is made in fixed time periods.
	F. Frequency		Sets the number of measurements to be used as the interval when the compensation is made with every fixed number of measurements.
A. Monitor Area	O. Draw		Sets the area (rectangular) for monitoring light fluctuation. Make sure that this area is not affected by the presence of the measurement object.

Note

1. For F300 measurement, light level adjustment processing is executed immediately after the set interval.
2. When “Time” is selected from the “M. Execution Interval” menu, only the setting for “I. Interval” will be valid. When “Freq” is selected, only the setting for “F. Frequency” will be valid. When “Command” is selected, both “I. Interval” and “F. Frequency” will be valid.
3. The results of brightness measurement in the monitoring area, obtained at the time of saving the reference image under the “O. Conditions” menu, are taken as the standard when the light level adjustment is executed. Therefore, if you want to execute the light level adjustment, be sure to save the reference image.

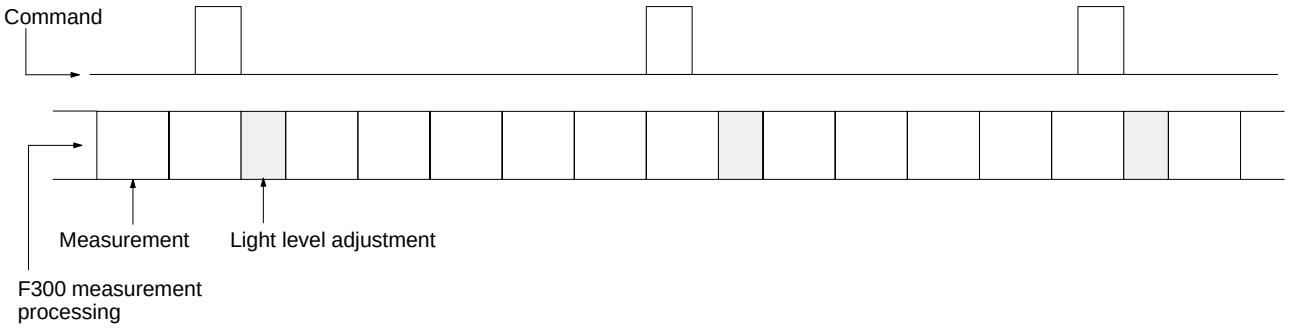
10-Minute Execution Time Interval Example



Measurement Example Where the number of measurements = 5.

External Input Example

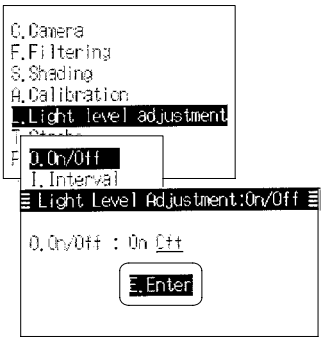
Light level adjustment can be executed at any time by means of key inputs or commands from the console, keyboard, Parallel I/O Unit, RS-232C I/F Unit, and so on.



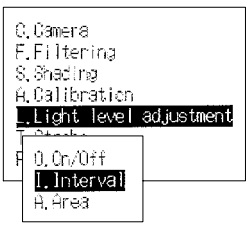
Setting Procedure

1, 2, 3...

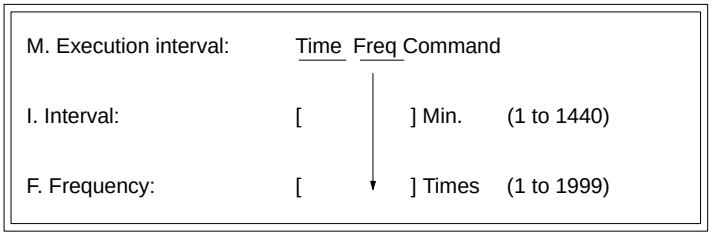
1. Select the camera number, and then select “L. Light Level Adjustment” from the menu.
2. Select “O. On/Off” from the menu.
3. Set the light level adjustment to On.



4. Select “I. Interval”.



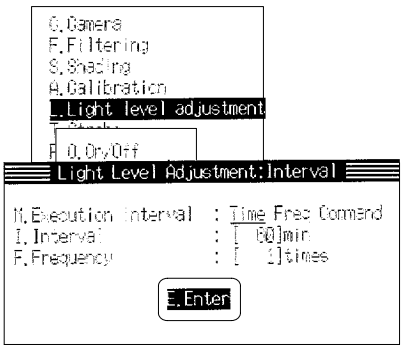
5. Set the timing for the compensation.



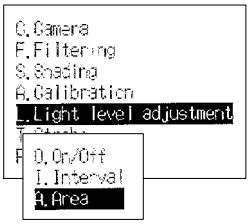
When “Time” is designated for the execution interval, “I. Time interval” is set.

When “Freq” is designated, “F. Frequency” is set.

When “Command” is designated, the setting is made by input from an external device, under the “M. Measurement” menu.

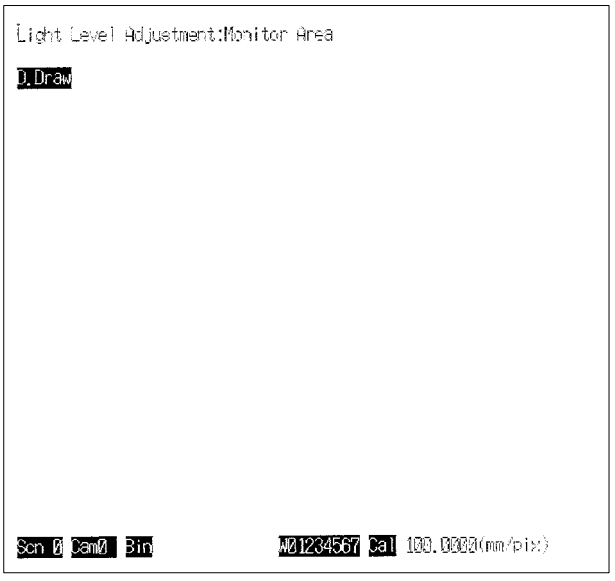


6. Select “A. Area” from the menu. This creates the area in which to measure lighting changes.



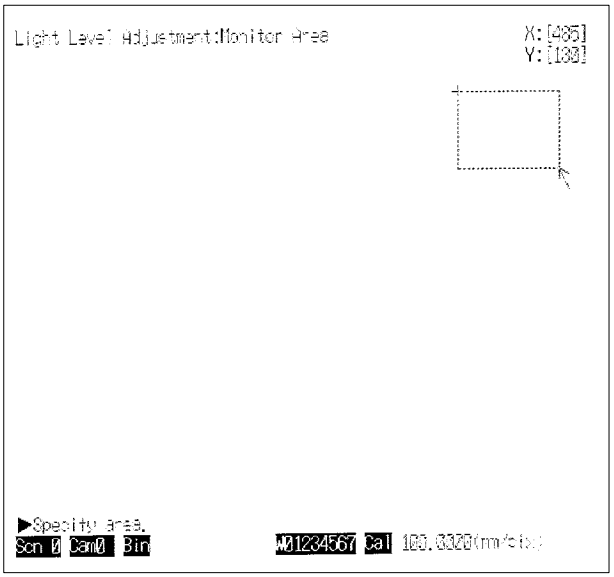
The menu for setting the monitor area will be displayed.

7. When “O. Draw” is selected, a message will be displayed in the comment line asking you to designate a square area.



8. Designate a square in an area that will not be affected by the presence of the object that is to be measured.

When the starting and ending points are designated, the dotted line will be changed to a solid line.

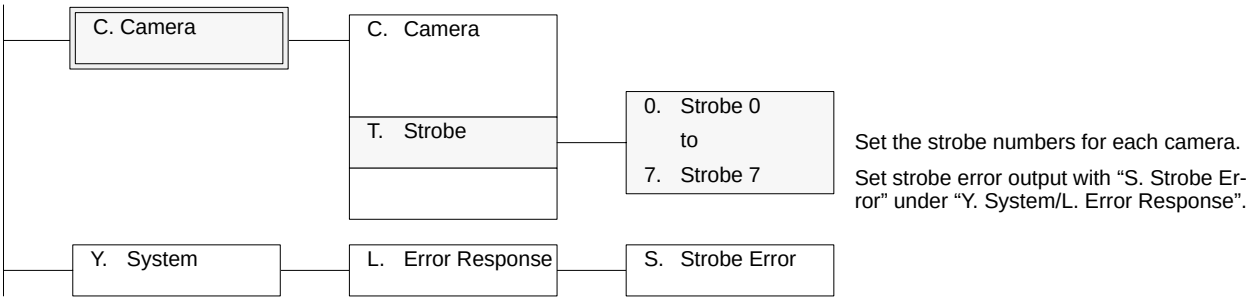


9. When you have finished designating the area, press the Escape Key to exit the menu. Setting is complete.

4-7 Selecting Strobes

When using strobes for measurement, select the numbers of the strobes to be used. This setting must be made separately for each camera. Multiple strobes for a single camera can be used.

Related Menus

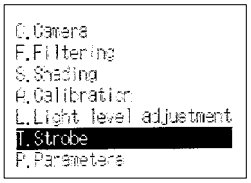


Set the strobe numbers for each camera.

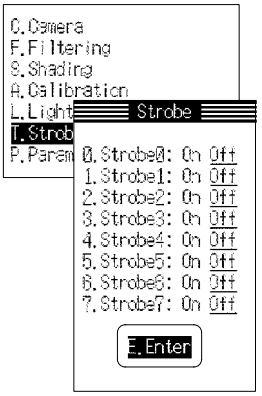
Set strobe error output with “S. Strobe Error” under “Y. System/L. Error Response”.

Settings

1, 2, 3... 1. Select “T. Strobe” from the “C. Camera” menu.

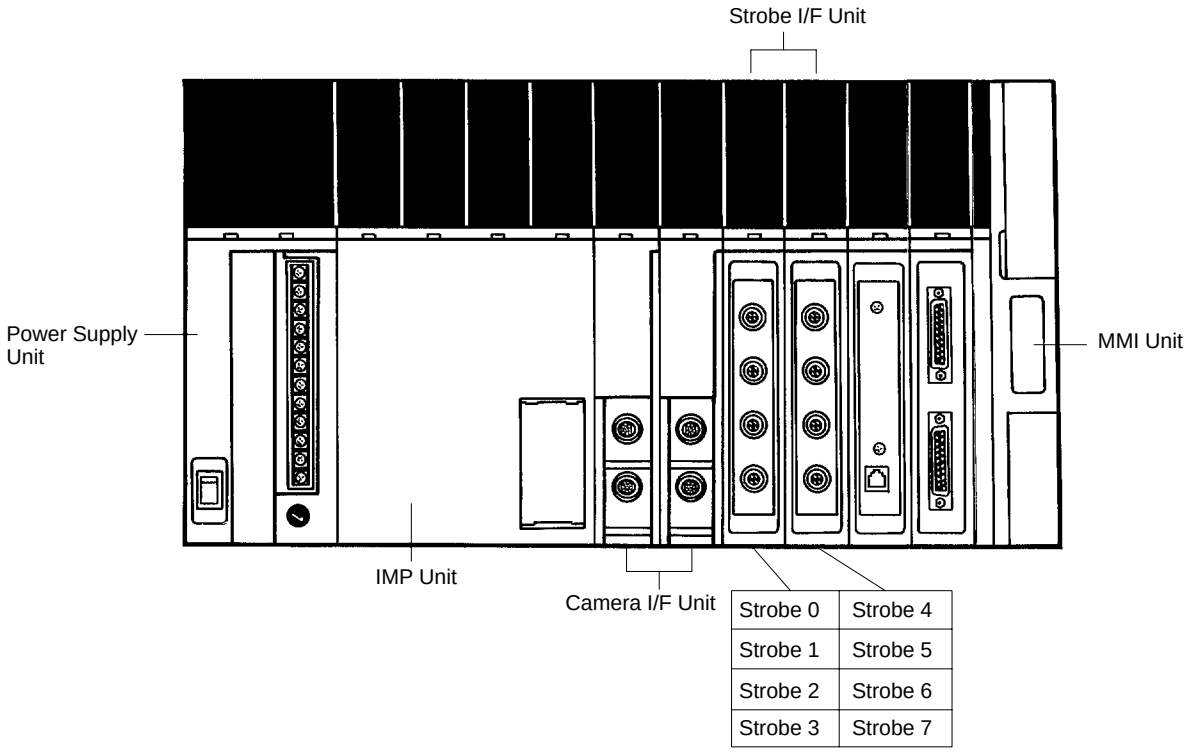


2. Set to “On” the numbers of the strobes to be used. Multiple strobes for a single camera can be selected, and the same strobe for other scenes or cameras can also be designated.



Strobe Numbers

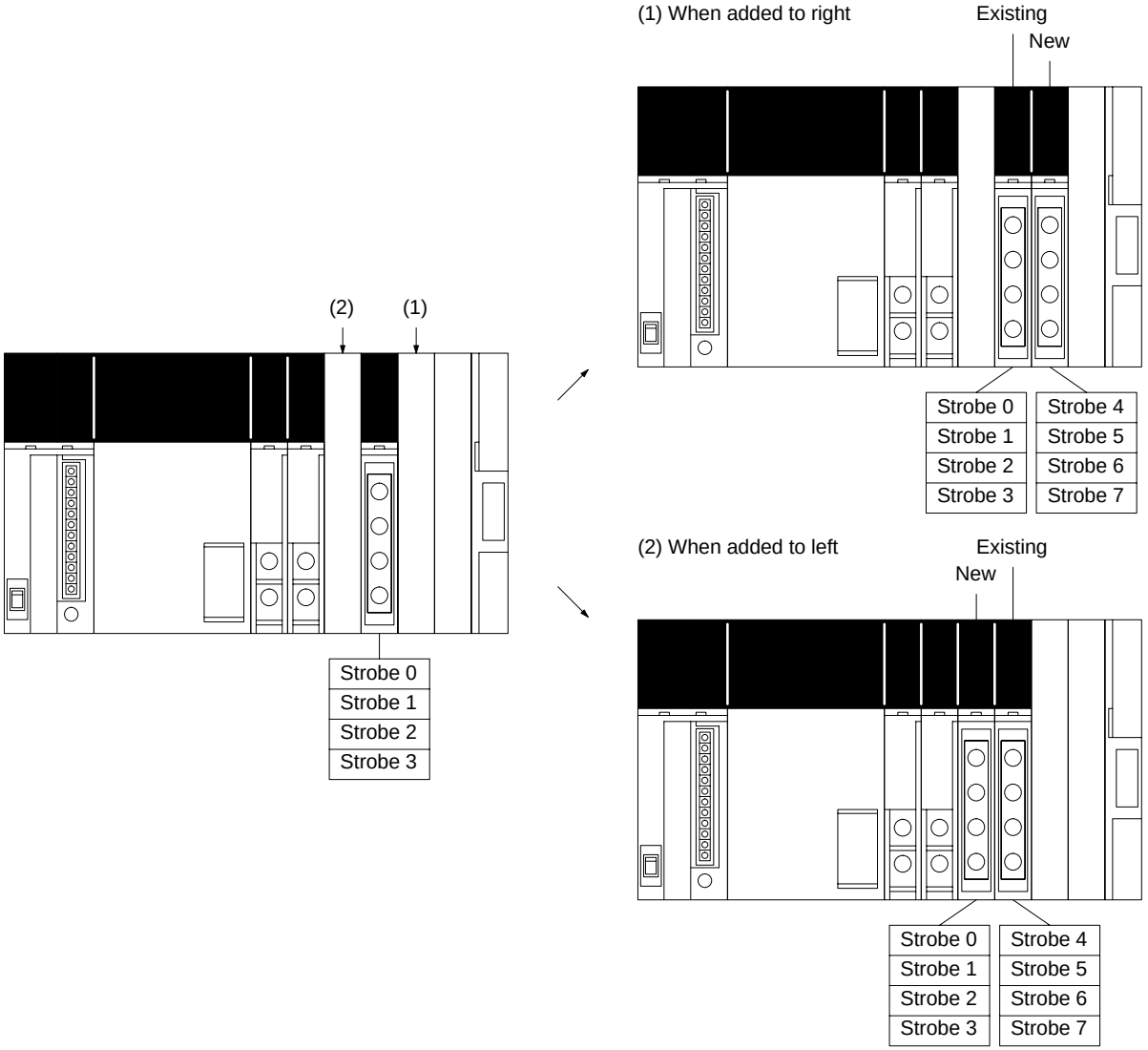
Strobe numbers are determined by the order in which the Strobe I/F Units are mounted, and by connector positions. As can be seen in the illustration, a single Strobe I/F Unit holds four strobes. The four strobes in the Strobe Unit mounted nearest the IMP Unit will be numbered from 0 to 3, and the four strobes in the other Strobe I/F Unit (mounted in one of the remaining slots, farther from the IMP Unit) will be numbered from 5 to 7.



Strobe 0	Strobe 4
Strobe 1	Strobe 5
Strobe 2	Strobe 6
Strobe 3	Strobe 7

A maximum of two Strobe I/F Units can be mounted in any of the slots between the IMP Unit and the MMI Unit. When adding a new Strobe I/F Unit to an existing

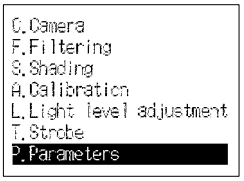
system, pay attention to the effect that the mounting position will have on the relationship between strobe numbers and connectors.



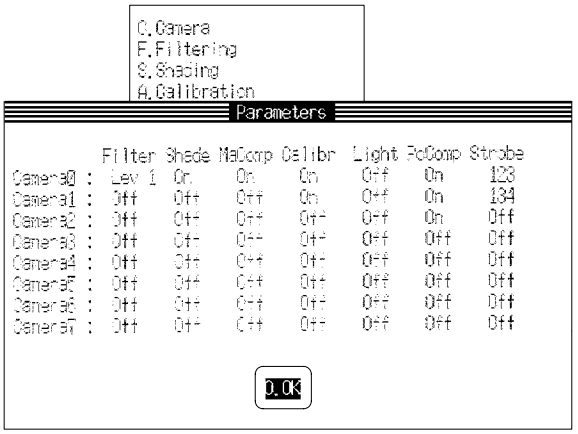
4-8 Displaying Parameters

The contents of camera data can be checked by displaying it in the form of a chart.

Select “P. Parameters”.



A list showing camera data settings will be displayed. This list is only for checking the settings. Changes in the set values cannot be made.

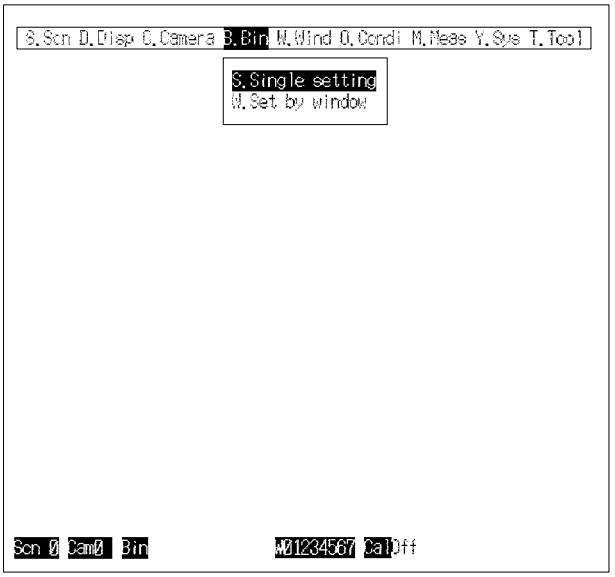


SECTION 5
Setting the Binary Level

This section provides the procedures required for setting the binary level.

5-1 Binary Processing

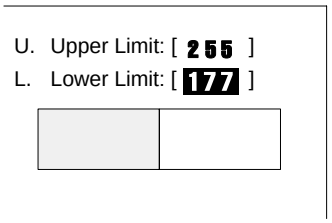
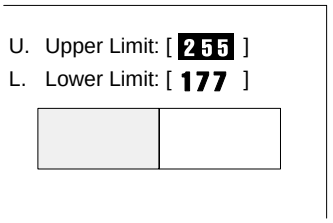
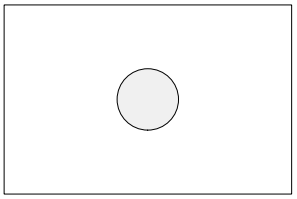
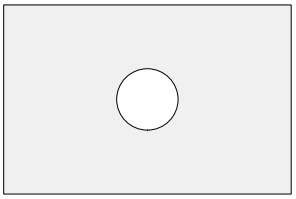
When the F300 measures items such as area, center of gravity, or inclination, it is the white pixels that it counts after binary processing. Here, binary processing refers to the separation into black and white of the raw image taken from the camera.



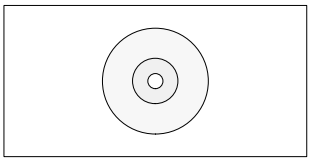
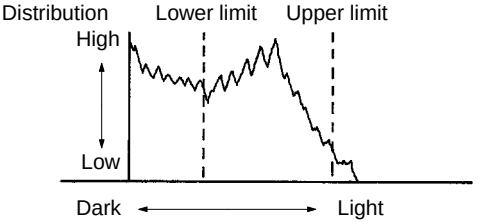
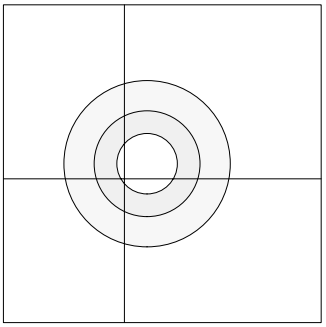
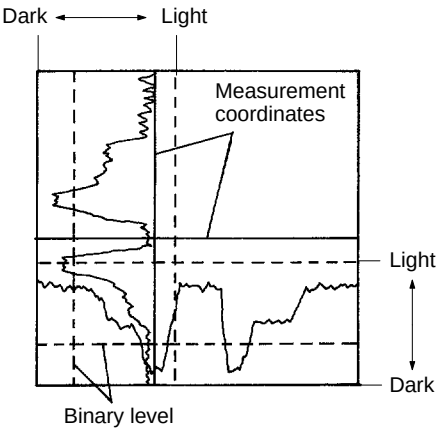
Menu Items

Item	Settings	Reference
S. Single setting	Sets the same binary level for all the window planes that have been set with the camera number presently displayed on screen. Be careful about making this setting after the settings have already been made for individual windows. This setting will change the binary levels for all of the windows.	Refer to 5-2
W. Set by window	Makes a separate binary level setting for each window plane.	Refer to 5-3

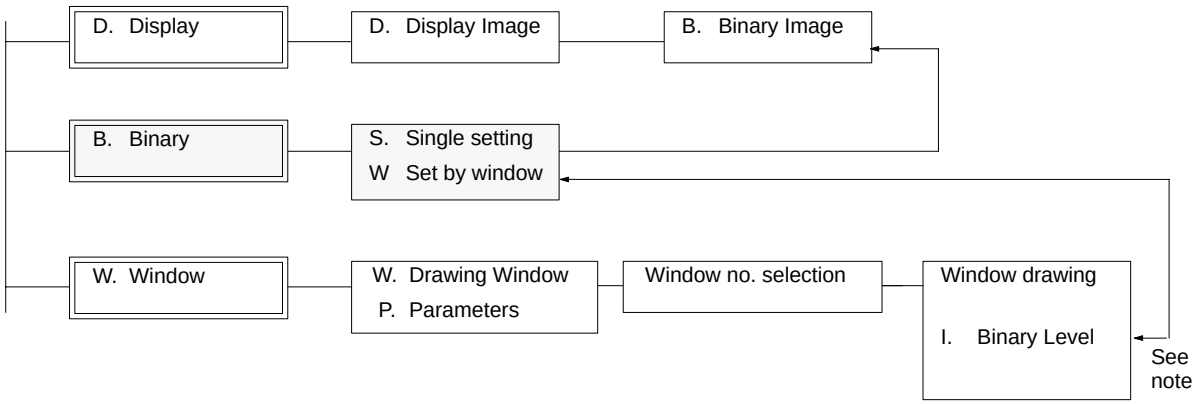
Comment Line

Key combination	Function
Shift Key+Enter Key (Automatic level setting)	Automatically sets the binary level to clearly distinguish dark and light. The setting can be made simply through F300 internal processing. When settings are being made separately for individual windows, this setting will apply only within the selected window plane.
Up/Down Keys (Upper and lower limits)	Use the Up and Down Keys to move the cursor to either “U. Upper Limit” or “L. Lower Limit”.  
Right/Left Keys (Dec./Inc. binary level)	Use the Right and Left Keys to decrease or increase the binary level.
Shift Key + Right/Left Keys (Dec./ Inc. binary level)	Use the Right and Left Keys with the Shift Key to decrease or increase the binary level by 10 units.
Shift Key+Up/Down Keys (Reverse black and white)	Reverses the display of black and white pixels. The white pixels are what the F300 measures, so be sure to reverse the display when measuring a dark object. When settings are being made separately for individual windows, only the pixels within the selected window plane will be reversed.  
Shift Key+Escape Key (Auxiliary tools)	Displays the menu for auxiliary tools.

Auxiliary Tools

Item	Function
N. Normal	Returns to the normal binary level setting screen which does not display histogram or line brightness.
H. Histogram	Displays as a graph the light distribution levels within a specified range on the screen. The upper and lower limits can be set while observing the histogram.  Range setting 
L. Line Brightness	Displays as a graph the brightness levels along any X or Y axis on the screen. The upper and lower limits can be set while observing the line brightness diagram.  Coordinate setting 
T. Strobe	Sets the flash period for the binary level setting, when “U. Unfreeze” is set. (“U. Unfreeze” can be selected from “F. Freeze” under the “D. Display Image” menu.)

Related Menus



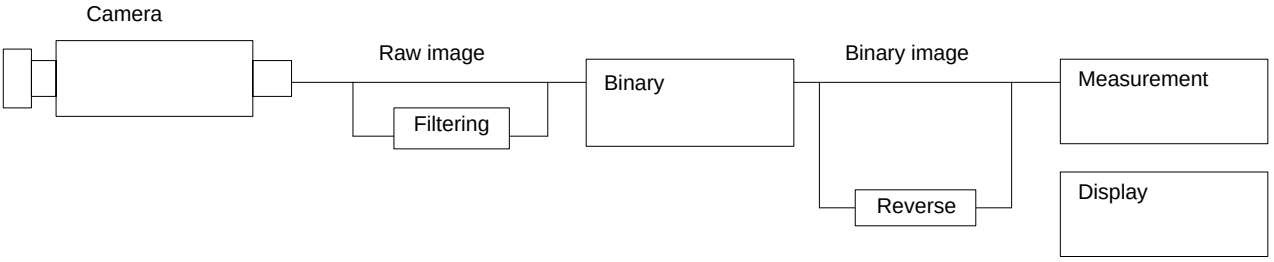
Note

1. Before setting the binary levels for separate windows, it is necessary to create the windows that are to be used with the “W. Window” menu.
2. The binary levels set with “I. Binary Level” and “W. Set by window” actually represent the same setting. It makes no difference which of these is set. Operations executed afterwards will be saved as scene data.
3. If the binary level is set with “S. Single Setting” after binary level settings have already been made for individual windows, all of those previous settings will be changed.

Binary Level Setting Procedure

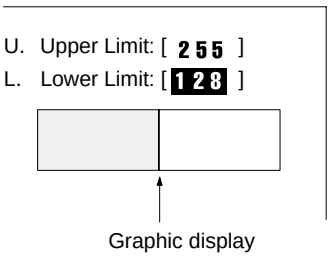
Binary processing is the process of separating a raw image into black and white pixels. Because the F300 measures only white pixels, it will be necessary to reverse the black and white pixels if the object to be measured is darker than its surroundings.

Image Processing Flow



Binary Level Settings

To set the binary level, adjust the upper and lower limits while observing the respective images.



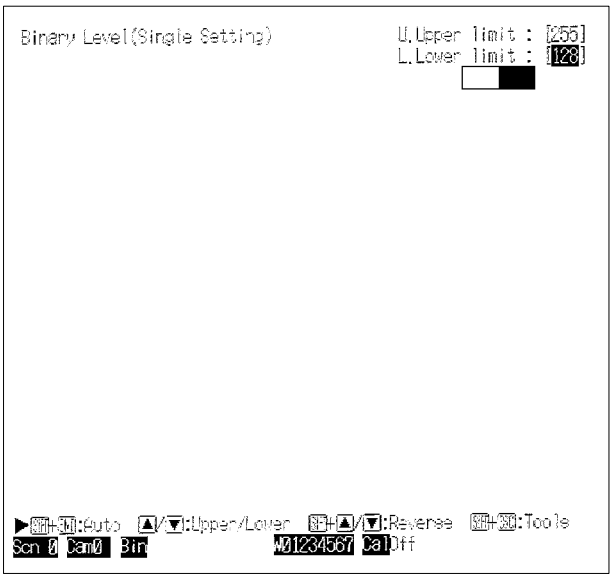
Upper and lower limits:	Up/Down Keys
Binary level:	Right/Left Keys
Automatic level setting:	Shift Key+Enter Keys
White/black reversal:	Shift Key+Up/Down Keys
Auxiliary tools:	Shift Key+Escape Key

5-2 Single Settings

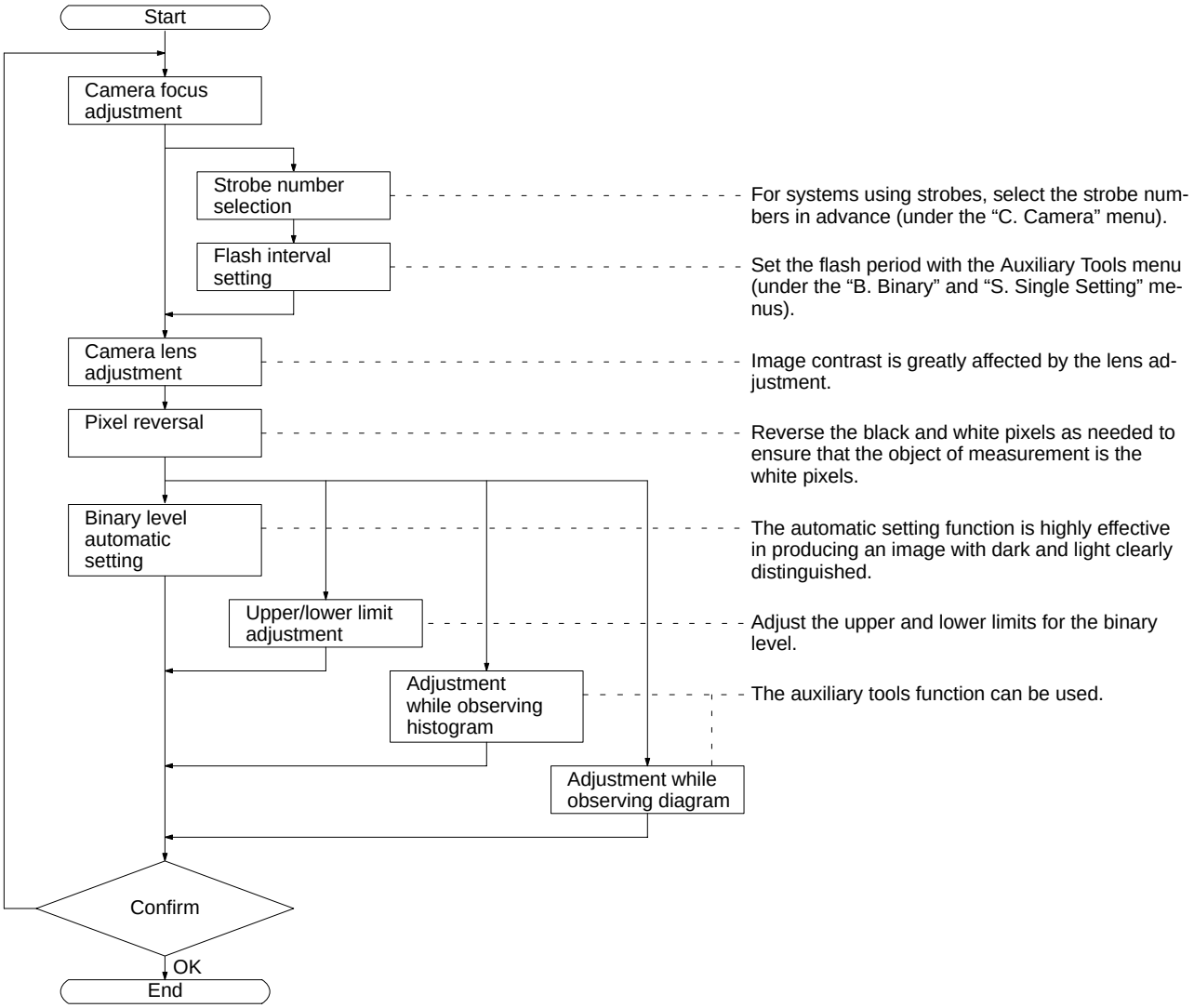
Sets the same binary level for all the window planes that have been set with the camera number presently displayed on screen. If it is executed after separate settings have already been made for individual windows, then all of those windows will be set to the same binary level.

1, 2, 3... 1. Select “S. Single setting” from the “B. Binary” menu.

2. Set the binary level while observing the image.

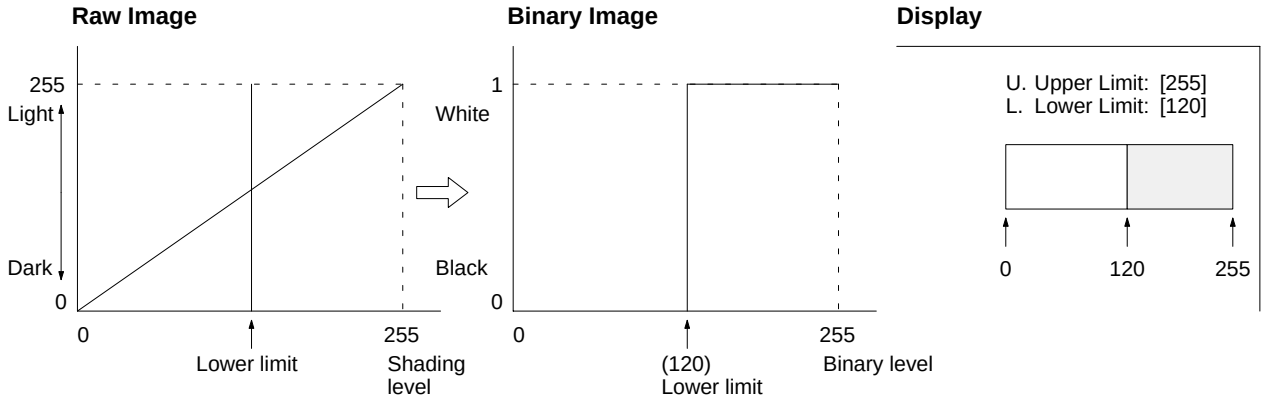


The procedure for setting the binary level and its upper and lower limits are as follows.



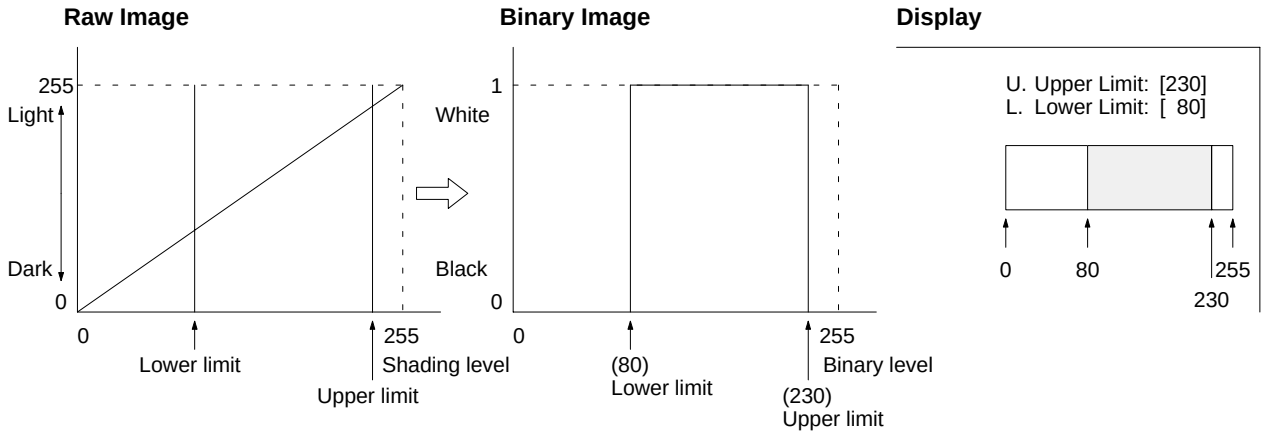
Examples on how to adjust the upper and lower limits are as follows.

Leaving the Upper Limit at 255 and Setting Only the Lower Limit



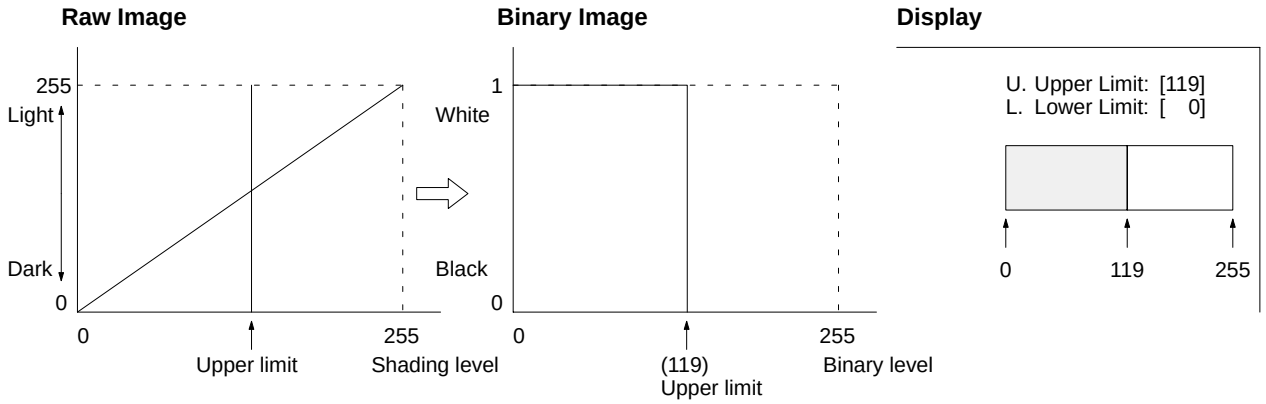
If the lower limit is set to 120, then the shading level region from 0 to 119 of the input image (i.e., the raw image) will be converted to black, and the region from 120 to 255 will be converted to white.

Setting Both the Upper and Lower Limits



If the upper limit is set to 230 and the lower limit to 80, then the shading level regions from 0 to 79 and 231 to 255 of the input image (i.e., the raw image) will be converted to black, and the region from 80 to 230 will be converted to white.

Leaving the Lower Limit at 0 and Setting Only the Upper Limit



If the lower limit is left at 0 and the lower limit is set to 119, then the shading level region from 0 to 119 of the input image (i.e., the raw image) will be converted to white, and the region from 120 to 255 will be converted to black. This would be the same as reversing the results of the processing associated with setting only the lower limit, as described previously.

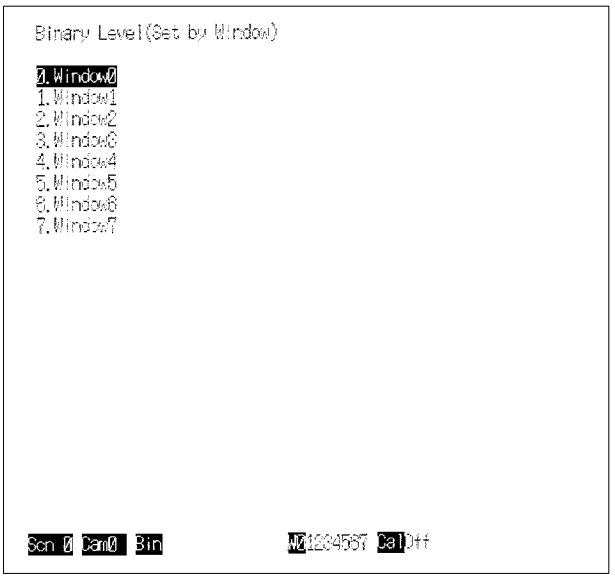
5-3 Setting by Window

The binary level can be set separately for individual windows. The windows must be created prior to making these settings. For instructions on creating windows, refer to *Section 6 Windows*.

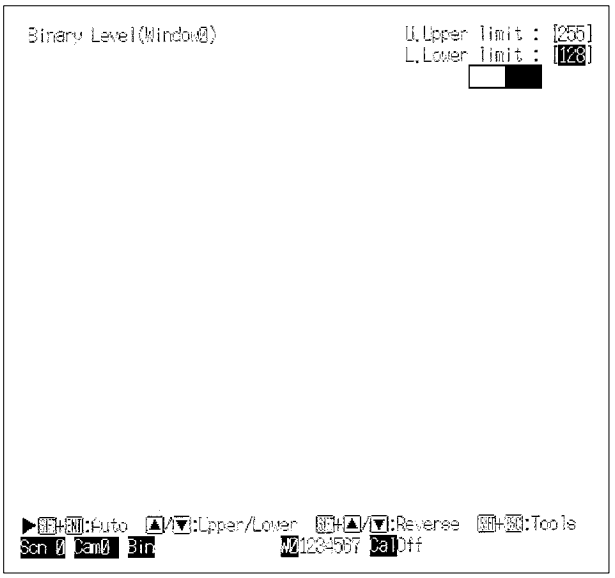
Setting Procedure

1, 2, 3... 1. Select “W. Set by window” from the menu.

The camera numbers currently being displayed will be displayed as window numbers set as input cameras.

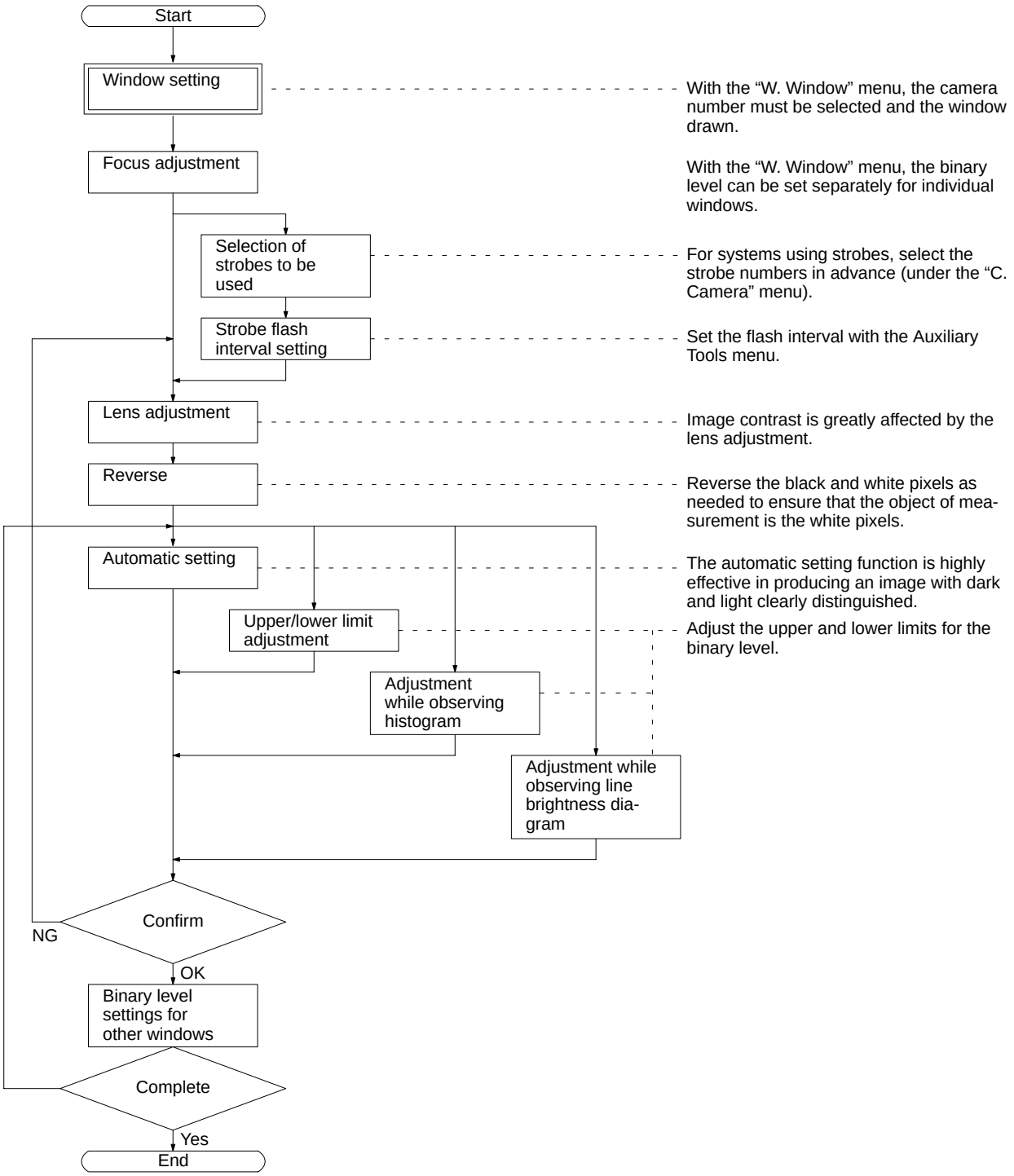


2. Set the binary level for each window while observing the image.



Note If the binary level is set with “S. Single Setting” after binary level settings have already been made for individual windows with regard to a particular camera, all of those previous settings will be changed.

Setting the Binary Level for Individual Windows



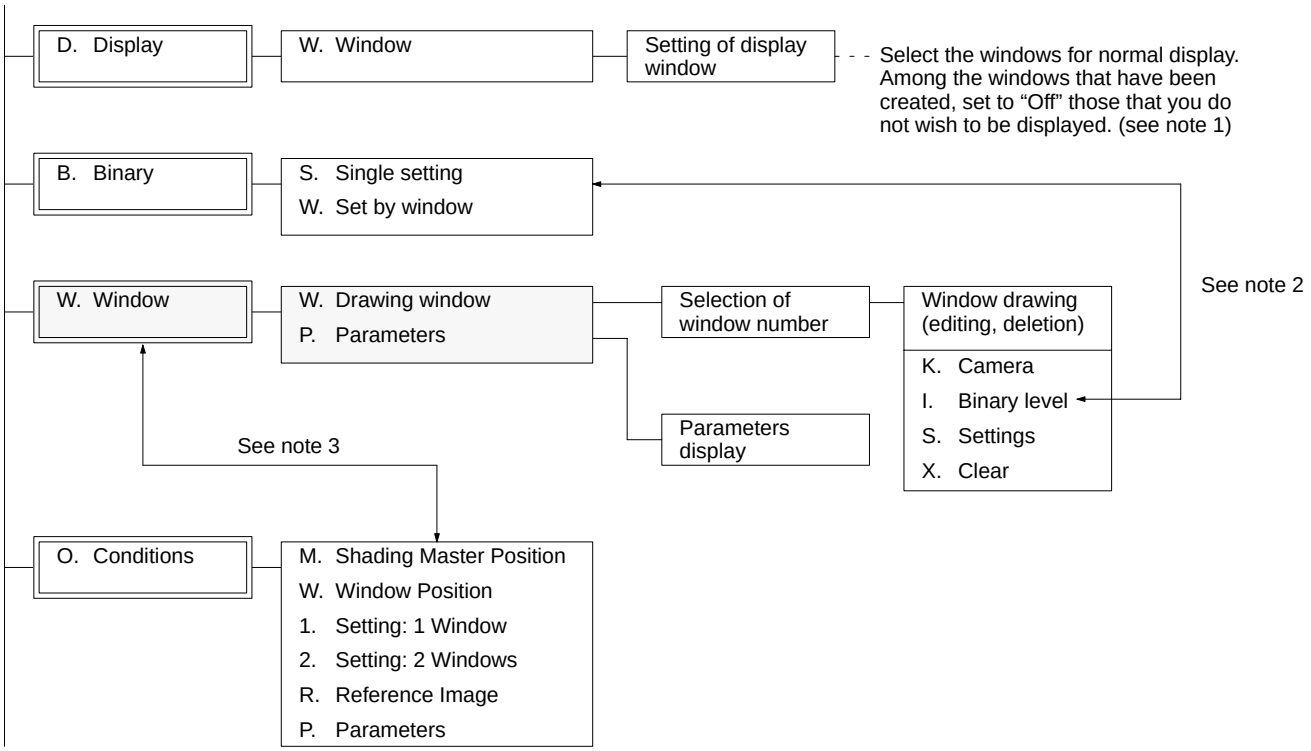
SECTION 6
Windows

This section provides the procedures and information required to perform window operations.

6-1 Before Creating Windows

Windows are used not only to specify the areas to be measured, but also to correct position displacement of the measurement object.

Related Menus



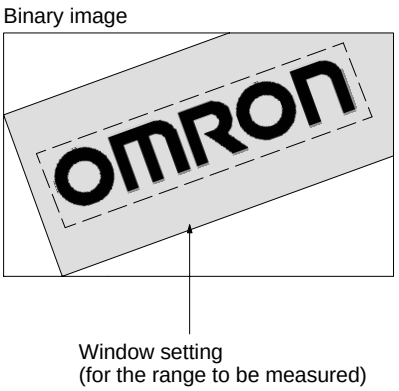
Note

1. "Display window no." under the "D. Display" menu is only a function for selecting the numbers of those windows that are not normally to be displayed. It has no relation to the actual time of measurement. The windows that are to be used for measurement are set under the "O. Conditions" menu.
2. The binary levels set with "I. Binary level" (under the "W. Window" menu) and "W. Set by window" (under the "B. Binary" menu) actually represent the same setting. Whichever one of these is set, whatever data is set last will be saved as scene data. If the binary level is set with "S. Single setting" (under the "B. Binary" menu), however, after binary level settings have already been made for individual windows, all of those previous settings will be changed.
3. The "O. Conditions" menu is for setting measurement conditions. Set the conditions based on the window data created under the "W. Window" menu.

6-1-1 Windows

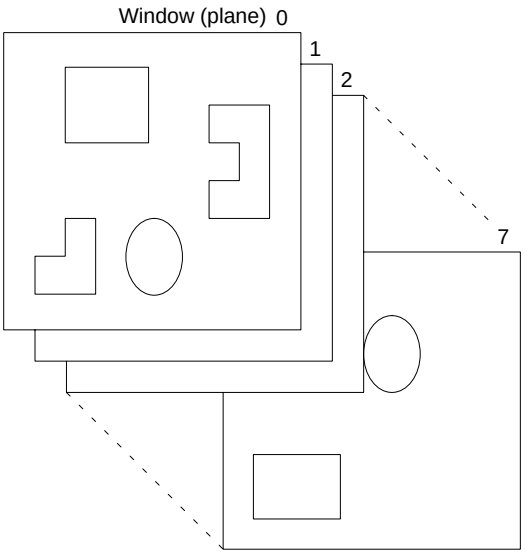
When measuring images, it is necessary to create windows. Only the white pixels of binary images within windows will be measured.

Windows can be created in shapes such as boxes, circles, arcs, polygons, or curved areas, or lines, curved lines, or points can be created for measuring single pixels.



The memory areas for creating window shapes are called “window planes” (or sometimes simply “windows” in this manual). There are eight window planes, numbered from 0 to 7, and they can be used independently in various scenes.

Multiple window graphics can be drawn within a single window plane.



6-1-2 Creating Windows

Besides simply measuring area, center of gravity, and inclination, windows can be used to correct position displacement.

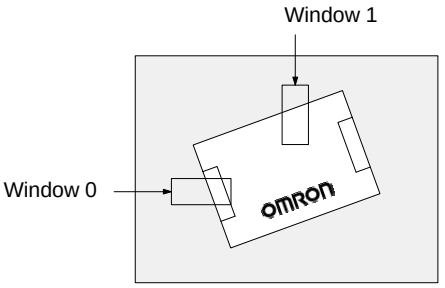
There are two types of position displacement correction. One is for shading masters, and the other is for reference images that have been saved.

When creating windows, the position and shape to be drawn must be considered and depends on what the window is to be used for.

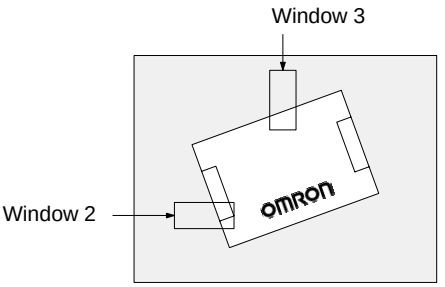
Window Usage Example

Window 0	Position corrected with regard to the shading master.
Window 1	
Window 2	Position corrected with regard to the reference image.
Window 3	
Window 4	Used for measurement. (using the window 7 paint function)
Window 5	Used for measurement.
Window 6	Not used.
Window 7	Synthesized with window 4.

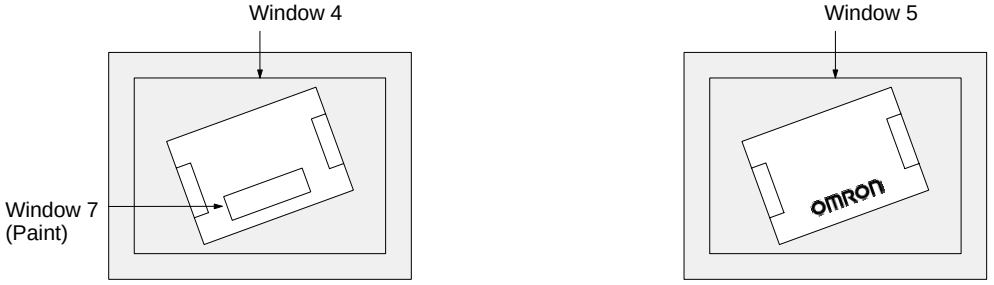
Windows for correcting the position of the shading master



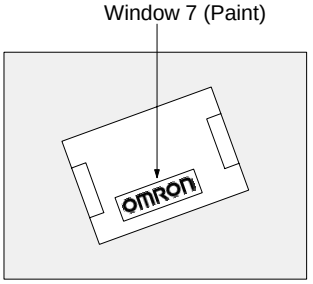
Windows for correcting the position of the windows used for measurement



Windows for measurement

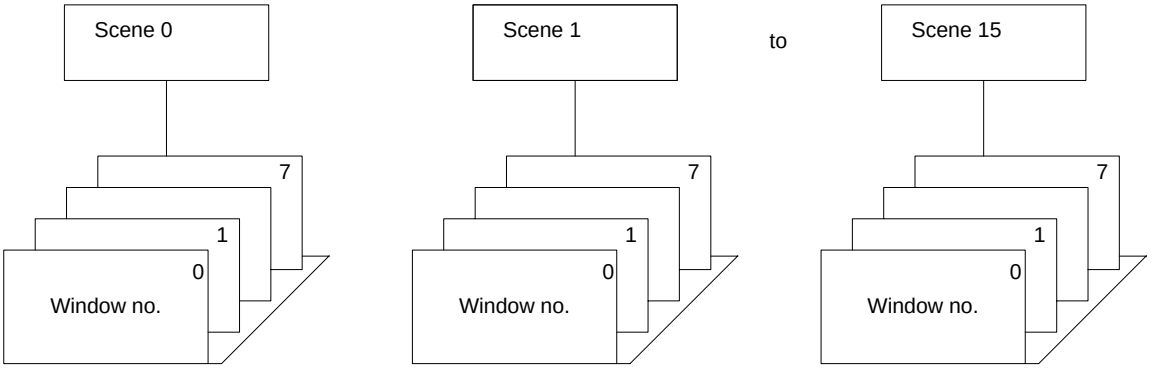


Paint window (used in combination with window 4)

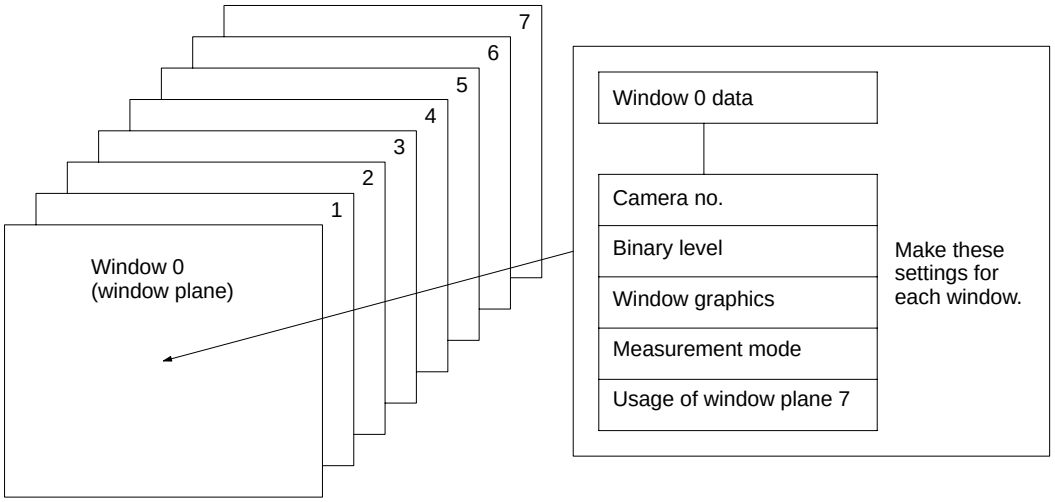


6-1-3 Window Numbers

Window planes can be set from 0 to 7 individually for each of scenes 0 to 15.



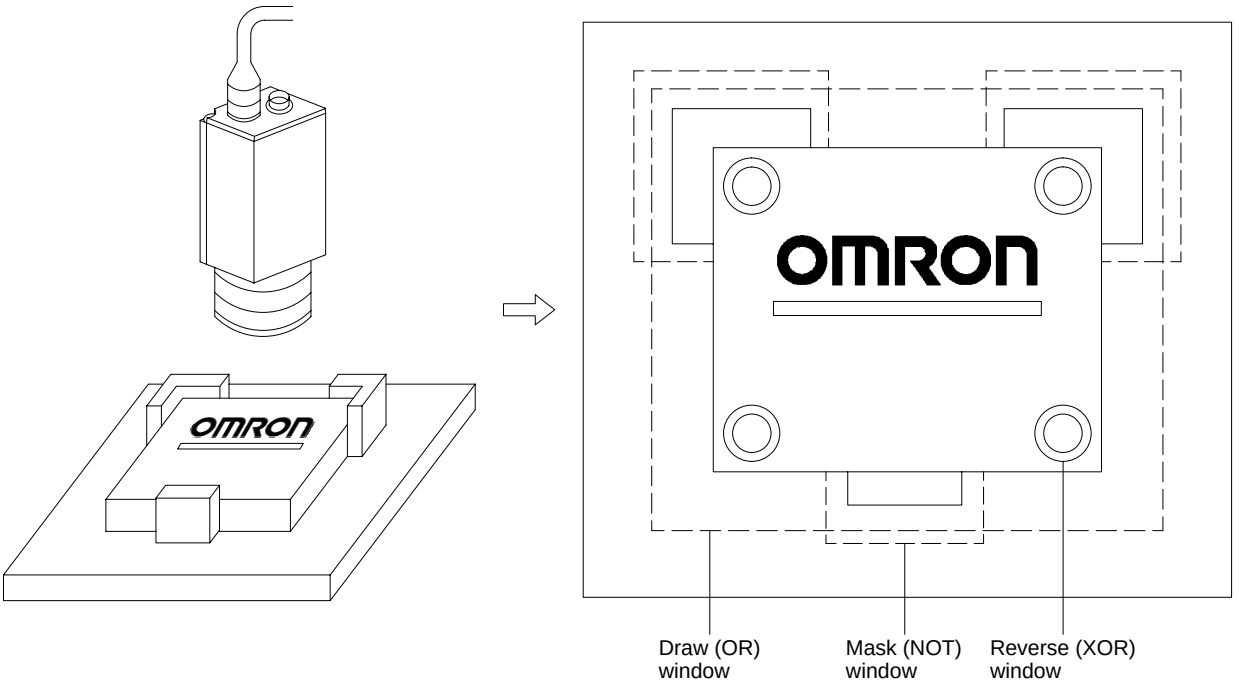
Multiple window shapes can be created for a single window plane. The data for the shape that has been drawn, the numbers of the cameras to be used, binary level, measurement mode, and the relationship to window plane 7 are all saved as window data.



Window plane 7 can be used as an ordinary window plane, but it can also be used as a paint window or a pattern matching window for complex measurements in conjunction with window planes 0 to 6.

6-1-4 Window Drawing Methods

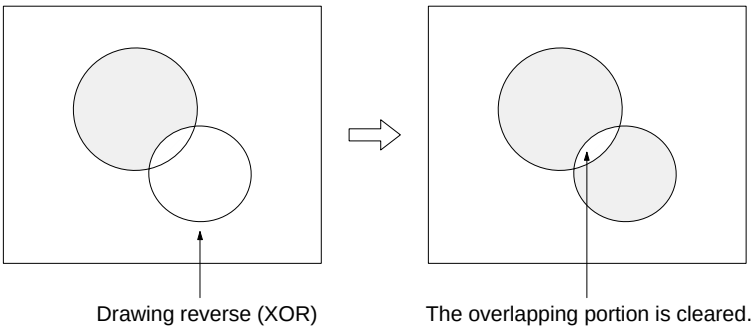
There are three methods for drawing windows: Draw (OR), Mask (NOT), and Reverse (XOR).



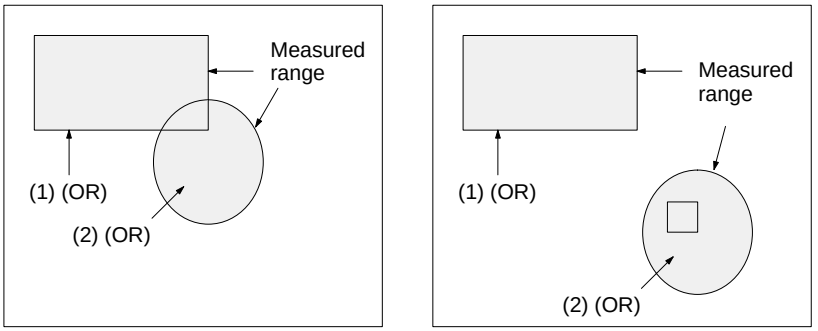
Draw (OR): Turns on the dots within the range of a designated figure. (Draws)

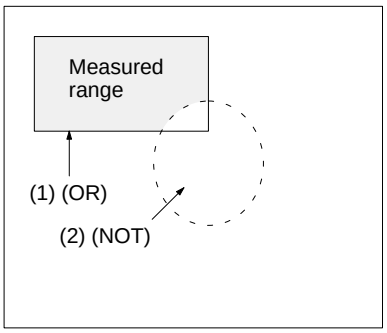
Mask (NOT): Turns off the dots within the range of a designated figure. (Clears)

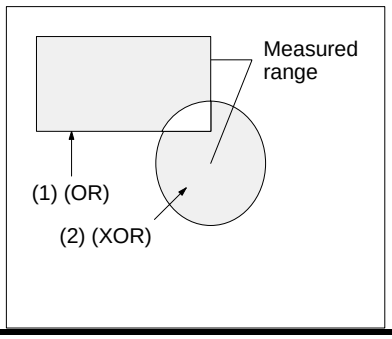
Reverse (XOR): Reverses a designated figure.



Window Drawing Modes

Mode	Function
O. Draw (OR)	Even if multiple windows are drawn in a single window plane, they will still function as a single window. 

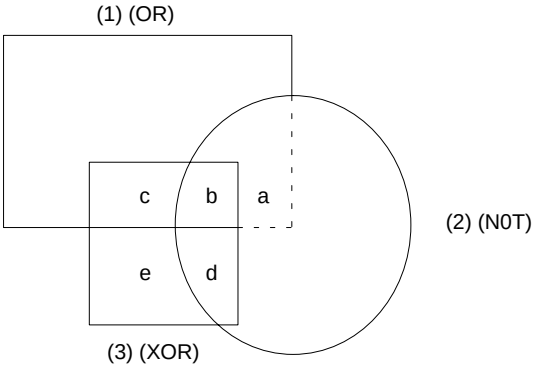
M. Mask (NOT)	Performs masking with regard to window shapes.
	If (2) (NOT) is drawn after (1) (OR) has already been drawn, the measurement range will be cut as shown in the illustration.
	If (1) (OR) is drawn after (2) (NOT) has already been drawn, window (2) will be ignored and the entirety of box (1) will be taken as the window.
	 

R. Reverse (XOR)	Overlapping portions of windows are cut. If (2) (XOR) is drawn so as to overlap (1) (OR or XOR), the overlapping portion will be excluded from the objects to be measured. 

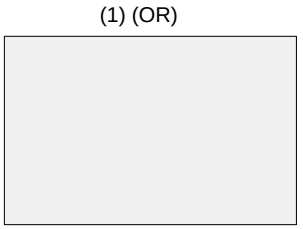
Window Drawing Modes and Order of Creation

The shape of a window will change according to the drawing mode and the order in which it is drawn. Special care is required when drawing windows with multiple overlaps or when moving, copying, rotating, or deleting them.

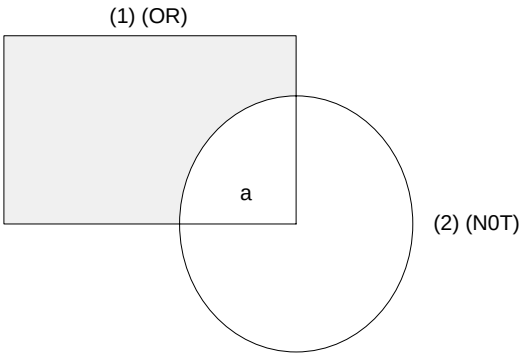
Drawing Example



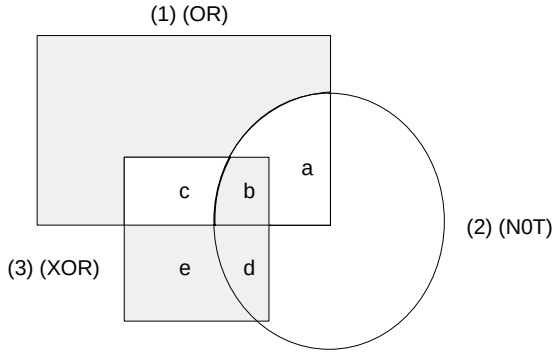
1, 2, 3... 1. Drawing a box (OR).



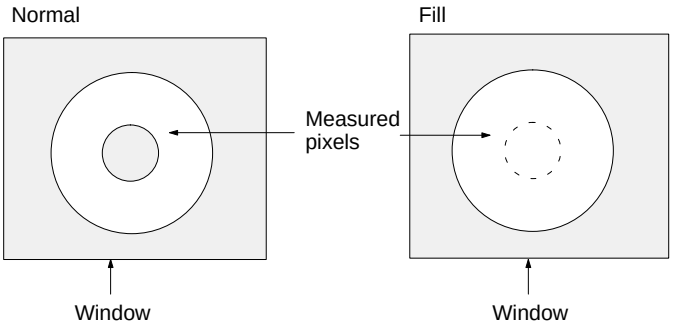
2. Drawing a circle (NOT).
   With NOT, because the shaded portion of the window that was drawn first will be cut, the “a” portion of the box will be cut out unconditionally.



3. Drawing a box (XOR).
   With XOR, the shaded portion of the window that was drawn first will be cut out and the remaining portion will be taken as the object of measurement. If a reverse window is created after a mask window, then the overlapped areas “b”, “d”, and “e” will be taken as objects of measurement.



6-1-5 Functions of Window Setting Menu

Item	Function		Reference
B. Box	Draws a box-shaped window.	You can select Draw (OR), Mask (NOT), or Reverse (XOR) as the window function.	Refer to page 86
C. Circle	Draws a circular window.		
A. Arc	Draws an arc-shaped window.		
P. Polygon	Draws a polygonal window.		
V. Curved area	Draws a curved window.		
L. Line	Draws a window in the shape of a continuous or single line.		
U. Curved line	Draws a window in the shape of a curved line.		
O. Point	Draws a window in the shape of continuous points or a single point.		
T. Object	The set of white pixels of an object that has been converted to binary can be designated as a window just as it is.		Refer to page 93
W. Drawing method	Sets the drawing method for boxes, circles, arcs, and lines, and selects continuous or single points.		Refer to page 95
M. Move	Moves windows that have been created.		Refer to page 87
R. Rotate	Rotates windows that have been created. Windows created by arcs or object generation cannot be rotated.		
Y. Copy	Copies windows that have been created. The newly copied window will have the same function (OR, NOT, or XOR) as the window that it was copied from.		
Z. Size	Enlarges or reduces the size of windows created by drawing or copying. This function will not work for windows that have been created or copied by object generation.		
D. Delete	Deletes either individually or as a group windows within a window plane.		
K. Camera	Selects the numbers of the cameras to be used by a window plane.		Refer to page 96
I. Binary level	The binary level can be set separately for each window plane.		Refer to page 97
S. Settings	Sets the attributes for the window plane. <u>Measurement Mode Setting</u> Normal: Measures only white pixels. Fill: Detects and measures the fill, ignoring the interior black pixels. <u>Special Operations For Window Plane 7</u> Paint: Measures figures drawn in window plane 7 by synthesizing them as white pixels. Pattern matching: Measures the number of pixels that do not match figures that have been drawn in window 7.  		Refer to page 99
X. Clear	Clears all data in window planes and returns to the initial values.		Refer to page 102

6-1-6 Window Drawing Methods

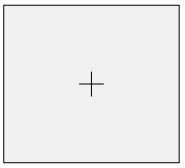
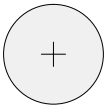
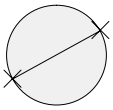
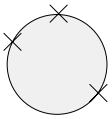
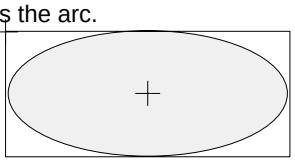
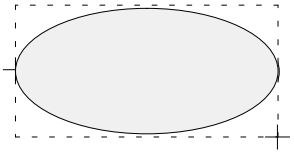
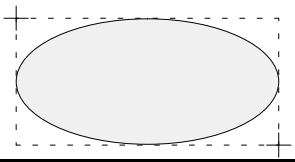
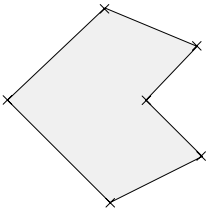
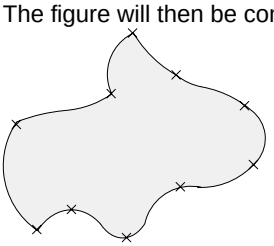
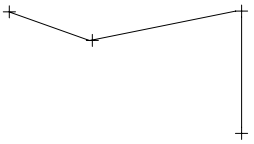
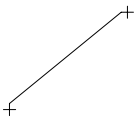
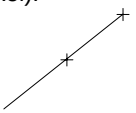
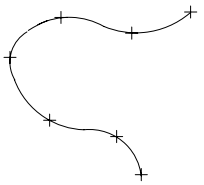
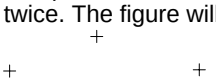
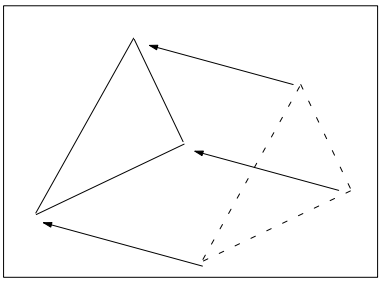
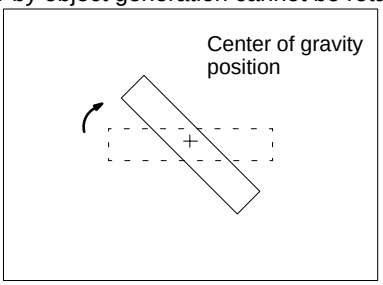
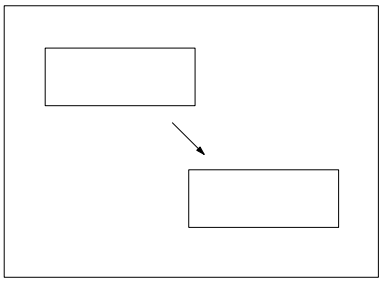
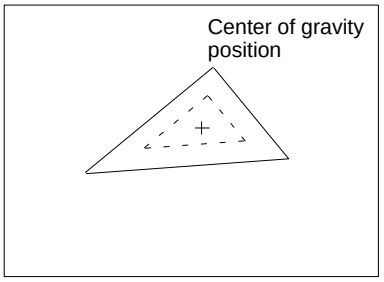
Figure	Item	Drawing method
B. Box	Two opposing corners (initial value)	Specify two opposing corners. As long as they are opposite from each other, it makes no difference which points are specified. 
	Center/corner	Specify the center position for the box, and then specify any corner. 
C. Circle	Center/circumference (initial value)	Specify the center position for the circle, and then specify any point on the circumference. 
	Two diameter points	Specify both ends of the diameter. 
	Three circumference points	Specify any three points on the circumference. 
A. Arc	Center/external corner (initial value)	Specify the center position, and then specify any corner of the external box that circumscribes the arc. 
	End point/external corner	Specify either the left or right end point for the arc, and then specify any corner of the external box that circumscribes the arc. 
	External corners	Specify opposing corners of the external box that circumscribes the arc. 

Figure	Item	Drawing method
P. Polygon	Specify the order of points. After specifying the end point, press the Enter Key twice to connect the end point with the starting point. The figure will then be complete. 	
V. Curved area	Specify the order of points. After specifying the end point, press the Enter Key twice to connect the end point with the starting point. The figure will then be complete. 	
L. Line	Continuous line (initial value)	Specify the order of points. After specifying the end point, press the Enter Key twice. The figure will then be complete. 
	Two end points	Specify any two points (for a straight line window with a width of one pixel). 
	Center/end point	Specify the center, and then specify either end point (for a straight line window with a width of one pixel). 
U. Curved line	Specify the order of points. After specifying the end point, press the Enter Key twice. The figure (a curved line window with a width of one pixel) will then be complete. 	
O. Point	Continuous points (initial value)	Draw continuous windows in 1-pixel units. After specifying the end point, press the Enter Key twice. The figure will then be complete. 
	Single point	Draw only a single-point window consisting of one pixel.

6-1-7 Editing Windows

Once a window has been created, it can be moved, rotated, copied, sized, or deleted. It is possible to edit multiple windows at the same time. After a window has been edited, the drawing mode (OR, NOT, or XOR) will not change.

Editing Functions

Item	Function
M. Move	Moves the window in a parallel direction. Windows created by drawing or by object generation can be moved. 
R. Rotate	Rotates the window. Windows created from arcs or by object generation cannot be rotated. 
Y. Copy	Copies an existing window to create a new one. Windows created by drawing or by object generation can be copied. 
Z. Size	Takes the center position as the base, and sizes the window both vertically and horizontally (in separate operations). Windows created by object generation cannot be sized. The line width of straight or curved lines cannot be sized. 
D. Delete	Windows can be deleted one at a time or all together. After windows have been deleted, the order of registration will be adjusted.

6-1-8 Precautions when Editing

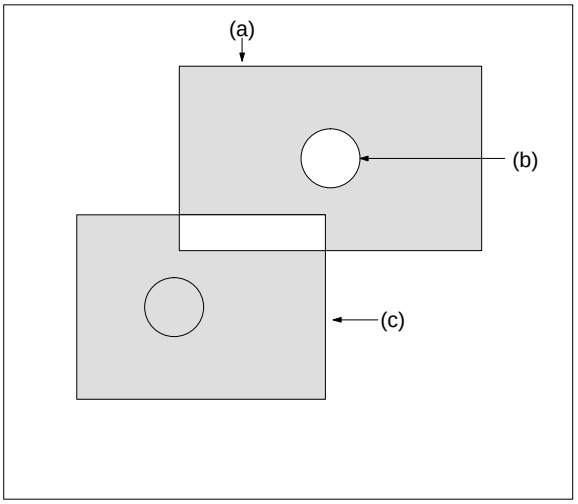
Window graphics are divided into various classifications (OR, NOT, and XOR). The classifying operation may be restricted depending on the order in which the windows have been created. Only the window shapes already created can be classified.

When a window is edited (e.g., moved, copied, rotated, sized, or deleted), any other windows that share an overlapping portion of that window will be affected.

Moving

When moving a mask window or a reverse window, the order of creation will affect the move if there is any overlapping with any other window that already occupies the position to which the window is being moved.

Order of Window Creation



Order of Creation	Position	Window	
1.	(a)	OR	Draw window
2.	(b)	NOT	Mask window
3.	(c)	XOR (OR)	Reverse window

Note When windows are created, the following situation can occur depending on the order in which the windows are created.

Situation: Even if the (b) NOT window is moved inside of the (c) XOR window, the shape is not cut from the (c) XOR window.

Cause: The (c) XOR window was created after the (b) NOT window, and so the (b) NOT window is ignored.

Remedy: Copy (b) NOT inside of (c) XOR. Because the copy source will no longer be needed, it can be deleted.

Rotating

As is the case with moving, the window classification and order of creation do not change, so any overlapping areas after rotation will be affected.

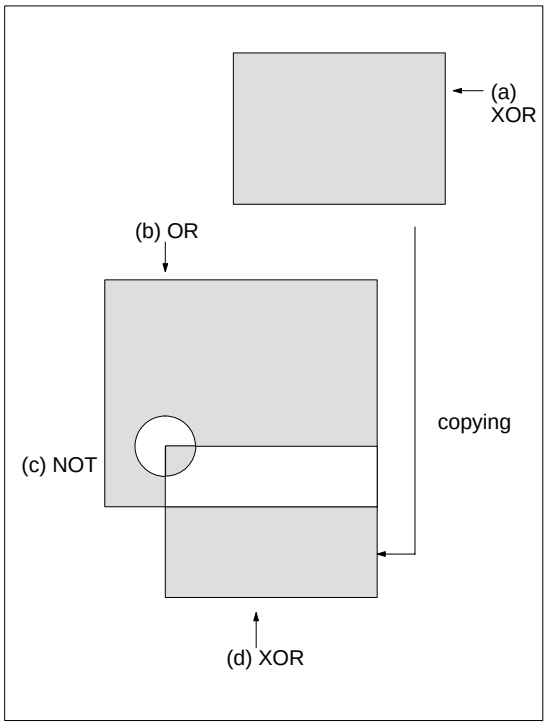
Sizing

As is the case with moving, the window classification and order of creation do not change, so any overlapping areas after sizing will be affected.

Copying

When a window is copied, a new window will be created with the same classification as the copy source. If a draw window is copied to overlap a mask window or a reverse window, the mask function will be lost.

Order of Window Creation



Before copying

Order of Creation	Position	Window
1.	(a)	XOR
2.	(b)	OR
3.	(c)	NOT

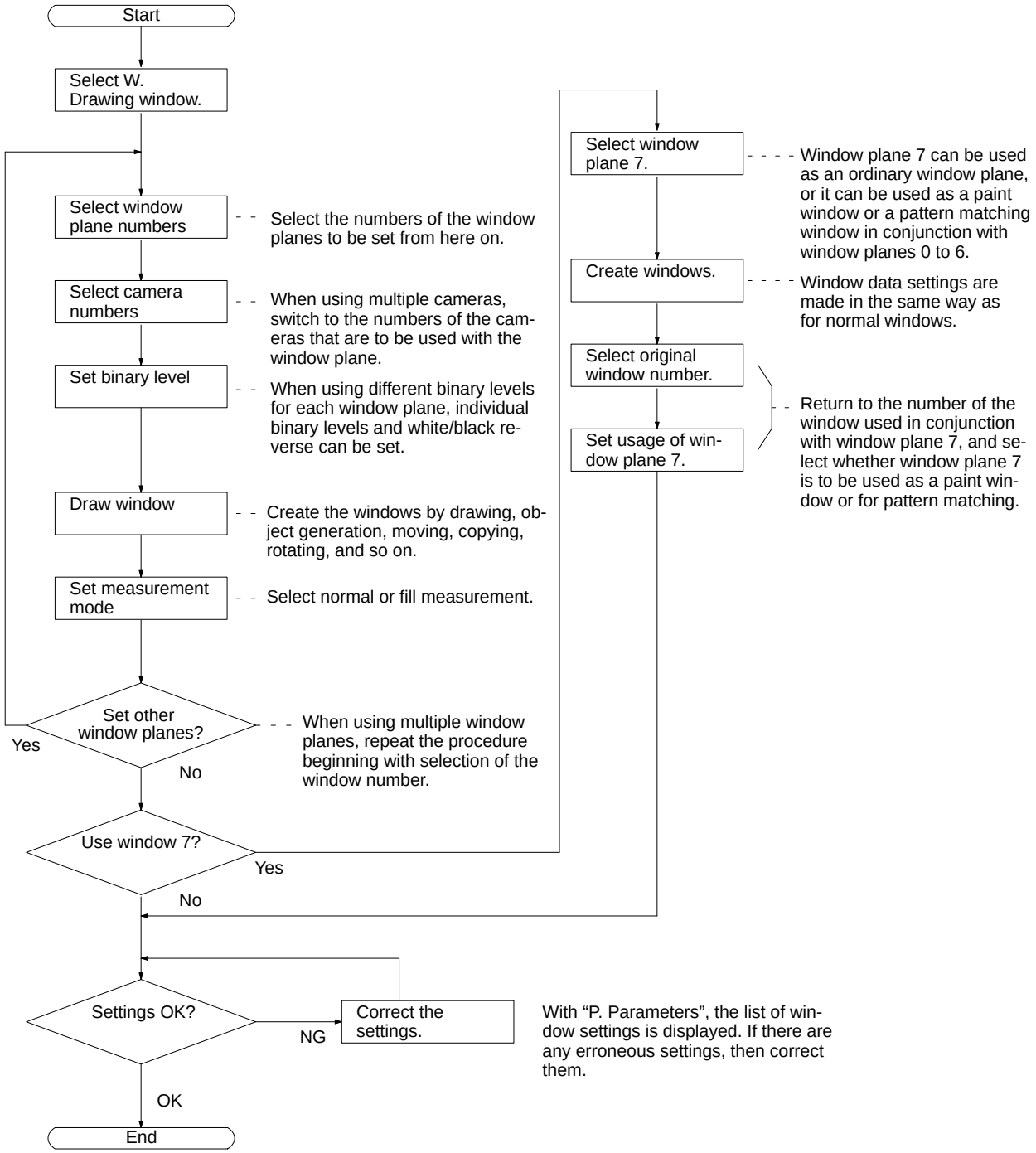
After copying

Order of Creation	Position	Window
1.	(a)	XOR
2.	(b)	OR
3.	(c)	NOT
4.	(d)	XOR

Copying

Even if a window is moved, rotated, or sized, the window's classification and order of creation will not change simply by the change in the window's position and size. If a window is copied, the original window's order of creation will not change. The copied window will be added to the end of the creation order as a newly created window.

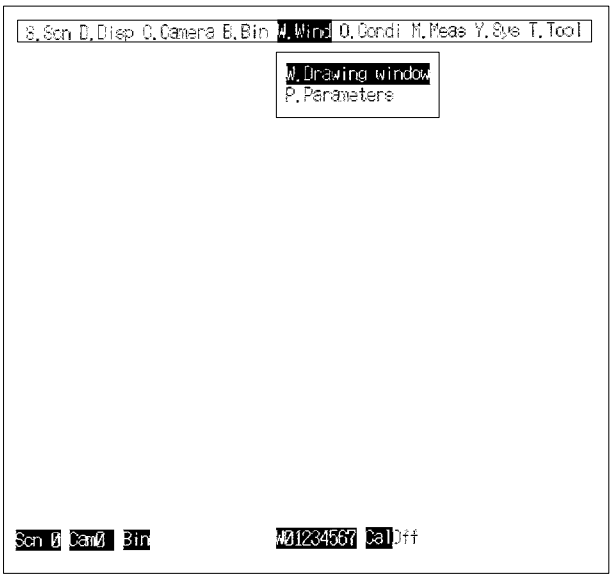
6-1-9 Window Setting Procedure



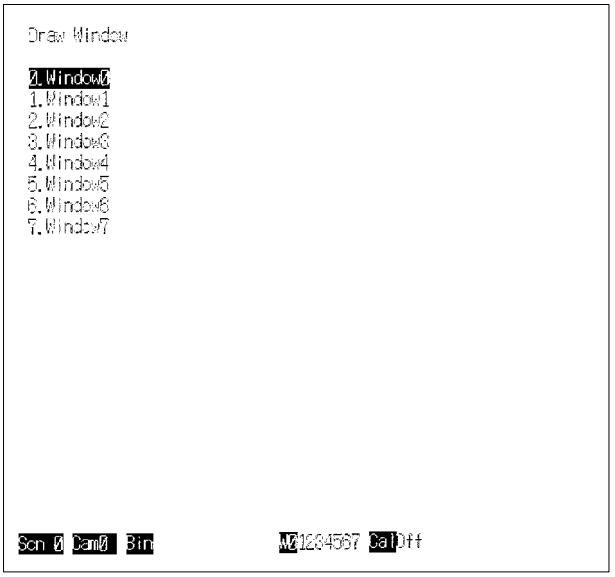
6-2 Selecting Window Numbers

F300 measurements are all taken inside of windows.

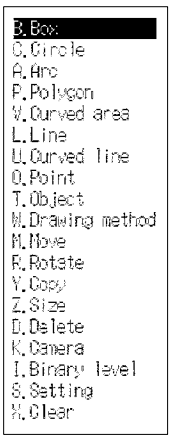
1, 2, 3... 1. Select “W. Drawing window” from the “W. Window” menu.



2. Select the number of the window to be set.



3. The window setting menu will be displayed.



If the image is not shown, first check to see if the connector for camera no. 0 is not connected to the camera.

There is a camera number setting for each window, and the initial value is camera 0. If any camera number other than camera 0 is set with the “K. Camera” menu, then no image will appear until the number of the connected camera is selected with the “W. Window” menu.

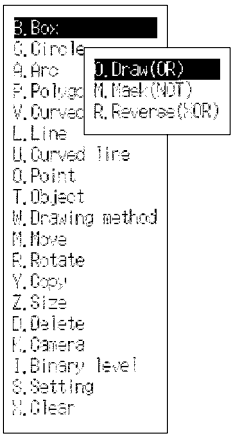
6-3 Drawing and Generating Windows

Window shapes can be created by drawing or by automatic generation. A maximum of 255 window graphics can be created for the F300.

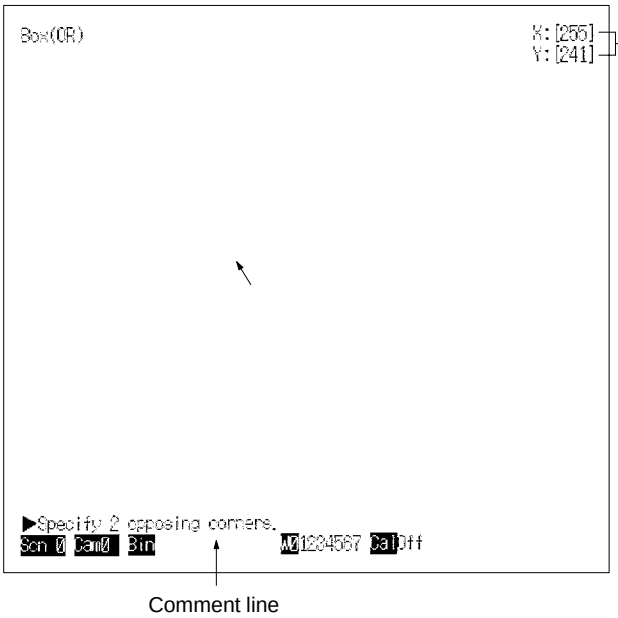
6-3-1 Drawing Windows

1, 2, 3... 1. Select the graphic to be drawn.

2. Select the type of window.



3. Draw the window in accordance with the message in the comment line.

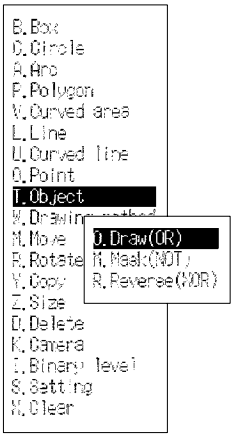


6-3-2 Creating Windows by Object Generation

When a window with a complex shape is required, the shape can be extracted from the white pixels of the binary image as a window just as it is. The size of that window can then be adjusted by means of the sizing function.

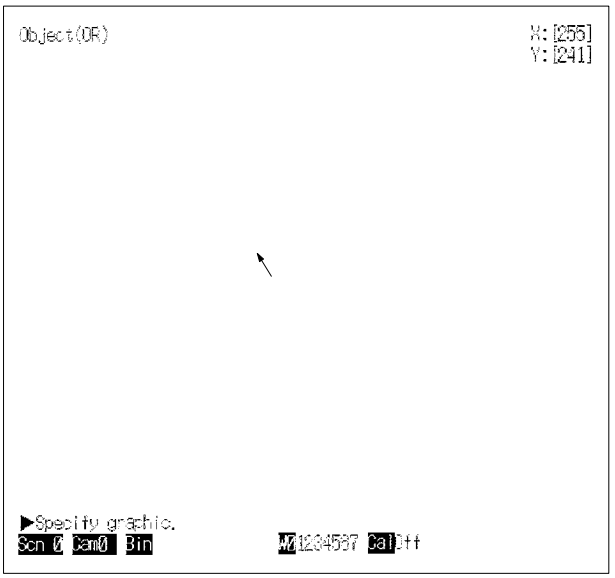
1, 2, 3... 1. Select “T. Object” from the menu.

2. Select the window type.



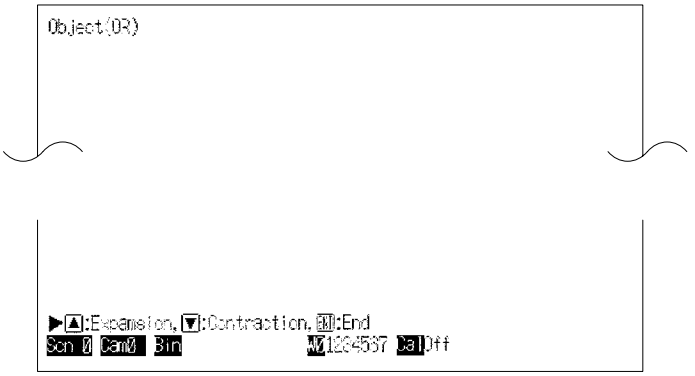
When the “T. Object” screen appears, the image type will be changed to binary.

3. Select the graphic of the white pixels for creating the window.

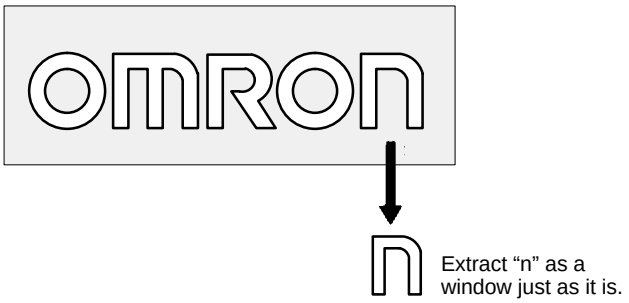


The shape that has been extracted as a window can be sized.

- Use the Up Key to increase the size by one pixel at a time.
- Use the Down Key to reduce the size by one pixel at a time.
- To increase or decrease the size by 10 pixels at a time, press the Up or Down Keys respectively while holding down the Shift Key.



Example of Creating a Window by Object Generation

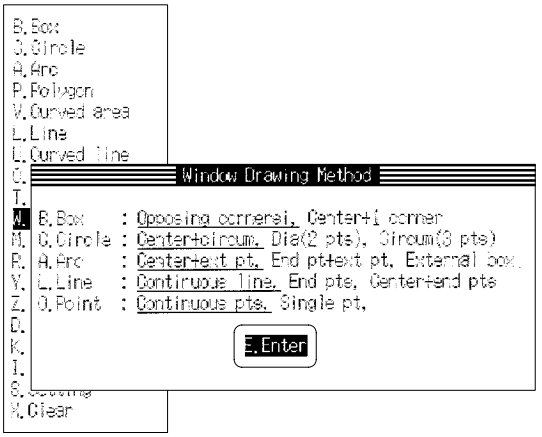


6-3-3 Changing the Window Drawing Method

The drawing methods for boxes, circles, arcs, lines, and points, can be changed as shown below. The drawing methods for other scenes and windows will be changes as well.

1, 2, 3...

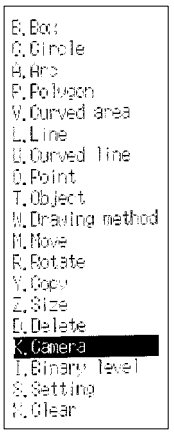
1. Select “W. Drawing method” from the menu.
2. Select the shape with which the change in the drawing method is to be made, and make the setting. Setting is complete.



6-3-4 Selecting Camera Numbers

You can set the cameras to be used for each window.

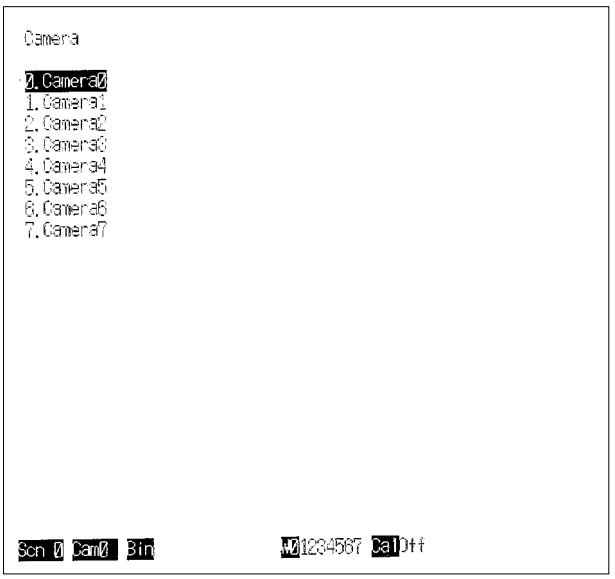
1, 2, 3... 1. Select “K. Camera” from the window setting menu.



2. Select the number of the camera to be used.

   The camera numbers selected under the “W. Window” menu are set for each window number as window data. Therefore, each time a camera number is switched, the images of the camera set for that window will be displayed.

   “C. Camera” under the “K. Camera” menu sets the camera number that is to be normally displayed in a scene.



3. Select using the Up or Down Keys and then press the Enter Key. Setting is complete.

6-3-5 Setting the Binary Level

This function sets the binary level for the window plane currently being set.

1, 2, 3... 1. Select “I. Binary level” from the window setting menu.

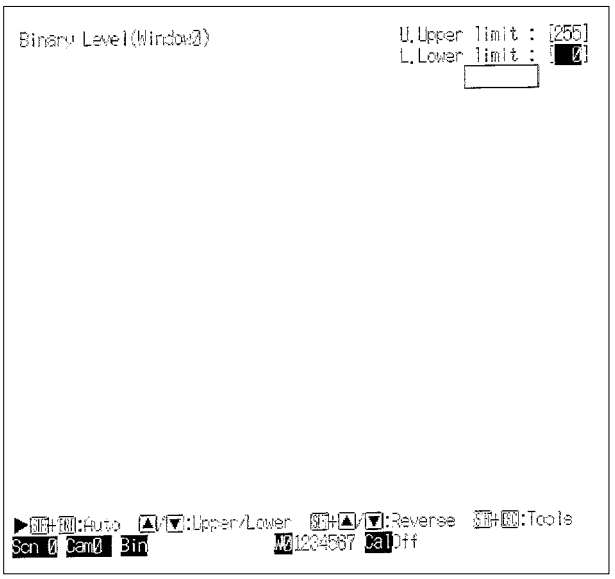
2. Set the binary level. The method is as described in *Section 5 Setting the Binary Level*.

   When setting the upper and lower limits, the auxiliary tool and the settings can be opened while observing the histogram and line brightness.

   Press the Shift and Enter Keys to automatically set the binary level to clearly distinguish dark and light.

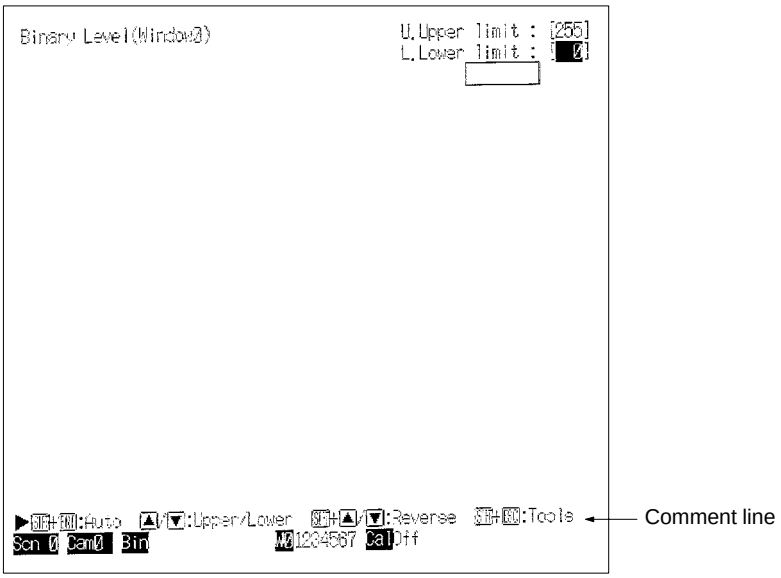
   Reverse light and dark in an image by pressing the Up and Down Keys while holding down the Shift Key.

   For systems using strobes, use “T. Strobe” under the “C. Camera” menu to set the strobe flash interval.

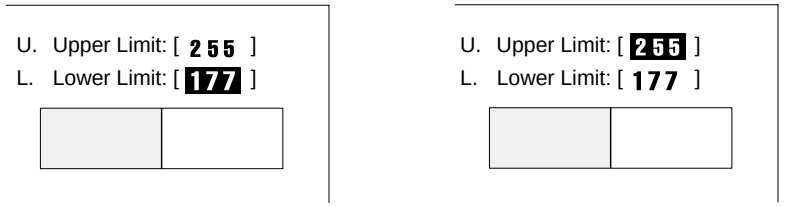


3. Set the upper and lower limits.

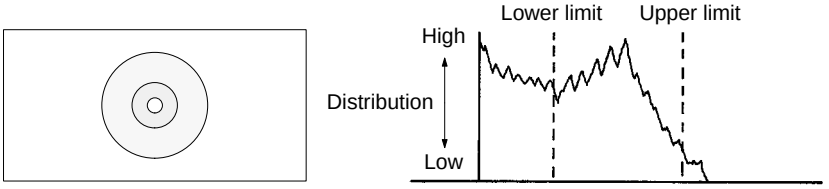
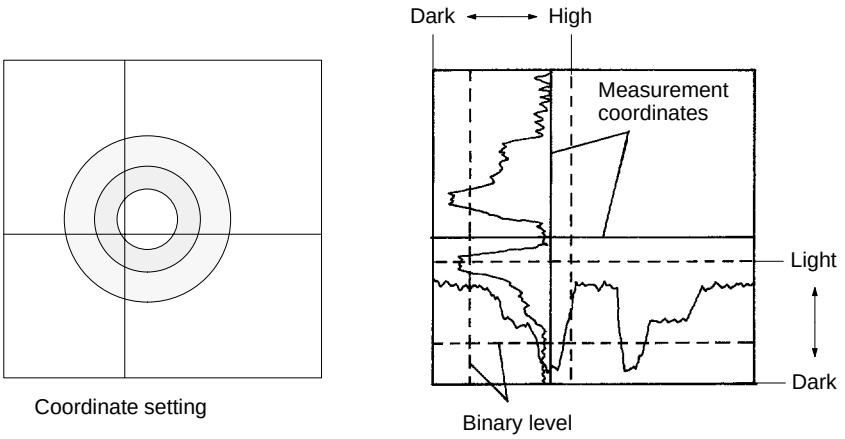
Setting from the Keyboard



Key sequences are as follows:

Item	Console/ Keyboard	Function
Automatic level setting	Shift Key+ Enter Key	Sets the binary level automatically. For images in which dark and light are clearly distinguished, the setting can be made simply.
Upper and lower limits	Up or Down Key	Up and Down Keys move the cursor to “U. Upper Limit” and “L. Lower Limit” respectively. 
Reverse	Shift Key+ Up/Down Keys	Reverses the display of black and white pixels. The white pixels are the object of measurement for the F300, so it is necessary to reverse the display when measuring a dark object. 
Auxiliary Tool	Shift Key+ Escape Key	Displays the auxiliary tools menu.

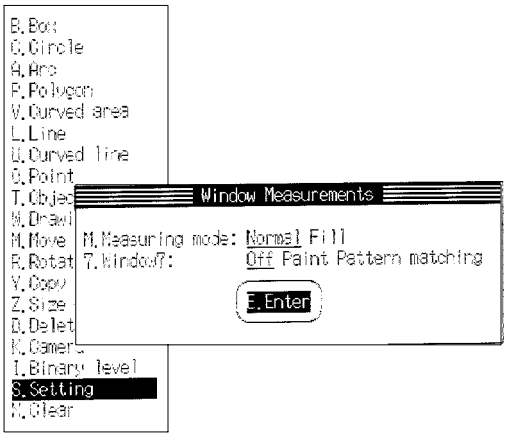
Auxiliary Tools

Item	Function
N. Normal	Returns to the normal binary level setting screen which does not display histogram or line brightness.
H. Histogram	Displays as a graph the light distribution levels within a specified range (box) on the screen. The upper and lower limits can be set while observing the histogram.  Range setting
L. Line brightness	Displays as a graph the brightness levels along any X or Y axes on the screen. The upper and lower limits can be set while observing the line brightness diagram.  Coordinate setting
T. Strobe	Sets the flash period for the binary level setting, when “U. Unfreeze” is set. (“U. Unfreeze” can be selected from “F. Freeze” under the “D. Display Image” menu.)

6-4 Setting Window Plane Measurements

After a window has been created, the measurement mode for that window must be selected. If window 7 is to be used as a paint window or as a reference pattern (for pattern matching), then the usage of window 7 must also be set.

Select “S. Settings” from the menu.



Note If window 7 is selected, there will be no “7. Window 7” menu.

Menu Items

Item		Description
M. Measurement mode	Normal	All of the white pixels in the window will be taken as the object for measurement.
	Fill	All of the white pixels between the starting and ending points along the horizontal axis will be measured.
7. Window 7	OFF	Measurement will not be executed in conjunction with window plane 7.
	Paint	Measurement will be executed in conjunction with window plane 7 as a paint window.
	Pattern matching	The number of white pixels that do not match figures that have been drawn in window 7 will be measured.

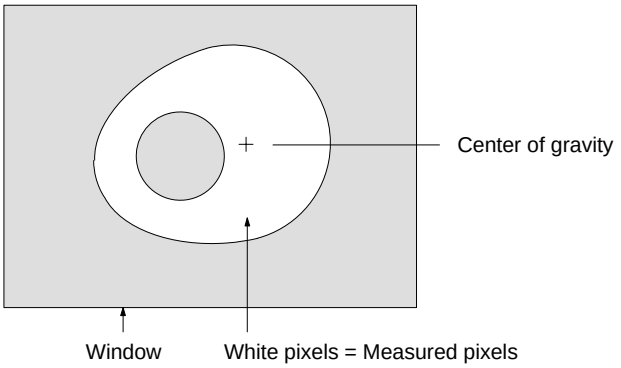
6-4-1 Measurement Modes

Normal Measurement

All of the white pixels in the window will be taken as the object of measurement.

Measuring Objects with Empty Space:

The area, center of gravity, and inclination, and so on, will be measured with the empty space included.

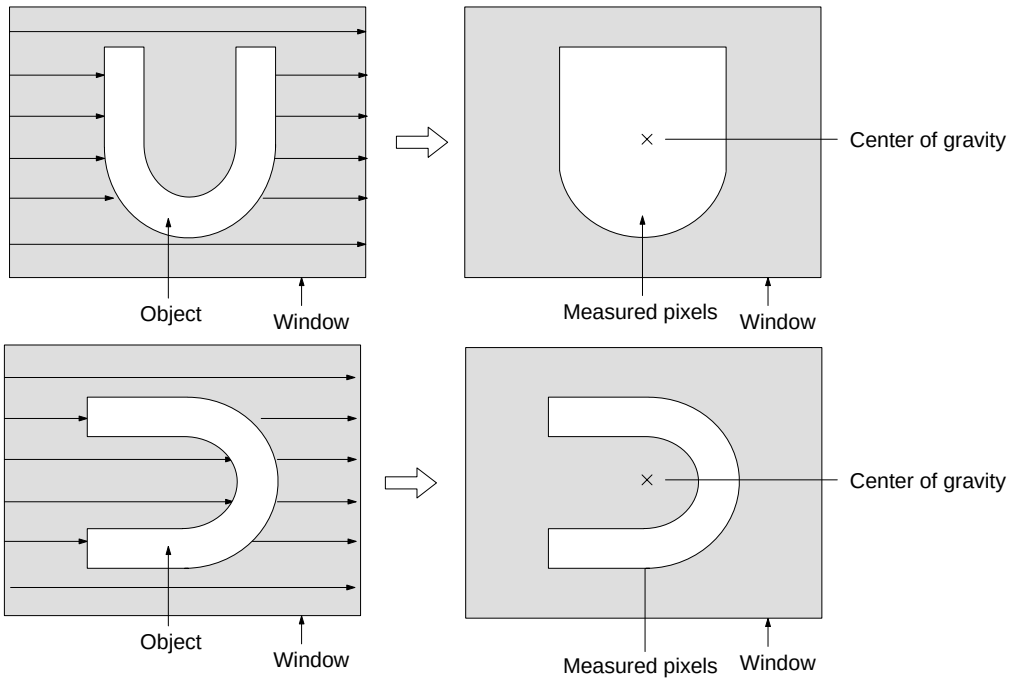


Fill Measurement

All of the white pixels between the starting and ending points along the horizontal axis will be regarded as white pixels and measured.

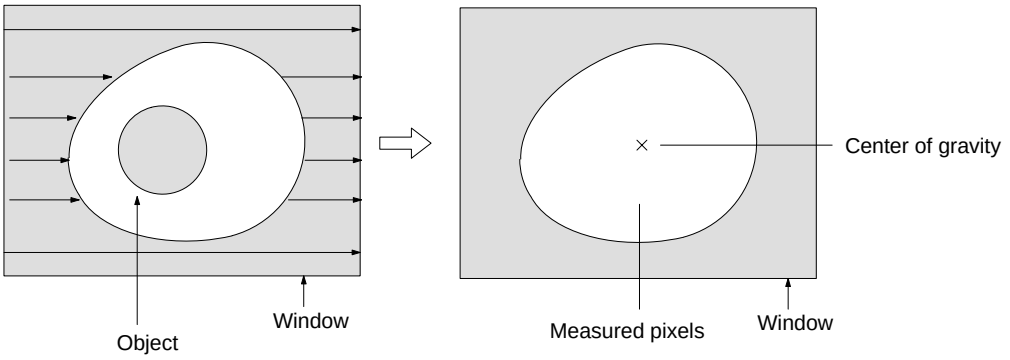
For objects with surface irregularities, the range of measurement will change according to the mounting direction.

Irregular Objects



When objects with empty space are measured, the empty space will be ignored.

Objects with Empty Space

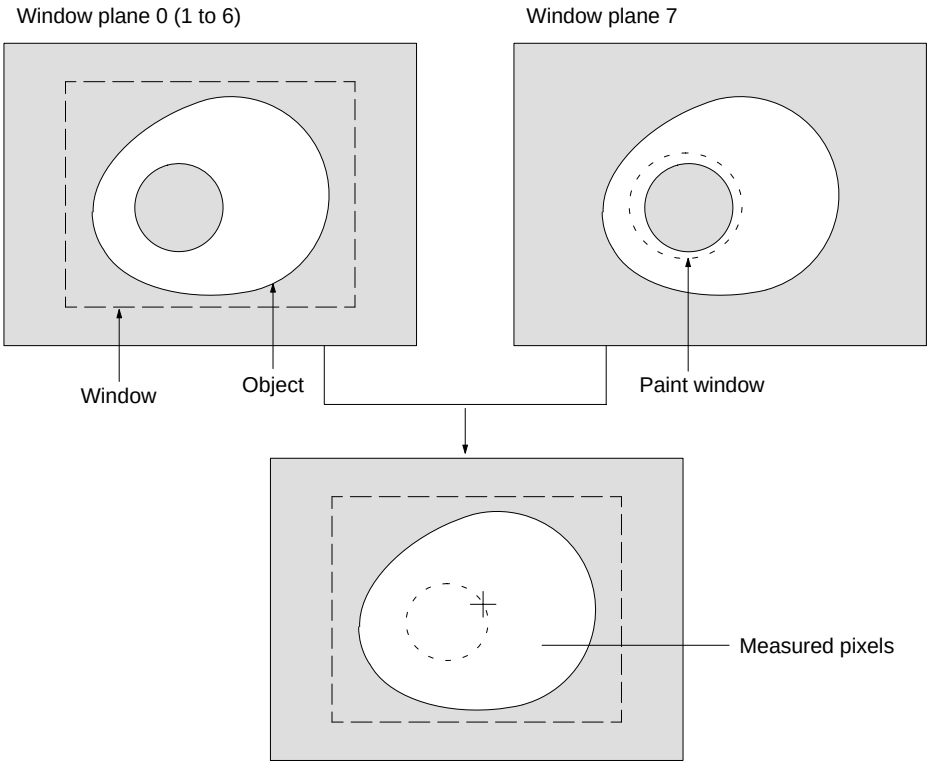


6-4-2 Ways of Using Window Plane 7

Window plane 7 can be used as an ordinary window plane, or it can be used as a paint window or a reference pattern (for pattern matching) by making the selection in the measurement settings for window planes 0 to 6.

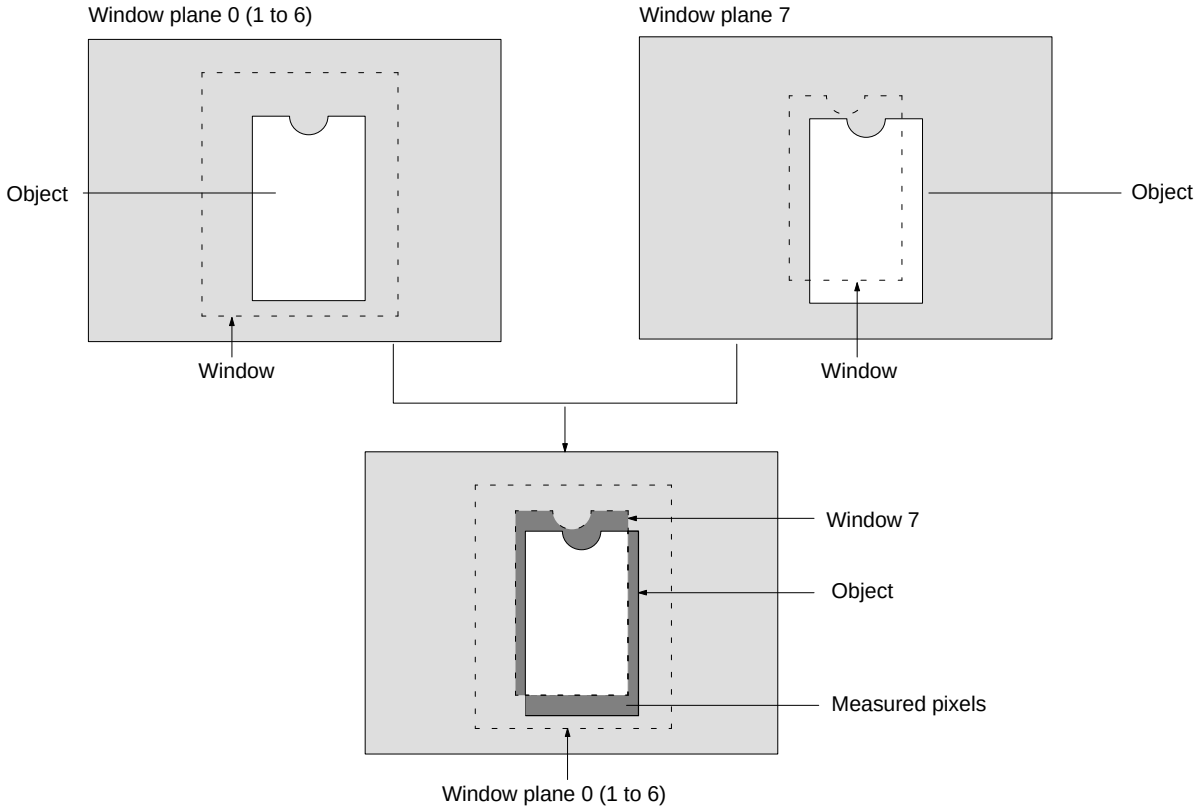
Off If set to “off,” then measurement will not be executed in conjunction with window plane 7.

Paint If set to “paint,” then window plane 7 will be used as a paint window. Windows created in window plane 7 will be regarded as consisting of all white pixels for measurement.



Pattern Matching

Window plane 7 can be used as a matching window. Comparison will be made to a window created in window plane 7, and the pixels that do not match will be measured.

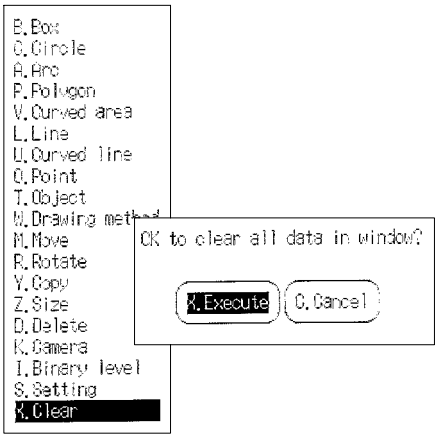


6-5 Clearing Window Setting Data

All window data can be cleared and returned to the initial values.

Select “X. Clear” from the menu. A message will be displayed asking for permission to clear all of the data except the camera number and the binary level. To confirm, select “X. Execute”.

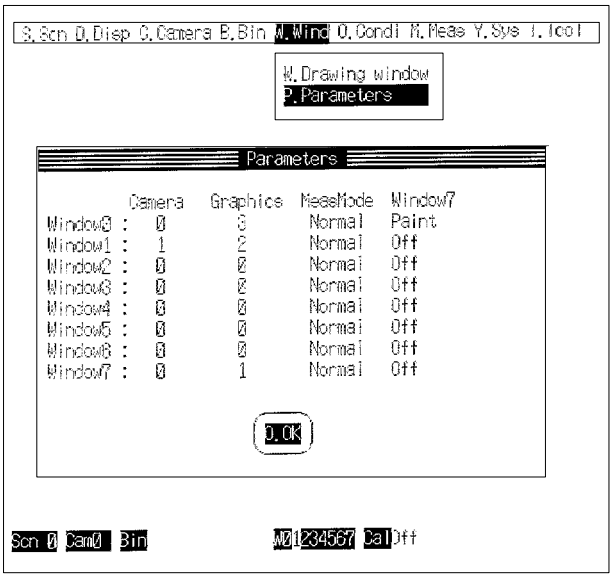
If all window settings are cleared, then all data except the camera number and binary level data in the window plane that is being set will be cleared.



6-6 Checking Window Settings

A list of window settings can be displayed for checking.

Select “P. Parameters” from the “W. Window” menu.

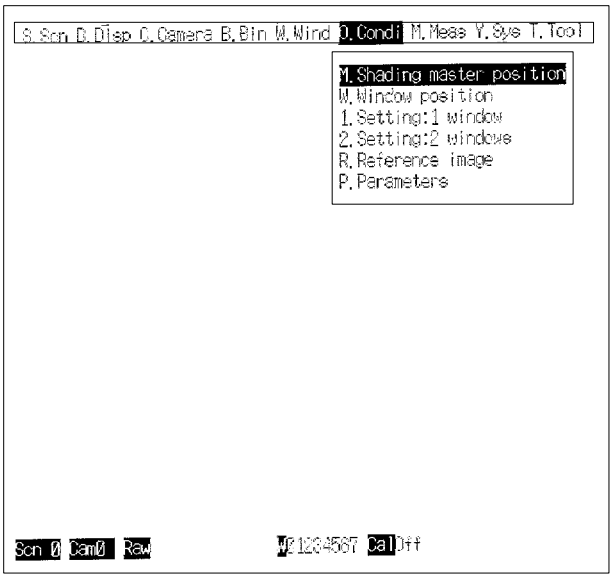


SECTION 7
Setting Measurement Conditions

This section provides the procedures required to set measurement conditions.

7-1 Measurement Conditions

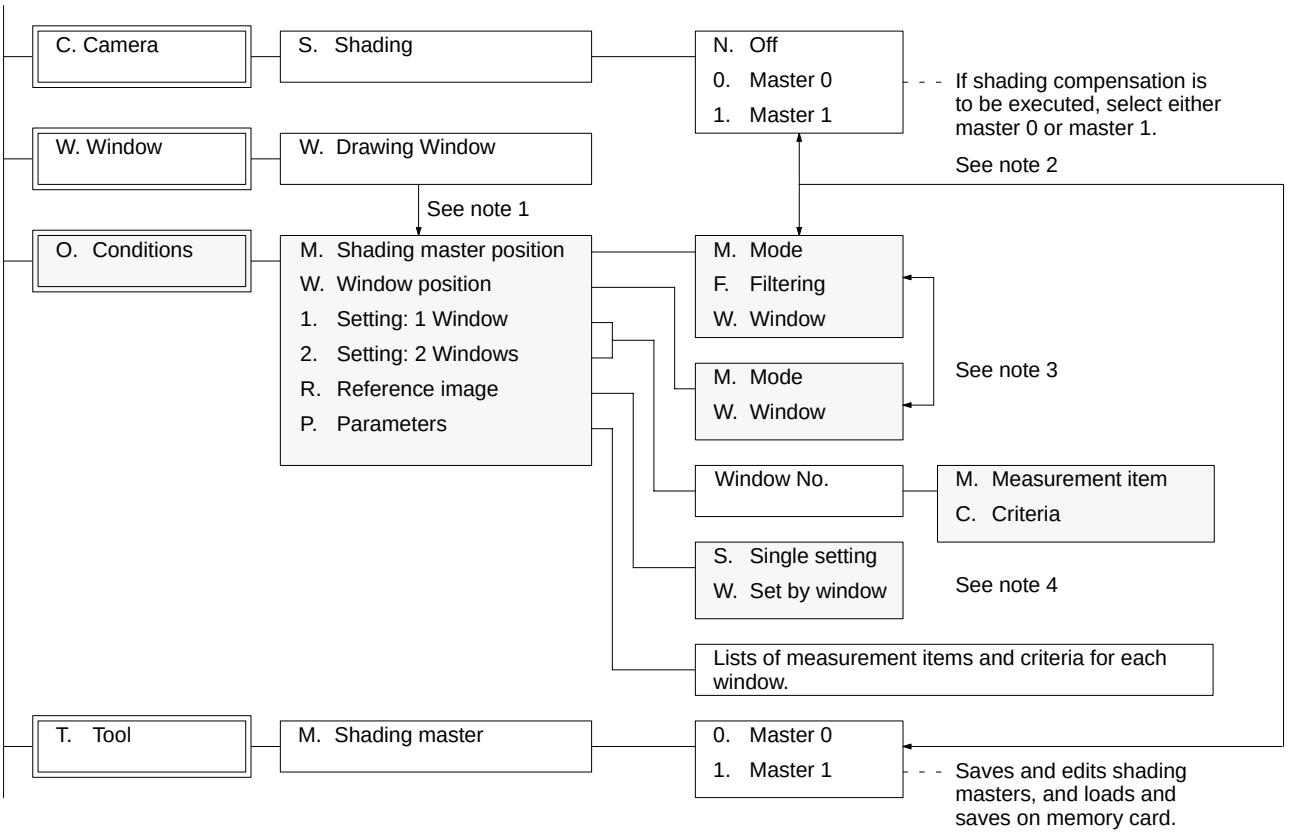
Under the “O. Conditions” menu, settings for measurement items and criteria can be made. When making measurements, it is possible to compensate for position displacement between the measured object and the shading master, and to compensate for position displacement from the reference image used for determination.



Menu Items

Item	Function	Reference
M. Shading master position	Corrects shading master position displacement. Selects the method for position displacement compensation, the filtering during compensation measurement, and the number of the window plane to be used for compensation.	Refer to 7-2
W. Window position	Compensates for position displacement from the reference image used for determination. Selects the method for position displacement compensation and the number of the window plane to be used for compensation.	Refer to 7-3
1. Setting: 1 window	Selects the number of the window plane to be used for measurement, selects the measurement items, and sets the criteria for determination.	Refer to 7-4-1
2. Setting: 2 windows	Measures the mid-point coordinates and the inclination between the centers of gravity when two windows are used. Also selects the number of the window plane to be used, selects the measurement items, and sets the criteria for determination.	Refer to 7-4-2
R. Reference image	Inputs the reference sampling and sets the determination value. There are two methods for inputting sampling. One is to input all of the window planes, and the other is to input them individually.	Refer to 7-5
P. Parameters	Displays a list of measurement parameters within a scene.	Refer to 7-6

Related Menus



Note

1. Before setting measurement conditions, create both the window for position displacement compensation and the window for measurement.
2. When using shading compensation, save the shading master and select the shading master number.
3. Shading master position displacement compensation and measurement window position displacement compensation will be made separately for individual window planes.
4. The standards for shading master position displacement compensation and measurement window position displacement compensation will be saved when “save reference image” is executed.

Position Displacement Compensation

The need for position displacement compensation arises when shading compensation is executed or when a comparison is made with an object that has been saved as a reference image, and when you wish to avoid measurement errors based on position displacement.

Shading Master

Shading compensation can prevent measurement errors due to uneven lighting or shadows on objects. Shading masters are saved by means of “M. Shading master” under the “T. Tool” menu. Up to two shading masters can be saved for all of the scenes, and use Shading, under the “C. Camera” menu, to select which of the two is to be used.

Reference Image

As a measurement criteria, a reference image can be set for each camera based on direct sampling. Saving is executed by means of “R. Reference image” under the “O. Conditions” menu.

Windows for Position Displacement

In order to compensate for position displacement, windows must be created for measuring the position displacement. Any of five modes can be selected for position displacement compensation. The windows for shading master and

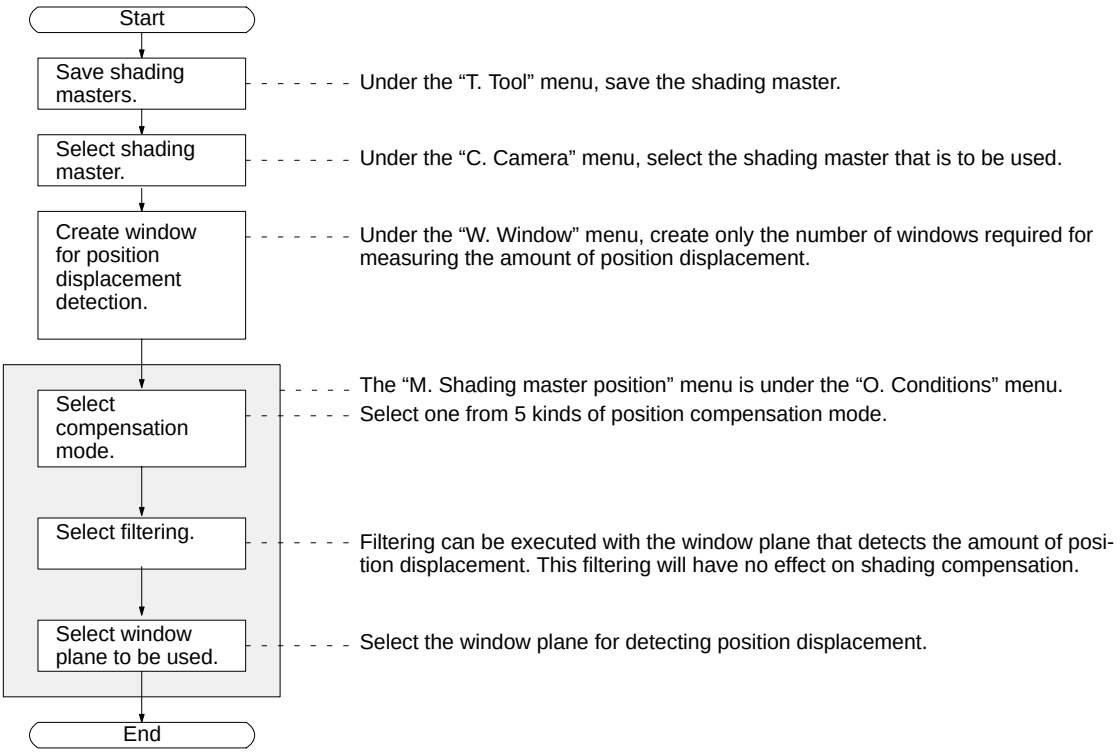
measurement window position displacement compensation must be created in separate window planes.

Measurement Windows Based on the amount of position displacement, the windows will be moved and rotated and measurement will be accurate even if the measurement object changes.

7-2 Shading Master Position Compensation

When shading compensation is required for an object, higher precision can be achieved by compensating for position displacement between the shading master and the measurement image.

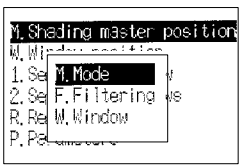
Setting Procedure



7-2-1 Selecting the Position Compensation Mode

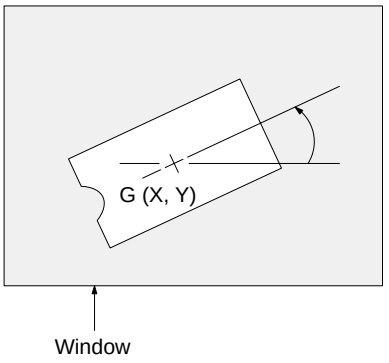
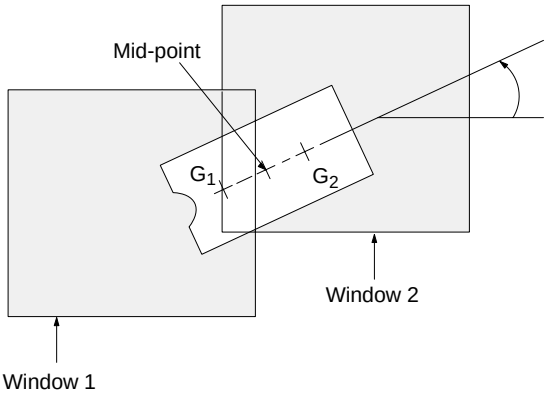
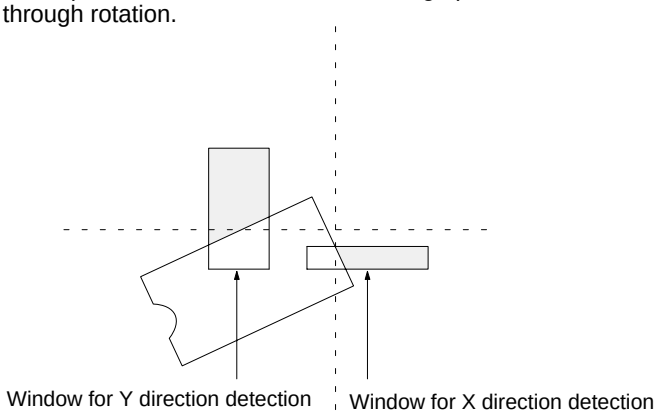
1, 2, 3...

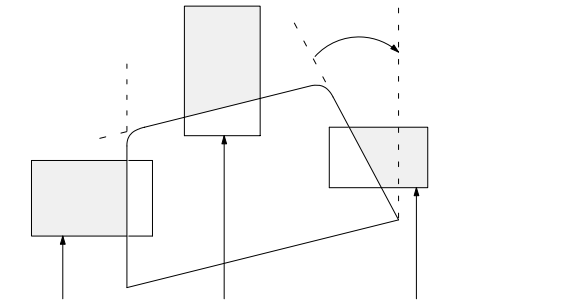
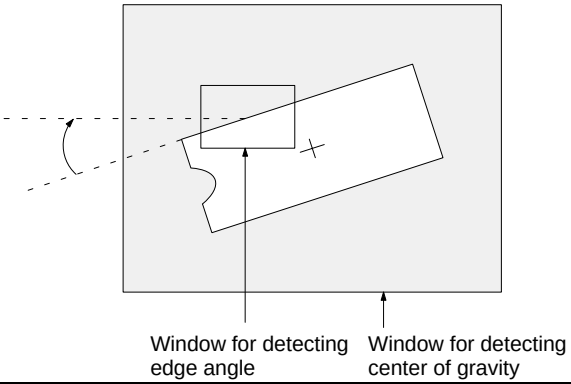
1. Select “M. Shading master position”.
2. Select “M. Mode”.
3. Select the mode that is to be used for position compensation. Setting is complete.



Position Compensation Modes

Any of five modes can be selected for position displacement compensation. The number of window planes to be used and their shapes will vary according to the mode which is selected.

Mode	Function
Normal	Detects the coordinates for the center of gravity and the inclination of the main axis, and compensates for position displacement. For detecting the X and Y coordinates for the center of gravity, as well as the angle of the main axis, individual window planes can be selected. 
Two windows	Uses two windows to detect the mid-point coordinates and the inclination between the centers of gravity, and corrects position displacement. Window 1 and window 2 use separate window planes. 
Run length	Uses two rectangular boxes to detect the boundaries between the white and black pixels in the X and Y directions, and corrects position displacement. If there is position displacement only in either the X or the Y direction, it is all right to use only a single window plane. If displacement is detected in both directions, however, then it is essential to create two window planes. In this mode, position displacement will be corrected through parallel movement in the X and Y directions, but not through rotation. 

Mode	Function
Cross point detection	Uses two rectangular boxes to detect the amount of position displacement of the points of intersection of the edges. Also detects edge inclination and corrects position displacement both through parallel movement and through rotation. Cross point windows 1 and 2 must be drawn one at a time as rectangles in separate window planes. When specifying the angle window separately from the cross point windows, it must be drawn in a separate window plane. The angle window can overlap one of the cross point windows. If no rotational compensation is performed, no angle window is necessary. 
Edge angle detection	Uses two windows to find the edge angle and the center of gravity. Corrects position displacement based on the edge angle (for rotational direction) and the center of gravity (for parallel direction). The window for detecting the edge angle must be drawn as a single rectangular box in a window plane separate from that of the window for detecting the center of gravity. 

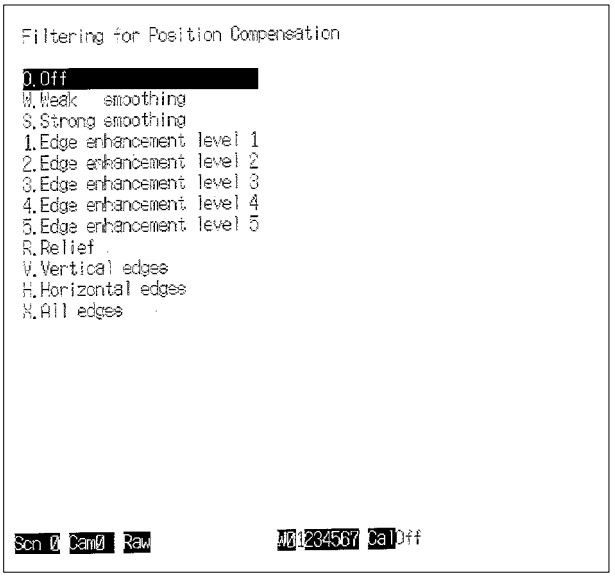
7-2-2 Selecting Filtering for Position Displacement Compensation

When compensating for position displacement with the shading master, filtering can be executed independently of the “F. Filtering” setting under the “C. Camera” menu.

The window number set for shading master displacement compensation will be binary-coded and measured according to the image that has been set before filtering.

1, 2, 3... 1. Select “F. Filtering” from the “M. Shading master position” menu under the “O. Conditions” menu.

2. Select the image filtering.



3. Select using the Up or Down Keys and then press the Enter Key. Setting is complete.

7-2-3 Selecting Window Numbers

You can select the numbers of the windows to be used for detecting position displacement.

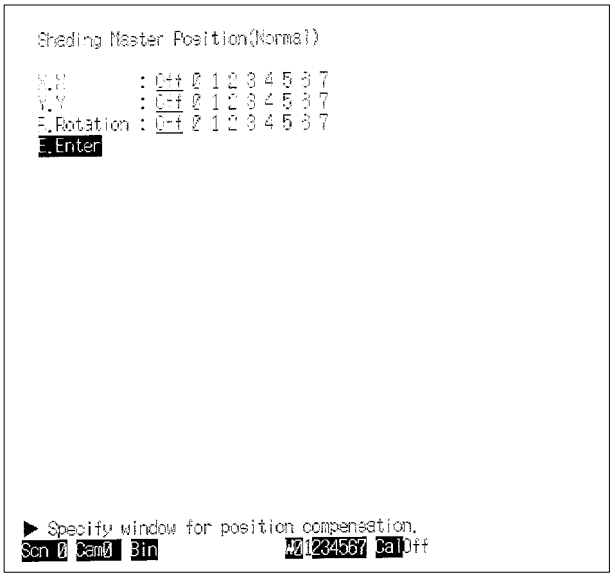
Select “W. Window” from the “M. Shading master position” menu.

If the position displacement compensation is set to “Off” under the “M. Mode” menu, a message will be displayed indicating that the position displacement compensation mode is not designated.

In accordance with the compensation mode set under the “M. Mode” menu, one of the following five window plane number selection screens will be displayed.

Normal Mode

Make the setting for each item.

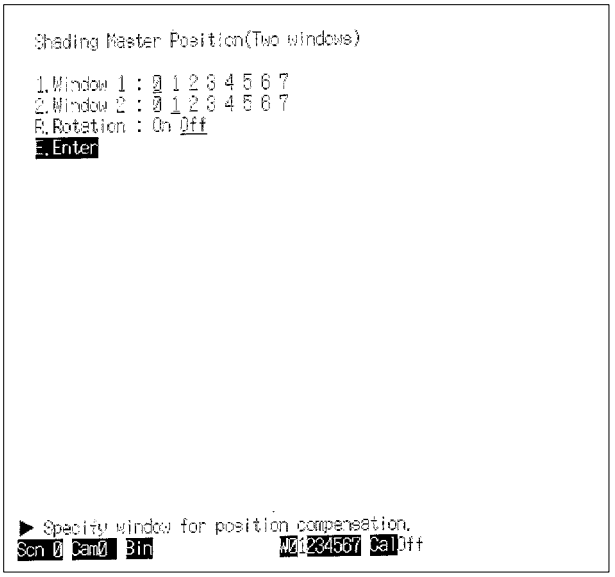


Item	Setting
X. X	Select the number of the window plane for detecting the center-of-gravity coordinates along the X axis. If not compensating for position displacement along the X axis, set this to “Off.”
Y. Y	Select the number of the window plane for detecting the center-of-gravity coordinates along the Y axis. If not compensating for position displacement along the Y axis, set this to “Off.”
R. Rotation	Select the number of the window plane for detecting the inclination of the main axis angle. If not using rotational compensation for position displacement, set this to “Off.”

Note It is all right if windows for detecting X, Y, and rotational position displacement overlap. Windows for measurement have to be in different locations.

Two Windows Mode

Make the setting for each item.

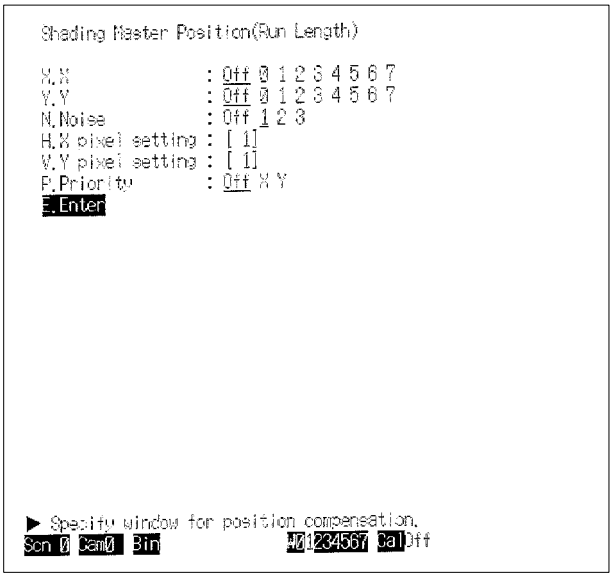


Item	Setting
1. Window 1	Select the number of the first window plane for detecting the center of gravity.
2. Window 2	Select the number of the second window plane for detecting the center of gravity.
R. Rotation	Select “On” for rotation compensation. If “Off” is selected, rotation compensation will not be executed.

Note Separate window plane numbers must be selected for window 1 and window 2.

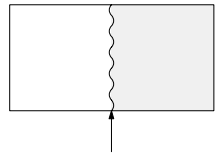
Run Length Mode

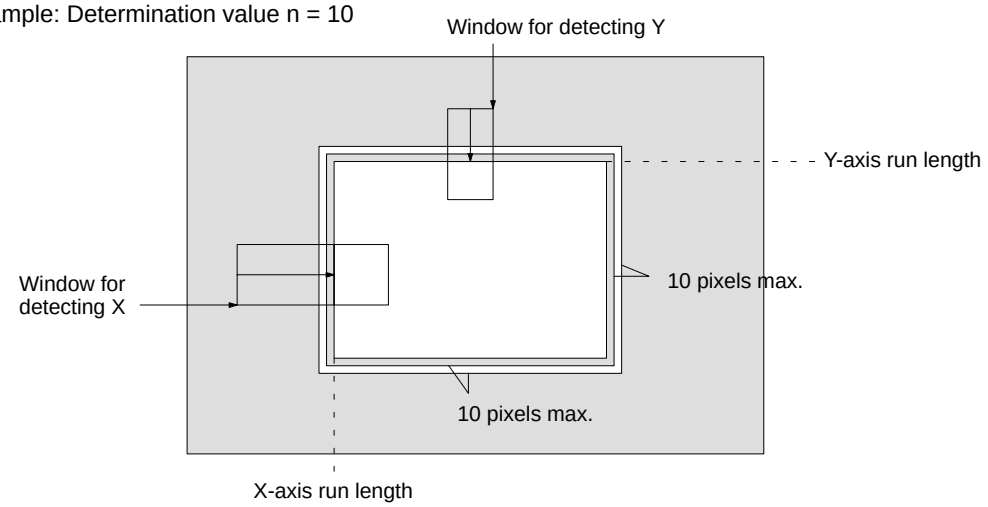
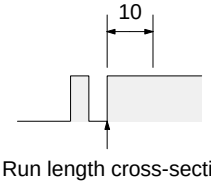
Make the setting for each item.



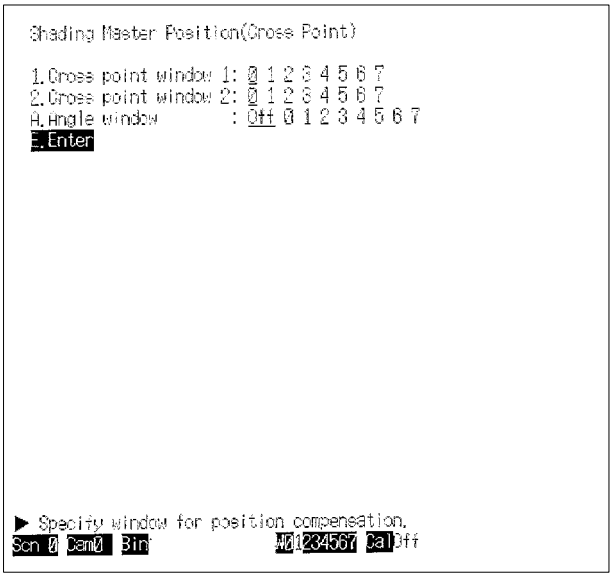
“Run length” refers to the boundary coordinates for white to black or black to white pixels.

Use a rectangular window for measuring run length.



Item	Setting
X. X	Select the number of the window for detecting the run length along the X axis. If not compensating for position displacement along the X axis, set this to “Off.”
Y. Y	Select the number of the window for detecting the run length along the Y axis. If not compensating for position displacement along the Y axis, set this to “Off.”
N. Noise	In order to reduce influence from noise, select (from 1 to 3) the number of consecutive pixels to be regarded as noise and ignored. If you do not wish to eliminate noise, select “Off.”
H. X Pixel Setting V. Y Pixel Setting	Set the number of pixels for detecting the run length. If the number of consecutive pixels meets or exceeds the determination value, the rising edge will be taken as the run length. Example: Determination value n = 10  A border thickness of 10 pixels or less on the outside will be ignored. 
P. Priority	Select X or Y to give one of them priority for compensation. Example: When X is Selected When X is selected, the order of processing will be as follows: X position displacement detected A X compensation A Y position displacement detected A Y compensation If you do not wish to set an order of priority, then select “Off.” In that case, position displacement compensation will be performed simultaneously for the X and Y axis.

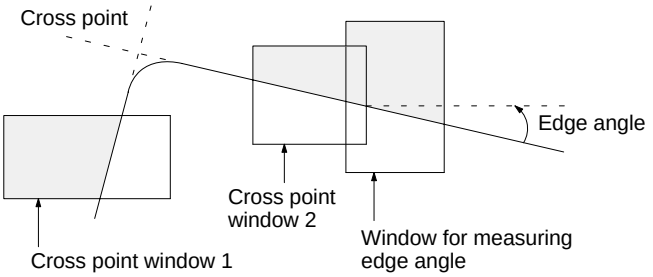
Cross Point Detection Mode Make the setting for each item.



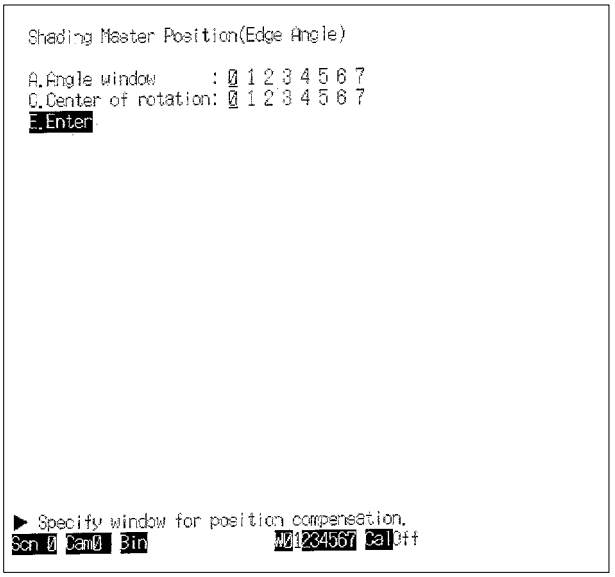
Rectangular windows must be used for measuring the point of intersection. Window 1 and window 2 must each be drawn in separate window planes.

Do not rotate the rectangular windows.

Item	Setting
1. Cross Point Window 1	Select the numbers of the window planes for measuring the point of intersection. Select separate window plane numbers for window 1 and window 2.
2. Cross Point Window 2	
A. Angle Window	When performing rotational compensation, select the numbers of the window planes to be used for that purpose. It is all right in this case if window planes 1 and 2 overlap. If rotational compensation will not be used, then select “Off.”



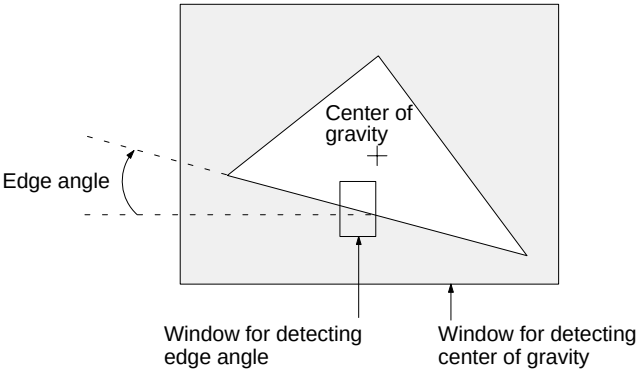
Edge Angle Detection Mode Make the setting for each item.



Rectangular windows must be used for detecting edge angles. Draw only one figure in a window plane.

Do not rotate the rectangular windows.

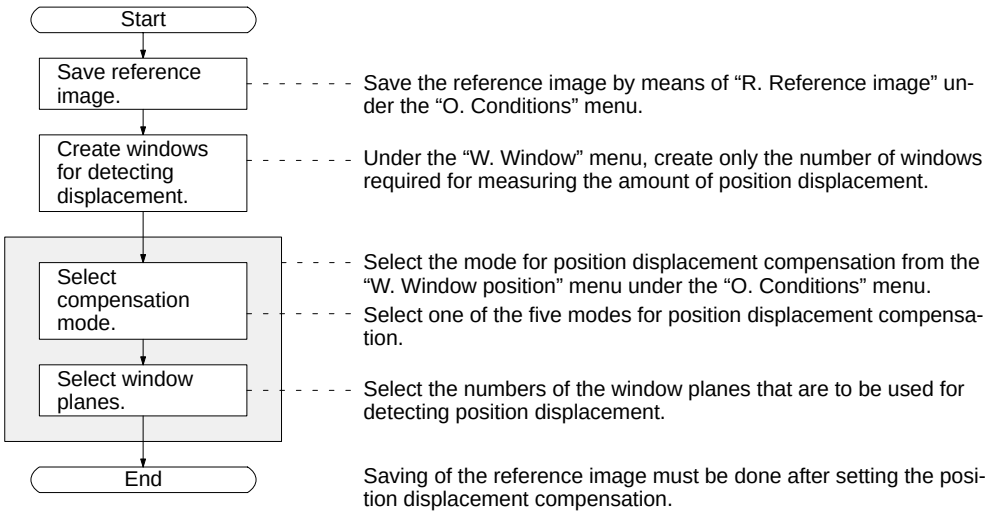
Item	Setting
A. Angle Window	Select the number of the window for detecting the edge angle.
C. Center of Rotation	Select the number of the window for measuring the center of rotational compensation. Rotational compensation is carried out around the center of gravity of the specified window.



7-3 Window Plane Position Compensation

When making a comparison with a reference image that has been saved, more precise measurement results can be achieved by executing window plane position displacement compensation. The settings are made in the same way as described in *7-2 Shading Master Position Compensation*.

Setting Procedure



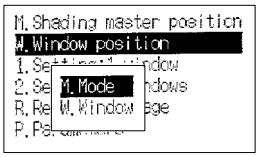
7-3-1 Selecting the Compensation Mode

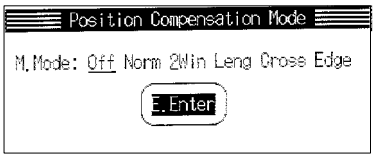
1, 2, 3... 1. Select “W. Window position” from the “O. Conditions” menu.

2. Select “M. Mode” from the “W. Window position” menu.

   The method for window position displacement compensation is the same as that for shading masters.

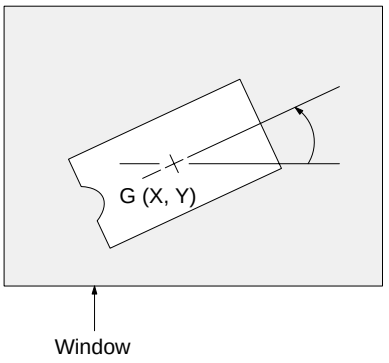
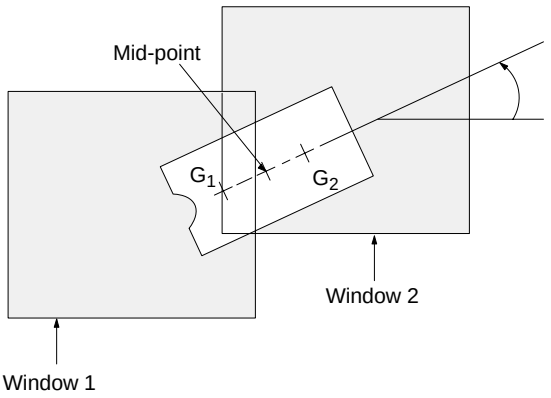
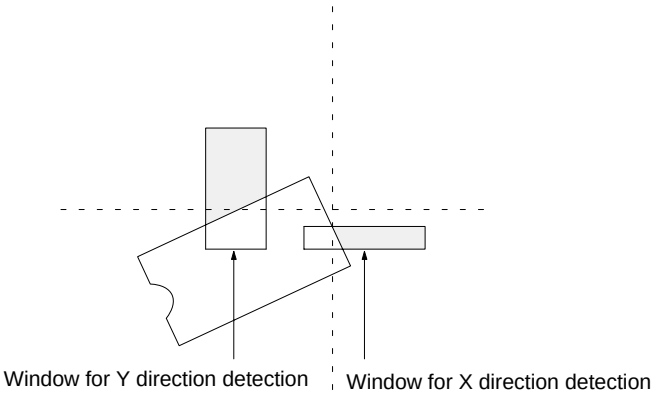
3. Select the compensation mode. Select using the Up or Down Keys and then press the Enter Key. Setting is complete.

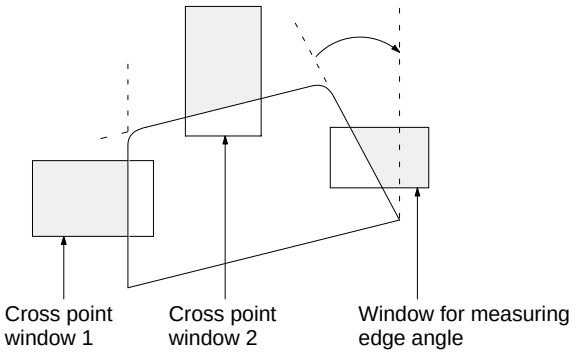
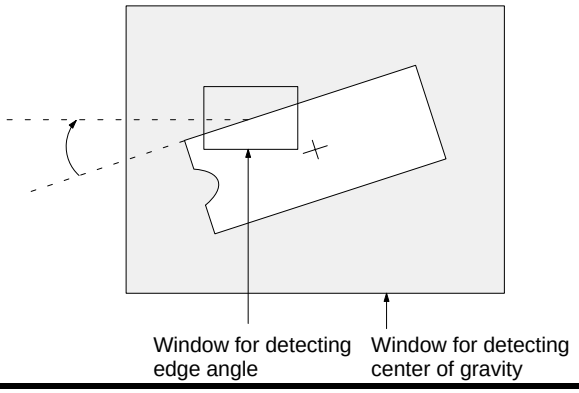




Compensation Modes

Any of five modes can be selected for position displacement compensation. The number of window planes to be used and their shapes will vary according to the mode which is selected.

Mode	Function
Normal	Detects the coordinates for the center of gravity and the inclination of the main axes, and compensates for position displacement. For detecting the X and Y coordinates for the center of gravity, as well as the angle of the main axes, you can select individual window planes. 
Two window	Uses two windows to detect the mid-point coordinates and the inclination between the centers of gravity, and corrects position displacement. Window 1 and window 2 use separate window planes. 
Run length	Uses two rectangular boxes to detect the boundaries between the white and black pixels in the X and Y directions, and corrects position displacement. If there is position displacement only in either the X or the Y direction, it is possible to use only a single window plane. If displacement is detected in both directions, however, it is necessary to create two window planes. In this mode, position displacement will be corrected through parallel movement in the X and Y directions, but not through rotation. 

Mode	Function
Cross point detection	Uses two rectangular boxes to detect the amount of position displacement of the points of intersection at the edges. Also detects edge inclination and corrects position displacement both through parallel movement and through rotation. Cross point windows 1 and 2 must be drawn one at a time as rectangles in separate window planes. When specifying the angle window separately from the cross point windows, it must be drawn in a separate window plane. The angle window can overlap one of the cross point windows. If no rotational compensation is performed, no angle window is necessary. 
Edge angle detection	Uses two windows to find the edge angle and the center of gravity. Corrects position displacement based on the edge angle (for rotational direction) and the center of gravity (for parallel direction). The window for detecting the edge angle must be drawn as a single rectangular box in a window plane separate from that of the window for detecting the center of gravity. 

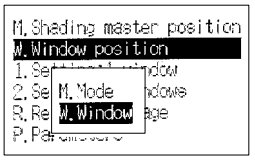
7-3-2 Selecting Window Numbers

1, 2, 3... 1. Select the numbers of the windows for detecting position displacement.

2. Select “W. Window” from the “M. Shading master position” menu.

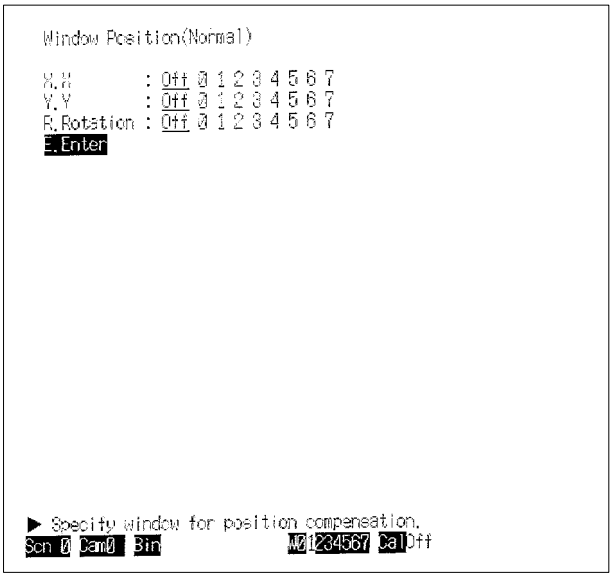
   If the position displacement compensation is set to “Off” under the “M. Mode” menu, a message will be displayed indicating that the position displacement compensation mode is not designated.

   In accordance with the compensation mode set under the “M. Mode” menu, one of the following five window plane number selection screens will be displayed.



Normal Mode

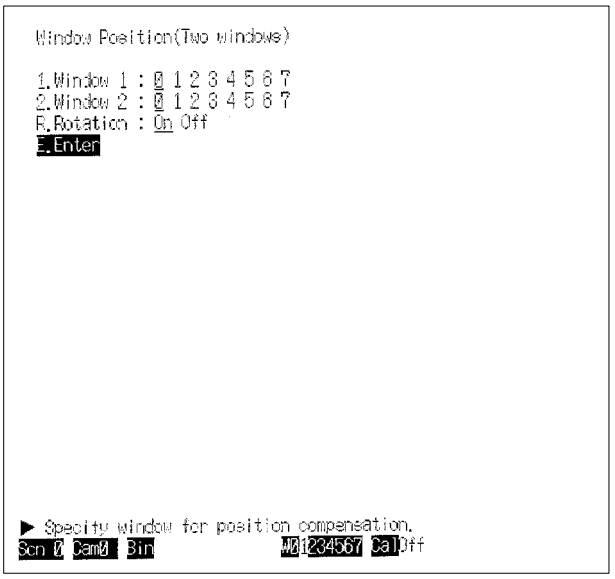
Make the setting for each item.



Item	Setting
X. X	Select the number of the window plane for detecting the center-of-gravity coordinates along the X axis. If you are not compensating for position displacement along the X axis, set this to “Off.”
Y. Y	Select the number of the window plane for detecting the center-of-gravity coordinates along the Y axis. If you are not compensating for position displacement along the Y axis, set this to “Off.”
R. Rotation	Select the number of the window plane for detecting the inclination of the main axis angle. If you are not using rotational compensation for position displacement, set this to “Off.”

Note It is all right if windows for detecting X, Y, and rotational position displacement overlap. Windows for detecting position displacement may not, however, overlap windows for measurement.

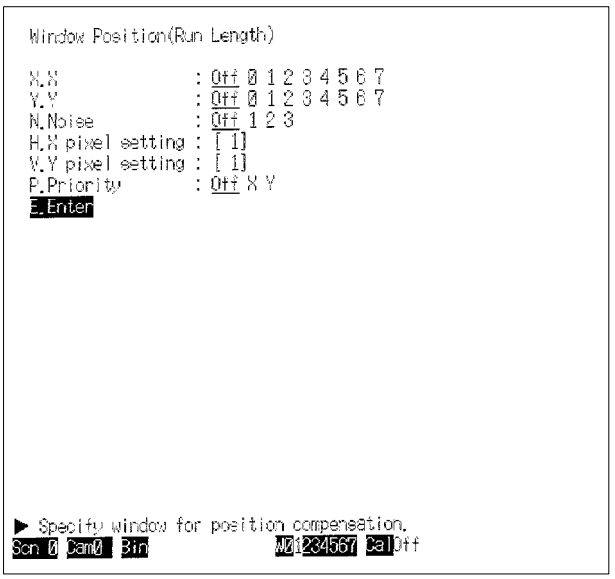
Two Windows Mode Make the setting for each item.



Item	Setting
1. Window 1	Select the number of the first window plane for detecting the center of gravity.
2. Window 2	Select the number of the second window plane for detecting the center of gravity.
R. Rotation	Select “On” for rotation compensation. If “Off” is selected, rotation compensation will not be executed.

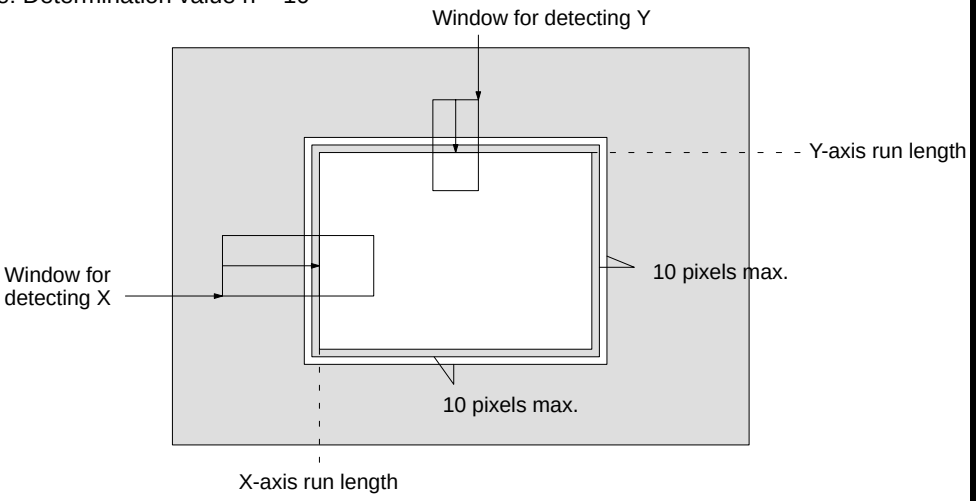
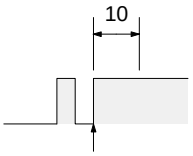
Note You must select separate window plane numbers for window 1 and window 2.

Run Length Mode Make the setting for each item.

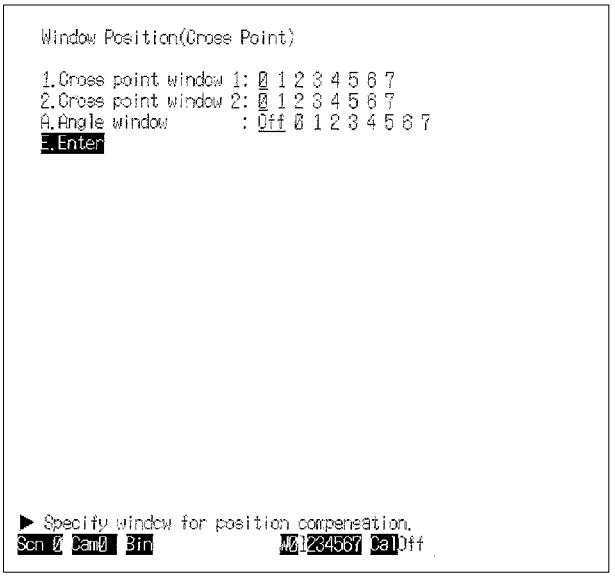


“Run length” refers to the boundary coordinates for white to black or black to white pixels. When measuring run length, use a rectangular window for the position displacement compensation window.

Separate window planes must be designated for window 1 and window 2.

Item	Setting
X. X	Select the number of the window for detecting the run length along the X axis. If you are not compensating for position displacement along the X axis, set this to “Off.”
Y. Y	Select the number of the window for detecting the run length along the Y axis. If you are not compensating for position displacement along the Y axis, set this to “Off.”
N. Noise	In order to reduce influence from noise, select (from 1 to 3) the number of consecutive pixels to be regarded as noise and ignored. If you do not wish to eliminate noise, select “Off.”
H. X pixel setting V. Y pixel setting	Set the number of pixels for detecting the run length. If the number of consecutive pixels meets or exceeds the determination value, the rising edge will be taken as the run length. Example: Determination value n = 10  A border thickness of 10 pixels or less on the outside will be ignored. 
P. Priority	Select X or Y to give one of them priority for compensation. Example: When X is Selected When X is selected, the order of processing will be as follows: X position displacement detected A X compensation A Y position displacement detected A Y compensation If you do not wish to set an order of priority, then select “Off.” In that case, position displacement compensation will be performed simultaneously for the X and Y axis.

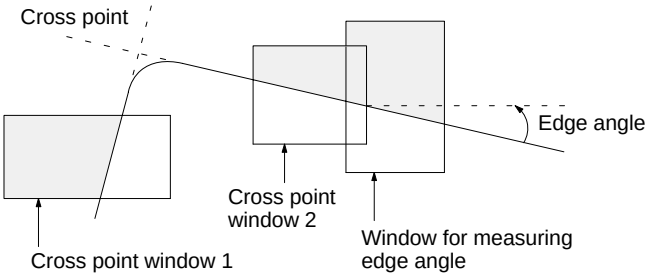
Cross Point Detection Mode Make the setting for each item.



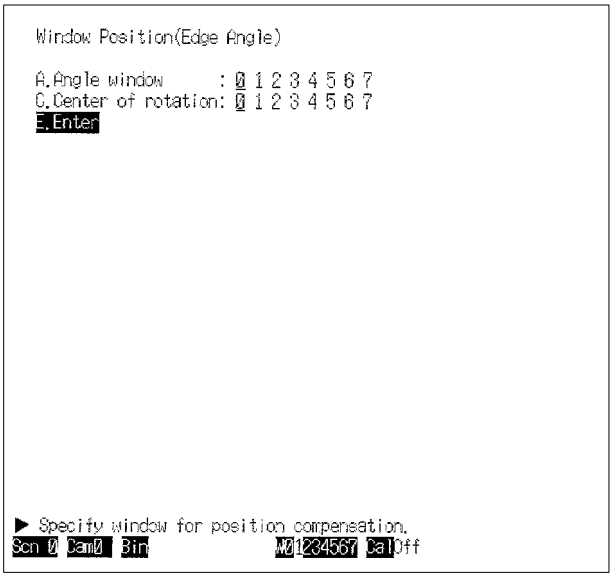
Rectangular windows must be used for measuring the point of intersection. Window 1 and window 2 must each be drawn in separate window planes.

Do not rotate the rectangular windows.

Item	Setting
1. Cross Point Window 1	Select the numbers of the window planes for measuring the point of intersection. Select separate window plane numbers for window 1 and window 2.
2. Cross Point Window 2	
A. Angle Window	When performing rotational compensation, select the numbers of the window planes to be used for that purpose. It is all right in this case if window planes 1 and 2 overlap. If rotational compensation will not be used, then select “Off.”



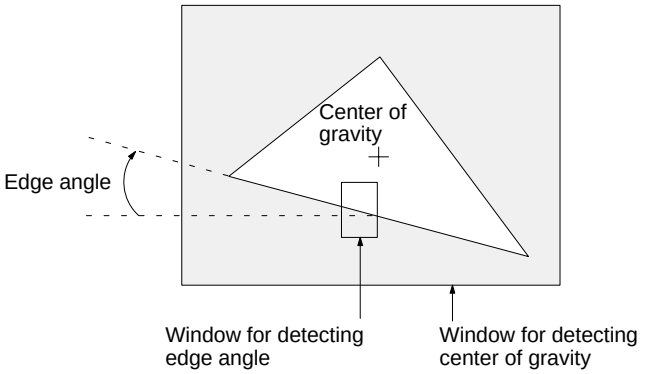
Edge Angle Detection Mode Make the setting for each item.



Rectangular windows must be used for detecting edge angles. Draw only one graphic in a window plane.

Do not rotate the rectangular windows when making settings.

Item	Setting
A. Angle Window	Select the number of the window for detecting the edge angle.
C. Center of Rotation	Select the number of the window for measuring the center of rotational compensation. Rotational compensation is carried out around the center of gravity of the specified window.



7-4 Setting Measurement Items

Select the window planes to be used for measurement, and for each window plane, set the item to be measured and the criteria to be used. A window that has been selected for detecting position displacement cannot be used for measurement.

Settings

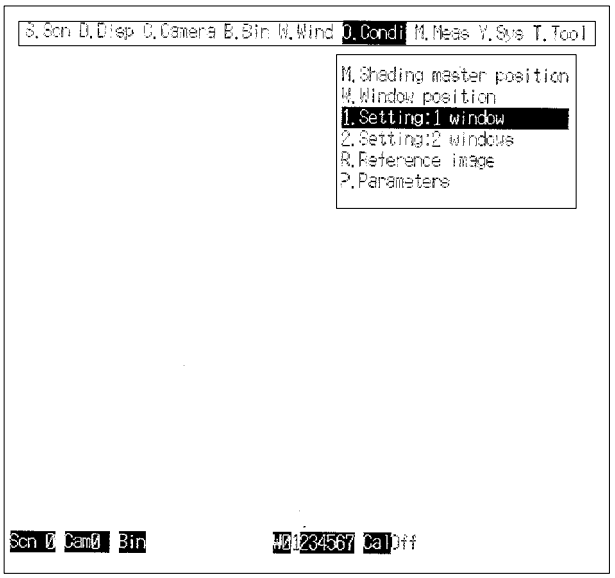
Item	Setting		Reference
1. Setting: 1 window	Select the number of the window plane to be used for measuring, and set the measurement item and criteria.		Refer to 7-4-1
	Selecting window plane number:	Select the number of the window plane to be used for measuring. You cannot select a window that has been selected for detecting position displacement.	
	Selecting measurement item:	Select whether the area, center of gravity, main axis angle, or edge angle is to be measured.	
	Setting criteria:	Set the criteria regarding whether the measurement results with respect to the area, center of gravity, main axis angle, or edge angle are to be taken as references.	
2. Setting 2 Windows	Select the numbers of the window planes for when measurement is executed using two window planes, and set the measurement items and criteria.		Refer to 7-4-2
	Selecting window plane number:	Select the number of the window plane to be used for measurement and the number of the other window. Set the measurement item and criteria for each window plane. You cannot select window planes that have been selected for detecting position displacement.	
	Selecting measurement item:	Select whether the mid-point between the centers of gravity, the inclination between the centers of gravity, and the point of intersection are to be measured.	
	Setting criteria:	Set the criteria regarding whether the measurement results with respect to the mid-point between the centers of gravity, the inclination, and the point of intersection are to be taken as references.	

7-4-1 Setting One Window

Select the number of the window plane to be used for measurement, and set the measurement item and the criteria to be used.

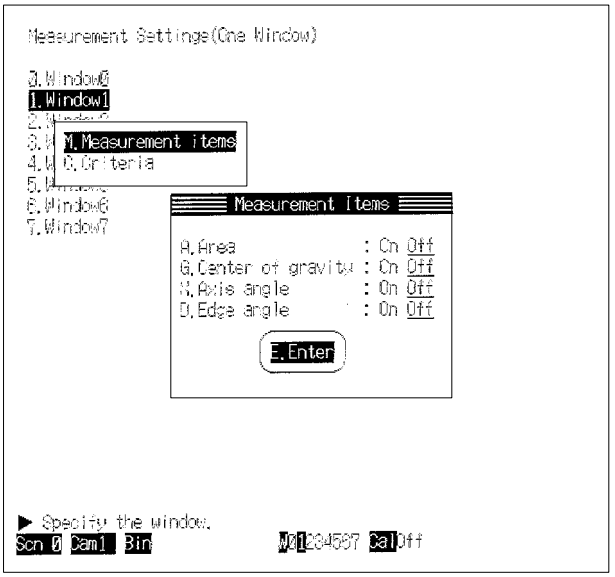
Selecting Window Plane Number and Measurement Item

1, 2, 3... 1. Select “1. Setting: 1 window” from the “O. Conditions” menu.



2. Select the number of the window plane to be used for measurement. You cannot overlap a window plane that has been selected for position displacement compensation.
3. Select “M. Measurement item” from the menu for the selected window plane.

   A list of measurement items will be displayed. Select “On” for the items to be measured. Select using the Up or Down Keys and then press the Enter Key. Setting is complete.

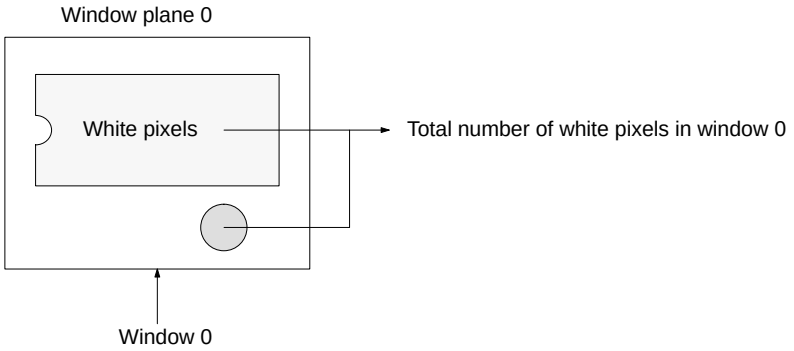


Measurement Items

Area

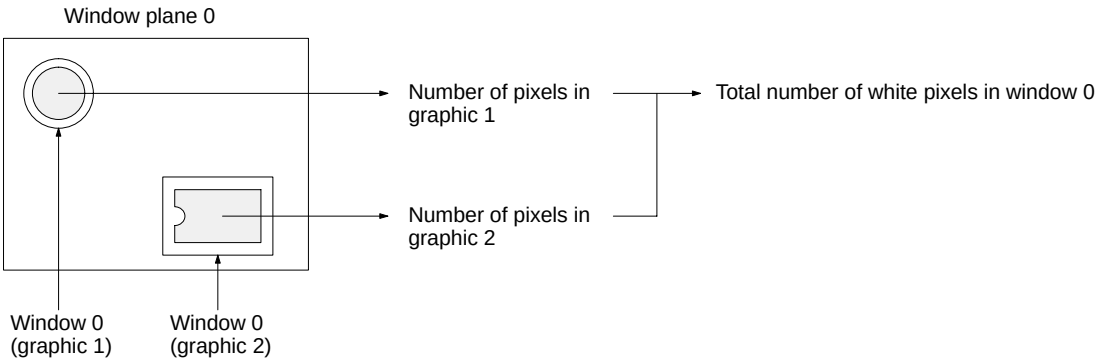
For measuring the area, the total number of white pixels is found. If calibration has not been set, then the result will be output in pixel units. If calibration has

been set then the result will be converted to the actual dimensions. The calibration setting is made under the “C. Camera” menu.



Multiple Windows:

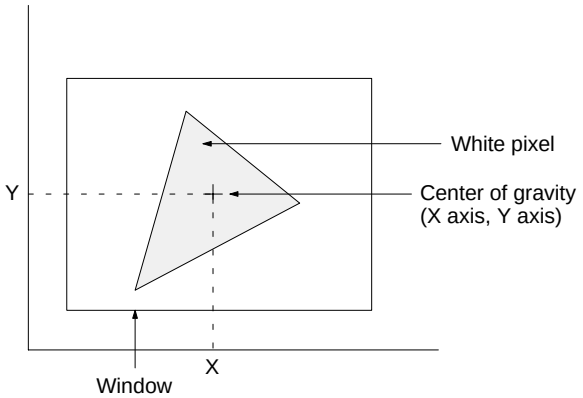
When there are multiple windows drawn in a single window plane, the sum of the results will be output.



Center of Gravity

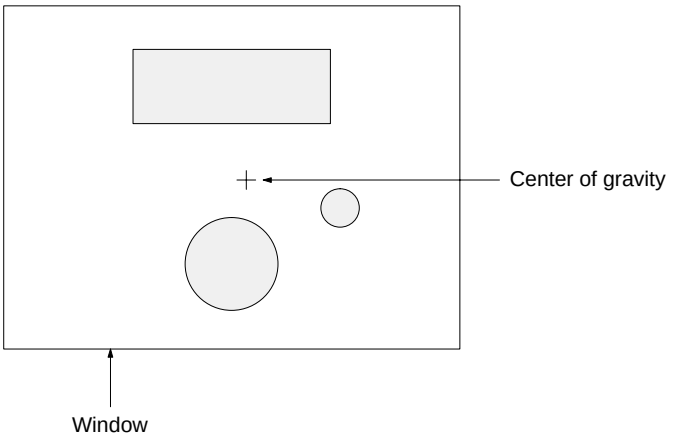
The center-of-gravity position (X axis, Y axis) for the white pixels in the window plane is measured.

If calibration has not been set, then the X and Y coordinates will be output in pixel units. If calibration has been set, then the coordinate system, coordinate axis, and unit system will be converted for output.

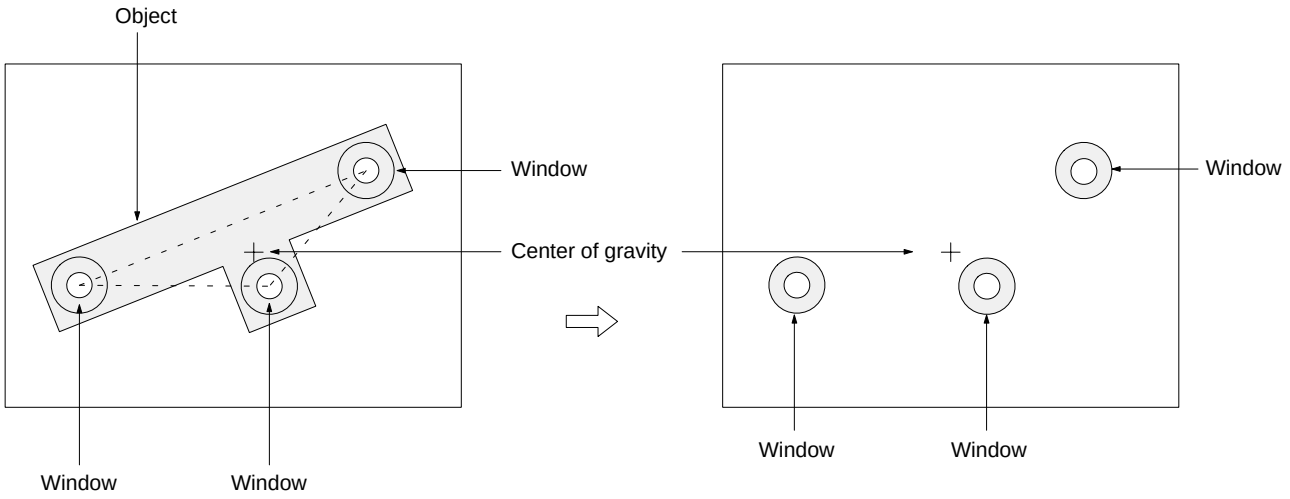


Multiple White Pixel Sets in a Window Plane:

The center of gravity in the window plane will be found based on the ratio of the various areas.



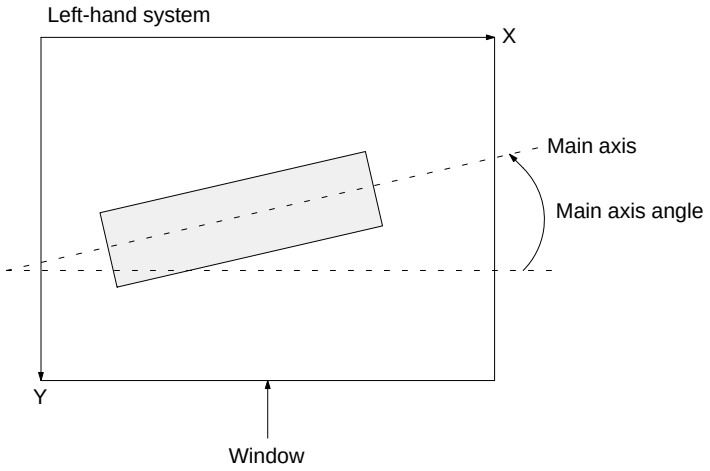
Multiple Windows:



Main Axis Angle

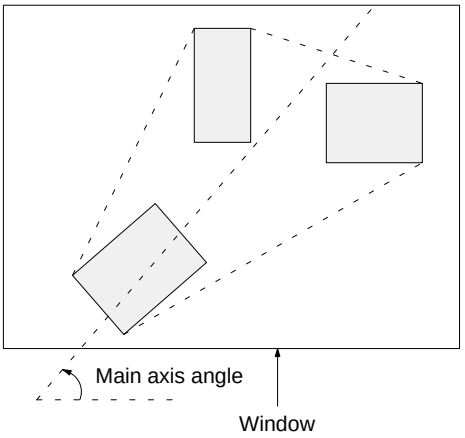
The inclination of the main axis of the set of white pixels in the window plane will be found.

If calibration has not been set, then the main axis angle of the camera coordinate system will be output.



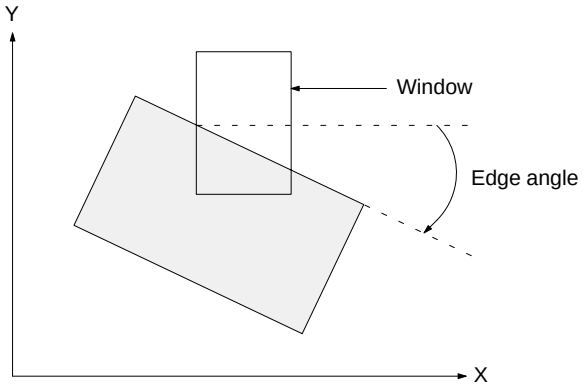
Multiple White Pixel Sets:

If there are multiple white pixel sets or multiple windows in a single window plane, then the main axis angle will be calculated taking all of the white pixels as objects of measurement.



Edge Angle

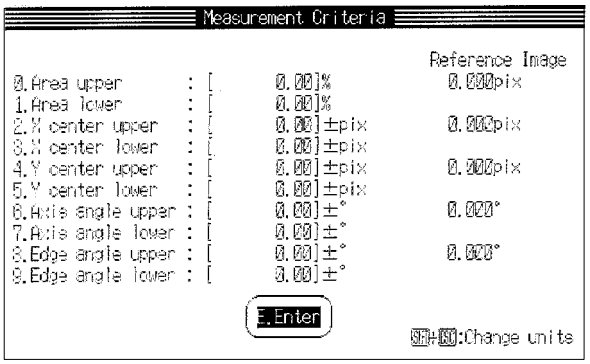
For measuring the edge angle, the inclination of the edge in the window will be found. The edge angle can only be measured when the only rectangular window that has been drawn in a window plane has been designated. At this time the rectangular window cannot be rotated.

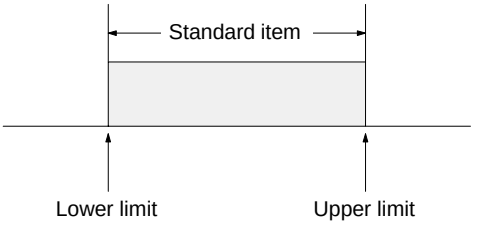


Setting Criteria

1, 2, 3...

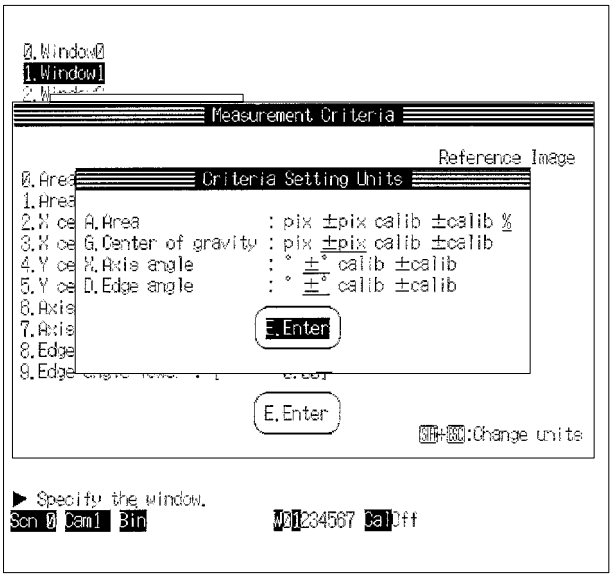
1. Select “C. Criteria” from the menu for the window plane.
2. A list of criteria will be displayed. Set the upper and lower limits for items that have been set to “On” with “M. Measurement item”.





3. To change the coordinate system or unit system for making settings, move the cursor anywhere outside of “E. Enter” and press the Shift and Escape Keys simultaneously.

If saved reference image data is displayed when calibration is on, it will be displayed in the units set by calibration.



4. Change the coordinate and unit systems for the reference values.

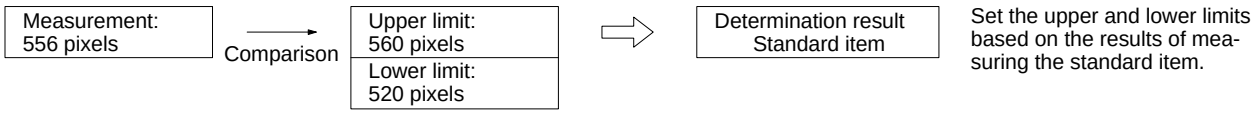
Criteria

Measurement item	Unit	Setting
Area	PIX	The criteria will be treated as the absolute value of pixel units.
	+PIX	The criteria will be treated as the relative value of pixel units with respect to the reference image.
	CALIB	The determination value will be treated as an absolute value, based on the unit system for the calibration setting.
	+CALIB	The determination value will be treated as a relative value with respect to the reference image, based on the unit system for the calibration setting.
	% (initial value)	The determination value will be treated as a relative value (percentage) with respect to the reference image.
Center of gravity	PIX	The criteria will be treated as the absolute value of the pixel units in the camera coordinate system.
	+PIX (initial value)	The criteria will be treated as the relative value of the pixel units with respect to the reference image in the camera coordinate system.
	CALIB	The determination value will be treated as an absolute value, based on the coordinate and unit systems of the calibration setting.
	+CALIB	The determination value will be treated as a relative value, with respect to the reference image, based on the coordinate and unit systems of the calibration setting.
Main axis angle	%	The criteria will be treated as an absolute value in the camera coordinate system.
	+% (initial value)	The criteria will be treated as a relative value with respect to the reference image in the camera coordinate system.
	CALIB	The determination value will be treated as an absolute value, based on the coordinate system of the calibration setting.
	+CALIB	The determination value will be treated as a relative value with respect to the reference image, based on the coordinate system for the calibration setting.
Edge angle	%	The criteria will be treated as an absolute value in the camera coordinate system.
	+% (initial value)	The criteria will be treated as a relative value with respect to the reference image in the camera coordinate system.
	CALIB	The determination value will be treated as an absolute value, based on the coordinate system for the calibration setting.
	+CALIB	The determination value will be treated as a relative value with respect to the reference image, based on the coordinate system for the calibration setting.

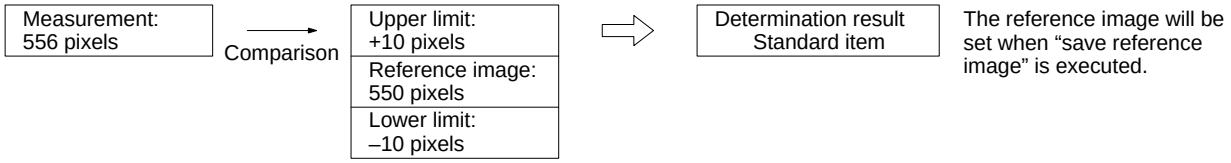
The following is an example for determining the criteria.

PIX (Absolute) and + PIX (Relative)

PIX (Absolute):



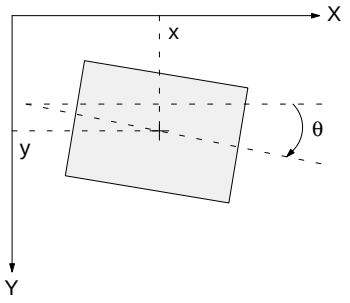
+ PIX (Relative):



Calibration Setting

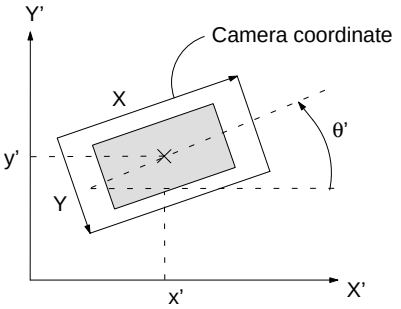
When Calibration Setting is Not Used:

When PIX, + PIX, %, %, or +% is selected, the calibration setting will be ignored and the determination value will be treated as a relative or absolute value for the camera coordinate system.



When Calibration Setting is Used:

When calibration is set, the coordinate system and unit system can be converted for measurement, so the determination value setting can also be made in the actual dimensions with the x', y', and θ' values.



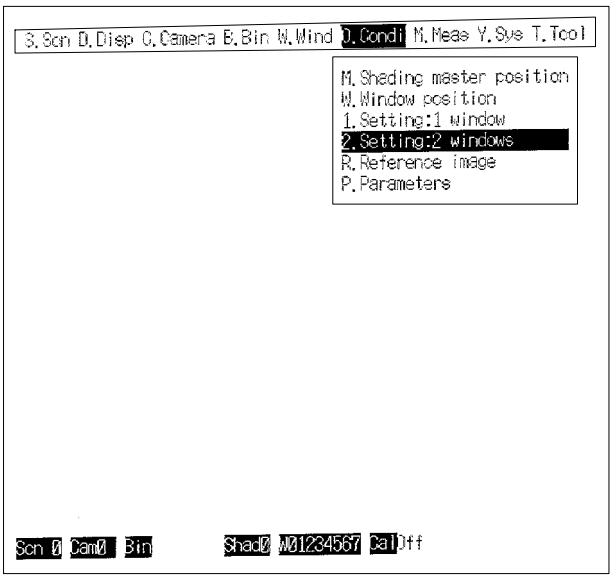
Actual coordinate (right-hand system)

7-4-2 Setting Two Windows

Using two window planes, the point of intersection, the mid-point and the inclination between the centers of gravity can be measured. Being able to select camera numbers and make measurement settings for each window plane allows for more complex measurements.

Setting Window Plane Numbers and Measurement Items

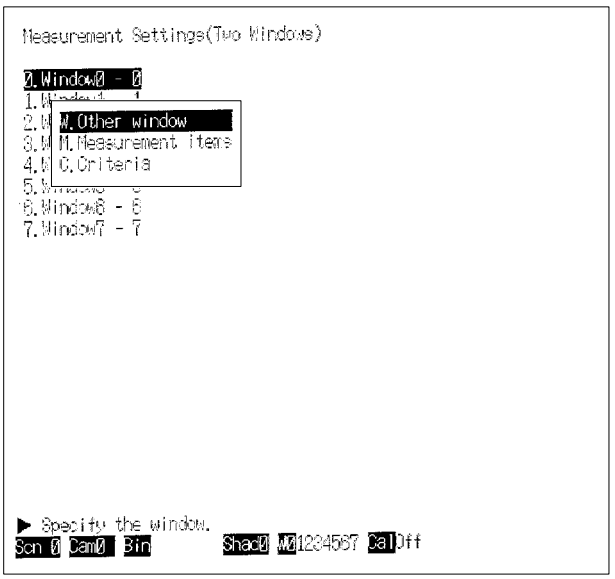
1, 2, 3... 1. Select “2. Setting: 2 Windows” from the “O. Conditions” menu.



2. Two window planes will be used for measurement. Select one of the two window planes.

   When two window planes are used for measurement, the results of measuring the point of intersection, the mid-point and the inclination between the centers of gravity will be output as measurement results for the first window that was set. For the window which is designated as the other window, the measurement item settings can be output independently.

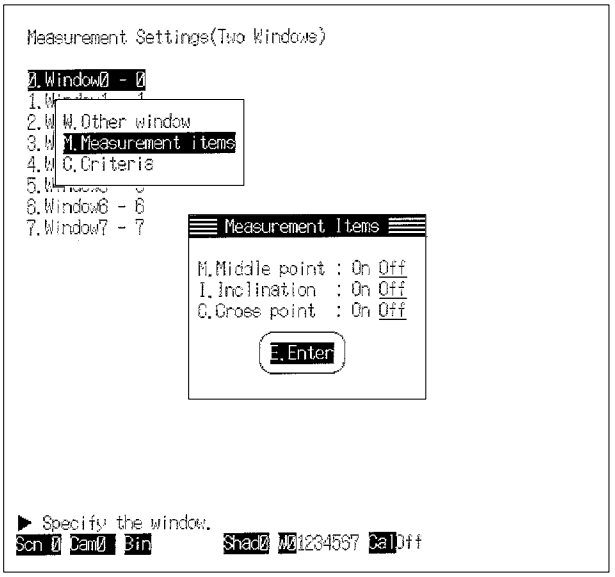
3. Select “W. Other Window” from the menu for the window plane.



4. Select the number of the other window plane.

5. Select “M. Measurement item”.

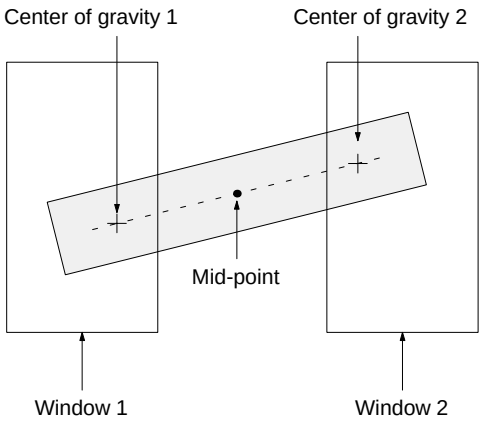
6. Select “On” for the item to be measured.



Measurement Items

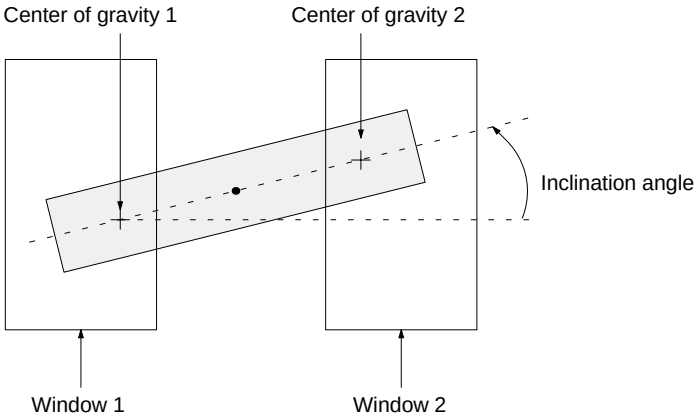
Mid-point Between the Centers of Gravity

Measure the centers of gravity for the two windows, and find the coordinates of the mid-point between the centers of gravity.



Angle of Inclination Between the Centers of Gravity

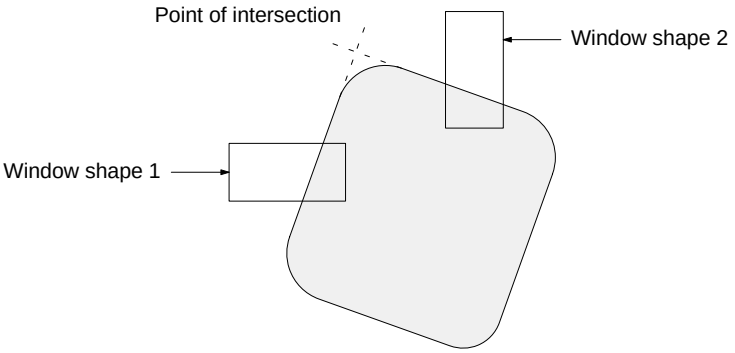
Find the inclination of a line connecting the two centers of gravity.



Point of Intersection

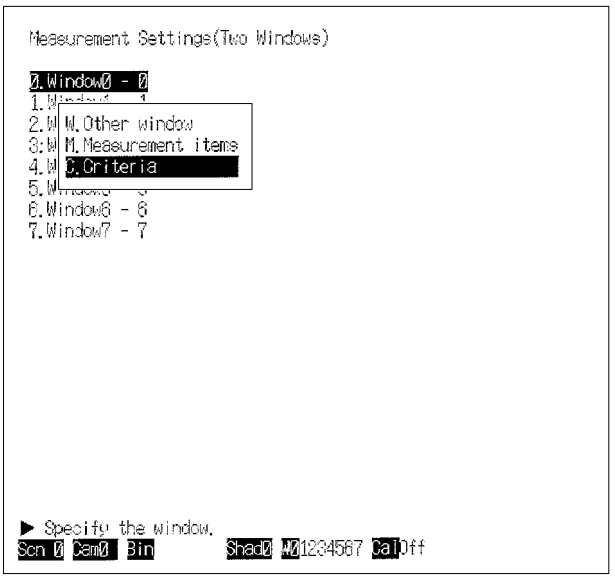
Find the point of intersection of the edge angles measured by the two window planes.

Do not rotate the rectangular windows.

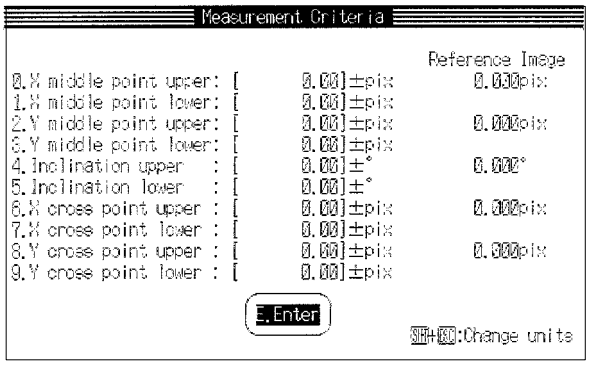


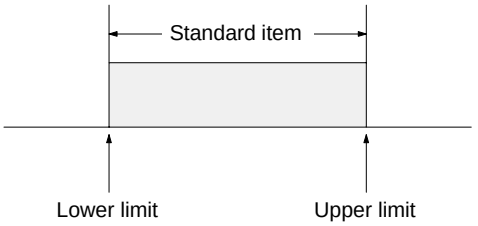
Setting Criteria

1, 2, 3... 1. Select “C. Criteria” from the menu for the window plane.



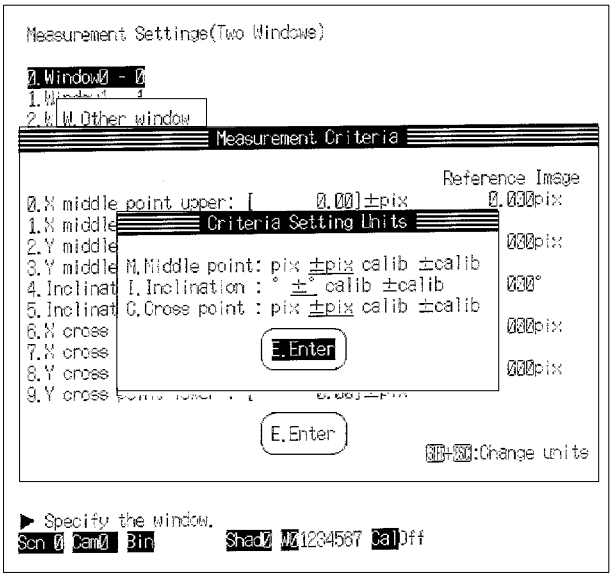
2. A list of criteria will be displayed. Set the upper and lower limits for items that have been set to “On” with “M. Measurement item”.





3. To change the coordinate system or unit system for making settings, move the cursor anywhere outside of “E. Escape” and press the Shift and Escape Keys simultaneously.

4. Change the coordinate and unit systems for the reference values.



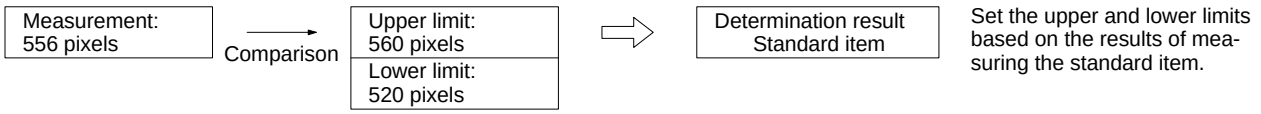
Criteria

Measurement item	Unit	Setting
Mid-point	PIX	The criteria for camera coordinates will be treated as the absolute value of pixel units.
	+PIX (initial value)	The criteria for camera coordinates will be treated as the relative value of pixel units with respect to the reference image.
	CALIB	The determination value will be treated as an absolute value, based on the coordinate and unit systems for the calibration setting.
	+CALIB	The determination value will be treated as a relative value with respect to the reference image, based on the coordinate and unit systems for the calibration setting.
Inclination angle	%	The criteria will be treated as an absolute value in the camera coordinate system.
	+% (initial value)	The criteria will be treated as a relative value with respect to the reference image in the camera coordinate system.
	CALIB	The determination value will be treated as an absolute value, based on the coordinate system of the calibration setting.
	+CALIB	The determination value will be treated as a relative value, with respect to the reference image, based on the coordinate system of the calibration setting.
Cross point	PIX	The criteria will be treated as the absolute value of the pixel units in the camera coordinate system.
	+PIX (initial value)	The criteria will be treated as the relative value, with respect to the reference image, of the pixel units in the camera coordinate system.
	CALIB	The determination value will be treated as an absolute value, based on the coordinate and unit systems for the calibration setting.
	+CALIB	The determination value will be treated as a relative value, with respect to the reference image, based on the coordinate and unit systems for the calibration setting.

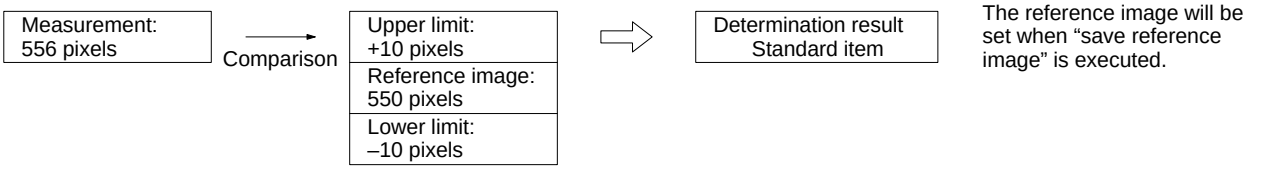
The following is an example for determining the criteria.

PIX (Absolute) and + PIX (Relative)

PIX (Absolute):



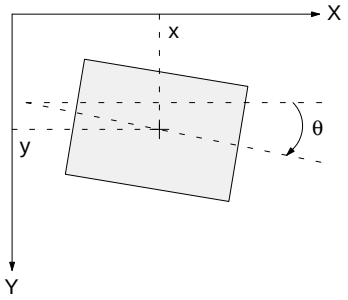
+ PIX (Relative)



Calibration Setting

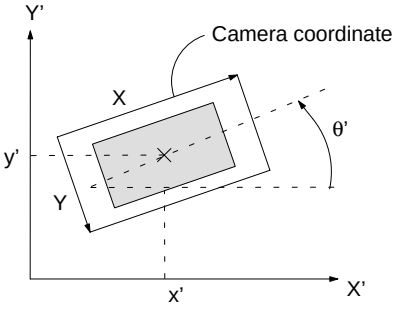
When Calibration Setting is Not Used:

When PIX, + PIX, %, %, or +% is selected, the calibration setting will be ignored and the determination value will be treated as a relative or absolute value for the camera coordinate system.



When Calibration Setting is Used:

When calibration is set, the coordinate system and unit system can be converted for measurement, so the determination value setting can also be made in the actual dimensions with the X’, Y’, and θ’ values.

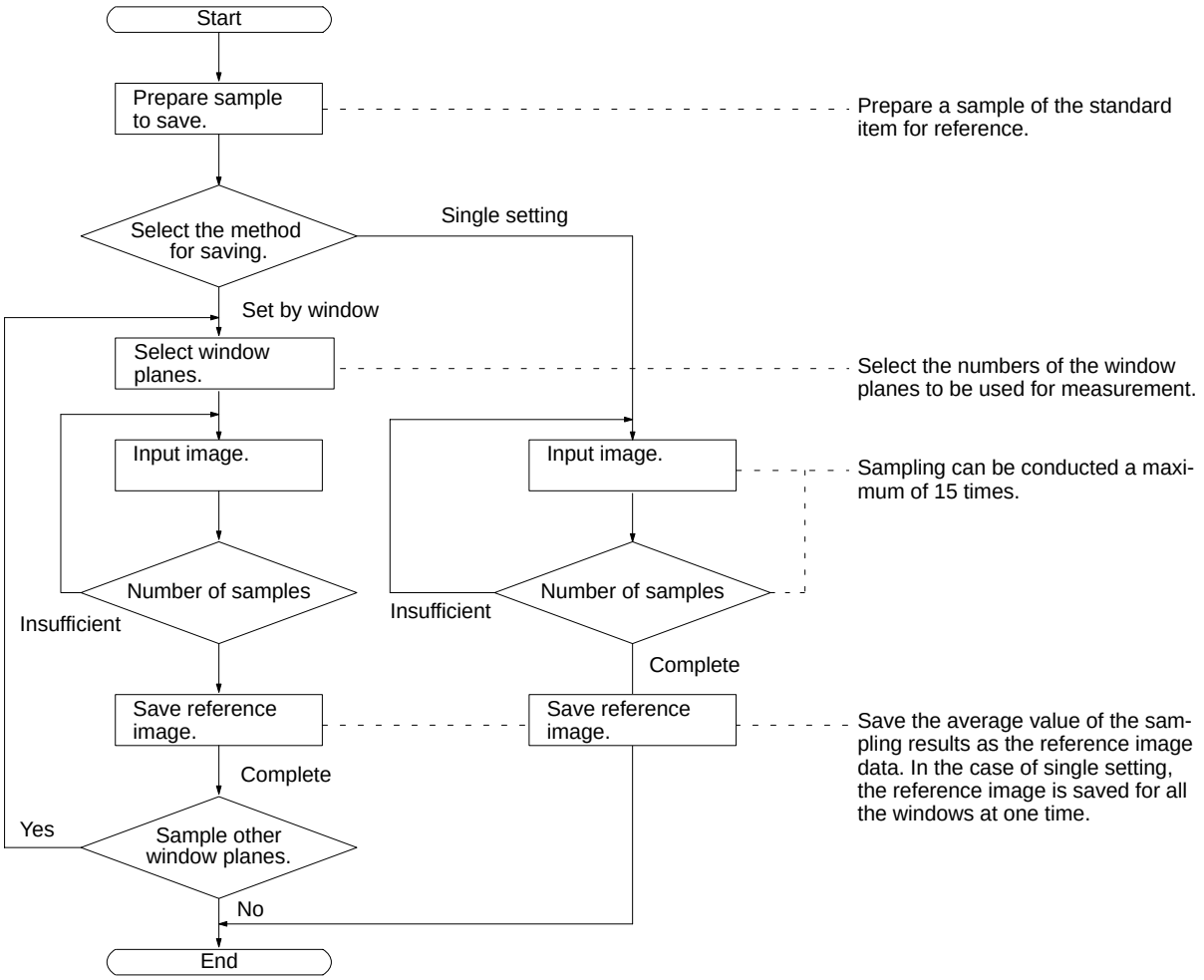


Actual coordinate (right-hand system)

7-5 Saving Reference Images

An image that is input by the camera can be measured, and the measurement values saved as reference image data. The reference image data will be used as a reference value for determining measurement results and compensating for position displacement. There are two ways to save a standard item. One method is to save it for windows 0 to 7 at one time (which is called single setting). The other method is to save it for each window (which is called setting by window).

Setting Procedure



1, 2, 3... 1. Select “R. Reference image” from the “O. Conditions” menu.

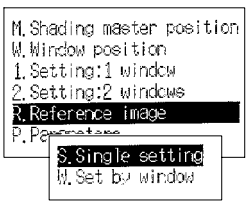
2. Select the method for saving the reference image.

   S. Single setting:

   The reference image will be saved for all of the window planes at one time. It will be saved for the measurement methods and cameras set for each window plane.

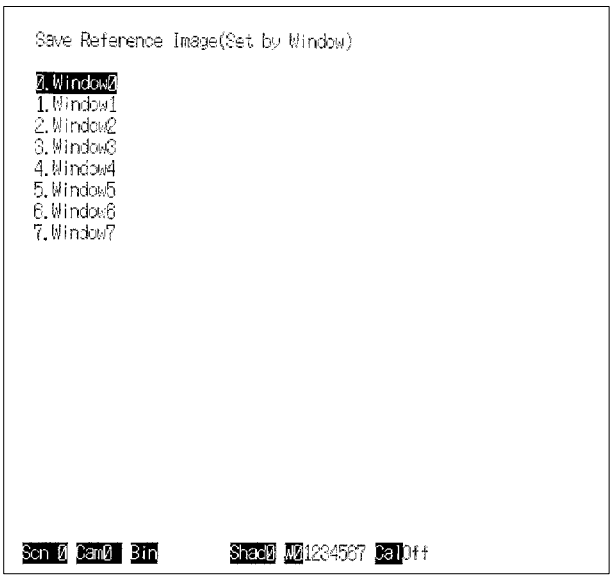
   W. Set by window:

   The reference image will be saved for the designated window plane only.



If “W. Set by window” is selected, a screen for selecting the window plane will be displayed. Select the number of the window plane to be used for measurement.

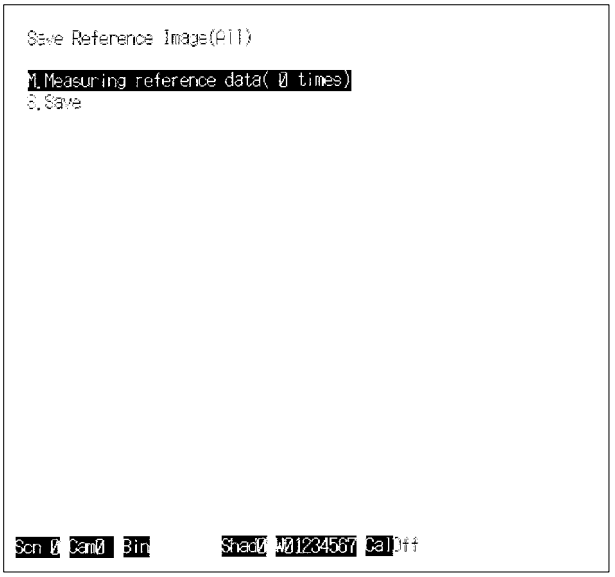
If “S. Single setting” is selected, the display will change to the screen for saving reference image (step 3).



3. Start the sampling of the reference image.

   Each time the Enter Key is pressed, the image will be input and the number of measurements will be counted. The sampling can be conducted a maximum of 15 times. After 15 times Enter Key input will not be accepted.

   Because the average value of all sampling results will be taken as the reference value for determination, it is recommended that as many samplings as possible be taken on as many standard items as possible.



4. After sampling has been completed, save the results as the reference value. Select S. Save.

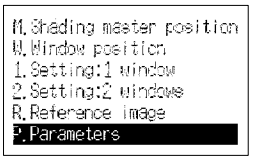
   When saving for individual windows, the display will change to the screen for selecting window planes (step 2). Select another window plane for measurement and conduct the sampling.

When saving for all window planes together, the display will return to step 1.

7-6 Checking Settings

A list can be displayed showing the uses and measurement items of the window planes.

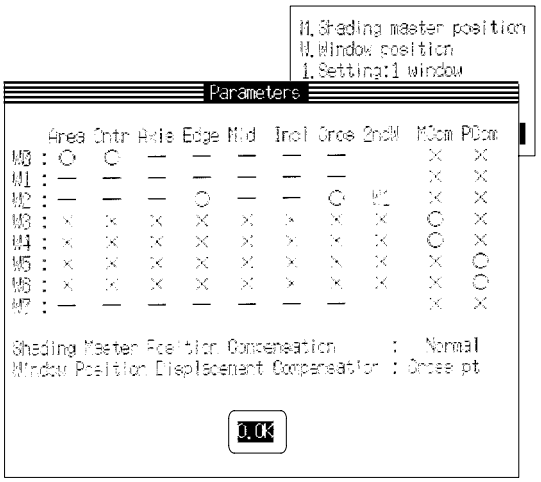
Select P. Parameter from the O. Conditions menu.



A list of measurement settings will be displayed.

- For each window, those measurement items for which “On” has been selected will be shown as a circle.
- “2nd W” refers to the other window plane in cases where measurement is conducted by two windows.
- For “MCom,” a circle is displayed for each window used for detecting position displacement with respect to the shading master.
- A circle under “PCom” means that the window is being used for detecting window plane position displacement.
- An “x” is marked for items that cannot by used with that window. (In the illustration shown below, the area and other items cannot be measured by window planes 3, 4, 5, and 6, which are used for detecting position displacement.)

- Those items which can be used with a given window, but which are not currently set, are indicated by a “–” mark.

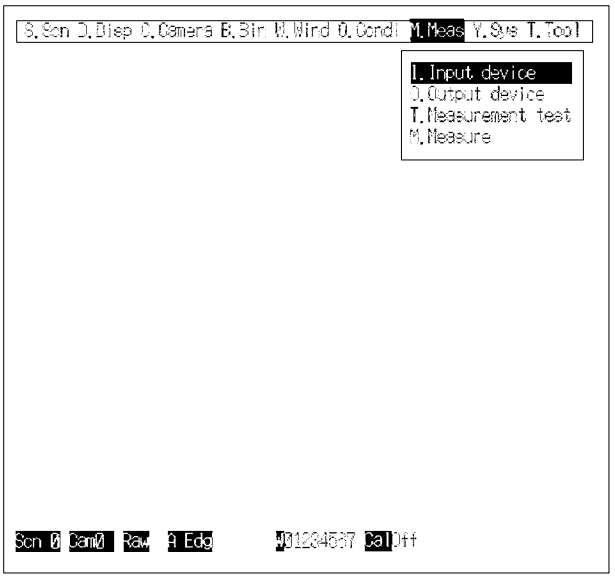


SECTION 8
Measurement

This section provides the procedures and information required to perform measurements.

8-1 Measurement

Under the “M. Measurement” menu, measurement is conducted based on the measurement items and criteria that have been set for each window.



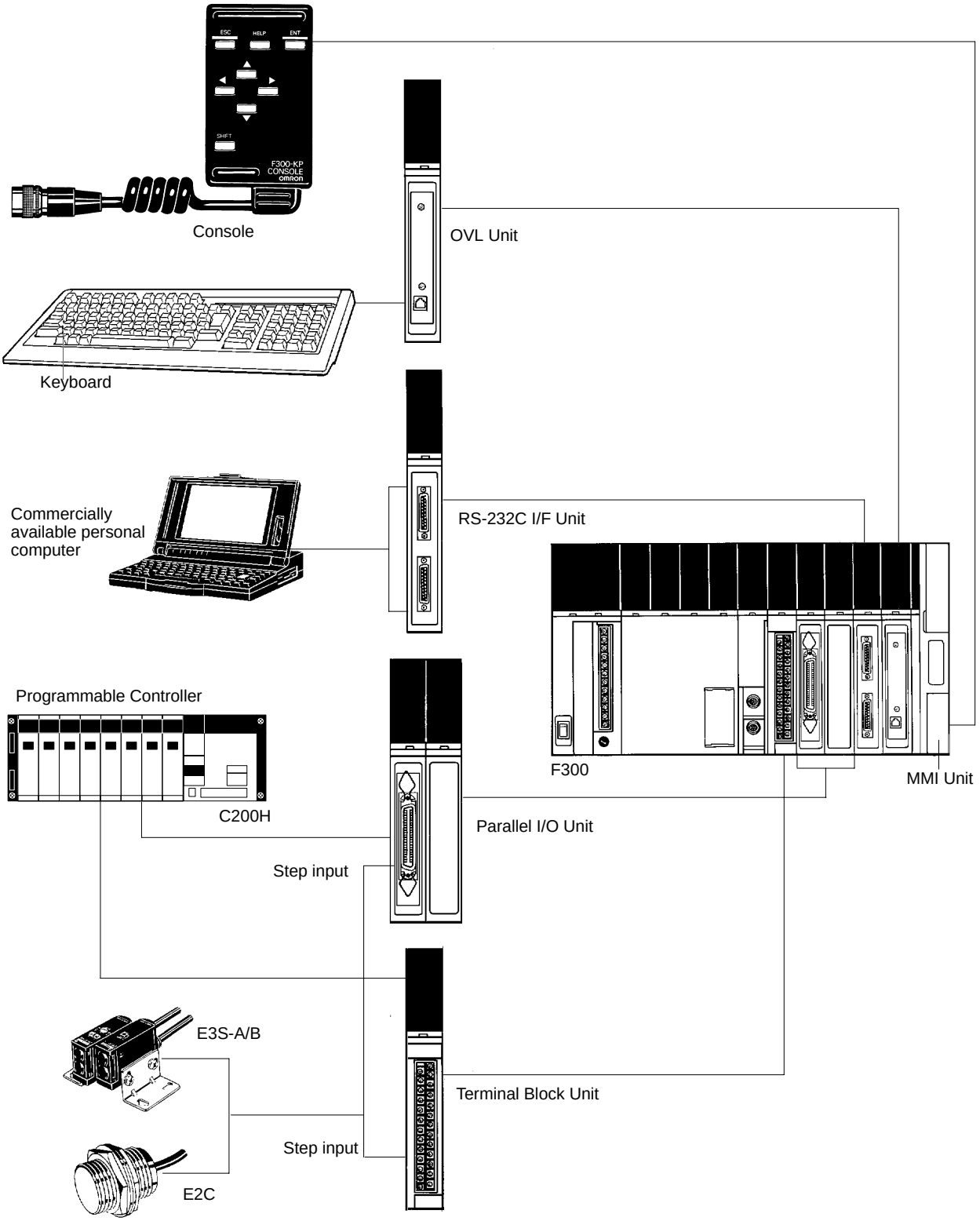
Menu Items

Item	Function	Reference
I. Input device	Select the device and form for inputting the starting and stopping of measurement and changes in various parameters.	Refer to 8-2
O. Output device	Select the devices and methods for outputting measurement results.	Refer to 8-3
T. Measurement test	Measurement tests can be conducted while switching scene numbers and camera numbers. Results can be observed on the monitor but they cannot be output to units and memory cards.	Refer to 8-4
M. Measurement	Measurement will be conducted based on scene data.	Refer to 8-5

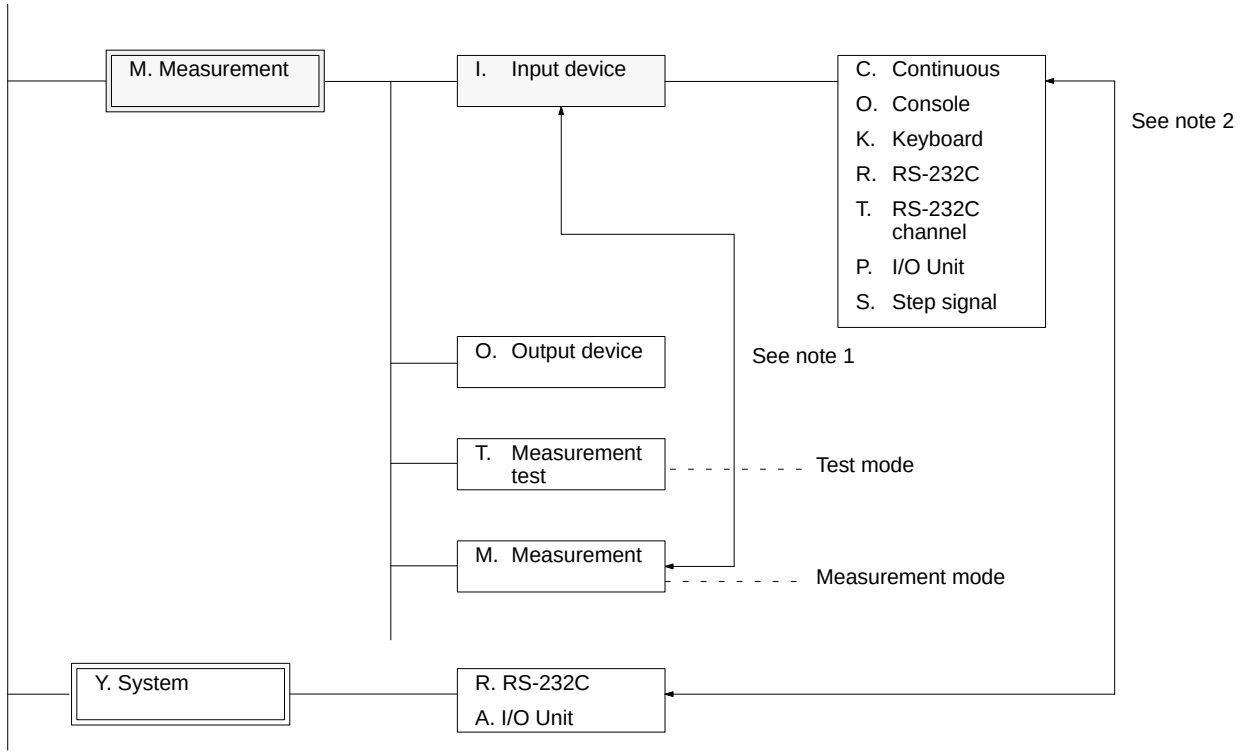
8-2 Setting Measurement Input

The conditions for starting measurement and the input devices to be used for normal measurement can be set.

Input Device Configuration



Related Menus



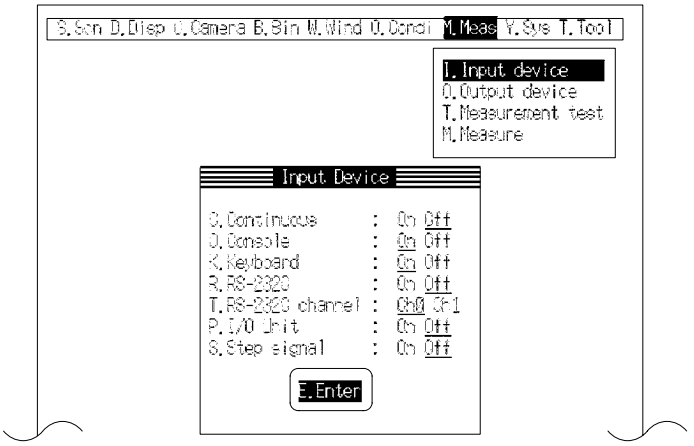
Note

1. With the “I. Input device” menu, select the conditions for conducting measurement and the device for inputting measurement commands.
2. When an RS-232C I/F Unit is used, communications specifications must be set for the channel numbers used under the “Y. System” menu.

Setting Operations

1, 2, 3...

1. Select “I. Input device”.
2. Select the input device to be used for measurement and the conditions for starting measurement.



Menu Items

Item	Settings
C. Continuous	For continuous measurement in the measurement mode, set to “On,” and for execution by external input only, set to “Off.”
O. Console	To receive measurement commands by key input from the console, set to “On.” To not receive commands from the console, set to “Off.”
K. Keyboard	To receive measurement commands from the keyboard, set to “On.” To not receive commands from the keyboard, set to “Off.”
R. RS-232C	To receive measurement commands from an RS-232C I/F Unit, set to “On.” To not receive commands from an RS-232C I/F Unit, set to “Off.”
T. RS-232C channel	With “T. RS-232C channel”, set the channels that are to be used. Under the “Y. System” menu, set the communications specifications.
P. I/O Unit	To receive measurement commands from a Terminal Block Unit or a Parallel I/O Unit, set to “On.” To not receive commands from these Units, set to “Off.”
S. Step signal	To begin by means of step inputs from a Terminal Block Unit or a Parallel I/O Unit, set to “On.” To not use step inputs, set to “Off.”

Measurement Command Functions

Command	Function
Measure	When a measurement command is input, measurement and determination will be executed one time.
Switch camera	Switches image display camera numbers.
Switch scene	Switches scene numbers and carries out measurement based on other scene data.
Save reference image	Saves measurement results as reference image data. Reference values saved for a window will be refreshed. You can save results for all windows at once or specify the numbers of individual windows.
Change binary level	Changes binary level settings during measurement. The changed setting will not be saved.
Quit measurement	Quits the measurement mode and returns to the main menu mode.
Reset	Executes software reset for controller.
Save scene data Save system data	Stores measurement condition set values in a device connected to the RS-232C I/F Unit or in a memory card.
Load scene data Load system data	Reads measurement conditions from a device connected to the RS-232C I/F Unit or from a memory card.
Light level adjustment	When the light level adjustment is set to “On,” the binary level will be adjusted automatically with regard to lighting fluctuations.

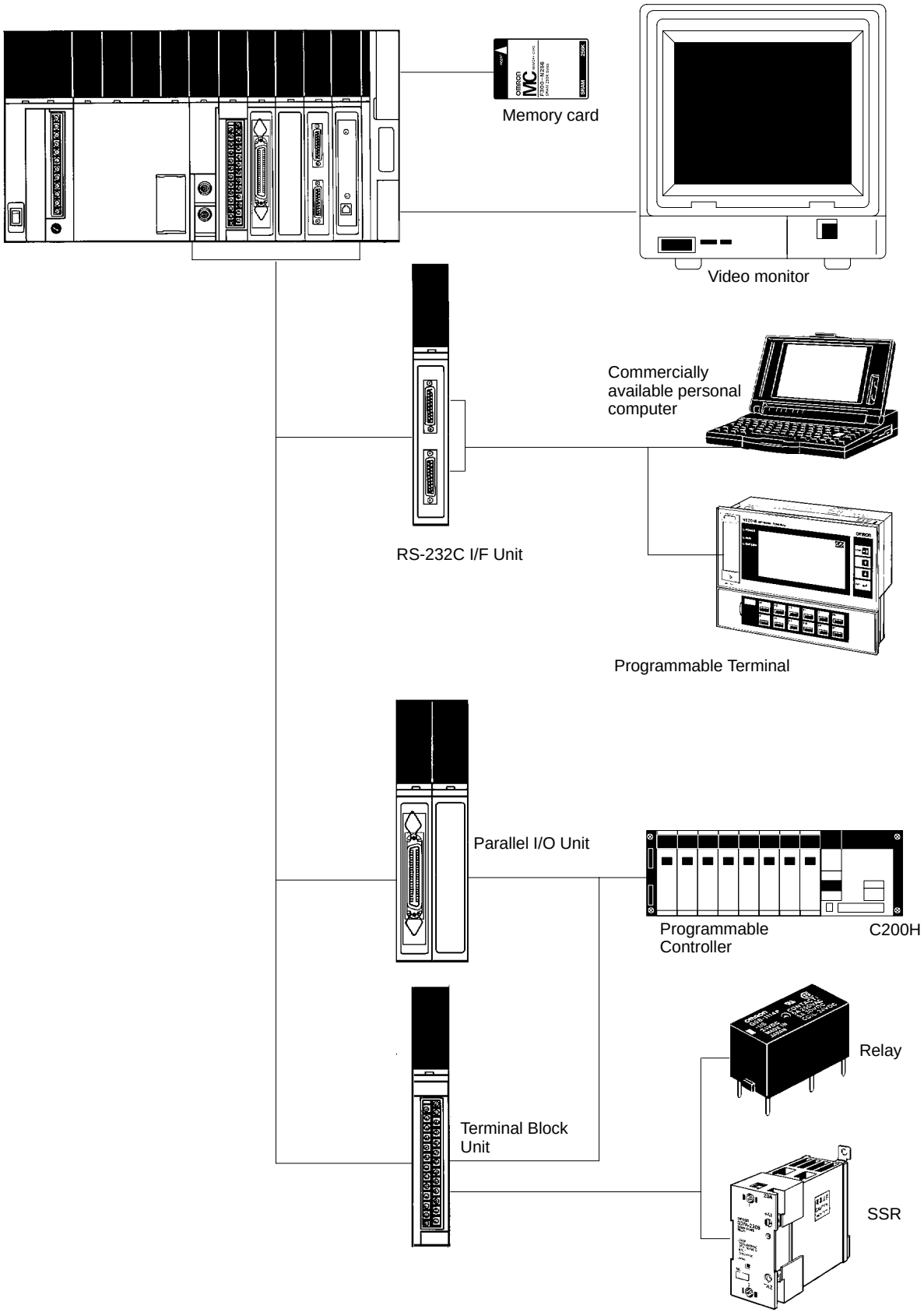
Measurement Command Input Devices

Command	Console	Keyboard	RS-232C I/F Unit (Channel 0)	RS-232C I/F Unit (Channel at time of designated measurement)	Parallel I/O Unit Terminal Block Unit
Measure	Valid when set to “On” by measurement input selection.	Valid when set to “On” by measurement input selection.	---	Valid when set to “On” by measurement input selection.	Valid when set to “On” by measurement input selection.
Switch camera	Valid when set to “On” by measurement input selection.	Valid when set to “On” by measurement input selection.	---	Valid when set to “On” by measurement input selection.	Invalid
Switch scene	Valid when set to “On” by measurement input selection.	Valid when set to “On” by measurement input selection.	---	Valid when set to “On” by measurement input selection.	Valid when set to “On” by measurement input selection.
Save reference image	Invalid	Valid when set to “On” by measurement input selection.	---	Valid when set to “On” by measurement input selection.	Valid when set to “On” by measurement input selection.
Change binary level	Invalid	Valid when set to “On” by measurement input selection.	---	Valid when set to “On” by measurement input selection.	Invalid
Quit measurement	Always valid, regardless of menu setting.	Always valid, regardless of menu setting.	Always valid, regardless of menu setting.	Valid when set to “On” by measurement input selection.	Invalid
Reset	Always valid, regardless of menu setting.	Valid when set to “On” by measurement input selection.	---	Valid when set to “On” by measurement input selection.	Invalid
Save scene data Save system data	Invalid	Invalid	---	Valid when set to “On” by measurement input selection.	Invalid
Load scene data Load system data	Invalid	Invalid	---	Valid when set to “On” by measurement input selection.	Invalid
Light level adjustment	Valid only when set to “On” by measurement input selection or when set to “On” by light level adjustment and set for external commands by adjustment interval.	Valid only when set to “On” by measurement input selection or when set to “On” by light level adjustment and set for external commands by adjustment interval.	---	Valid only when set to “On” by measurement input selection or when set to “On” by light level adjustment and set for external commands by adjustment interval.	Valid only when set to “On” by measurement input selection or when set to “On” by light level adjustment and set for external commands by adjustment interval.

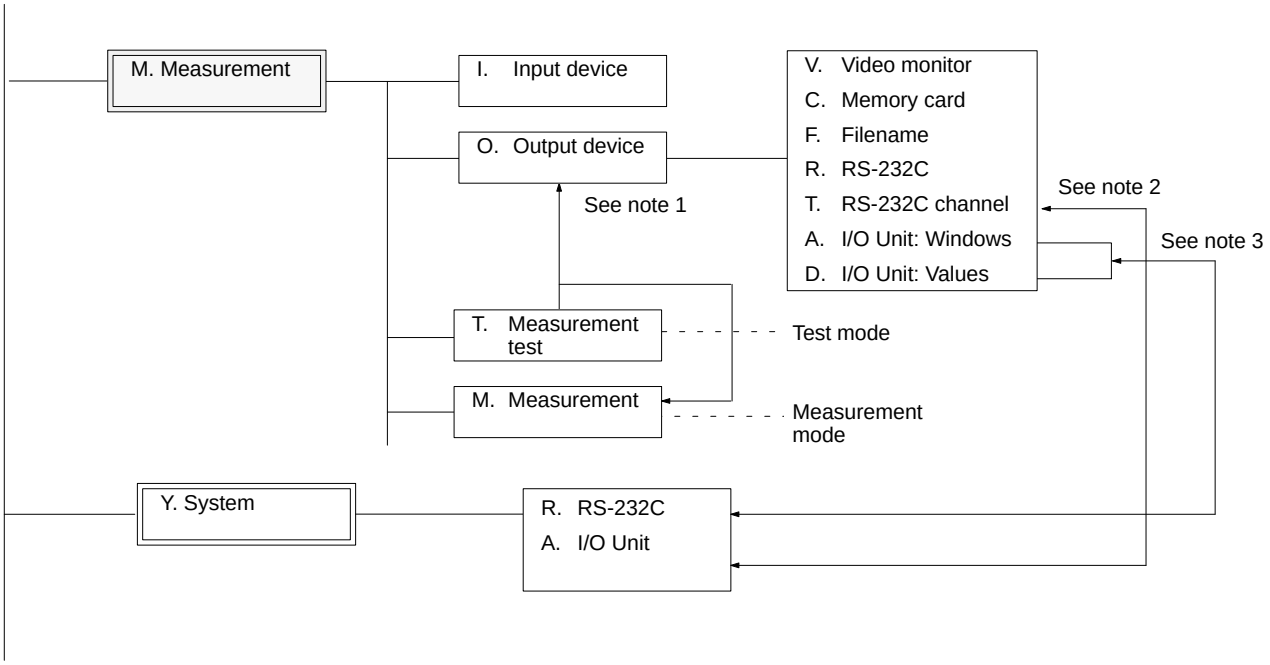
8-3 Setting Measurement Output

The devices and methods for outputting measurement results can be selected.

Output Device Configuration



Related Menus



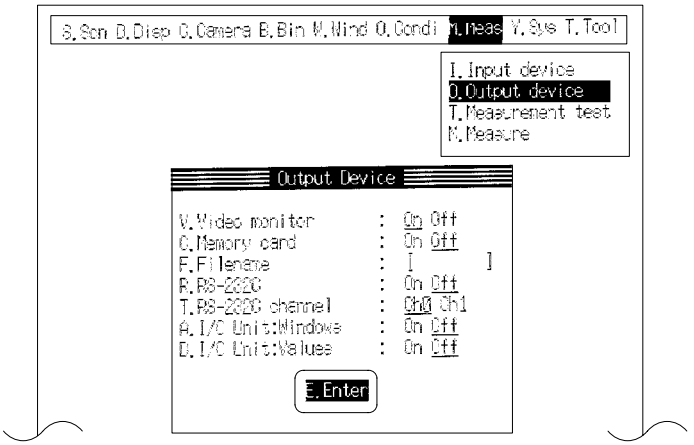
Note

1. With the “O. Output device” menu, devices and methods can be selected for outputting measurement results in the measurement mode.
2. When using an RS-232C I/F Unit, the communications specifications for the channels to be used must be set (under the “Y. System” menu).
3. When using Parallel I/O Units or Terminal Block Units, set the output method with the “O. Output device” menu and the communications specifications with the “Y. System” menu.

Setting Procedure

1, 2, 3...

1. Select “O. Output device” from the “M. Measurement” menu.
2. Select the output devices and methods.



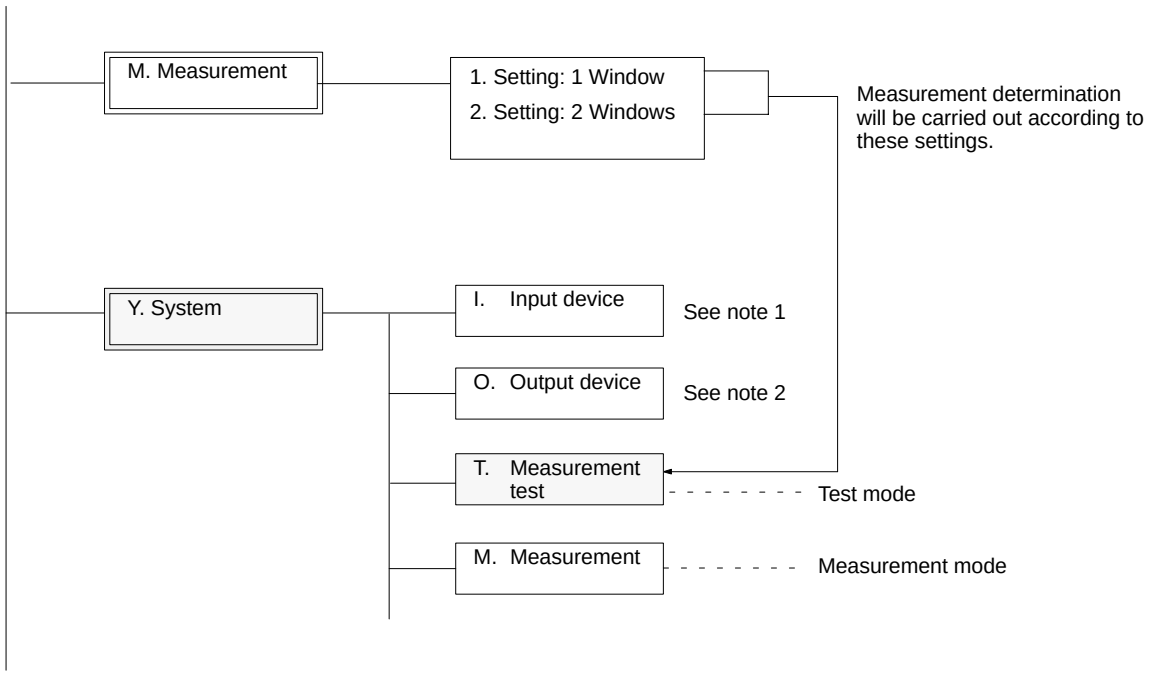
Menu Items

Item	Settings
V. Video monitor	To output measurement and determination results to the video monitor, set to “On.” Otherwise, set to “Off.”
C. Memory card	To write measurement and determination results to the memory card, set to “On.” In that case, the filename must also be set. If you do not wish to write measurement results to the memory card, set to “Off.”
F. Filename	
R. RS-232C	To output measurement and determination results to an RS-232C Unit, set to “On.” Otherwise, set to “Off.”
T. RS-232C channel	With the “T. RS-232C channel” menu, set the channels that are to be used by the RS-232C Unit. Under the “Y. System” menu, set the communications specifications.
A. I/O Unit: Windows	To output a determination result (OK or NG) for each window to a Parallel I/O Unit or Terminal Block Unit, set to “On.” Otherwise, set to “Off.” Under the “Y. System” menu, set the communications specifications.
D. I/O Unit: Values	To output measurement values to a Parallel I/O Unit or Terminal Block Unit, set to “On.” Otherwise, set to “Off.” Under the “Y. System” menu, set the communications specifications.

8-4 Measurement Tests

Measurement tests can be conducted by means of input from the Console Box or the keyboard. When you select “T. Measurement test”, the F300 will enter the test mode. While in the test mode, measurement and determination processing conditions can be checked on the video monitor.

Related Menus

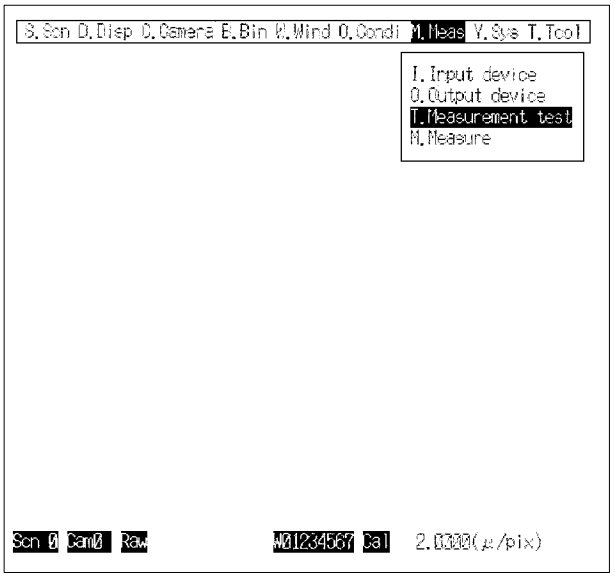


Note

1. Regardless of measurement input settings, in the test mode key input can be used from the Console or keyboard to carry out measurements or to select scene or camera numbers.
2. Regardless of measurement output settings, in the test mode measurement results will be output to the video monitor. In addition, while in the test mode measurement and output times will be displayed at the bottom of the screen.

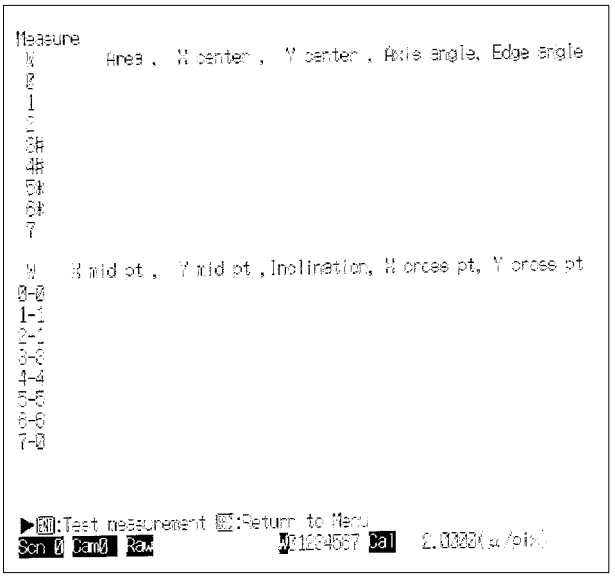
Measurement Test Operations

1, 2, 3... 1. Select “T. Measurement test” from the “M. Measurement” menu.



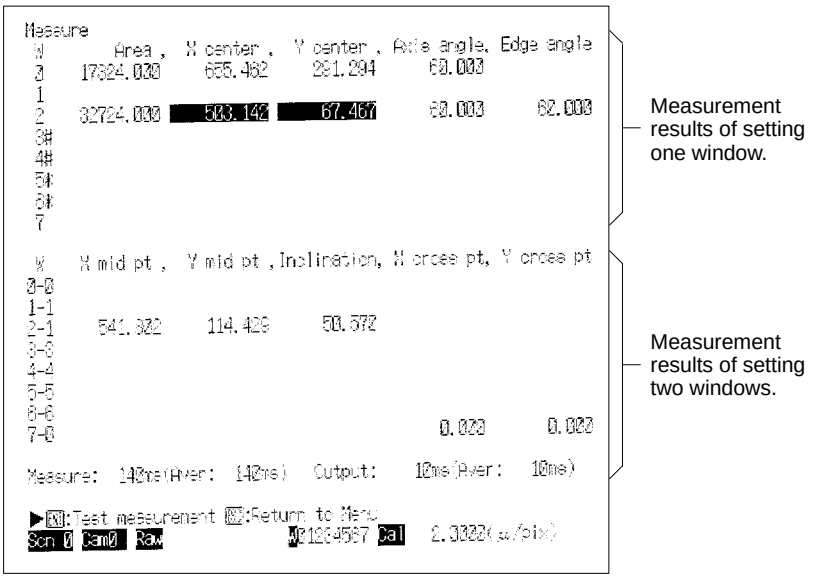
The mode will change to the test mode.

In the test mode, measurement inputs will only be accepted from the Console or keyboard, and measurement input and output settings will be irrelevant. Measurement results will only be output to the video monitor.



2. Press the Enter Key again to begin measurement. From this point on, measurement will be carried out each time the Enter Key is pressed.

Determination results and measurement values exceeding the range of the upper and lower limits will be highlighted for display (i.e., displayed in reverse video).



Operations in Test Mode

In the test mode, you can perform operations from the Console or keyboard regardless of the settings made with the “I. Input device” menu. Likewise, measurement results will be output to the video monitor regardless of the settings made with the “O. Output Device” menu.

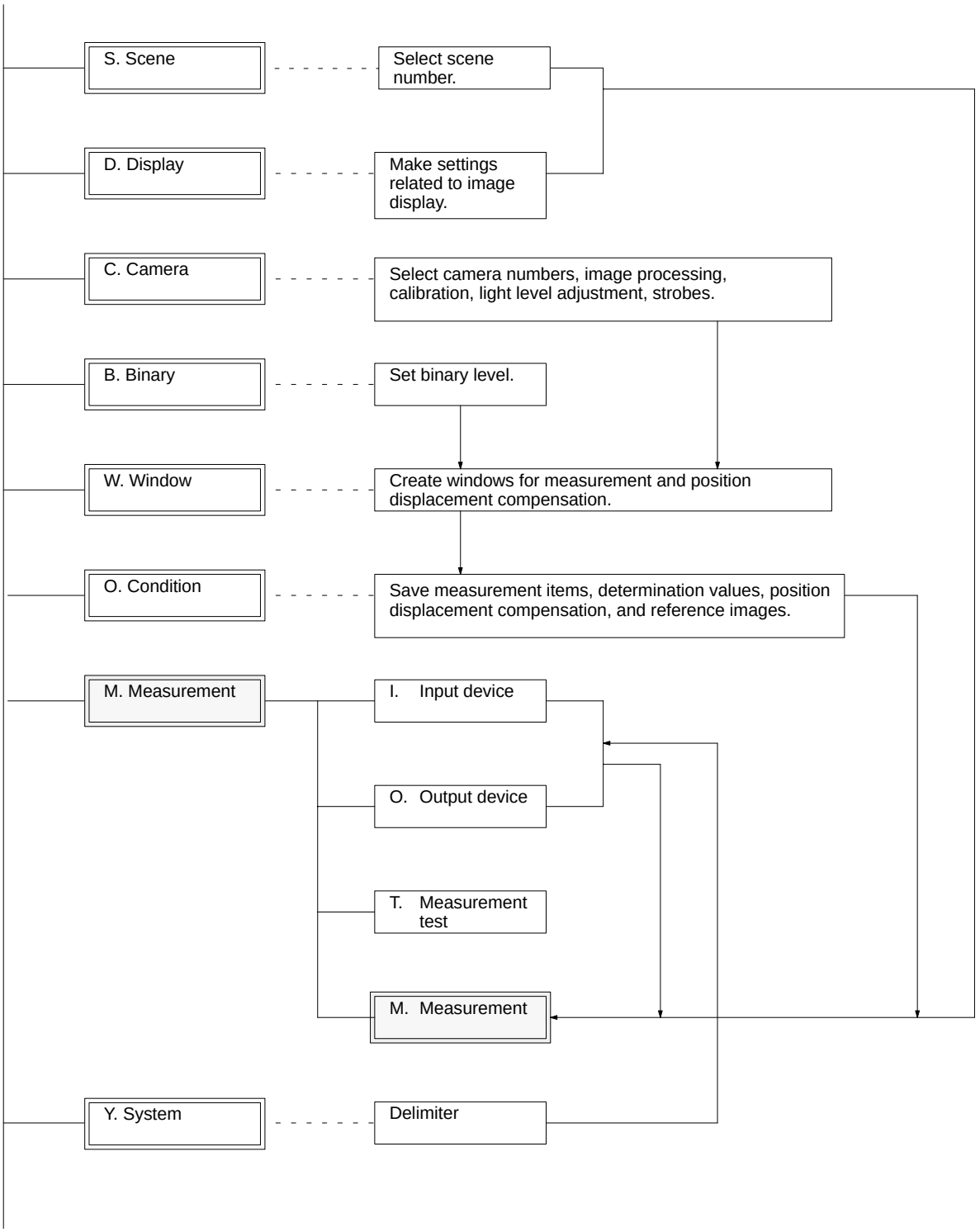
Command name	Console	Keyboard	Function
Measure	Enter Key	m Key, Enter Key	Carries out measurement one time.
Switch Camera	Left or Right Keys	Select using the Left or Right Keys, Ctrl+s Keys or Ctrl+d Keys	Switches the camera displaying the image. Measurement is carried out by the camera designated in the measurement window, so there will be no effect on measurement processing.
Switch Scene	Up or Down Keys	Select using the Up or Down Keys, Ctrl+e Keys or Ctrl+x Keys	Switches the scene number.
	---	s Key, *scene no.*, Enter Key	Directly switches the scene number.
Adjust Light Level	Shift+Enter Keys	Shift+Enter Key or a Key, Enter Key	If light level adjustment is set with the “C. Camera” menu, this operation will change the binary level and automatically correct the light/dark ratio with regard to fluctuations in lighting. The binary level set value itself will not change. In addition, the changed binary level will not be saved.
Quit Measurement	Esc Key	Esc Key or Home Clr Key or q Key, Enter Key	Quits the measurement mode and returns to the menu mode.
Reset	Shift+Help+Enter Keys	i Key, Enter Key	Resets the software for the controller. After the reset has been executed, the status will be the same as if the power had been turned on, then off, and then on again. The reset operation can always be used regardless of the mode at the F300 itself.

8-5 Measurement Menu Item

When “M. Measurement” is selected, the F300 will enter the measurement mode. In the measurement mode, measurements and determinations will be

carried out based on the measurement conditions that have been set, and then output to designated devices.

Related Menus



Switching to Measurement Mode

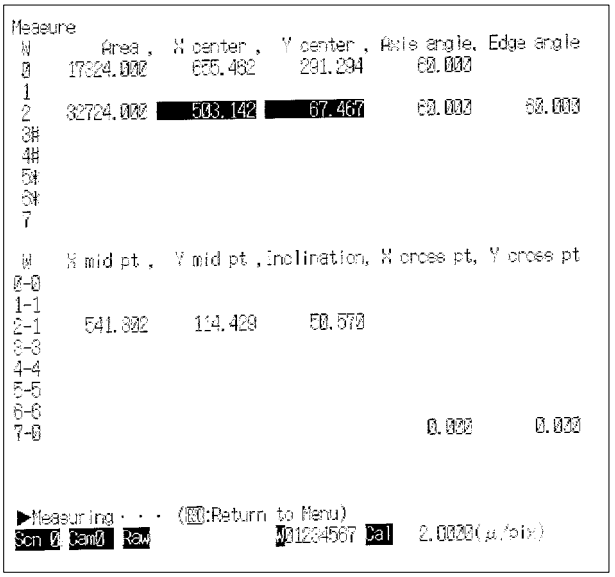
Select “M. Measurement” from the “M. Measurement” menu.

The measurement mode screen will be displayed.

If “V. Video monitor” has been set to “On” with the “O. Output device” menu, then the measurement results will be displayed.

If the determination results exceed the range for the upper and lower limits, the measurement value will be highlighted on the screen.

If “O. Console” has been set to “Off” with the “I. Input device” menu, then scene numbers and camera numbers cannot be switched. Measurement can be quit by means of the Escape Key.



Operations in Measurement Mode

If “O. Console” and “K. Keyboard” have been set to “On” with the “I. Input device” menu, then the following operations will be possible in the measurement mode.

Command name	Console	Keyboard	Function
Measure	Enter Key	m Key, Enter Key	Carries out measurement one time.
Switch Camera	Left or Right Keys	Select using the Left or Right Keys, Ctrl+s Keys or Ctrl+d Keys	Switches the camera displaying the image. Measurement is carried out by the camera designated in the measurement window, so there will be no effect on measurement processing.
Switch Scene	Up or Down Keys	Select using the Up or Down Keys, Ctrl+e Keys or Ctrl+x Keys	Switches the scene number.
	---	s Key, *scene no.*, Enter Key	Directly switches the scene number.
Adjust Light Level	Shift+Enter Keys	Shift+Enter Key or a Key, Enter Key	If light level adjustment is set with the “C. Camera” menu, this operation will change the binary level and automatically correct the light/dark ratio with regard to fluctuations in lighting. The binary level set value itself will not change. In addition, the changed binary level will not be saved.
Quit Measurement	Esc Key	Esc Key or Home Clr Key or q Key, Enter Key	Quits the measurement mode and returns to the menu mode. Quitting will be possible even if “O. Console” and “K. Keyboard” have been set to “Off” with the “I. Input device” menu.
Reset	Shift+Help+Enter Keys	i Key, Enter Key	The reset operation can always be used regardless of the mode of the controller itself. Reset will be possible even if “O. Console” and “K. Keyboard” have been set to “Off” with the “I. Input device” menu.
Save Reference Image	---	r Key, Enter Key	Refreshes the reference image. If no window number is specified, then it will be possible to save for all the windows at once. If a window number has been specified, then the specified window can be saved individually.
		r Key, *window no.*, Enter Key	
Binary Level	---	u Key, *window no.*, “,” Key, *upper limit*, Enter Key	Changes the upper limit for specified windows.
		l Key, *window no.*, “,” Key, *lower limit*, Enter Key	Changes the lower limit for specified windows.

8-6 Measurement Commands and Output Timing

8-6-1 RS-232C I/F Units

Input Command Chart

Channels Designated by "I. Input device" Menu

If RS-232C is set to ON using the "I. Input device" menu, the following commands can be input from specified channels.

Command name	Command (ASCII Code)	Function
Measure	"M" or "m"	When the command is input, measurement will be carried out one time according to the measurement conditions in the current scene.
Switch Camera	Ctrl Key+S Key	Switches displays among cameras set in a scene. (Same as when the Left Key is pressed on the Console or keyboard.)
	Ctrl Key+D Key	Switches displays among cameras set in a scene. (Same as when the Right Key is pressed on the Console or keyboard.)
Switch Scene	Ctrl Key+E Key	Switches measurement scenes. (The scene number will be incremented by only one, just as when the Up Key is pressed on the Console or keyboard.)
	Ctrl Key+X Key	Switches measurement scenes. (The scene number will be decremented by only one, just as when the Down Key is pressed on the Console or keyboard.)
	"S" or "s"	Switches the scene to the designated scene number.
Save Reference Image	"R" or "r"	Carries out measurement with respect to the input image, and refreshes reference image data for the window designated by the scene.
Set Binary Level	"U" or "u"	Changes binary level upper limit to the designated value.
	"L" or "l"	Changes binary lower upper limit to the designated value.
Light Level Adjustment	"A" or "a"	Adjusts the light level.
Quit Measurement	"Q" or "q"	Quits the measurement mode and returns to the main menu.
Reset	"I" or "i"	Executes software reset for controller.
Save Scene Data (RS-232C)	"V" or "v"	Saves measurement conditions for a designated scene to a device connected to the RS-232C I/F Unit.
Load Scene Data (RS-232C)	"O" or "o"	Loads the scene's measurement conditions from a device connected to the RS-232C I/F Unit.
Save System Data (RS-232C)	"Y" or "y"	Saves system setting data to a device connected to the RS-232C I/F Unit.
Load System Data (RS-232C)	"T" or "t"	Loads system setting data from a device connected to the RS-232C I/F Unit.

For Channel 0:

The command shown below will always be valid for channel 0, regardless of the RS-232C channel setting.

Command name	Command (ASCII Code)	Function
Quit Measurement	"Q" or "q"	Quits the measurement mode and returns to the main menu. At that time the scene will be the last scene for which measurement was carried out.

Input Command Communications Formats

Measure

When the following commands are input, measurement will be carried out one time.

"M" ($4D)	Delimiter	or	"m" ($6D)	Delimiter

Switch Camera

This command switches displays among cameras set in a scene. It has the same effect as pressing the Left and Right Keys on the Console or keyboard.

CTRL + "S" ($53)	(Just as when the Left Key is pressed, the camera number will be decremented.)
CTRL + "D" ($44)	(Just as when the Right Key is pressed, the camera number will be incremented.)

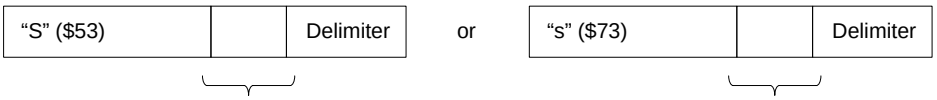
Switch Scene (Command 1)

This command changes scene numbers one by one. It has the same effect as pressing the Up and Down Keys on the Console or keyboard.

CTRL + "E" ($45)	(Just as when the Up Key is pressed, the scene number will be incremented.)
CTRL + "X" ($58)	(Just as when the Down Key is pressed, the scene number will be decremented.)

Switch Scene (Command 2)

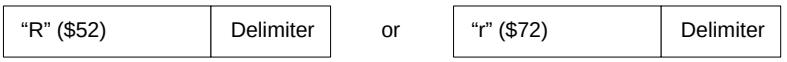
This command directly switches the scene to another scene whose number has been designated.



New scene no. (Select a number from 0 to 15 to specify the scene in ASCII code.)

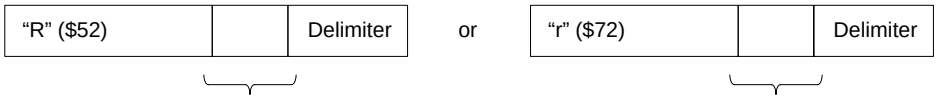
Save Reference Image (Command 1)

Measurement will be carried out with respect to the input image, and reference image data for all windows will be refreshed.



Save Reference Image (Command 2)

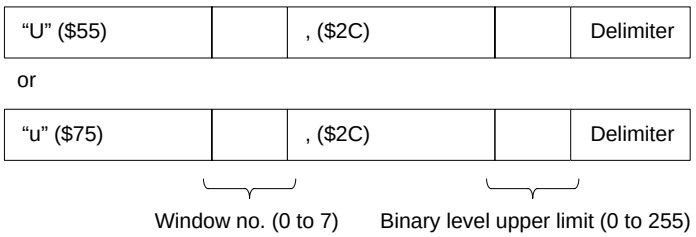
Measurement will be carried out with respect to the input image, and reference image data for the designated window will be refreshed.



Number of window for saving data (Select a number from 0 to 7 to specify the window in ASCII code.)

Change Binary Level (Upper Limit)

This command changes to a specified value the binary level upper limit that has been set for a window.

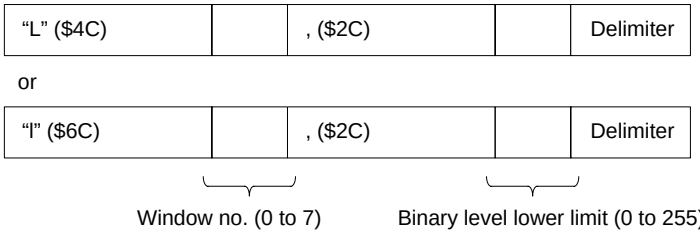


Window no. (0 to 7) Binary level upper limit (0 to 255)

Designate the window number and the upper limit for the binary level in ASCII code.

Change Binary Level (Lower Limit)

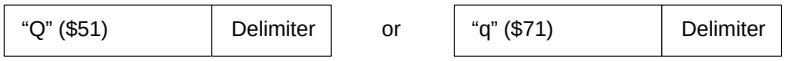
This command changes to a specified value the binary level lower limit that has been set for a window.



Designate the window number and the lower limit for the binary level in ASCII code.

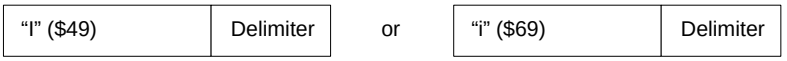
Quit Measurement (Return to Menu)

This command quits the measurement mode and returns to the main menu.



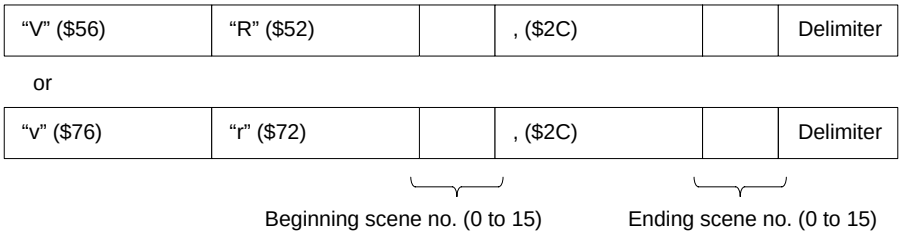
Reset

This command executes software reset for the controller.



Save Scene Data (RS-232C)

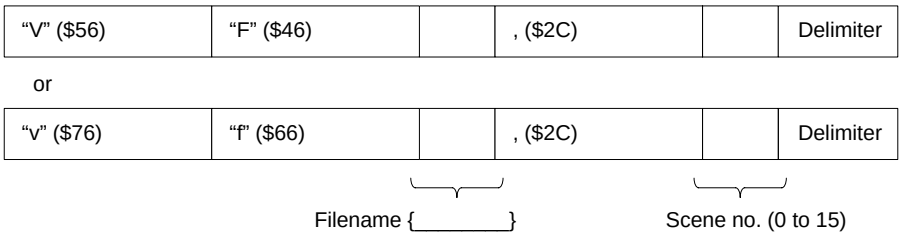
This command saves scene measurement conditions within a specified range for a device connected to the RS-232C I/F Unit. When this command is entered, data will be transmitted for channel 0 (fixed).



Specify both the beginning scene number and the ending scene number in ASCII code.

Save Scene Data (Memory Card)

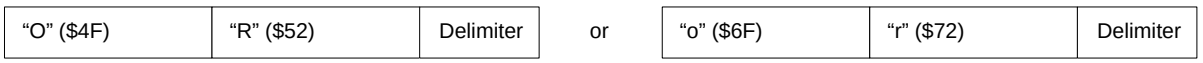
This command saves measurement conditions for a designated scene to a designated file in the memory card.



Specify both the filename and the scene number in ASCII code. The filename may be entered in either upper case or lower case.

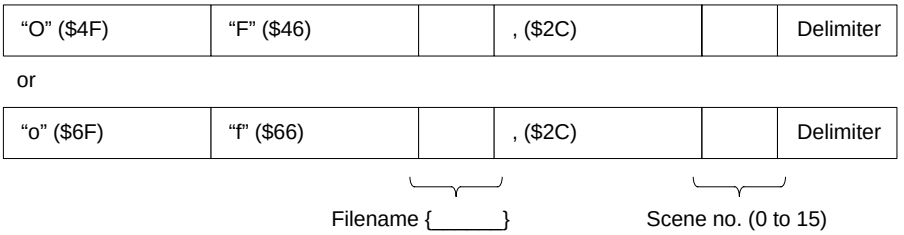
Load Scene Data (RS-232C)

This command loads scene data that has been saved for a device connected to the RS-232C I/F Unit. The data will be loaded to a scene that has been saved by means of the save command. Transmit via channel 0 (fixed) the data that is to be loaded.



Load Scene Data (Memory Card)

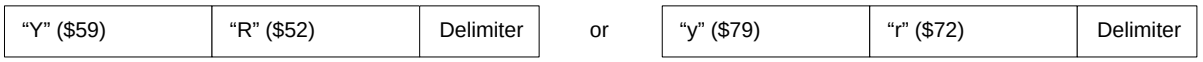
This command loads scene measurement conditions from a designated file in the memory card to a designated scene.



Specify both the filename and the scene number in ASCII code. The filename may be entered in either upper case or lower case.

Save System Data (RS-232C)

This command saves system setting data for a device connected to the RS-232C I/F Unit.



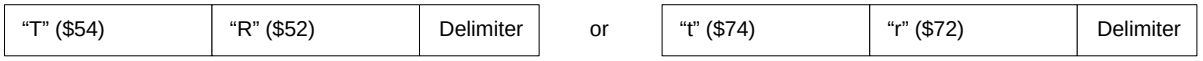
Save System Data (Memory Card)

This command saves system setting data to a designated file in the memory card.

Specify the filename in ASCII code. The filename may be entered in either upper case or lower case.

Load System Data (RS-232C)

This command loads system setting data from RS-232C. Following this command, transmit the saved system data via channel 0 (fixed).



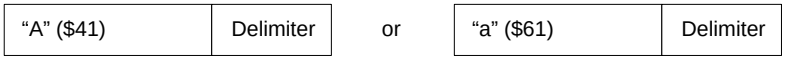
Load System Data (Memory Card)

This command loads system setting data from a designated file on the memory card.

Specify the filename in ASCII code. The filename may be entered in either upper case or lower case.

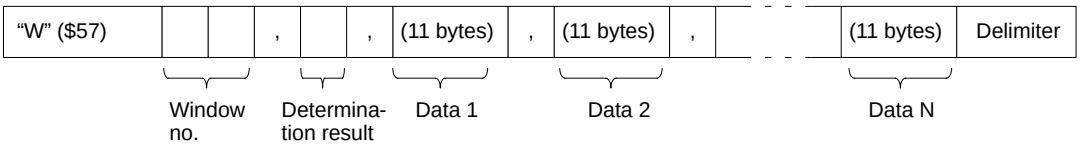
Light Level Adjustment

This command adjusts the light level.



Output Data Format

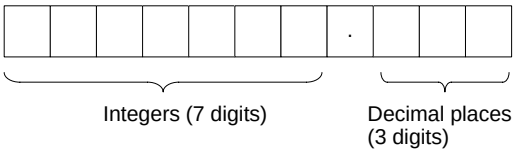
The format for outputting measurement results is as shown below.



Data is output in the order of the window number.

Window No.	Outputs the window number in two bytes.
Determination result	Outputs "0" if determinations for all of the measurement items set in the window are OK, and otherwise outputs "1."
Data 1 to Data N	Outputs in ASCII code the measurement values for items set in the window. The order of priority for outputting values is as follows: 1 Area 2 Center of gravity X 3 Center of gravity Y 4 Main axis angle 5 Edge angle 6 Mid-point X 7 Mid-point Y 8 Inclination angle 9 Cross point X 10 Cross point Y

Each measurement data item (i.e., the items listed above) will be output in a fixed format of seven integers and three decimal places.



The following is an example of outputting "–123.4".

			–	1	2	3	.	4	0	0

Spaces ($20) are entered in the blank area.

No measured result of the F300 greater than 2147483.647 or smaller than –999999.999 can be displayed. The displayed value will be 2147483.647 if the result is greater than 2147483.647 and –999999.999 will be displayed if the result is smaller than –999999.999.

8-6-2 Parallel I/O Units and Terminal Block Units

Units and Number of Points

The two types of Input/Output Units are shown in the table below, along with the numbers of input and output points for each.

	Input points	Output points	Control points
Terminal block units (F300-D)	8	8	5 (see note 1)
Parallel I/O units (F300-DC)	8	32	3 (see note 2)

Note 1. BUSY, GATE, AND, OR, DSA
2. BUSY, GATE, DSA

I/O Points Required for Each Operation

The numbers of input and output points required for each operation using I/O Units are shown in the following table.

Function	Points required
Inputting measurement command	Input: 8 pts.
Outputting results of measurement determination	Output: 8 pts.
Outputting measurement data (BCD) (see note)	Output: 32 pts.
	Output: 48 pts.
	Output: 64 pts.
Outputting measurement data (Binary)	Output: 32 pts.

Note When outputting measurement values in BCD, 32, 48, or 64 output points can be specified for use. Make the designation with the "Y. System/A. I/O Unit menu.

Input Commands

The commands possible through Parallel I/O Units and Terminal Block Units are shown below.

Command name	Command									Function
	DI	7	6	5	4	3	2	1	0	
Measure		0	0	0	1	*	*	*	*	Measurement will be repeated while DI4 is ON.
Switch Scene		0	0	1	0	(Scene No.)				The scene will be switched to the scene number designated by DI0 to DI3. For timing, DI5 must turn ON after DI0 to DI3 are set.
Save Reference Image		0	1	0	0	(Window No.)				Reference image will be saved for the designated window. If "–1" (1111) is designated for the window number, then the reference image will be saved for all of the windows together. While DI6 is ON, the reference image will be repeatedly saved, and not only the scene configuration data but also the reference image data will be refreshed. Measurement data will not be averaged. For timing, DI6 must turn ON after DI0 to DI3 are set.
Light Level Adjustment		1	0	0	0	*	*	*	*	While DI7 is ON, the light level will be repeatedly adjusted.

Note If bits DI4 to DI7 turn ON simultaneously, the order of priority for command recognition will be as follows:

Measure > Switch Scene > Save Reference Image > Light Level Adjustment

Output Format of Determination Results ("I/O Unit: Windows")

Outputting Determination Results

The format for outputting determination results for individual windows (i.e., when "A. I/O Unit: Windows" is designated) is as shown in the following table.

Determination results will be output with ON/OFF signals for each Terminal from DO0 to DO7.

Output terminal	Determination results
DO0	Window 0 OK (Output off): NG (Output on)
DO1	Window 1 OK (Output off): NG (Output on)
DO2	Window 2 OK (Output off): NG (Output on)
DO3	Window 3 OK (Output off): NG (Output on)
DO4	Window 4 OK (Output off): NG (Output on)
DO5	Window 5 OK (Output off): NG (Output on)
DO6	Window 6 OK (Output off): NG (Output on)
DO7	Window 7 OK (Output off): NG (Output on)

The definitions of OK and NG for window determination values are as follows:

OK (Output off)	Determination results for all measurement items set for the relevant window are OK.
NG (Output on)	The determination result for one (or more) measurement item set for the relevant window is NG.

Terminals corresponding to windows for which no measurement items are set (including windows set for position displacement compensation or shading master position compensation) will always be off.

Outputting Logical Operations

Terminal Block Units (F300-D) have special AND and OR contacts, thus making it possible to output values for logical operations involving the determination results for all windows.

If either “A. I/O Unit: Windows” is set to “On” (from the “M. Measurement/O. Output device” menu), AND and OR data will be output for the measurement results for all windows.

Terminal	Output contents	
AND	NG (Output on):	If the determination results for the measurement items set for all of the windows are NG
	OK (Output off):	Otherwise
OR	NG (Output on):	If the determination result for even one window is NG
	OK (Output off):	Otherwise

Format for Outputting Measurement Data “I/O Unit: Values”

With the “Y. System/A. I/O unit” menu, either BCD or Binary can be selected as the format for outputting measurement data.

The order of priority when measurement items are output is shown in the following table. Measurement data will be output in this order for items that have been set to “On.”

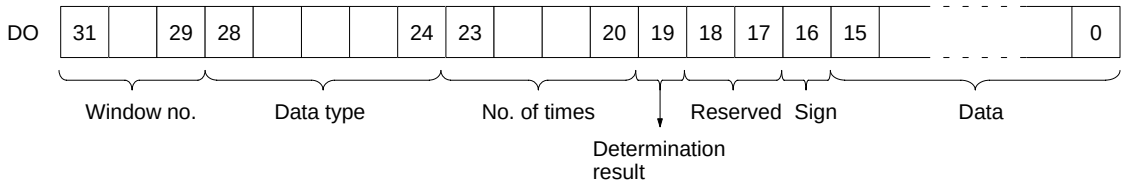
Order	Measurement item
1	Area
2	Center of gravity X
3	Center of gravity Y
4	Main axis angle
5	Edge angle
6	Mid-point X
7	Mid-point Y
8	Inclination angle
9	Cross point X
10	Cross point Y

BCD Output

The format for outputting measurement data in BCD is shown below.

Outputting 32 Bits

Each type of data will be output in two sections of seven integers and one decimal place.



Output item	Bits	Description
Window No.	3	Shows the window (0 to 7) from which data is currently being output.
Data type	5	Shows the type of data that is currently being output. 00000: Area 00001: Center of gravity X 00010: Center of gravity Y 00101: Main axis angle 00110: Edge angle 00111: MId-point X 01000: Mid-point Y 01011: Inclination angle 01100: Cross point X 01111: Cross point Y
No. of times	4	For BCD 32-bit output, a single piece of measurement data is divided into two outputs. This function shows which of the two sections of data is being currently output. First output: 0001 Second output: 0010
Determination result	1	Shows the determination value for the measurement item currently being output. 0: OK 1: NG
Reserved	2	(Reserved for future expansion of functions.)
Sign	1	Shows the sign for the data being output. 0: Positive 1: Negative
Data	16	Outputs the absolute value for the measurement data.

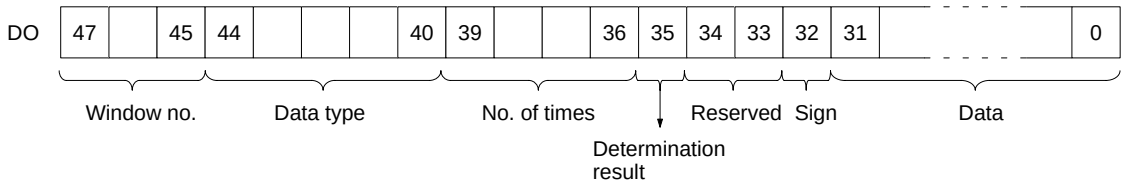
The output section for absolute value of data is shown in the following table.

Section	First output	Second output
DO15 to DO12	10^6	10^2
DO11 to DO8	10^5	10^1
DO7 to DO4	10^4	10^0
DO3 to DO0	10^3	10^{-1}

No measured result of the F300 greater than 2147483.647 or smaller than –2147483.647 can be displayed. The displayed value will be 2147483.6 if the result is greater than 2147483.6 and –2147483.6 will be displayed if the result is smaller than –2147483.6.

Outputting 48 Bits

Each type of data will be output at one time with seven integers and one decimal place. (The bit for the number of times will always be set to 0001.)



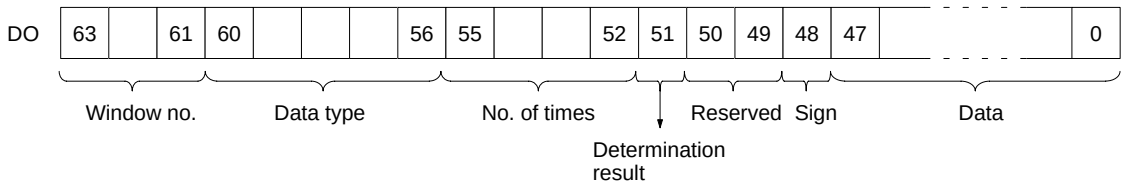
The output section for absolute value of data is shown in the following table.

Section	First output
DO31 to DO28	10^{6}
DO27 to DO24	10^{5}
DO23 to DO20	10^{4}
DO19 to DO16	10^{3}
DO15 to DO12	10^{2}
DO11 to DO8	10^{1}
DO7 to DO4	10^{0}
DO3 to DO0	10^{-1}

No measured result of the F300 greater than 2147483.647 or smaller than –2147483.647 can be displayed. The displayed value will be 2147483.6 if the result is greater than 2147483.6 and –2147483.6 will be displayed if the result is smaller than –2147483.6.

Outputting 64 Bits

Each type of data will be output at one time with seven integers and one decimal place. (The bit for the number of times will always be set to 0001.)



The output section for absolute value of data is shown in the following table.

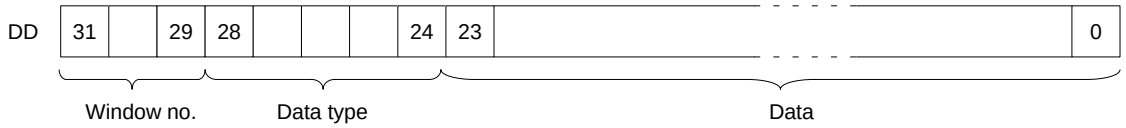
Section	First output
DO47 to DO44	10^{7}
DO43 to DO40	10^{6}
DO39 to DO36	10^{5}
DO35 to DO32	10^{4}
DO31 to DO28	10^{3}
DO27 to DO24	10^{2}
DO23 to DO20	10^{1}
DO19 to DO16	10^{0}
DO15 to DO12	10^{-1}
DO11 to DO8	10^{-2}
DO7 to DO4	10^{-3}
DO3 to DO0	10^{-4}

No measured result of the F300 greater than 2147483.647 or smaller than –2147483.647 can be displayed. The displayed value will be 2147483.647 if the

result is greater than 2147483.647 and –2147483.647 will be displayed if the result is smaller than –2147483.647.

Binary Output

The format for outputting measurement data in Binary is shown below.



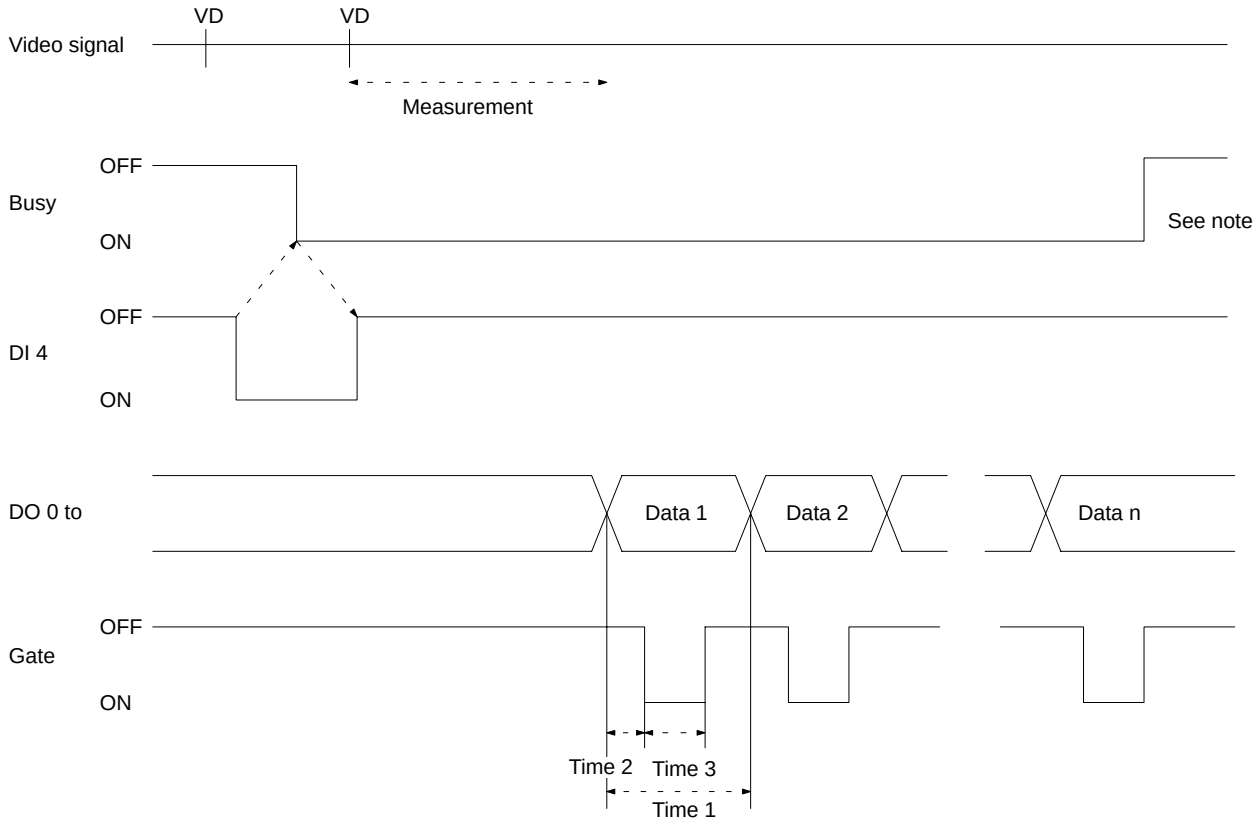
Output item	Bits	Description
Window No.	3	Shows the window (0 to 7) from which data is currently being output.
Data type	5	Shows the type of data that is currently being output. 00000: Area 00001: Center of gravity X 00010: Center of gravity Y 00101: Main axis angle 00110: Edge angle 00111: MId-point X 01000: Mid-point Y 01011: Inclination angle 01100: Cross point X 01101: Cross point Y
Data	24	The integer portion only of the measurement result will be output as a two's complement expression. (The decimal portion will be discarded.) No measured result of the F300 greater than 2147483.647 or smaller than –2147483.647 can be displayed. The displayed value will be 2147483.647 if the result is greater than 2147483.647 and –2147483.647 will be displayed if the result is smaller than –2147483.647.

Process Timing using I/O Unit

Process timing using I/O Units is shown in the following illustration.

Note If “I/O Unit: Windows” (determination result output) and “I/O Unit: Values” (measurement data output) are set to ON using the output device menu, the determination results and measurement data will be output in this order.

Measurement (Without Handshake)

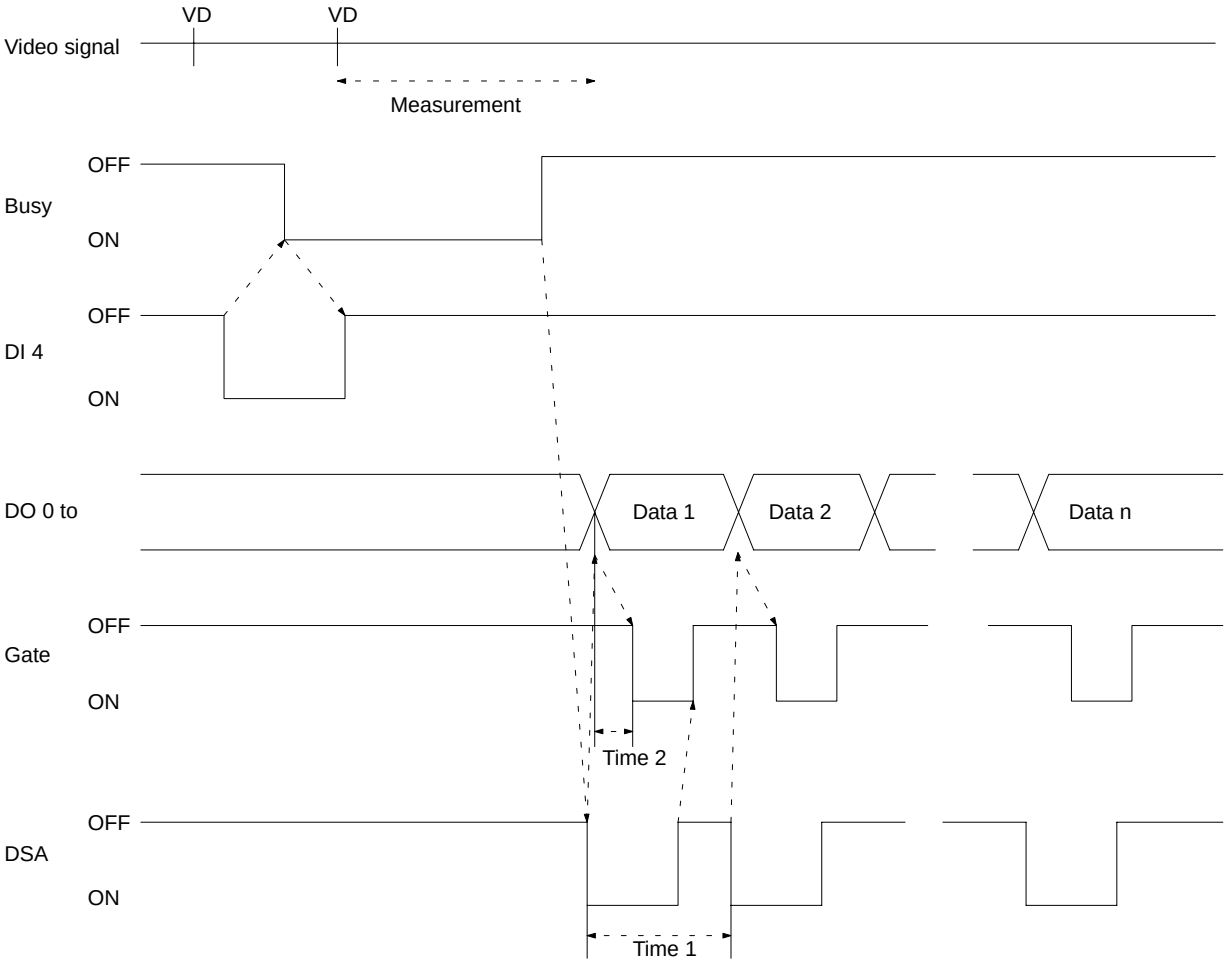


Times 1 to 3 are set with the “Y. System/A. I/O Unit menu.

Time 1: C. Output Period
Time 2: D. Delay
Time 3: O. Output Time

Depending on the measurement conditions, the relationship between the timing for the busy signal to change from ON to OFF and the timing for data output will vary.

Measurement (With Handshake)

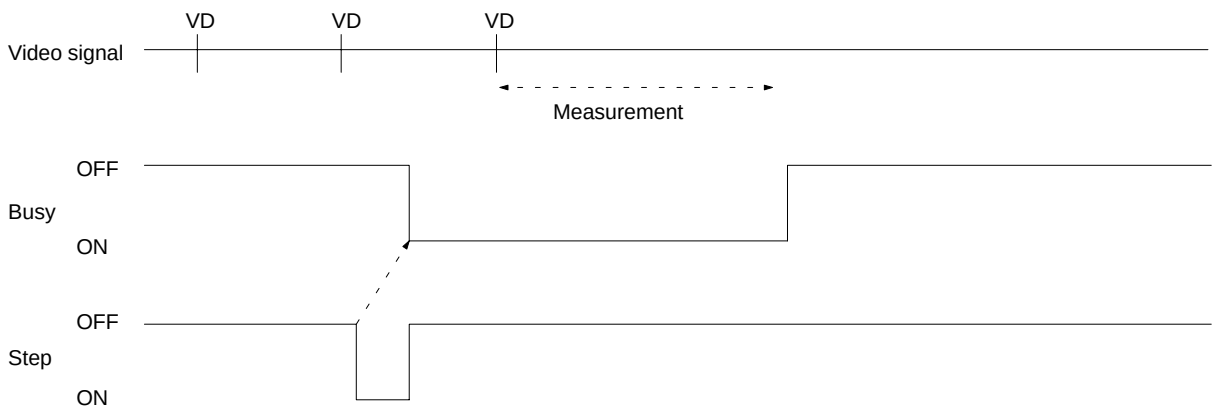


Timeout control will be based on time 1 in the illustration above. Set the maximum allowable time (the timeout) for time 1, as well as time 2, by means of the “Y. System/A. I/O Unit menu.

Time 1: T. Timeout
Time 2: D. Delay

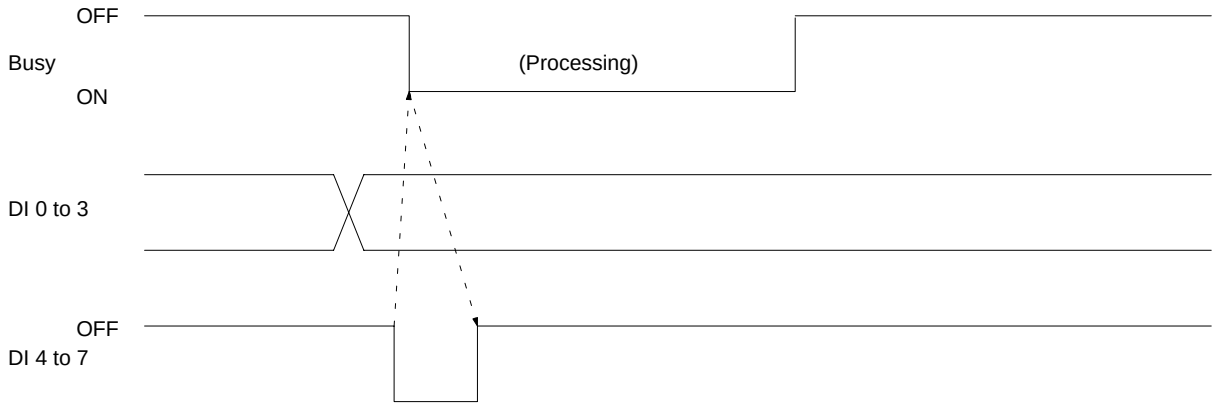
Measurement by Step Signal Input

When the step input changes from OFF to ON, measurement will be carried out one time.



When Commands Other than Measure are Input

The illustration below shows how commands other than Measure (e.g., Switch Scene, Save Reference Image, Light Level Adjustment) are processed.



SECTION 9
System Settings

This section provides the procedures for making the system settings.

9-1 System Settings

Use the “Y. System” menu to set the specifications for the hardware used in common by all scenes.

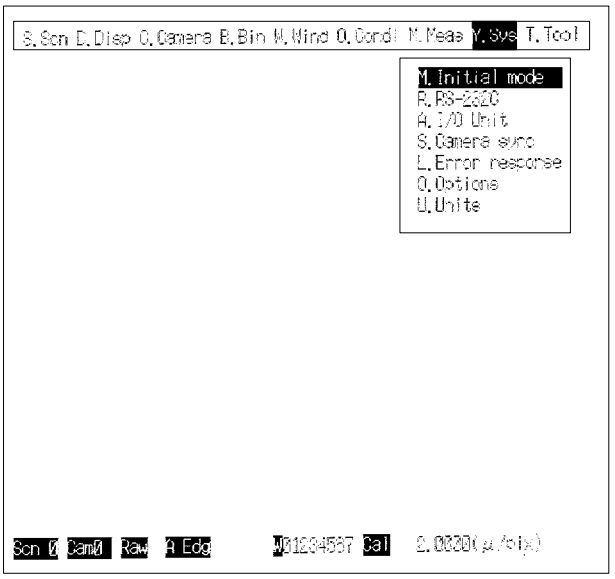
Menu Items

Item	Function	Reference
M. Initial mode	Sets the operation mode for when the power is turned on.	Refer to 9-2
R. RS-232C	Makes the settings to match communications specifications to connected devices when an RS-232C I/F Unit is used.	Refer to 9-3
A. I/O Unit	Sets the output specifications for Parallel I/O Unit and Terminal Block Unit.	Refer to 9-4
S. Camera sync	Sets whether internal or external synchronization is to be used as the camera synchronization method.	Refer to 9-5
L. Error response	Sets the processing for each kind of error that can occur during measurement.	Refer to 9-6
O. Options	Sets whether hardware will be checked during start-up, whether one-touch keys will be displayed, and whether the console beep will sound.	Refer to 9-7
U. Units	Displays a list of Units that are currently connected.	Refer to 9-8

9-2 Setting the Initial Mode

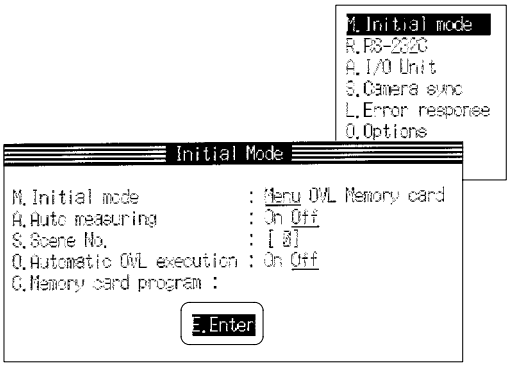
The operation mode that is to be entered can be set when the power is turned on.

1, 2, 3... 1. Select “M. Initial mode” from the “Y. System” menu.



2. Make the setting for each item.

When “C. Memory card program” is selected, a list of filenames for the application programs stored on the memory card will be displayed.

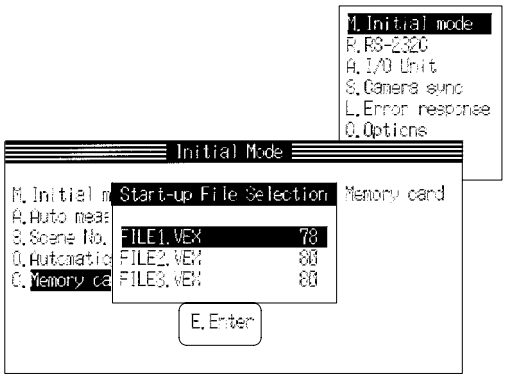


The following table shows the relation between initial modes and settings.

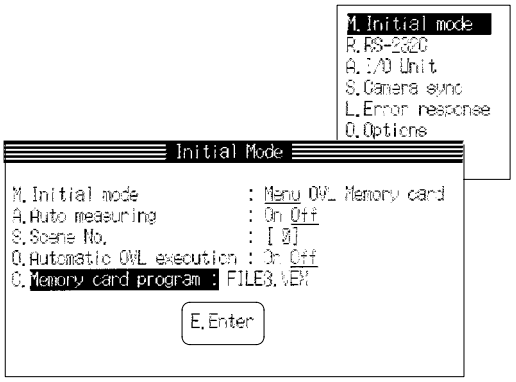
Item	Menu mode		OVL mode		Memory card application program
	No automatic measurement	Automatic measurement	No automatic user program execution	Automatic user program execution	
M. Initial mode	Menu	Menu	OVL	OVL	Memory card
A. Auto measuring	OFF	ON	---	---	---
S. Scene No.	---	Scene No.	---	---	---
O. Automatic OVL execution	---	---	OFF	ON	---
C. Memory card execution	---	---	---	---	File selection

Note “---” indicates that the setting will be ignored.

If an application program stored on the memory card is to be executed at the time of start-up, select the filename from the list.



When a filename has been selected, you will be returned to the “Initial mode” menu, and the filename will be displayed next to “C. Memory card program”.

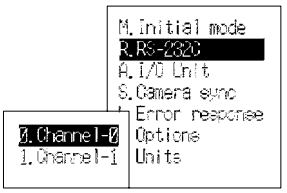


9-3 Setting RS-232C Interface

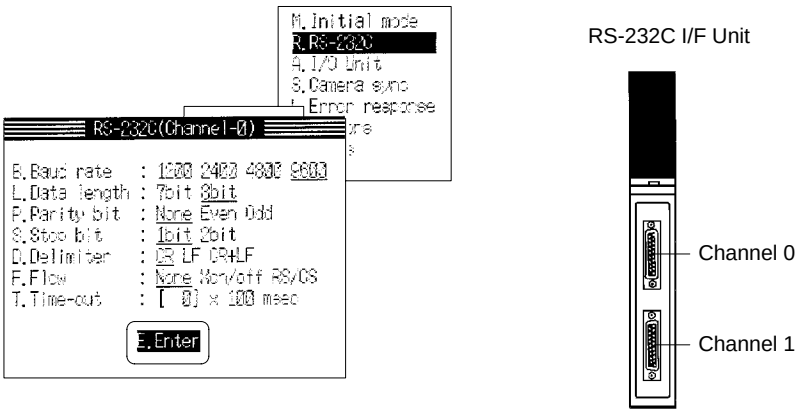
The communications specifications for the RS-232C I/F Unit and the number of the channel to be used for communications can be set.

1, 2, 3... 1. Select “R. RS-232C”.

2. Select either channel 0 or 1 for the RS-232C I/F Unit.



3. Set the communications specifications for channel 0 or channel 1.



Select using the Up or Down Keys and then press the Enter Key. Setting is complete.

RS-232C Communications Specifications

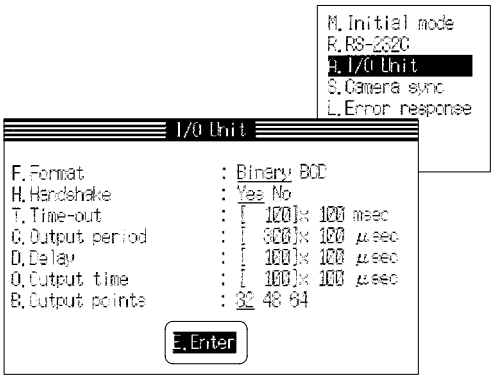
Item	Setting
B. Baud rate	Selects a baud rate of 1200, 2400, 4800, or 9600 bps.
L. Data length	Selects whether the data length for the ASCII code will be seven or eight bits.
P. Parity	Sets the parity bit. None: No parity setting Even: Even parity setting Odd: Odd parity setting
S. Stop bits	Selects whether one or two stop bits are to be used.
D. Delimiter	Sets the delimiter. CR: CR only used. LF: LF only used. CR + LF: CR and LF used.
F. Flow control	Sets the handshake method. None: No handshaking. Xon/off: Executed by software. RS/CS: Executed using RS and CS lines.
T. Timeout	Sets the waiting time for the response when handshaking is executed. If there is no response even after the timeout time has elapsed, an RS-232C error will be generated.

9-4 Setting I/O Unit Output

The output specifications for Parallel I/O Units and Terminal Block Units can be set.

1, 2, 3... 1. Select “A. I/O Unit output” from the “Y. System” menu.

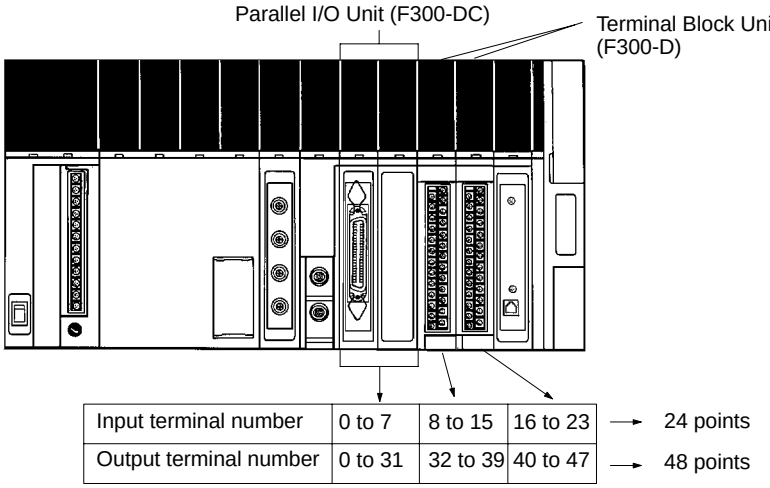
2. Make the setting for each I/O Unit output specification item.



Relation Between I/O Numbers and Units

The input and output numbers for Parallel I/O Units and Terminal Block Units will be assigned in order beginning with the Unit closest to the IMP Unit.

Unit	Input points	Output points	Control signals
Terminal Block Unit (F300-D)	8	8	5: BUSY GATE AND OR DSA
Parallel I/O Unit (F300-DC)	8	32	3: BUSY GATE DSA



I/O Unit Output Specifications

Item	Setting
F. Format	Sets Binary or BCD as the format for outputting data.
H. Handshake	Sets whether or not handshaking will be used.
T. Timeout	Sets the waiting time for the response when handshaking is used. If there is no response even after the timeout time has elapsed, a terminal block error will be generated.
C. Output period	Sets the output period when handshaking is not used.
D. Delay	Sets the time until the GATE signal turns ON after data is output.
O. Output time	Sets the output time when handshaking is not used.
B. BCD output points	Sets the number of output points when BCD is set as the output format.

9-5 Setting Camera Synchronization

The method for synchronizing cameras can be set.

1, 2, 3...

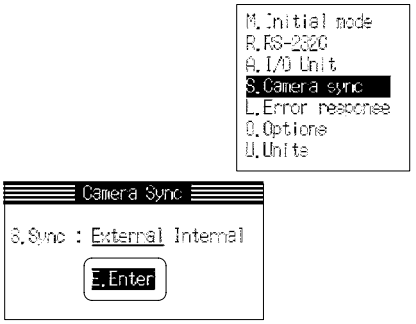
1. Select “S. Camera” sync from the “Y. System” menu.
2. Select either internal or external synchronization.

External synchronization:

Synchronizes cameras with vertical and horizontal synchronization signals from the Camera Unit. Be sure to set for external synchronization when using OMRON cameras for the F300.

Internal synchronization:

Make this setting only for cameras especially designed for internal synchronization.

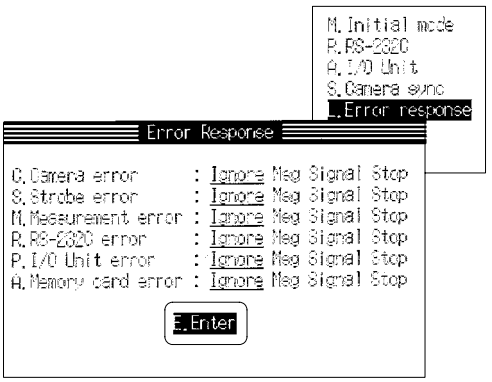


9-6 Setting the Error Response

For each kind of error, set the output method and set whether or not measurement is to be stopped.

1, 2, 3... 1. Select “L. Error response”.

2. Set the processing method for each error.



Errors in Measurement Mode

Item	Error content
C. Camera error	Due to a problem such as a disconnected line, synchronous signals were not detected from cameras.
S. Strobe error	There was an error concerning the strobe flash.
M. Measurement error	There is no object to be measured in window used for compensating position displacement with respect to shading master, or for compensating window position displacement.
R. RS-232C error	There was a communications error (such as incorrect data or a timeout error) at the RS-232C Unit.
P. I/O Unit error	There was a communications error (such as a timeout error) at a Terminal Block Unit or a Parallel I/O Unit in a case where handshaking was used.
A. Memory card error	When memory card measurement results were to be output, the memory card was not installed or there was a write-protect error or a data error.

Processing Method Settings

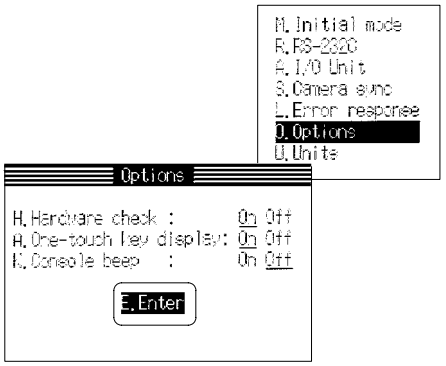
Setting	Ignored	Message	Terminal	**Stop** (see note 5)
Buzzer sound	No	Yes	Yes	Yes
Error display	No	Yes (see note 1)	Yes (see note 1)	Yes (see note 2)
External output (ERR terminal) (see note 3)	No	No	Yes	Yes
ERR LED (see note 4)	No	No	Yes	Yes
Measurement continued	Yes	Yes	Yes	No
Return	---	When the next measurement I/O processing is correctly completed, the error condition will be restored.		No
Measurement output	Yes	Yes	Yes	No

Note
1. "Error: *name of error*" will be displayed at the lower left of the screen.
2. "Fatal error: *name of error*" will be displayed at the lower left of the screen.
3. The ERR output on the Power Supply Unit will turn on.
4. The ERR indicator on the IMP Unit will turn on.
5. The F300 stops. Reset or turn off the power and turn it back on.

9-7 Setting Options

You can select whether hardware will be checked during start-up, whether one-touch keys will be displayed, and whether the console beep will sound.

1, 2, 3...
1. Select "O. Options".
2. Make the setting for each item.



Settings

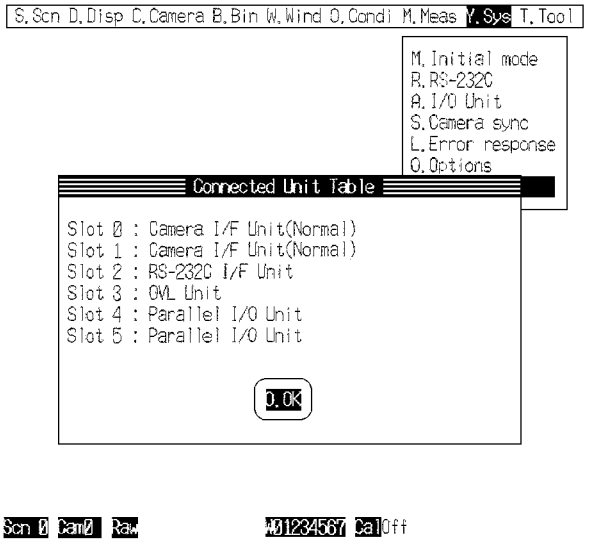
Item	Function
H. Hardware check	Enables or disables hardware check during F300 start-up.
A. One-touch key display	Sets whether or not one-touch inputs will be accepted from the keyboard.
K. Console beep	Sets whether or not console beep will sound when keys are pressed.

9-8 Displaying List of Connected Units

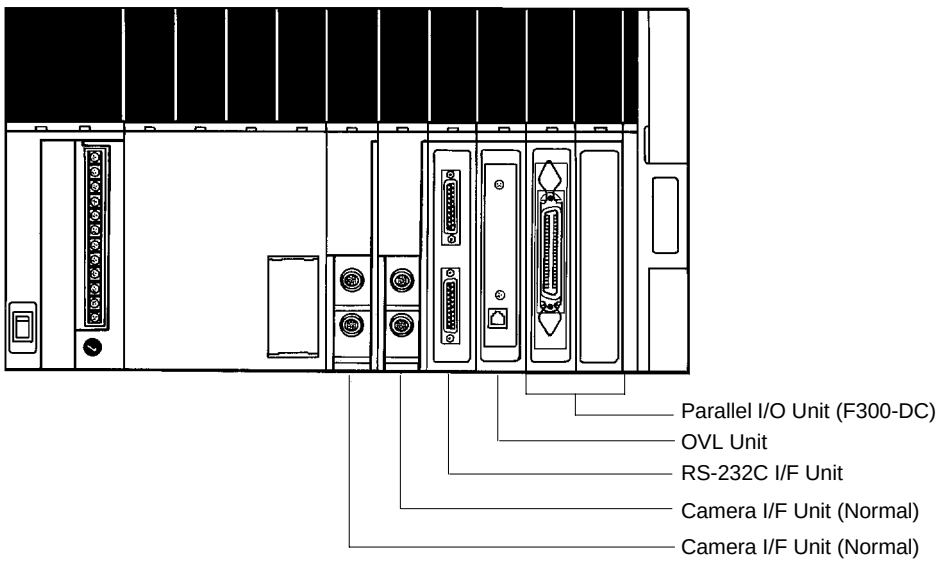
A list of all the Units connected to the base unit can be displayed.

Select “U. Units”.

Slots are numbered in order, from 0 to 5, beginning with the slot closest to the IMP Unit. A single Parallel I/O Unit (F300-DC) occupies two slots, so “Parallel I/O Unit” will be displayed for both the slots.



Units

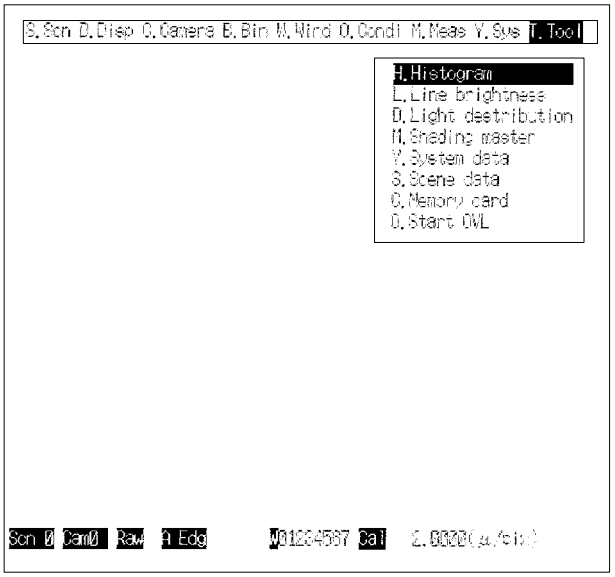


SECTION 10
Tools

This section provides procedures and information on the auxiliary functions which take full advantage of the F300's features.

10-1 Tools

The “T. Tool” menu provides auxiliary functions to enable you to take full advantage of the advanced features of the F300.



Menu Items

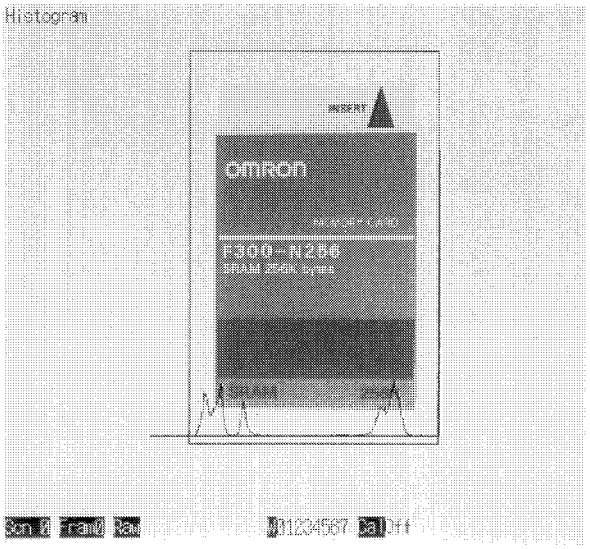
Item	Function	Reference
H. Histogram	Displays light distribution for any specified rectangular area of the displayed image.	Refer to 10-2
L. Line brightness	Displays light distribution along either the X axis or the Y axis of the displayed image.	
D. Light distribution	Displays light distribution of the displayed image as a 3-D graph.	
M. Shading master	Creates and edits master for shading compensation.	Refer to 10-3
Y. System data	Saves data set by “Y. System” in a memory card and RS-232C or loads it from the memory card and RS-232C.	Refer to 10-4
S. Scene data	Saves scene data in a memory card and RS-232C or loads it from the memory card or RS-232C.	
C. Memory card	Initializes and changes filenames for memory card.	Refer to 10-5
O. Start OVL	Start the OVL mode.	Refer to 10-6

10-2 Numeric Image Analysis

The density distribution of a displayed image can be displayed as a graph.

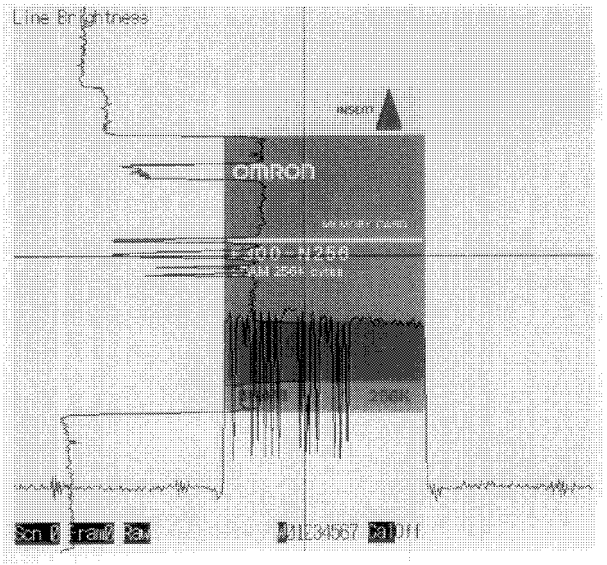
Histogram

The light distribution can be displayed for any specified rectangular area of the displayed image.



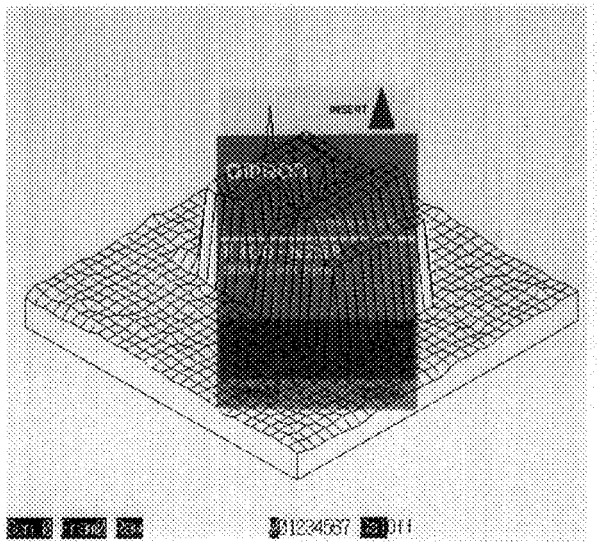
Line Brightness

The light level can be displayed for any coordinate along the X axis or Y axis of a displayed image.

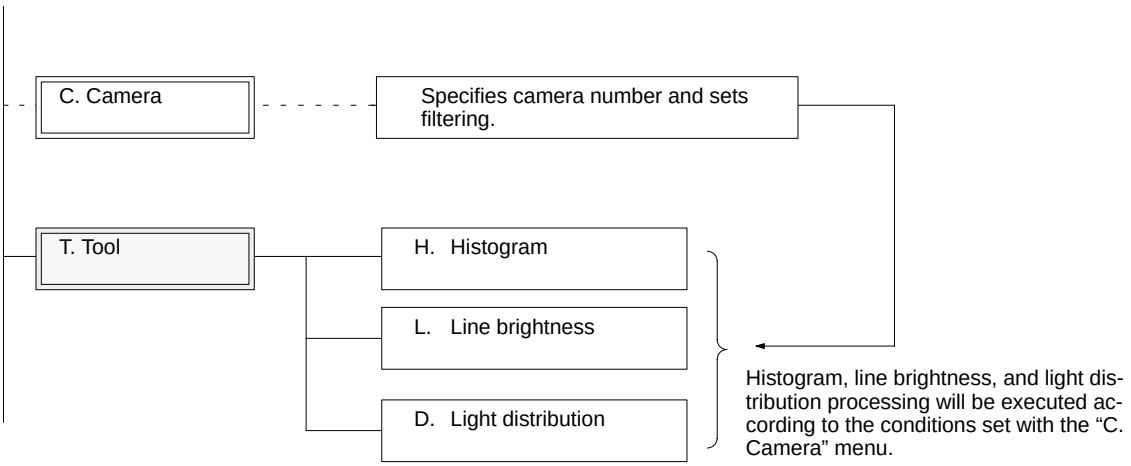


3-D Light Distribution

The shading distribution of a displayed image can be found for both the X axis and the Y axis, and display it as a 3-D graph.

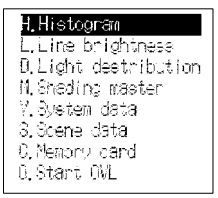


Related Menus

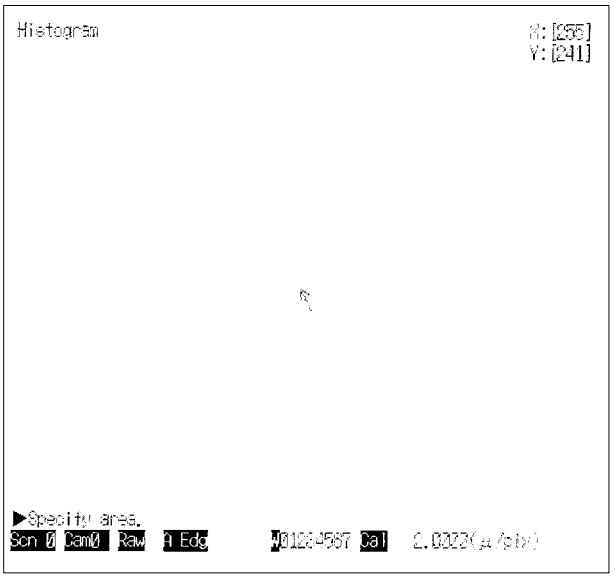


10-2-1 Displaying Histograms

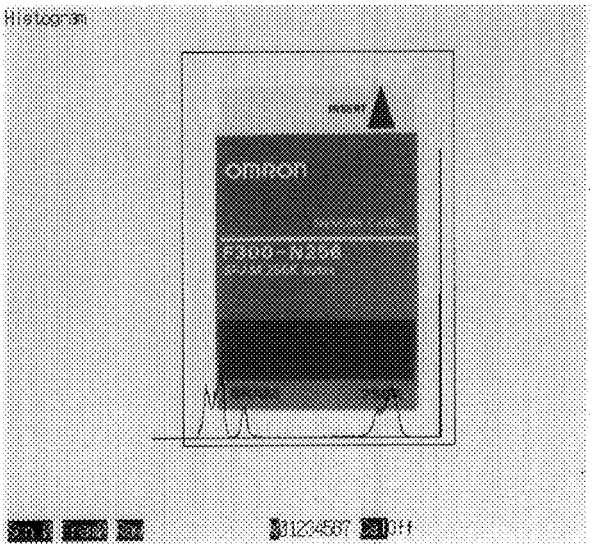
1, 2, 3... 1. Select “H. Histogram”.

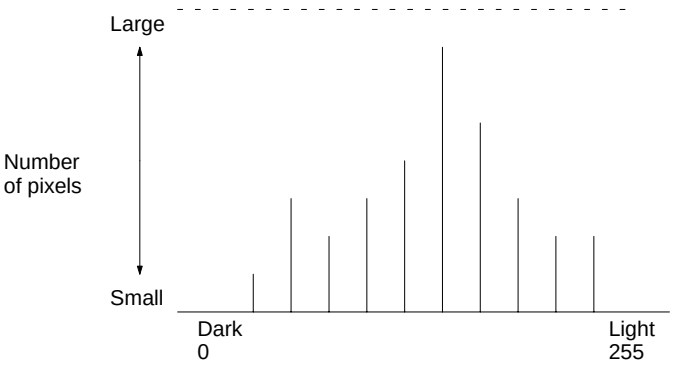


2. Specify the area on the screen for creating the histogram.



3. The histogram in the specified rectangular area will be displayed.

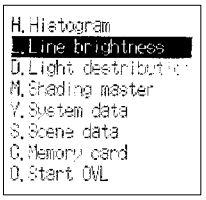




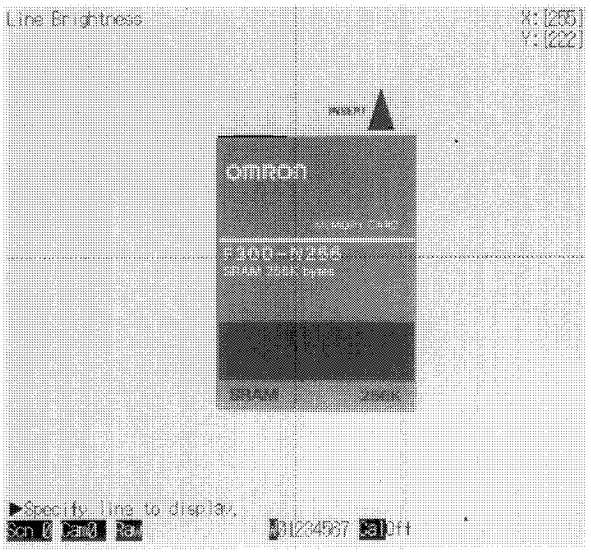
To return to the original screen (step 1), press the Enter Key or the Escape Key.

10-2-2 Line Brightness

1, 2, 3... 1. Select “L. Line brightness”.

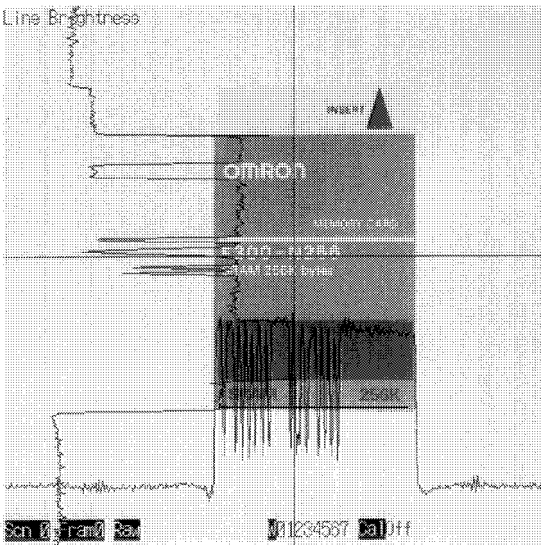


2. Move the cursor to the X-axis or Y-axis coordinates for displaying line brightness.



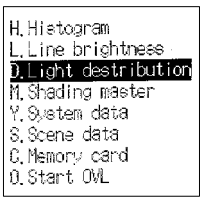
3. Press the Enter Key.

   The respective light levels for the specified coordinates will be displayed. To return to the original screen (step 1), press the Enter Key or the Escape Key.

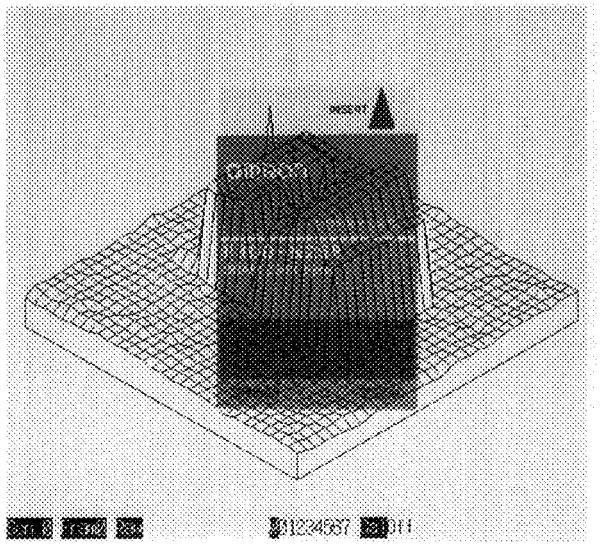


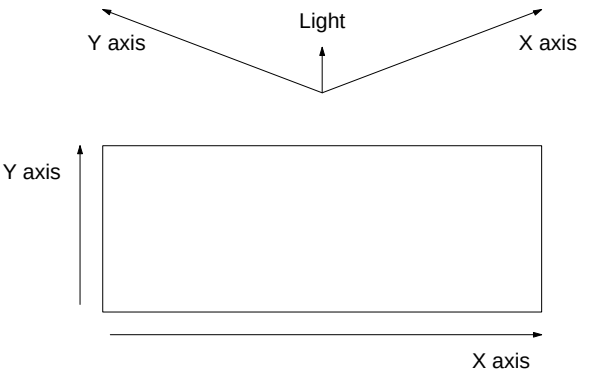
10-2-3 Displaying 3-D Light Distribution

Select “D. Light distribution”.



The light distribution for the entire screen will be displayed as a three-dimensional graph.





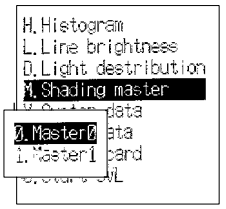
To return to the original screen (step 1), press the Enter Key or the Escape Key.

10-3 Creating and Saving Shading Masters

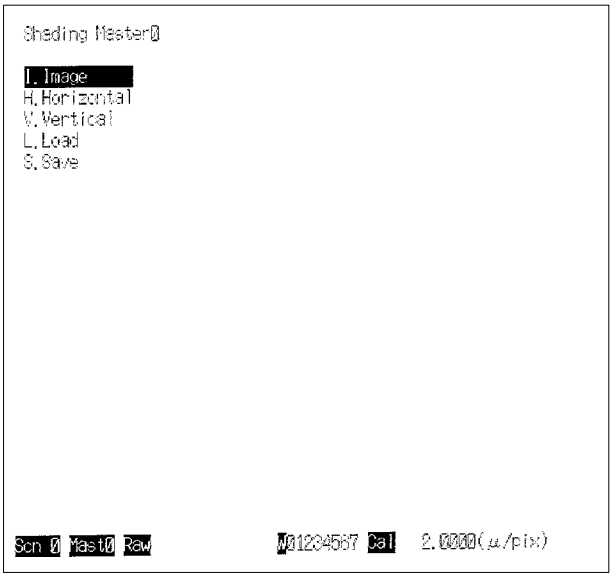
Create and save two shading masters (master 0 and master 1) to be used in common by all of the scenes. With the “C. Camera” menu, you can then select which of these two masters is to be used for any particular scene.

1, 2, 3... 1. Select “M. Shading master”.

2. Select either “0. Master0” or “1. Master1”.



The operation menu for the shading master will be displayed.



Menu Items

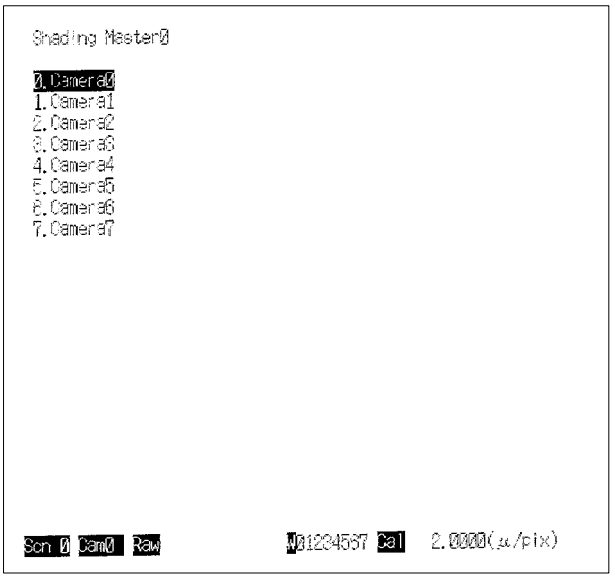
Item	Function	Reference
I. Image	Converts input image from camera to shading master.	Refer to 10-3-1
H. Horizontal	Edits horizontally (in pixel units) the shading master light level taken from the camera.	Refer to 10-3-2
V. Vertical	Edits vertically (in pixel units) the shading master light level taken from the camera.	
L. Load	Loads the shading master from the memory card.	Refer to 10-3-3
S. Save	Saves the shading master to the memory card.	

10-3-1 Inputting Shading Master Images

An image can be taken to be used for a shading master.

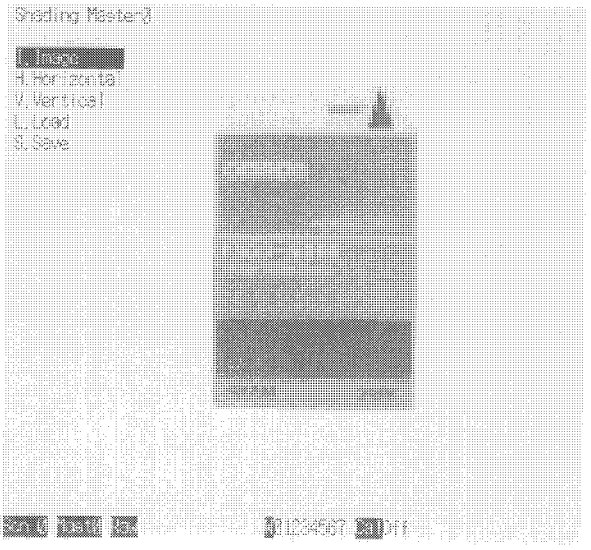
1, 2, 3...

1. Select the shading master number, and then select “I. Image”.
2. Select the number of the camera to be used for inputting the image.

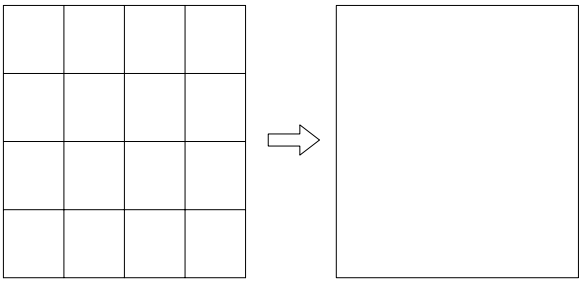


The display for taking the shading master image will appear.

3. To begin taking the image, press the Enter Key. When the operation is complete, the saved image will be displayed.



For the shading master, 4 x 4 pixel blocks will be treated as single pixels. The average value for the 16 pixels will be used for shading.



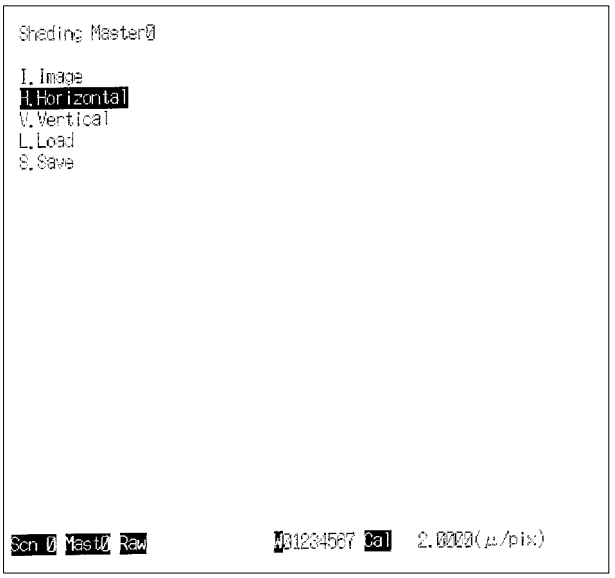
10-3-2 Editing Shading Masters

Saved shading masters can be edited by pixel unit.

Use “H. Horizontal” or “V. Vertical” to edit either horizontally or vertically. Edit either by means of “D. Direct Edit” or “C. Copy”.

Basic Procedure

1, 2, 3... 1. Select either “H. Horizontal” or “V. Vertical”.



2. Select the editing method.

   D. Direct Edit

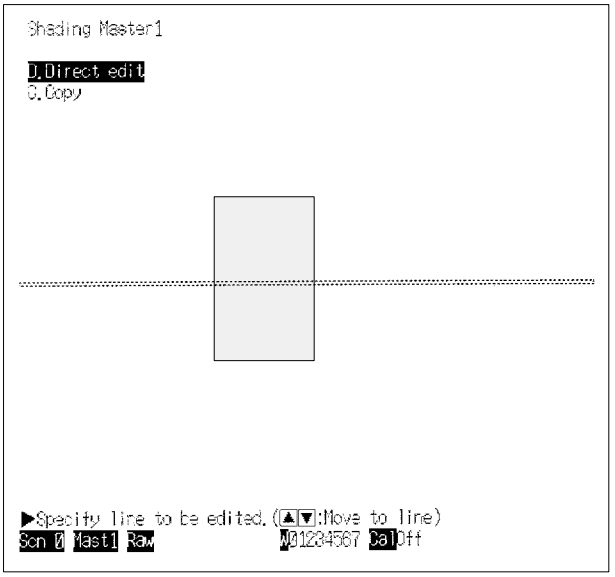
   The light levels for designated 1-pixel width vertical and horizontal lines will be displayed as a graph. Move the cursor and change the light levels pixel by pixel.

   C. Copy

   Copy the light levels for designated 1-pixel width vertical and horizontal lines to any area on the screen.

Horizontal Direct Editing Procedure

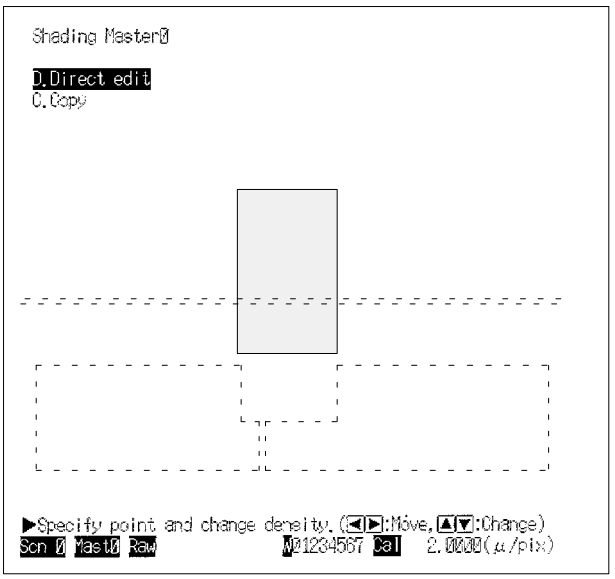
1, 2, 3... 1. Select “H. Horizontal”, and then select “D. Direct edit”. Use the Up and Down Keys to move the line to the Y-coordinate position where you want to change the light level.



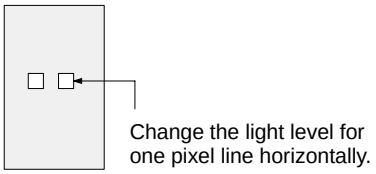
2. The light level on the specified horizontal line will be displayed as a graph.

   Use the Right and Left Keys to move the cursor to the X-coordinate position where the light level is to be changed.

   Use the Up and Down Keys to change the light level. To change several pixels on the same line, use the Right and Left Keys to move the cursor one pixel at a time and use the Up and Down Keys to change the light level for each pixel.



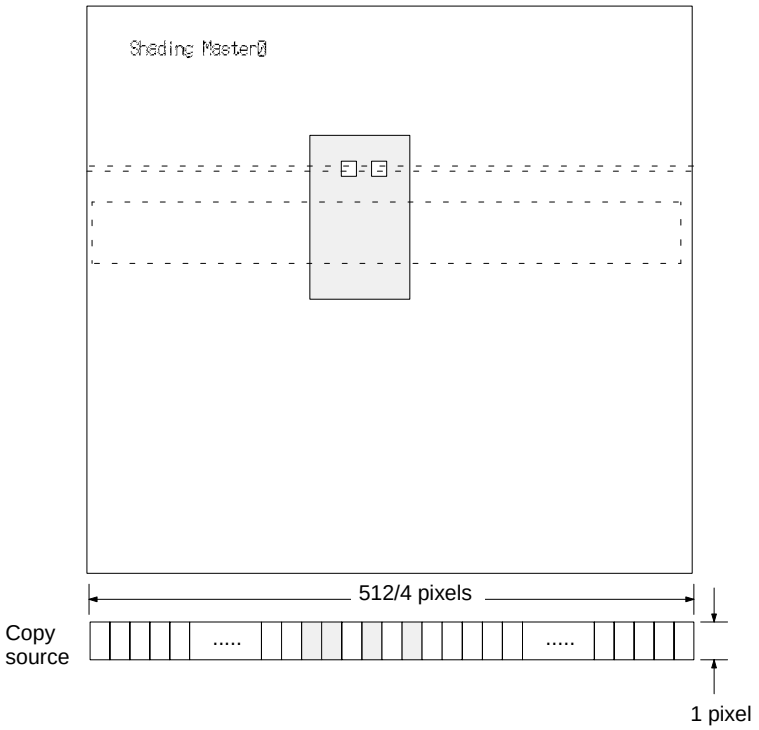
3. When the Enter Key is pressed, the shading master will be changed to the revised light level shown in the graph.



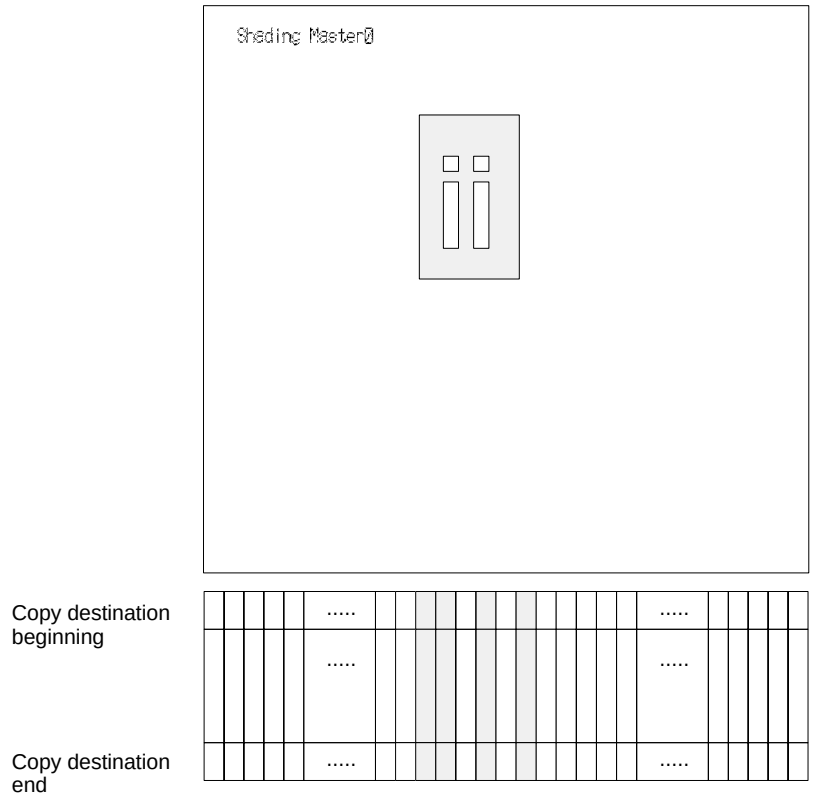
Horizontal Copying Procedure

1, 2, 3...

1. Select “H. Horizontal” and then select “C. Copy”. Use the Up and Down Keys to specify the line that is to be copied.
2. Select the beginning and ending lines for the copy destination.
3. Select using the Up or Down Keys and then press the Enter Key.

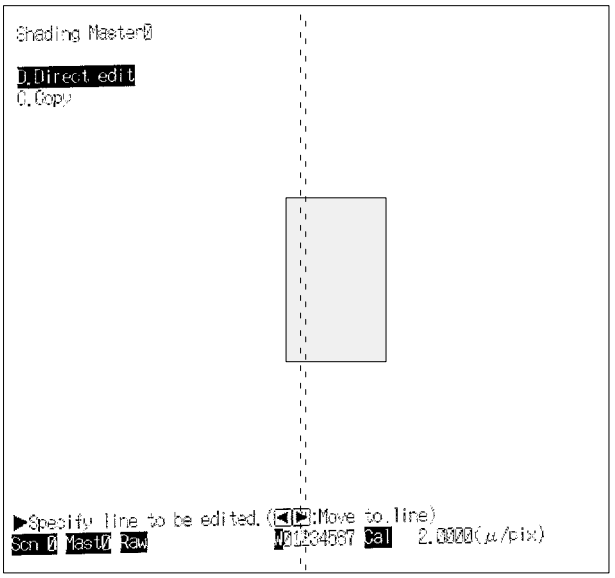


4. Press the Enter Key. Copying is complete.



Vertical Direct Editing Procedure

1, 2, 3... 1. Select “V. Vertical”, and then select “D. Direct Editing”.

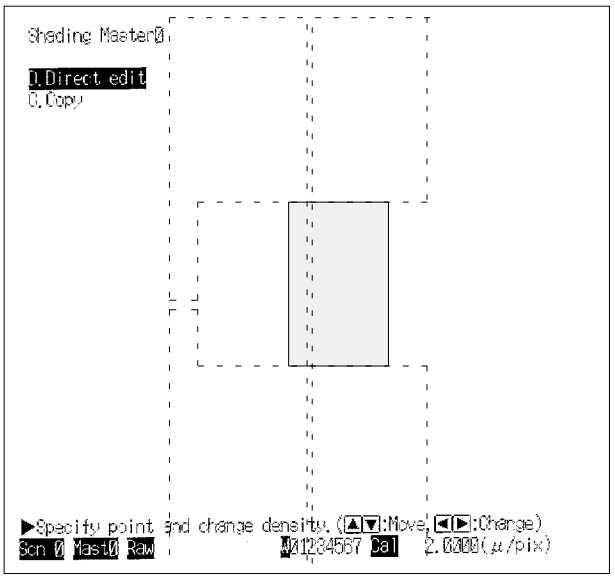


2. The light level on the specified vertical line will be displayed as a graph.

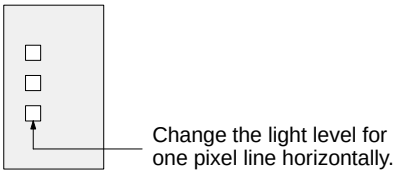
   Use the Up and Down Keys to move the cursor to the Y-coordinate position where the light level is to be changed.

   Use the Right and Left Keys to change the light level. To change several pixels on the same line, use the Up and Down Keys to move the cursor one

pixel at a time and use the Right and Left Keys to change the light level for each pixel.



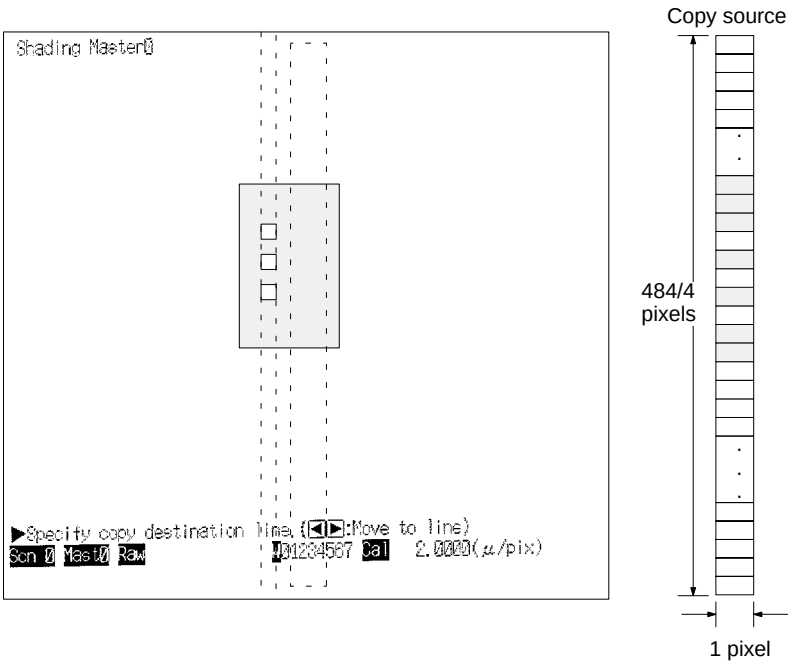
When the Enter Key is pressed, the shading master will be changed to the revised light level shown in the graph.

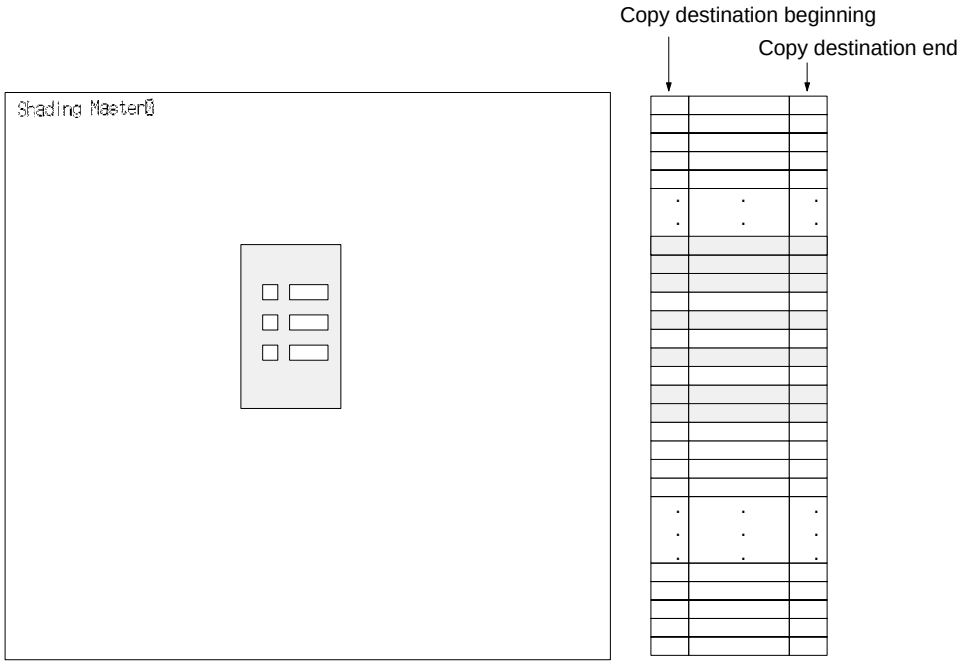


Vertical Copying Procedure

1, 2, 3...

1. Select “V. Vertical” and then select “C. Copy”. Use the Right and Left Keys to specify the line that is to be copied.
2. Select the beginning and ending lines for the copy destination.
3. Select using the Right or Left Keys and then press the Enter Key.





4. Press the Enter Key. Copying is complete.

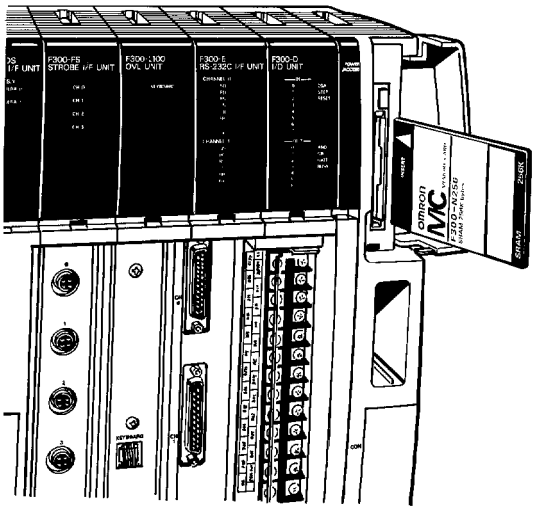
10-3-3 Saving and Loading Shading Masters

Once a shading master has been created, it can be named and saved to a memory card. Then at any time it can be read into the F300.

Installing Memory Cards

1, 2, 3...

1. Open the memory card cover at the top of the MMI Unit, and insert a dedicated F300 memory card.



2. The memory card must be initialized before a shading master can be saved to it. To initialize a memory card, execute “C. Memory Card” under the “T. Tool” menu.
3. The memory card has a write-protect switch. This switch must be turned off before data can be saved to the memory card.
4. When the memory card has been inserted and the cover closed, the memory indicator will light in green. When data is being transmitted to or from the F300, it will turn orange. While the indicator is orange, absolutely do not open the cover or remove the card.
5. To remove the memory card, press the ejector button on the top of the connector and immediately pull the card out.

Saving Shading Masters

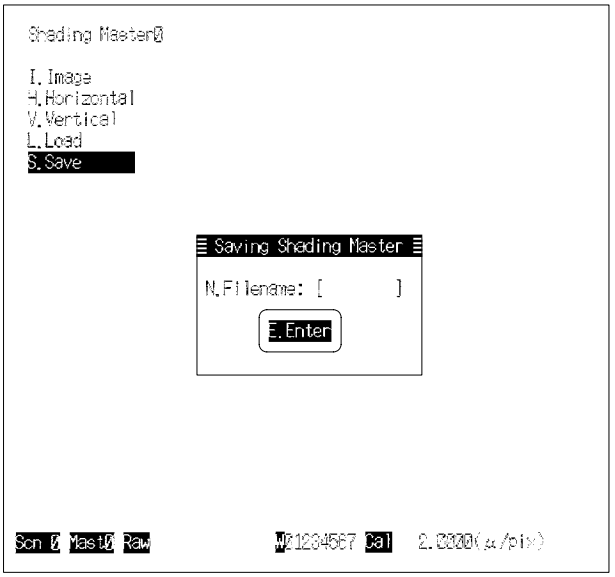
Give a filename to a shading master before saving it to a memory card. For the filename, up to eight normal letters or numbers can be input.

1, 2, 3...

1. Select “S. Save”.
2. Input the filename, using either the keyboard or the Console.

   If you use the Console, the Up and Down Keys can be pressed to display the alphabet in order and select the characters. Use the Right and Left Keys to

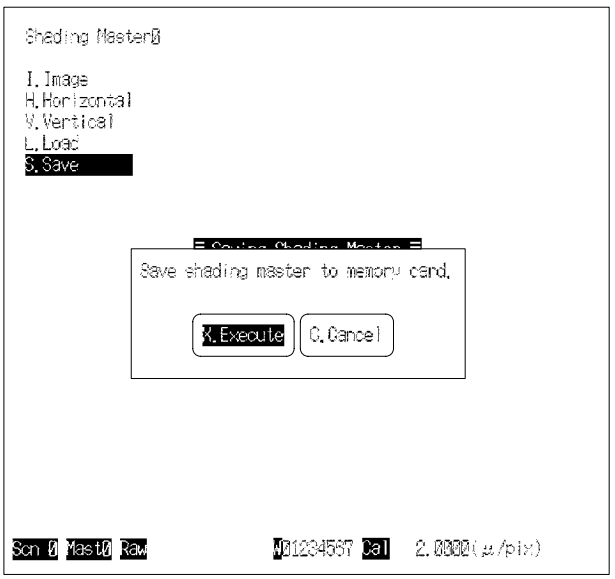
select the columns for input. After inputting the filename, press the Enter Key.



Once the filename has been input and “E. Enter” selected, the shading master can be saved to the memory card.

3. Select “X. Execute” to begin writing to the memory card. When the operation has been successfully completed, a message will be displayed with the information that the shading master has been saved. Press “O. Confirm” to return to the original display.

   If the data cannot be written to the memory card, an error message will be displayed. In that case, check the content of the error and then repeat the operation.

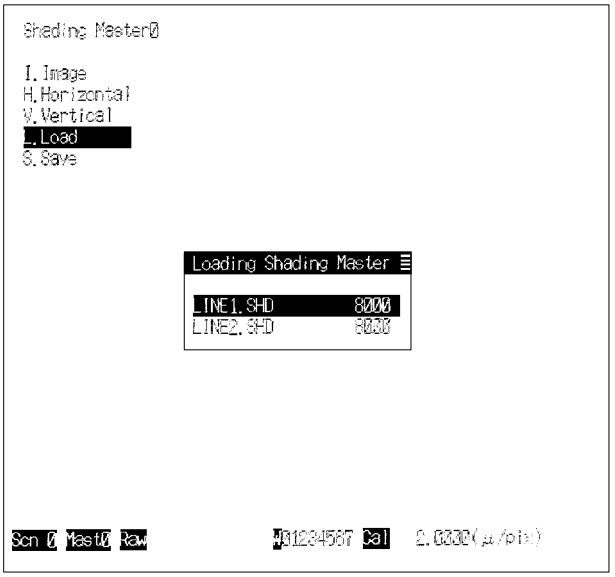


Loading Shading Masters

Once shading masters have been saved to a memory card, they can be loaded to the F300. The shading masters will have been saved as master 0 and master 1, so select one of them before beginning operations.

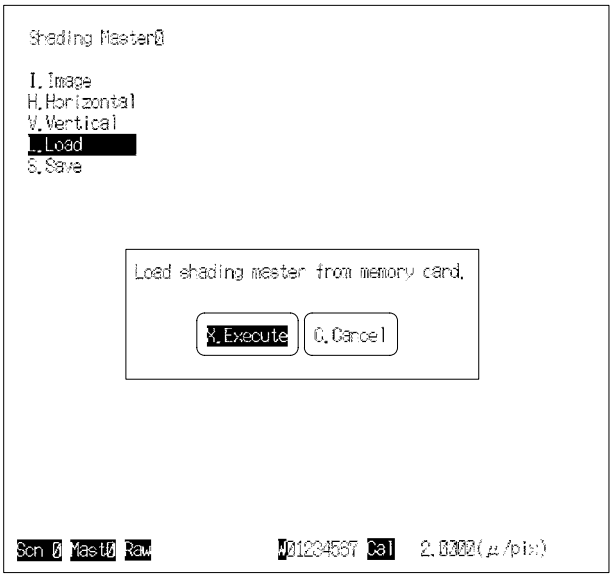
1, 2, 3...

1. Select “L. Load”.
2. The filenames saved on the memory card will be displayed. Select a filename and then press the Enter Key.



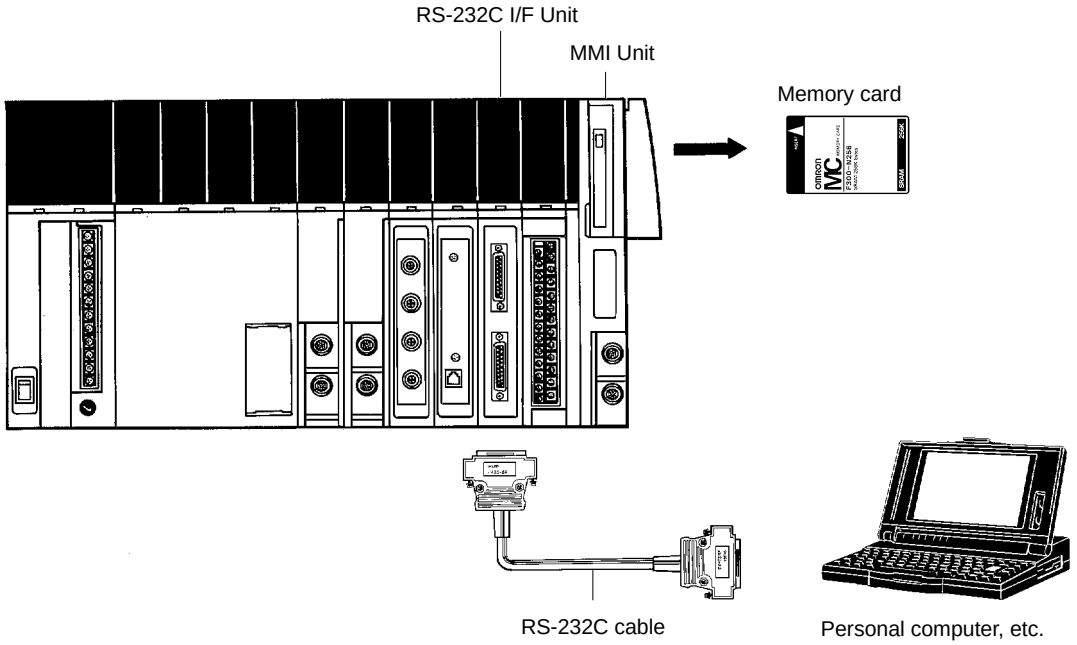
3. When “X. Execute” is selected, the data from the memory card will be loaded to the specified master number.

   When the operation has been successfully completed, a message will be displayed with the information that the shading master has been loaded. The master image that has been loaded will also be displayed.



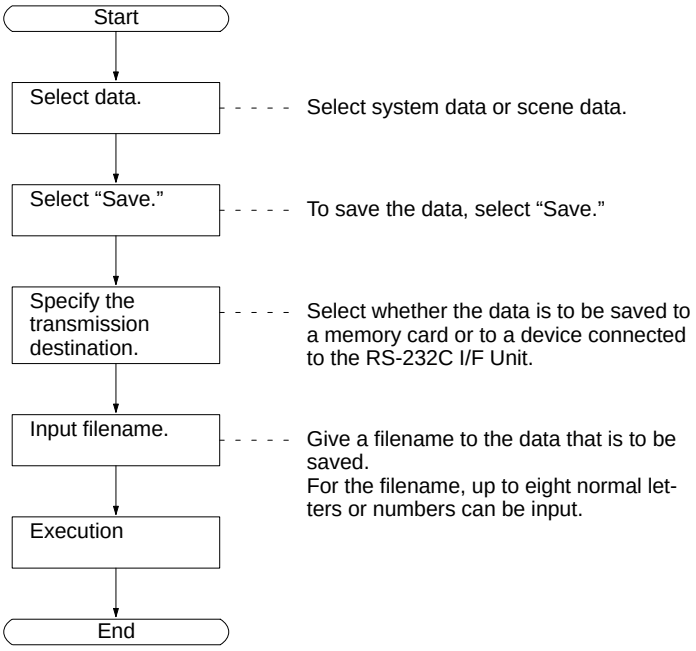
10-4 Saving and Loading Data

System data and scene data can be saved to and loaded from a memory card or a device connected to the RS-232C I/F Unit.

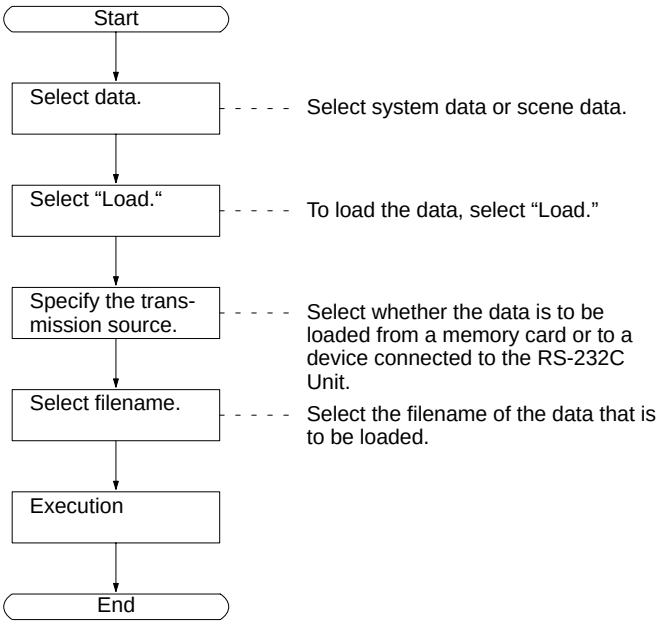


Note The memory card must be initialized before it can be used. To initialize a memory card, execute “C. Memory Card” under the “T. Tool” menu.

Procedure for Saving Data



Procedure for Loading Data

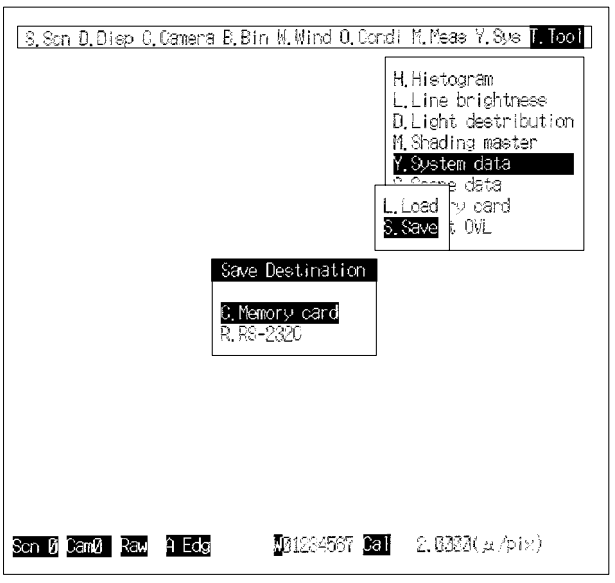


10-4-1 Saving Data

System data and scene data can be saved to a memory card or to a device connected to the RS-232C I/F Unit. The system data that can be saved is the data set under the "Y. System" menu. The scene data that can be saved is the data set under the "S. Scene", "D. Display", "C. Camera", "B. Binary", "W. Window", "O. Conditions", and "M. Measurement" menus.

1, 2, 3...

1. Select "Y. System Data" or "S. Scene Data" from the "T. Tool" menu.
2. Select "S. Save".
3. Specify the destination for saving the data.

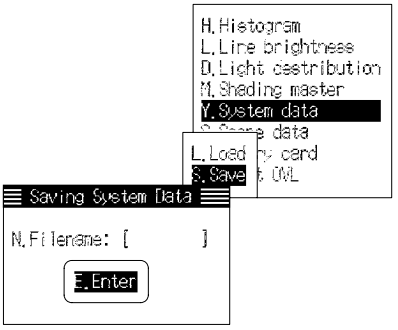


When saving to a memory card, a filename consisting of up to eight normal letters or numbers must be input. When inputting the filename, the Shift and Escape Keys can be simultaneously pressed to display a list of characters. It will then be easy to input the characters with the Console.

Saving Data to a Memory Card

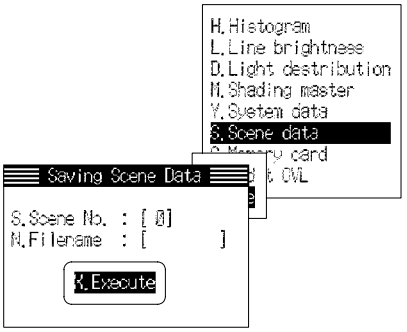
Saving System Data

System data is used in common for all scenes, so there is no need to select a scene number.



Saving Scene Data

When saving scene data, specify with “S. Scene No.” the scene that is to be saved, and use “N. Filename” to give it a name. Then select “X. Execute”.

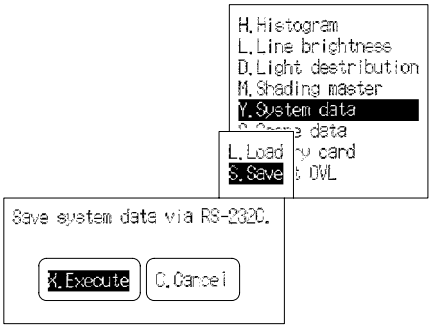


Saving Data to a Device Connected to the RS-232C I/F Unit

Saving System Data

Before saving the data, be sure to check the communications specifications and the channel number.

System data is used in common for all scenes, so there is no need to select a scene number.



Saving Scene Data

When saving scene data, the data for multiple scenes can be transmitted as a group. In addition, scene data and scene numbers can be saved at the same time.

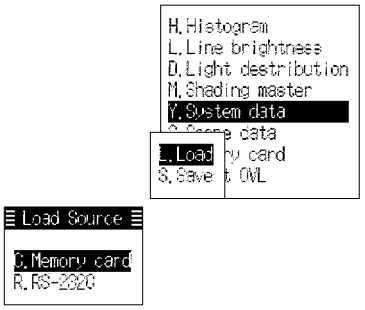
Specify the beginning and ending scene numbers for transmission. When only transmitting the data for a single scene, specify the same number for both the beginning and ending scenes.

10-4-2 Loading Data

System data and scene data can be loaded from a memory card or from a device connected to the RS-232C I/F Unit.

1, 2, 3...

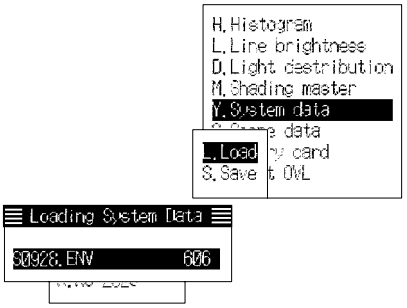
1. Select “Y. System Data” or “S. Scene Data” from the “T. Tool” menu.
2. Select “L. Load”.
3. Specify the source from which the data is to be read.



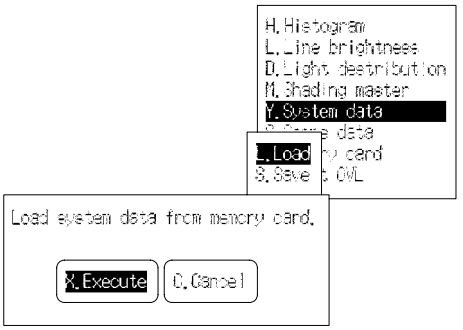
Loading from a Memory Card

When loading data that has been saved on a memory card, select the filename of the data that you want to load.

Loading System Data. Select the name of the file that is to be read from among the system data that has been saved on the memory card.

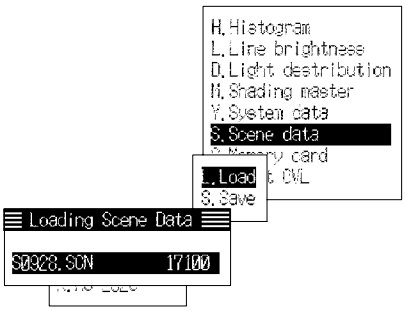


System data is used in common for all scenes, so there is no need to select a scene number.

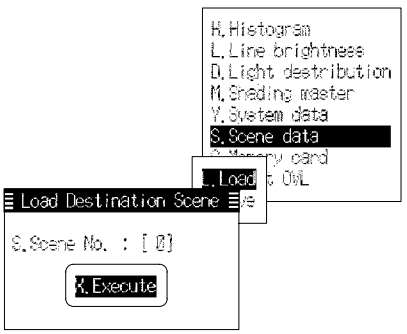


Loading Scene Data

1, 2, 3... 1. Select the name of the file that is to be read from among the scene data that has been saved on the memory card.



2. Specify the number of the scene at the F300 where the data is to be loaded, and then select “X. Execute”.

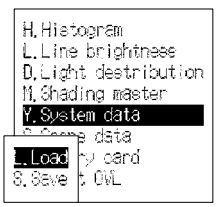


Loading from a Device Connected to the RS-232C I/F Unit

Before loading the data, be sure to check the communications specifications and the channel number.

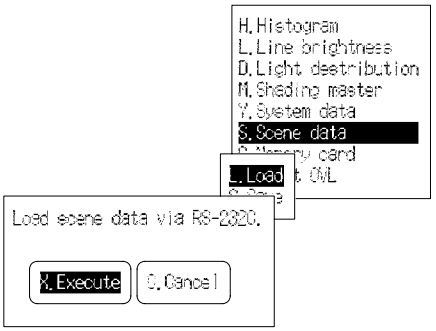
Loading System Data

System data is used in common for all scenes, so there is no need to select a scene number at the F300.



Loading Scene Data

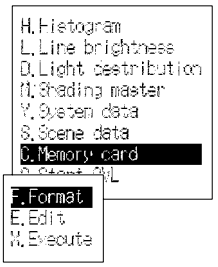
System data and scene numbers are saved at the same time for the RS-232C I/F Unit, so when loading there is no need to specify a scene number.



10-5 Memory Card Operations

"C. Memory Card" can be used to initialize the memory card and edit files.

Select "C. Memory Card".



Menu Items

Item	Function	Reference
F. Format	Initializes the memory card. When saving data to a new memory card, first initialize the memory card.	Refer to 10-5-1
E. Edit	Copies, renames, and deletes files in the memory card.	Refer to 10-5-2
X. Execute	Runs the application program stored in the memory card. This application program only works with products sold separately by OMRON.	---

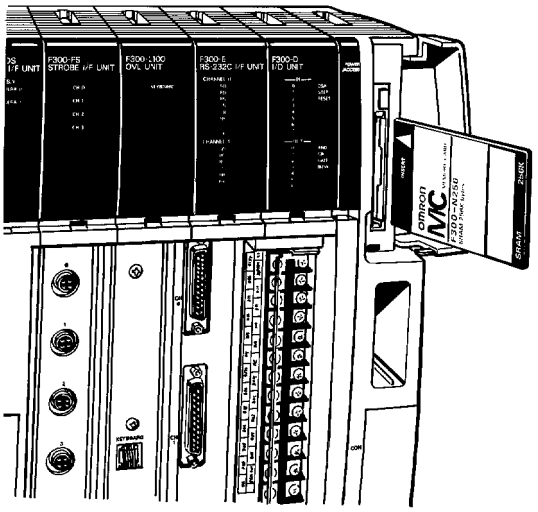
10-5-1 Initializing Memory Cards

When using a new memory card, be sure to initialize it first.

Installing the Memory Card

1, 2, 3...

1. Open the memory card cover at the top of the MMI Unit and insert the dedicated F300 memory card.



Memory Cards Usable with F300:

Model	Capacity
F300-N256	256 Kbytes
F300-N512	512 Kbytes

2. Insert the memory card with the labeled side facing the left. Be sure to close the cover after the card has been inserted.

   When the memory card has been inserted and the cover closed, the memory indicator will light in green. When data is being transmitted to or from the F300, it will turn orange. While the indicator is orange, absolutely do not open the cover or remove the card.

3. To remove the memory card, press the ejector button on the top of the connector and immediately pull the card out.

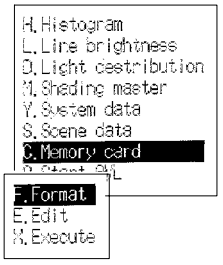
Initializing the Memory Card

1, 2, 3...

1. The memory card has a write-protect switch. When initializing the memory card, be sure that this switch is set to off.

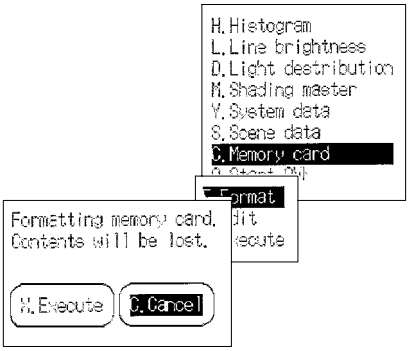
Switch setting	Initialization	Writing data	Reading data
OFF	Possible	Possible	Possible
ON	Not possible	Not possible	Possible

2. To initialize the memory card, first install the card properly and close the cover. Then select “F. Format”.



If the memory card has not been properly installed, or if the cover has not been closed, a message will be displayed with the information that the card is not installed.

or if the memory card is write-protected, a message will be displayed with the information that the card is write-protected.



3. Press the Enter Key.

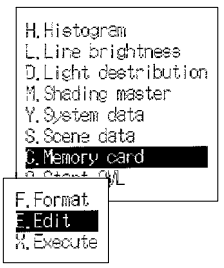
   While the memory card is being initialized, a message will be displayed to inform you of that fact. When the operation has been completed, you will be returned to the original menu display.

```
Formatting memory card ...
Please wait.
```

10-5-2 Editing Memory Card Files

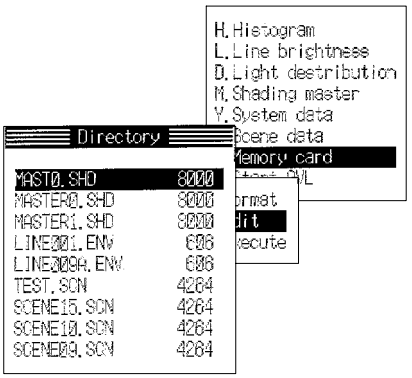
Copying, renaming, or deleting files that have been stored on a memory card is possible.

1, 2, 3... 1. Select “E. Edit”.



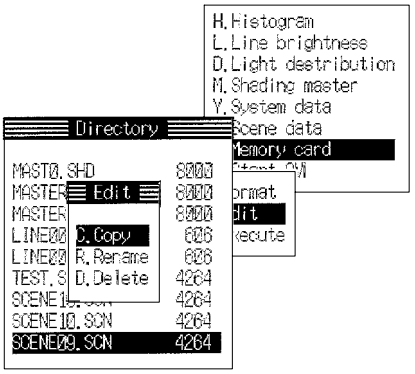
2. From the list of filenames, select the file to be edited.

   In the list, each filename is displayed with an identifier and the capacity of the file.



File identifier	Data content
.SHD	Shading master
.ENV	System data
.SCN	Scene data

After you have selected the file has been selected and the Enter Key pressed, the operation menu will be displayed.



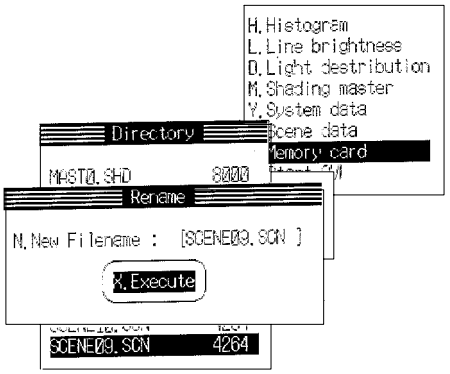
C. Copy

Copies an existing file to make a new file.

The copied file cannot have the same name as the original, so when copying a file be sure to change to a different filename.

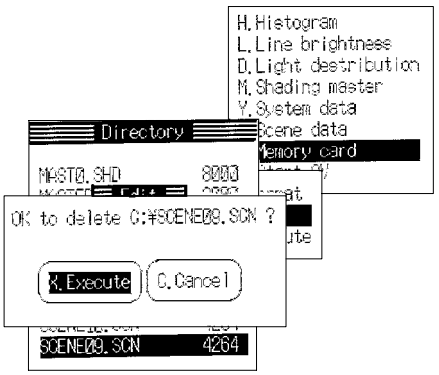
R. Rename

Changes the filename.



D. Delete

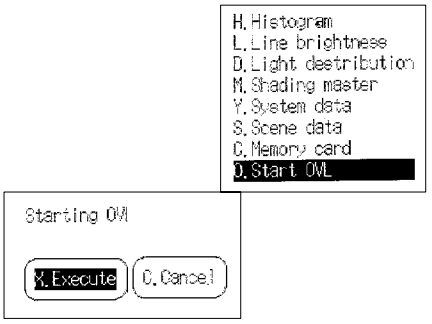
Deletes the file.



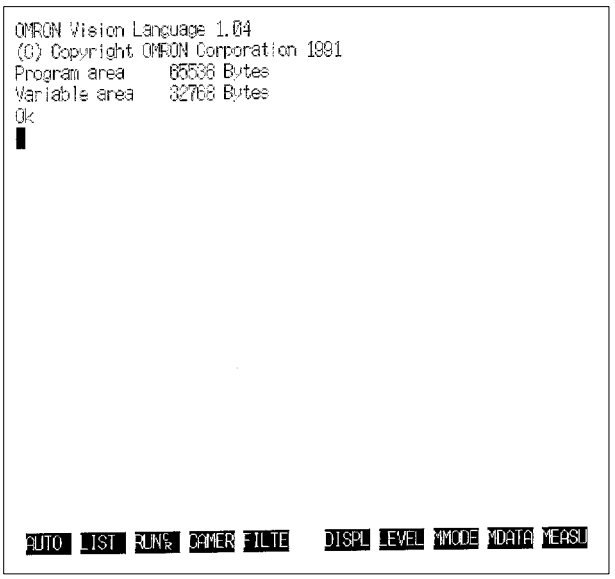
10-6 Starting OVL Mode

The OVL mode can be entered from the menu mode.

Select “O. Start OVL”.



For instructions on operations in the OVL mode, refer to the separate *F300 OVL Reference Manual*.



PART II
Version 2.00

SECTION 1
Introduction to Version 2.00

This section introduces the new Version 2.00, and describes its added features and its relationship with the earlier Version 1.□□.

1-1 Added Features

The new features that have been added or changed for Version 2.00 are described below. All of these operations are explained in more detail in *Part II Section 2 New Operations in Version 2.00*.

Changes to Freeze Menu

The menu which specifies whether an image will be frozen or unfrozen has been changed by adding an operation that freezes an image by means of a STEP signal. In addition, when an image is unfrozen while a strobe is set to be used, the focus and lens adjustability have been improved by making the strobe flash continuous.

Image Saving and Loading

An operation has been added whereby a currently displayed image can be saved to a memory card, or an image previously saved to a memory card can be loaded to the F300.

Copying Between Window Planes

An operation has been added whereby a window graphic drawn in another plane can be copied to the plane in which a window is currently being drawn.

Referencing Windows

An operation has been added whereby a window drawn in one plane can be displayed for reference while drawing a window in another plane.

Editing Operations Display

With Version 2.00, it is now possible to display on the screen items such as the amount of movement of a graphic during movement, rotation, sizing, and so on, of a window graphic that is being drawn.

Axis Cross Point

A measurement item called “axis cross point” has been added.

Filtering for Position Displacement Compensation

With Version 2.00, image filtering can be set independently with regard to measurement for position displacement compensation and measurement after position displacement compensation.

Saving Reference Images by Means of STEP Signal

With Version 2.00, reference images can be saved even by means of a STEP signal.

List of Saved Reference Images

A menu has been added for displaying a list of the reference images that have been saved.

Menu for Registering Reference Density

With Version 2.00, the operation of saving the reference density for light level adjustment has been made independent in a separate menu.

Improvement in Measurement Screen Visibility

With the previous version, when measurement of a window for position displacement compensation was completed, the original position was restored. With Version 2.00, this has been changed so that scroll status will stay in effect until the next measurement is begun. This makes it easier to check the position displacement compensation. In addition, windows used for position displacement compensation are framed with white dotted lines during measurement, thus making them easier to distinguish.

Lighting Conditions Alarm

A function has been added whereby an alarm can be output when a significant change occurs in the lighting conditions for a screen during measurement.

Menu for Setting Sensor Gate Timing

When a camera other than an F300-S Normal Camera or a PJLG-55-Z Shutter Camera is used, the sensor gate (SG) timing for the F300 must be changed. With Version 2.00, a menu has been added for that purpose.

Histogram Units Scale units are now indicated when a histogram is displayed.

Simultaneous Saving or Loading of Scene Data An operation has been added whereby the data that has been set for all 16 scenes can be saved or loaded simultaneously as a unit.

Menu for Displaying the ROM Version A menu has been added for displaying the version of ROM that is currently being used.

Bypassing the Initial Mode With Version 2.00, automatic measurement or automatic OVL execution that have been set as the initial mode can be bypassed by holding down the Escape Key while starting up the system.

Battery Voltage Drop Detection Even with the previous version a drop in the voltage of the memory backup battery was detected and indicated at system startup. With Version 2.00, the message has been made easier to read, and in addition an error signal is output.

Memory Card Battery Status With Version 2.00, the status of the memory card battery is always indicated in the lower right-hand corner of the screen.

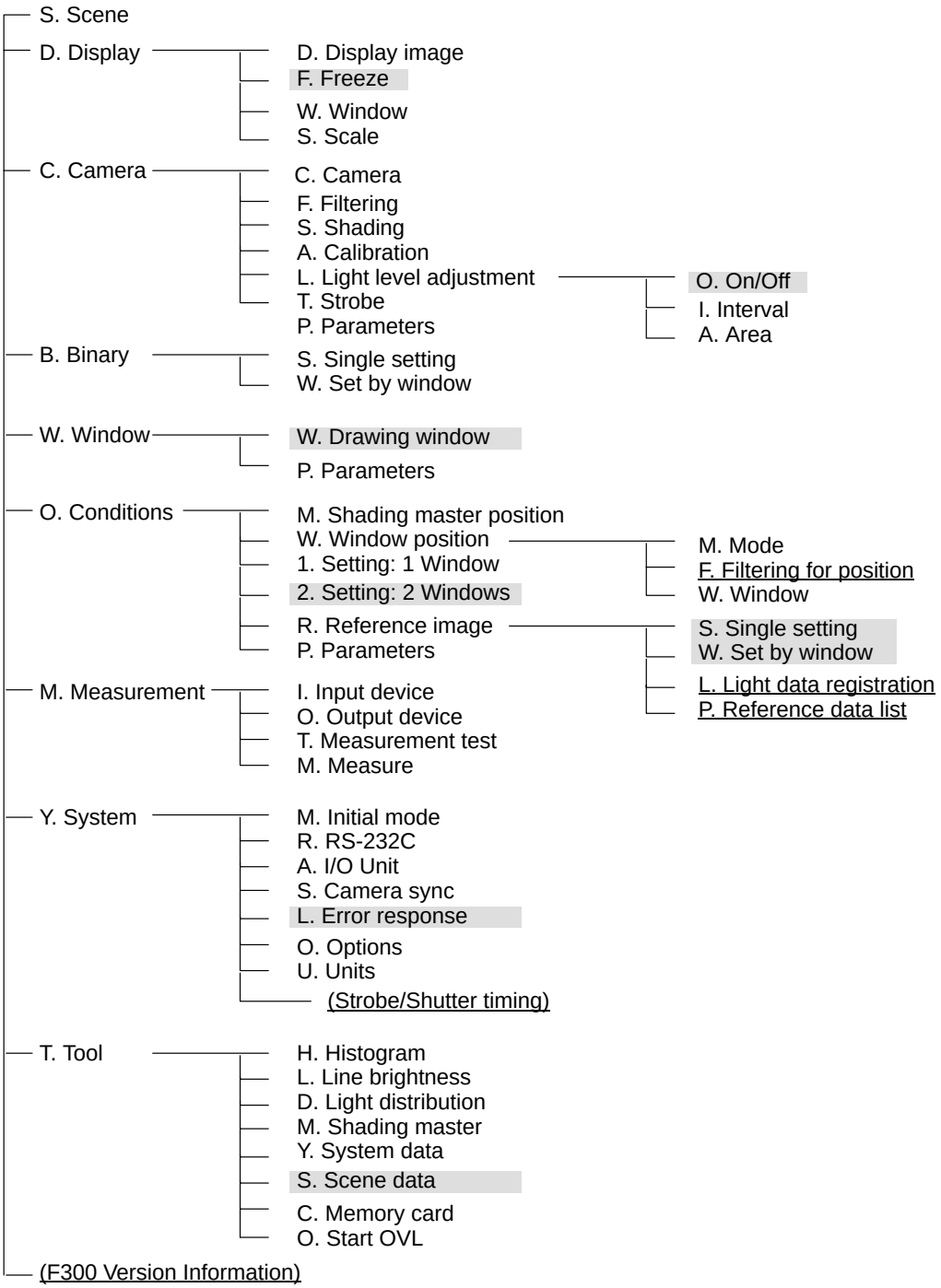
Note

1. Be sure to use F300-L100E Version 2.□□ for OVL operation on F300-C10E/C11E Version 2.□□.
2. The following ROM combinations for the F300-C10E/C11E and F300-L100E are available.

Model	F300-C10E	F300-C10EV2/C11E
F300-L100E	Yes	No
F300-L100EV2	No	Yes

1-2 Menu Hierarchy

The main menu hierarchy for Version 2.00 is shown below. Completely new items that have been added for Version 2.00 are underlined. Items for which certain operations have been changed are shaded. The items in parentheses can be accessed by simultaneously pressing the Shift and Escape keys while the menu one level higher in the hierarchy is being displayed.



1-3 Performance Improvements

Performance has been improved in the following areas:

- Switching between scenes has been speeded up, thereby shortening the time required for switching scenes.
- Memory card access speed has been improved, thereby shortening the time required for saving and loading scene data to and from memory cards. (On average, saving and loading can be executed 1.5 times faster with Version 2.00, but the access speed varies somewhat depending on the contents of the data.)
- The accuracy of object generation windows has been improved, enabling window graphics to be created with higher precision. In addition, the windows can now be sized more quickly.

1-4 Data Interchangeability with Version 1.□□

Any data created with Version 1.□□ can normally be used with Version 2.00. This includes system data, scene data, and image with shading masters saved. The limitations described below apply, however.

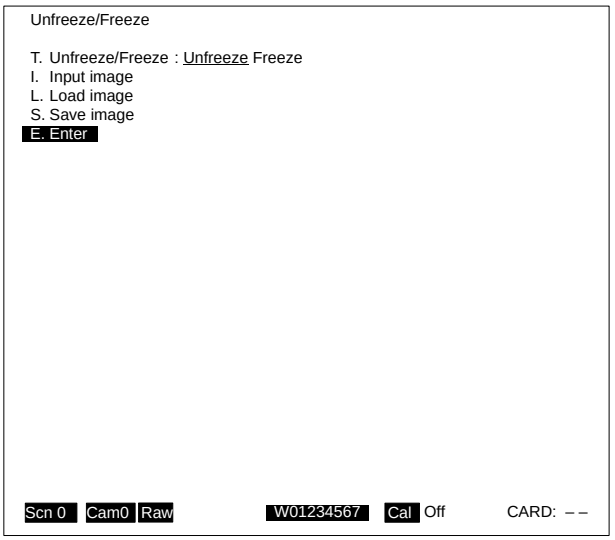
- **System Data**
  An item called “Lighting error” has been added to the error response setting. When system data created in Version 1.□□ is loaded to Version 2.00, “Lighting error” will always be set to “Ignore.”
- **Scene Data**
  A mode called “Alarm only” has been added to the light level adjustment function, but the settings made in Version 1.□□ will appear identically in Version 2.00.

SECTION 2
New Operations in Version 2.00

This section explains in detail the operations that have been either added or changed for Version 2.00.

2-1 Changes to Freeze Menu

This section describes the changes that have been made to the “F. Freeze” menu under “D. Display.”



T. Unfreeze/Freeze

This menu switches between freezing and unfreezing an image. Moving the cursor to “Unfreeze” unfreezes the image. When the cursor is moved to “Freeze,” the image is taken at that point and frozen. If either “I. Input image” or “L. Load image” is executed, “freeze” will be set automatically.

I. Input image

When “I. Input image” is selected, the screen for inputting images from the camera will be displayed. While in that screen, images can be input and frozen either by pressing the Enter Key or by means of inputs from the STEP terminal of a Terminal Block Unit or a Parallel I/O Unit.

L. Load image

When “L. Load image” is selected, a list of image files saved on the memory card that is inserted in the MMI Unit will be displayed. When one of those files is selected, the image data from that file will be loaded and frozen for display on the screen.

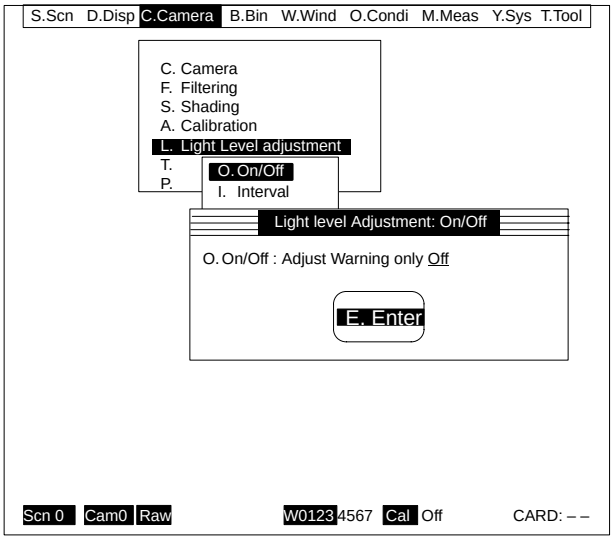
S. Save image

When “S. Save image” is selected, the menu for entering the filename will appear. When the filename is entered, the currently displayed image will be saved to the memory card.

When an image is frozen by means of these menus, that image will be displayed during subsequent setting operations. In addition, when an image is unfrozen while a strobe is set to be used, the strobe flash will be continuous for a period of 1/30 second.

2-2 Changes to Light Level Adjustment Menu

A mode called “Warning only” has been added to the previous choices of “On” and “Off” in the “Light level adjustment” menu (accessed through “C. Camera/L. Light level adjustment/O. On/Off).”



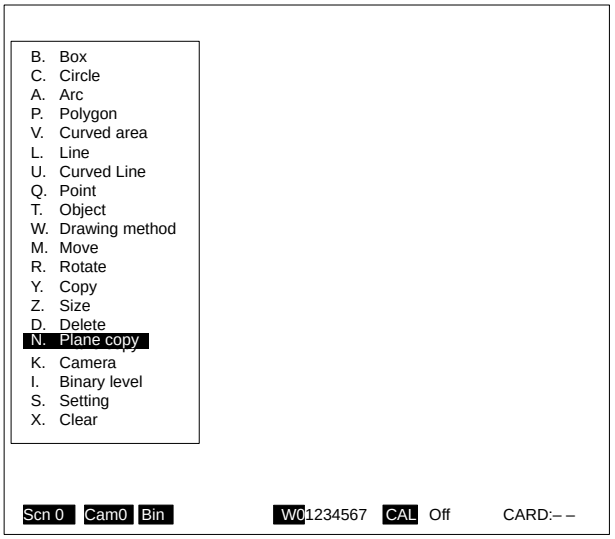
When either “Adjust” or “Warning only” is set here, an alarm will be output if the density value that was registered as a reference standard is exceeded by ±20%. The alarm method can be specified by means of “L. Lighting error” (accessed through “Y. System/L. Error response”).

If “Warning only” is set, the alarm will be output but the binary level will not be adjusted.

Refer to *PART II 2-7 Saving Reference Images* for registering reference density in the monitor area. Refer to *PART II 2-9 Lighting Errors* for error response settings.

2-3 Copying Between Window Planes

An operation has been added for Version 2.00 whereby a window graphic drawn in another plane can be copied to the plane in which a window is currently being drawn.

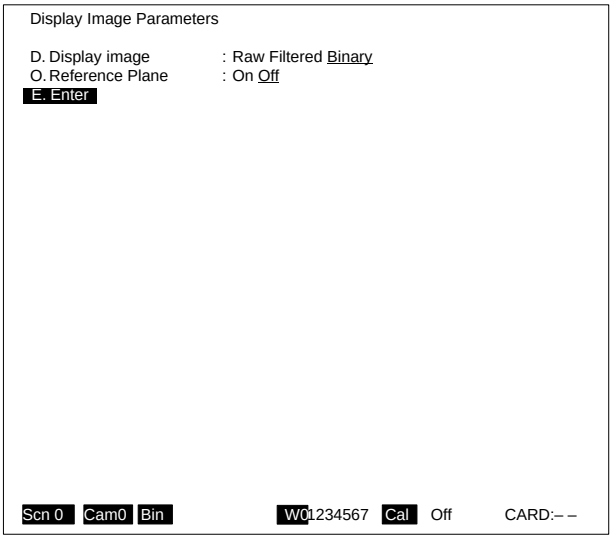


When “N. Plane copy” is specified, the screen for selecting the window plane will be displayed. When a particular window plane is selected in that screen, all of

the window graphics in that plane will be copied to the window plane in which a window is currently being drawn.

2-4 Referencing Window Graphics in Another Plane

An operation has been added whereby a window drawn in one plane can be displayed for reference while drawing a window in another plane. The following screen can be displayed by pressing the Shift and Escape keys simultaneously while the window-drawing menu (see the screen in *2-3 Copying Between Window Planes* above) is being displayed.



Settings made by means of this menu are valid only during window-drawing operations for the window that is currently being set. As soon as the window-drawing menu is quit, the display will revert to the status prior to the settings made in this menu. The operations are as follows for the items in this menu:

D. Display image

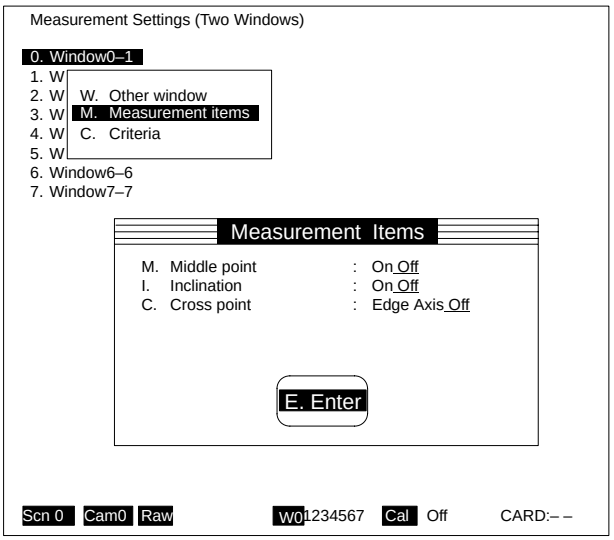
The user can select “Raw,” “Filtered,” or “Binary.”

O. Reference plane

When this item is set to “On,” the window graphics in other planes will be displayed as blinking. Windows for which “display” is set to “Off” at the “D. Display/W. Window” menus are not displayed.

2-5 Axis Cross Point

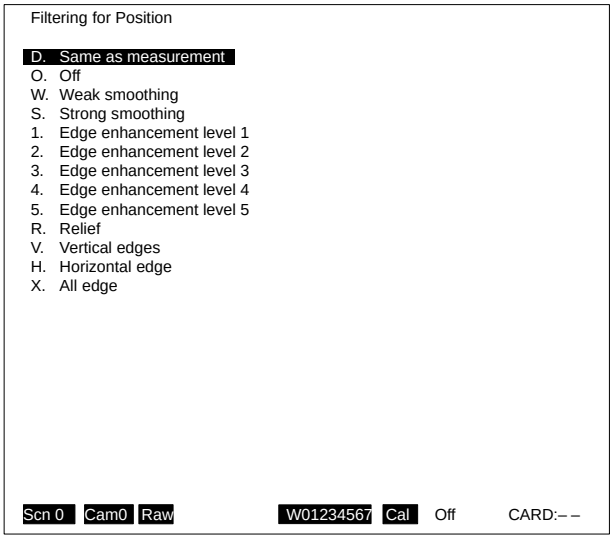
A measurement item called “axis cross point” has been added, and the previous “cross point” is now called “edge cross point.” These items can be selected from the screen shown below, which is accessed through “O. Conditions/2. Setting: 2 Windows.”



The mid-point and angle of inclination are set just as in Version 1.□□, but with Version 2.00 the user can choose between “edge cross point” and “axis cross point” for the cross point. When “cross point” is indicated on other menus, such as the menus for setting criteria or displaying measurement values, it will refer to whichever of the two types of cross point is specified here.

2-6 Filtering for Position

A menu called “F. Filtering for Position” has been added so that image filtering can be set independently with regard to measurement for position displacement compensation and measurement after position displacement compensation. This menu is accessed through “O. Conditions/W. Window position.”



If “D. Same as measurement” is selected here, the image filtering at the time of position displacement compensation will be the same as that set for “F. Filtering” under the “C. Camera” menu. If anything other than “D. Same as measurement”

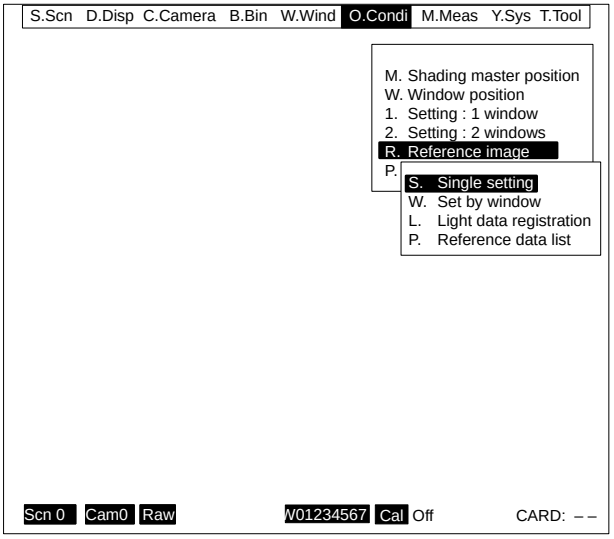
is selected, the designated image filtering will be used for measurement for position displacement compensation.

2-7 Saving Reference Images

Version 2.00 has made some changes to the menu accessed through “O. Conditions/R. Reference image.” The main changes are as follows:

- Reference images can now be saved by means of STEP signals.
- The previously measured values for reference image data are now displayed on the screen.
- A new menu has been added for displaying a list of the reference images that have been saved.
- The reference density for light level adjustment has been made independent of the reference images and placed on a separate menu.

When “R. Reference image” is selected, the following menu will be displayed.



The operations accessed through this menu are as follows:

S. Single setting

Reference images will be saved for all windows as a group. Reference values can now be measured by means of a STEP signal, and measured values will be displayed on the screen.

W. Set by window

Reference images will be saved for the designated window only. Reference values can now be measured by means of a STEP signal, and measured values will be displayed on the screen.

L. Light data registration

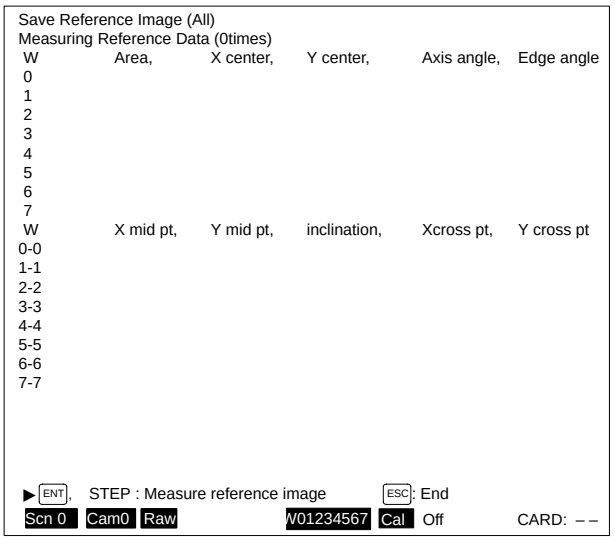
The reference value will be saved for the image density used for light level adjustment. The lighting data will be saved separately for each camera. If the light level adjustment function is not being used, the lighting data will be meaningless even if it is saved.

P. Reference data list

A list of the reference data that is set for each window will be displayed.

2-7-1 Screen for Saving Reference Images

The screen shown below will be displayed when reference images are saved. The screen is the same whether saving images as a group (i.e., a single setting) or by window.



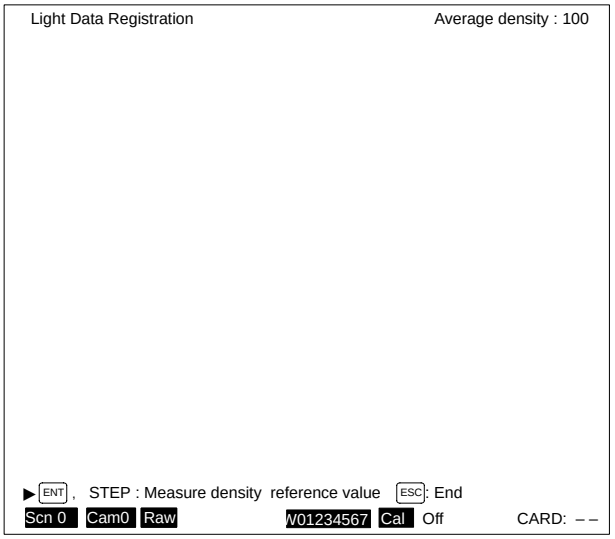
Measurement is carried out when the Enter Key is pressed or a STEP signal is input, and the measurement results are displayed on the screen. When saving images as a group, the operation will be carried out for all measurement items in all windows. When saving images window by window, it will be carried out for all measurement items in the designated window.

The operation will be ended manually when the Escape Key is pressed or automatically when 15 measurements have been carried out. When it is ended, a message will be displayed asking whether the measured values are to be saved as reference image data. If “X. Execute” is selected, then the average values of the measurements carried out up to that point will be saved as reference image data.

If the display is frozen, then images will not be taken at the time of reference image measurement, and measurement will be carried out instead with respect to the frozen image. It is meaningless, therefore, to carry out multiple measurements when the display is frozen.

2-7-2 Screen for Light Data Registration

The screen shown below will be displayed when lighting data is saved.



The average image density in the monitor area set by the “L. Light level adjustment” menu (accessed through “C. Camera”) is measured and taken as the reference value for light level adjustment.

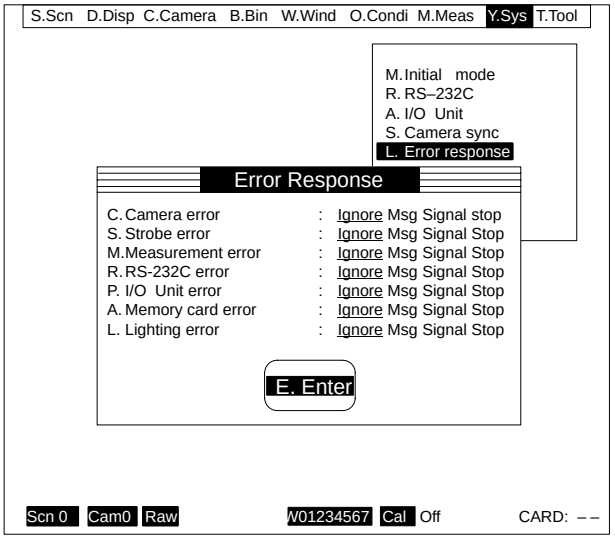
The reference density measurement is executed when the Enter Key is pressed or when a STEP signal is input, and the operation is ended when the Escape Key is pressed. The reference density can be measured up to a maximum of 15 times. Once the limit of 15 times has been reached, the operation will be ended automatically. When it is ended, a message will be displayed asking whether the measured values are to be saved as the reference density value. If “X. Execute” is selected, then the average value of the measurements carried out up to that point will be saved as the reference density value for reference.

2-8 Improvement in Measurement Screen Visibility

With Version 2.00, when measurement is carried out for position displacement compensation, the window remains in the status that exists after the position displacement compensation has been completed. In addition, windows used for position displacement compensation during measurement are framed with white dotted lines, and these frames are not scrolled.

2-9 Lighting Errors

An item called “L. Lighting error” has been added to the “L. Error response” menu (accessed through “Y. System”).

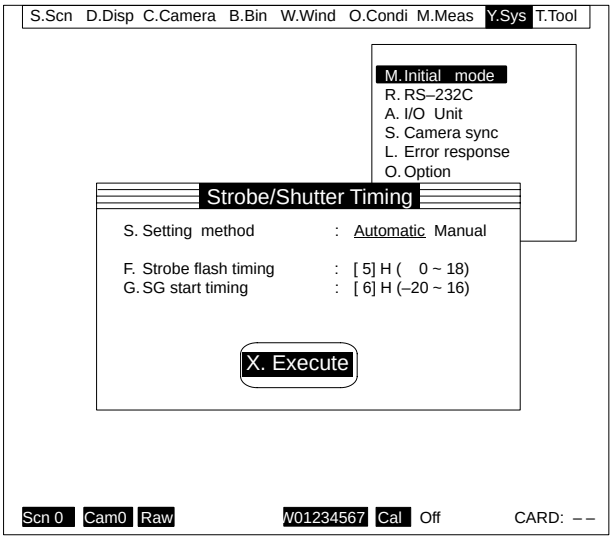


When “L. Lighting error” is set to other than “Ignore” then at the time of measurement the density in the monitor area will be checked according to the items set at the “C. Camera/L. Light level adjustment” menu. If the density fluctuates by ±20% with respect to the reference density that has been set, then the error processing specified by this menu will be executed.

The “L. Lighting error” setting is only valid when “L. Light level adjustment” (accessed by “C. Camera”) is set to either “Adjust” or “Warning only.”

2-10 Strobe/Shutter Timing

When a camera other than an F300-S Normal Camera or a PJLG-55 Shutter Camera is used, the sensor gate (SG) timing for the F300 must be changed. With Version 2.00, a menu has been added for that purpose. The menu shown below, which is used for setting the SG timing, can be accessed by simultaneously pressing the Shift and Escape Keys while the “Y.System” menu is being displayed.



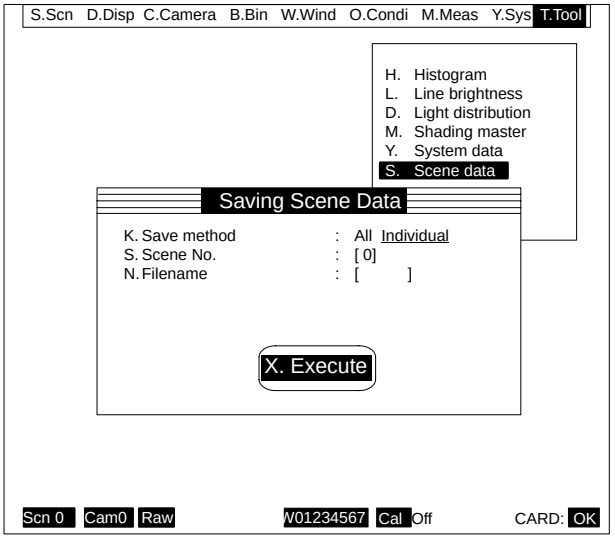
When “Automatic” is specified for “S. Setting method,” the values that have been set by the system according to the Camera I/F Units that are used will be displayed for “F. Strobe flash timing” and “G. SG start timing.” (The numbers that are displayed on the screen at that time cannot be changed.) When “Manual” is specified for“S. Setting method,” numeric values can be input for “F. Strobe flash timing” and “G. SG start timing.”

If either an F300-S Normal Camera or a PJLG-55 Shutter Camera is used, “Automatic” must be specified. If any other camera is used, the timing must be set according to the specifications of that particular camera. In that case, be sure to check the specifications carefully before making the settings.

The settings made with this menu are preserved even when the power is turned off, but they are not saved to the memory card as scene data or system data. Moreover, if these settings are not appropriate for the particular type of camera being used, then measurements cannot be carried out correctly. It is very important, therefore, that these settings be made carefully.

2-11 Loading and Saving Scene Data

An operation has been added for Version 2.00 whereby the data that has been set for all 16 scenes can be saved to or loaded from a memory card simultaneously as a unit. The menu shown below, which is used for setting the conditions for saving data to a memory card, can be accessed through “T. Tool/S. Scene data/S. Save/C. Memory card.”



When “All” is selected for “K. Save method,” the data set for all of the scenes (0 to 15) will be saved to the designated file at one time. When “Individual” is selected for “K. Save method,” the data set for the scene designated by “S. Scene No.” will be saved.

When loading scene data from a memory card, the loading operation is executed by means of “T. Tool/S. Scene data/L. Load/C. Memory card.” This procedure is the same whether loading data was saved all at one time or separately. When loading data that was saved all at one time, however, all of the data in scenes 0 to 15 will be overwritten.

2-12 Bypassing the Initial Mode

With Version 2.00, automatic measurement or automatic OVL execution that have been set as the initial mode in “Y. System/M. Initial mode” can be bypassed by means of holding down the Console’s Escape Key while starting up the system. In that case, the automatic measurement will not be carried out.

This bypass is only temporary, however, so at subsequent system start-ups the mode set as the initial mode will again be executed unless the Escape Key is held down again.

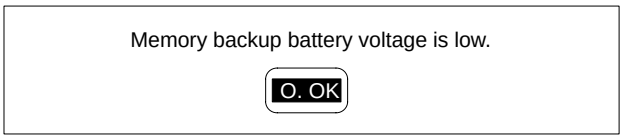
2-13 Displaying the ROM Version

A menu has been added to Version 2.00 for displaying the version of ROM that is currently being used. This menu can be accessed by simultaneously pressing the Shift and Escape keys while only the menu bar at the top of the screen is displayed. The various ROM versions are as follows:

- The ROM version for the main CPU (68020)
- The BIOS version for the main CPU (68020)
- The BIOS version for the sub CPU (H16)
- The OVL version (only when an OVL Unit is mounted)

2-14 Battery Voltage Drop Detection

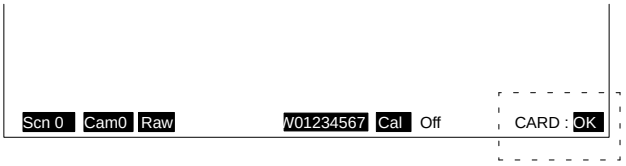
At system startup, a drop in the voltage of the memory backup battery is detected and the message shown below is displayed. At the same time, the Power Supply Unit's error signal output is turned ON. (The message will not be displayed, however, if "Hardware check" is set to "Off" at "Y. System/O. Options.")



If "O. OK" is selected, the message will disappear and menu operations can begin.

2-15 Memory Card Battery Status

With Version 2.00, the status of the memory card battery is always indicated in the lower right-hand corner of the screen (indicated by the dotted line in the illustration below).



The meanings of the three possible displays are as follows:

CARD: OK	The memory card battery voltage is sufficient.
CARD: NG	The memory card battery voltage is too low.
CARD: – –	There is no memory card inserted.

If "NG" is indicated, it means that the voltage is too low and the battery must be replaced. Refer to the memory card instruction manual for details.

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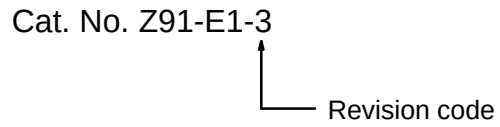
Revision History

A manual revision code appears as a suffix to the catalog number on the front cover of the manual.



The following table outlines the changes made to the manual during each revision. Page numbers refer to the previous version.

Revision code	Date	Revised content
1	September 1992	Original production
2	March 1993	**Page 7:** Second sentence of step 5 has been corrected. **Page 32:** Related Menus chart has been corrected. **Page 37:** “See note” reference position corrected in the display. **Page 59:** “Time interval” corrected to “Interval” in the table. **Page 68:** Settings description has been corrected for “W. Set by window.” **Page 69:** Two key combinations have been added to the table. **Page 73:** Graphs have been corrected throughout this page. **Pages 89, 90:** Diagrams have been altered. **Page 102:** Second sentence in *6-5 Clearing Window Setting Data* has been rewritten. **Page 106:** Page references in the table have been corrected. **Page 112:** Note has been rewritten. **Page 129:** “E. Escape” has been corrected to “E. Enter.” **Page 159:** “or” has been added to the format diagrams of Save Scene Data (RS-232C) and Save Scene Data (Memory Card). **Page 161:** Format diagram at the top of the page has been corrected and a sentence has been added. Data 1 to Data N description has been corrected in the table. **Page 164:** First sentence and table have been corrected. **Page 165:** Data type description has been corrected in the table. **Pages 165 to 167:** Measured result display data has been corrected. **Page 167:** Descriptions in the table have been corrected. **Page 176:** Setting description has been corrected for D. Delay in the I/O Unit Output Specifications table.
3	March 1994	Version 2.00 of the F300 Visual Inspection System added as Part II, Sections 1 and 2. **Page 31:** Note 2 added. **Page 102:** Last sentence of page corrected. Minor change to the pattern matching graphic. **Pages 130, 137, 138, 140, 147:** Standard value(s) changed to reference value(s). **Page 145:** Commercially available personal computer added to the diagram.