Cat. No. Z162-E1-02

Z300 V3

High-precision Visual Displacement Measurement System

Manual 2: OPERATION MANUAL

OMRON

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High-precision Visual Displacement Measurement System

Manual 2: Operation Manual

Produced March 2003

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.

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.
Notice	Indicates information required to take full advantage of the functions and performance of the product. Incorrect application methods may result in the loss of damage or damage to the product. Read and follow all precautionary information.
CHECK	Indicates points that are important in using product functions or in application procedures.
1,2,3...	Indicates lists of one sort or another, such as procedures, checklists, etc.
SeeAlso	Indicates where to find related information.

Notation

Screen Messages In this manual, screen message are given in bold/italic.

E.g.: Application

TABLE OF CONTENTS

About this Manual:

This manual describes operating procedures for the Z300 and it includes the sections described below.
This is one of two manuals used to operate the Z300. Refer to the following table for the contents of each manual.

Manuall	Contents	Cat. No.
1: Setup Manual	Provides information on system hardware and installation. Be sure to read this manual first.	Z161-E1-02
2: Operation Manual	Describes operation of the Z300.	Z162-E1-02

Please read the above manuals carefully and be sure you understand the information provided before attempting to install or operate the Z300.

Section 1 explains the menu hierarchies and basic menu operation.

Section 2 describes how to set measurement conditions and the flow of operation using the Application Menu.

Section 3 explains how to set measurement conditions using the Expert Menu and provides details on functions common to the Application Menu and Expert Menu, for example, in RUN Mode and VIEW Mode.

Section 4 provides details on the inputs and outputs used for communications with external devices via terminal blocks or RS-232C.

Section 5 lists the errors that may occur during Z300 operation in . If an error occurs, check the items described in this section.

Section 6 describes changes made to functions with version upgrades and data compatibility with between versions.

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⚠ **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.

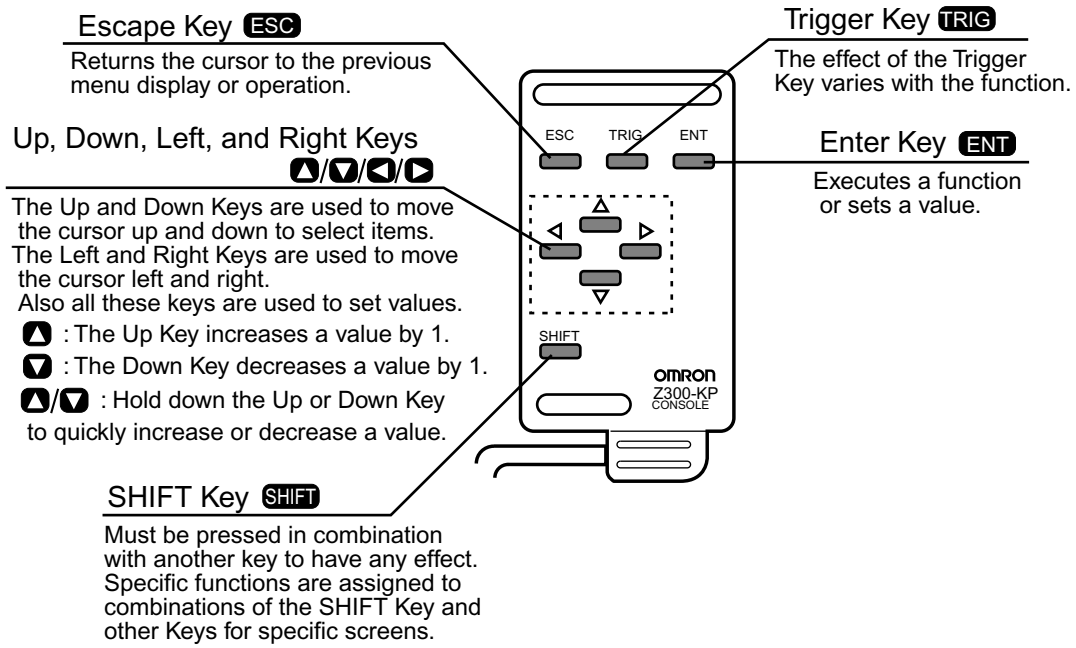
SECTION 1
Preparation

The menu hierarchies and explanations for basic menu operation are given in this section.

1-1 Menu Operation

1-1-1 Input Device

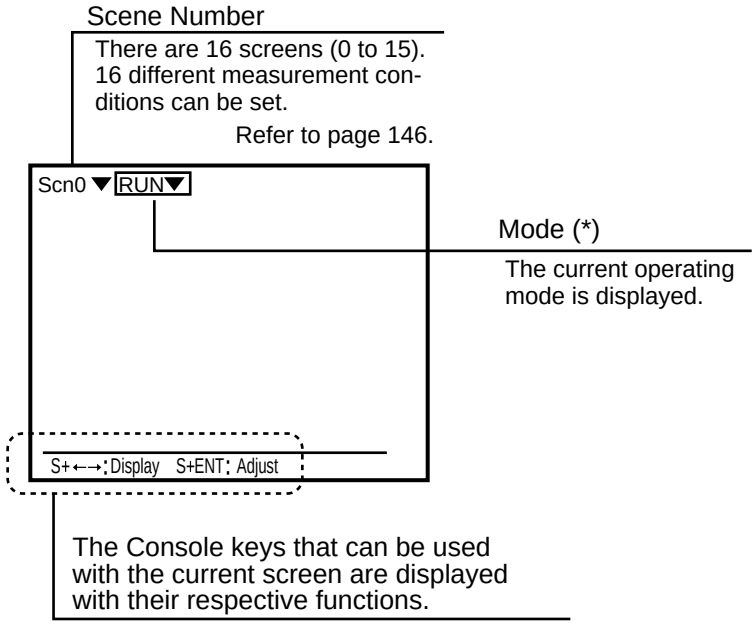
Menu operations are performed on the Console.
The basic functions of the Console keys are as follows.



1-1-2 Menu Display and Operation Method

The Z300 is operated by selecting functions displayed on the screen. Familiarize yourself with each function before operating the Z300.

Basic Screen Configuration



Mode(*)

Display	Description
SET	Mode to set the inspection conditions.
RUN	Performs measurement. The measurement results are output to an external device via terminal block or RS-232C.
VIEW	Mode for changing the display contents.
TOOL	Used to save settings and images to a computer as backup.
SYS	Used to set system conditions for the Z300. Select this mode to switch menus and settings for communications with external devices.
SAVE	Used to save data to flash memory in the Z300. If new settings have been made, be sure to save the data before quitting.

Operation Method

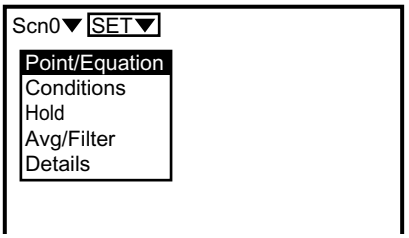
Menu Tree

Z300 menus are hierarchical. The cursor is moved to the required functions to set measurement conditions. Use the following procedures to move around the menu tree.

Procedure

1. Move the cursor to the item to be moved.

   Use the **Up/Down** and **Right/Left** Keys to move the cursor.

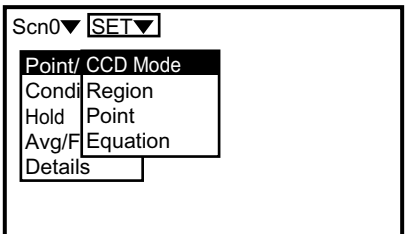


2. Press the **ENT** Key.

   In this example, the cursor will move to the ***Point/Equation*** Menu.
   Repeat 1. to move to lower levels.

3. Press the **ESC** Key once.

   The screen in (1.) will return.



Inputting Values

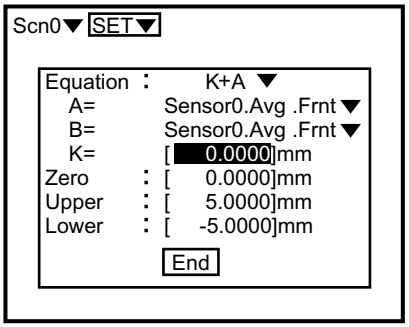
The section explains how to input values when setting judgement values.

Procedure

1. Move the cursor to the item for which a value is to be changed.

2. Press the **ENT** Key.

   The cursor will change to a cursor the size of a single digit.

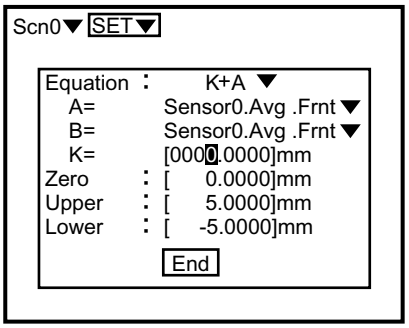


3. Move the cursor to the digit to be changed.

   Use the **Left** and **Right** Keys to move the cursor.

4. Change the value.

   Use the **Up** Key to increase the value.
   Use the **Down** Key to decrease the value.
   Repeat 3. and 4. to change other values.



5. Press the **ENT** Key.

   The values will be set.

Triangle Mark

Items with an inverted triangle after them have a list of alternatives. The method for selecting the alternatives is given here.

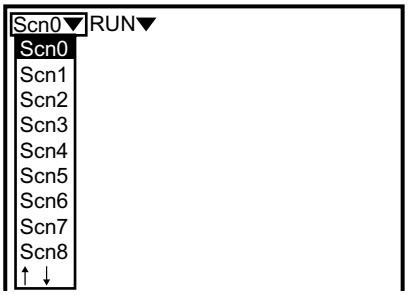
Procedure

1. Move the cursor to the item to be selected.

   Use the **Up/Down** and **Right/Left** Keys to move the cursor.

2. Press the **ENT** Key.

   The selections will be displayed.

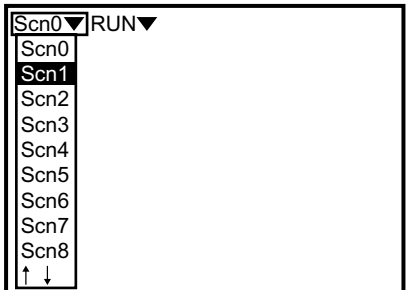


3. Select the desired scene number from the selections.

   Use the **Up** and **Down** Keys to move the cursor.

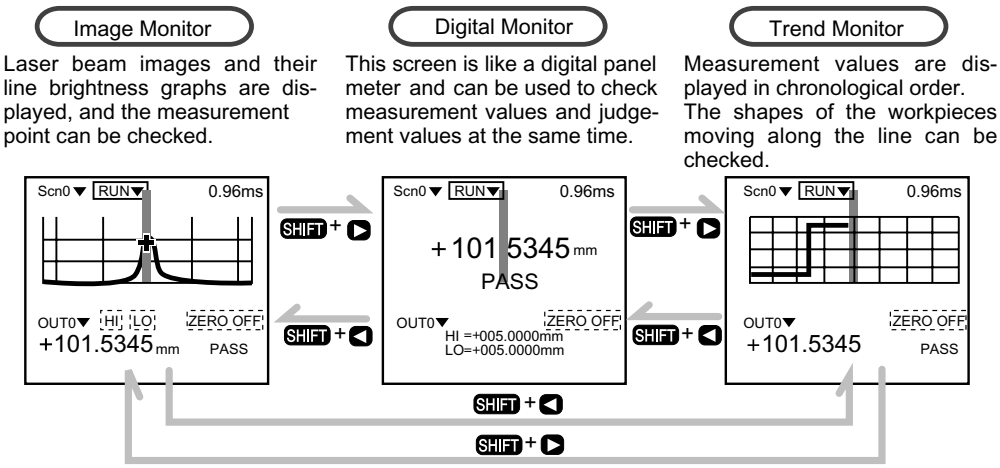
4. Press the **ENT** Key.

   The selected setting will be entered.



1-1-3 Screen Types and Display Methods

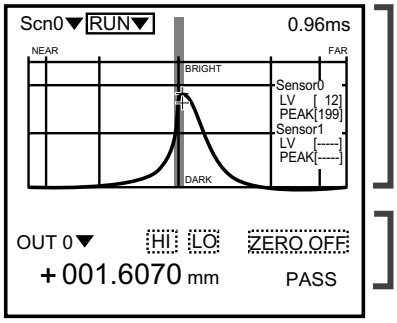
There are 3 Monitors to display images on Z300; Image Monitor, Digital Monitor and Trend Monitor. Use the **SHIFT** + **Right** Key or **SHIFT** + **Left** Key on the console to change the Monitors. The first time the power supply is turned ON after delivery, the Image Monitor is displayed.



CHECK Enable to select which Monitor will be displayed when the Z300 turns ON.
Refer to page 139.

Image Monitor

Mostly used to set the measurement conditions and change the settings.
The first time the power supply is turned ON after delivery, this screen is displayed.
Press the **SHIFT** + **ENT** Keys to display the menu for changing settings. The measurement conditions can be changed without changing the Modes.
Refer to page 100.

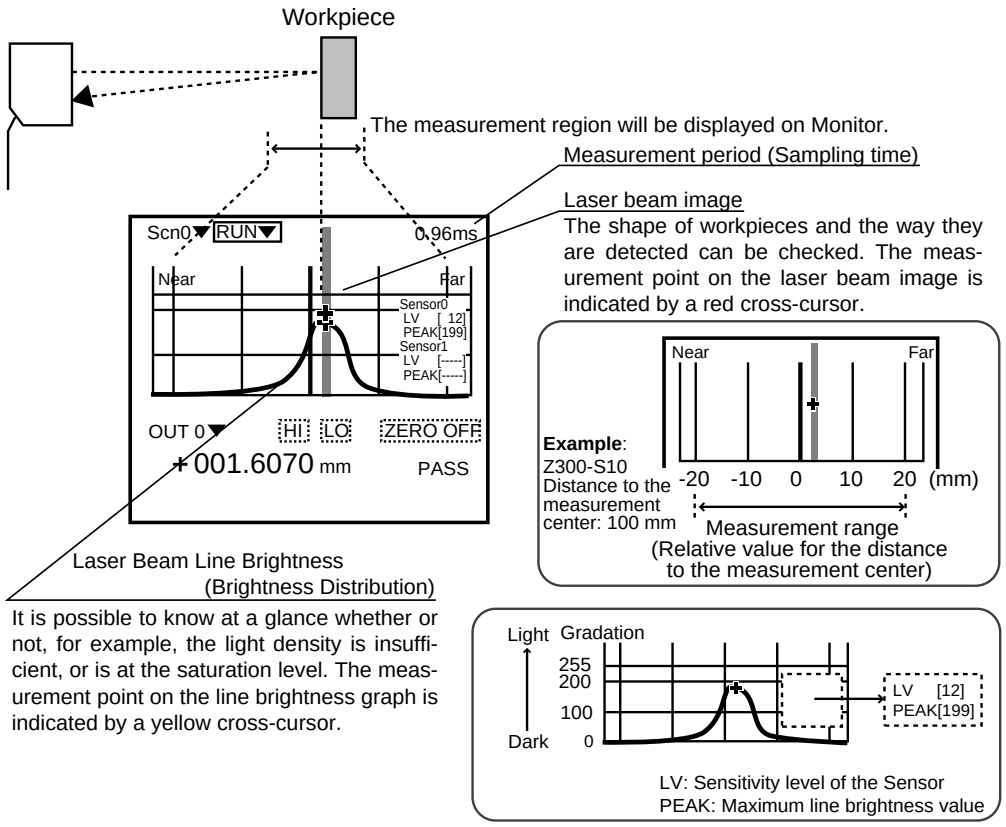


Screen Display
Displays the laser beam image currently being measured and the laser beam's line brightness graph (light density distribution).

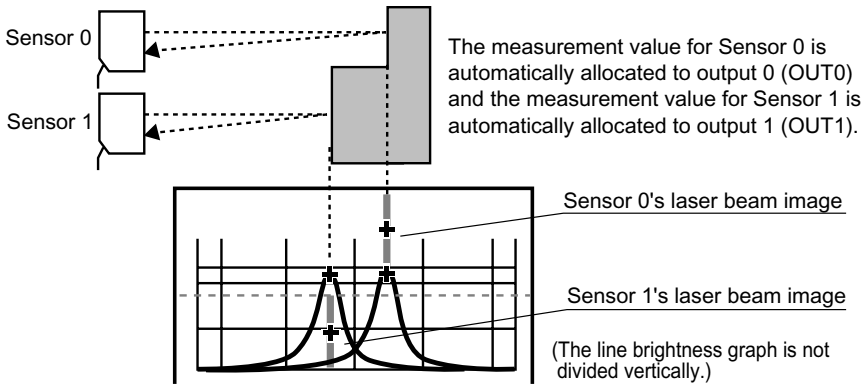
Values Display
Displays measurement values and judgement results.

CHECK If the NG record is set to ON, the most recent NG image is displayed.
Refer to page 122.

Screen Display

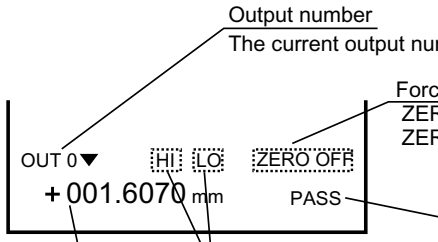


CHECK When there are 2 Sensors of the same model connected, the display is divided into two parts in the way shown below. (The display is divided vertically in the same way even if 2 regions have been selected in the measurement region specification for 1 Sensor.)



Values Display

The measurement value and judgement value for the currently displayed output number are displayed. Also, the judgement value can be set and forced-zero executed.



Output number
The current output number is displayed.

Forced-zero
ZERO OFF: Forced-zero not executed
ZERO O N : Forced-zero executed

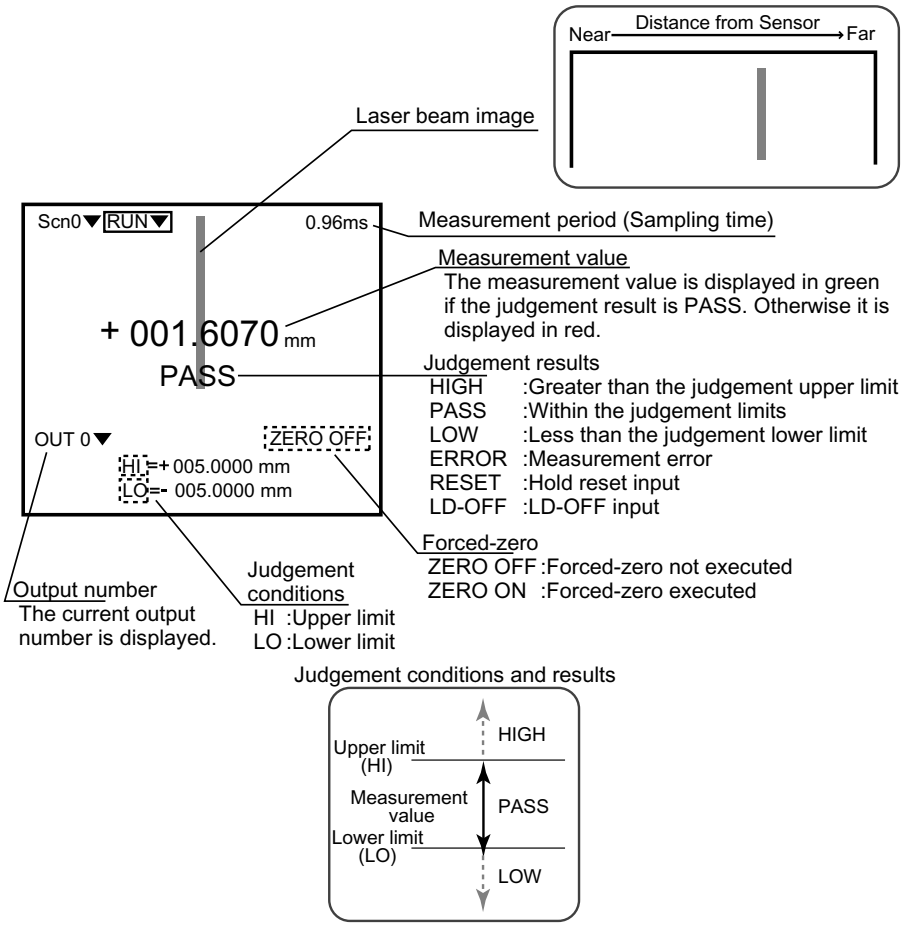
Judgement results
HIGH :Greater than the judgement upper limit
PASS :Within the judgement limits
LOW :Less than the judgement lower limit
ERROR :Measurement error
RESET :Hold reset input
LD-OFF :LD-OFF input

Judgement conditions
HI : Upper limit
LO : Lower limit

Measurement value
The measurement value is displayed in green if the judgement result is PASS. Otherwise it is displayed in red.

Digital Monitor

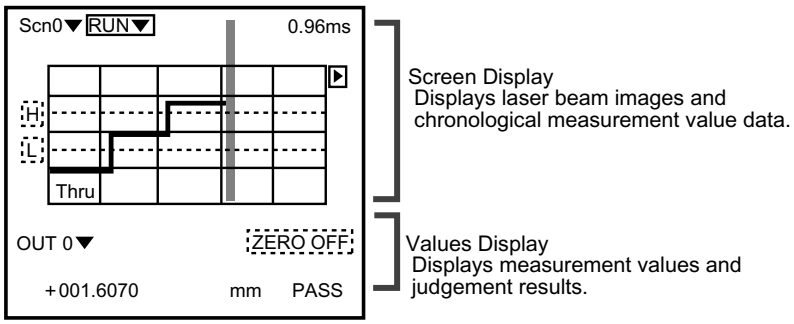
Mostly used during line operation.
The measurement value and judgement value for the currently displayed output number are displayed.
Also, the judgement value can be set and forced-zero executed.
Press the **SHIFT** + **ENT** Keys to display the menu for changing settings. The measurement conditions can be changed without changing the modes.
Refer to page 100.



CHECK With the Digital Monitor, measurement values, judgement results, and judgement values for OUT0 to OUT3 can be displayed in list format. This is a convenient feature for monitoring the measurement status for each output.
Refer to page 104.

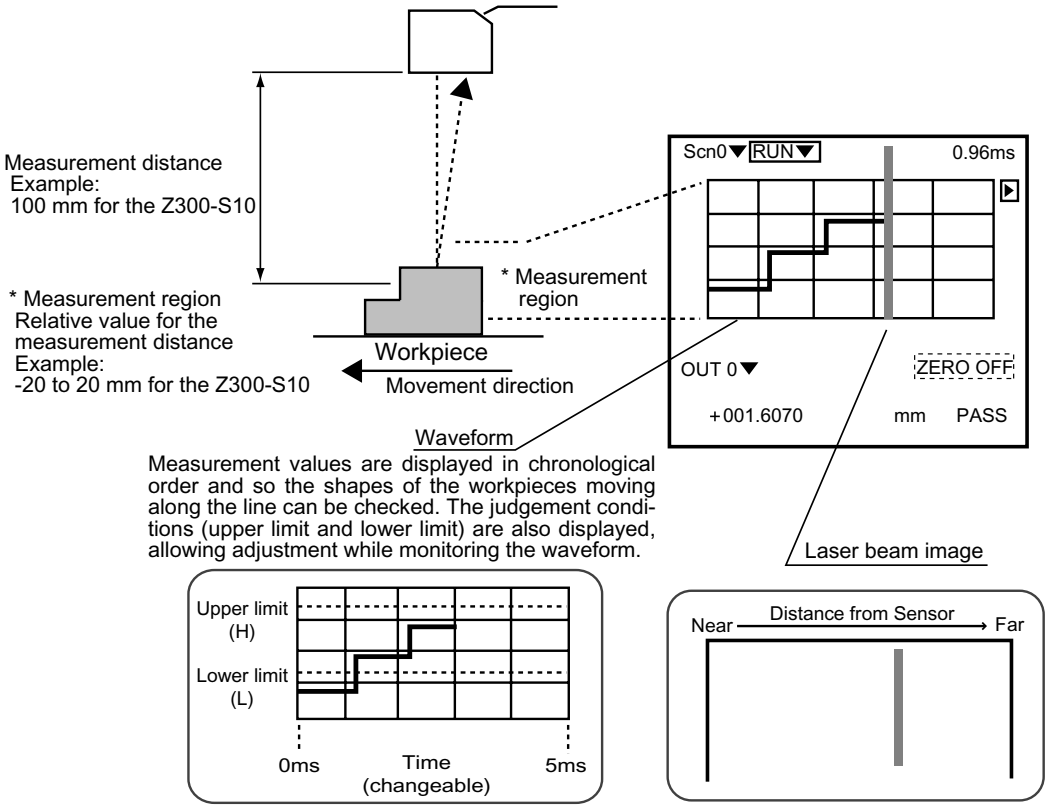
Trend Monitor

Mostly used for setting and checking the hold function, and checking the waveform during operation.
Measurement values are displayed in chronological order and so the shapes of the workpieces moving along the line can be checked.
Press the **SHIFT** + **ENT** Keys to display the menu for changing settings. The measurement conditions can be changed without changing the Modes.
Refer to page 100.



CHECK If the NG record is set to ON, the most recent NG image is displayed.
Refer to page 122.

Screen Display



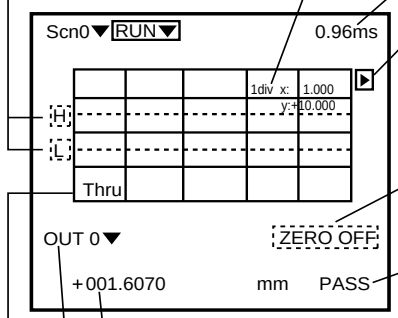
Values Display

The measurement value and judgement value for the currently displayed output number are displayed. Also, the judgement value can be set and forced-zero executed.

The units corresponding to 1 division (1 div) on the waveform display are displayed. If the setting is changed, the display also changes.
Use these values as reference when displaying the waveform

1div y 1div x: 1.000
x y:+10.000

The coordinate values after conversion can also be displayed.
Refer to page 105.



Conversion values for X and Y axes

Judgement conditions
HI :Upper limit
LO :Lower limit

Measurement period (Sampling time)

Waveform display status
When the screen mode is through mode:
During waveform display, ▶ (green) is displayed.
While the waveform is stopped, ▮▮ (red) is displayed.
When the screen mode is trigger mode, only □ is displayed.

Forced-zero
ZERO OFF :Forced-zero not executed
ZERO ON :Forced-zero executed

Judgement results
HIGH :Greater than the judgement upper limit
PASS :Within the judgement limits
LOW :Less than the judgement lower limit
ERROR :Measurement error
RESET :Hold reset input
LD-OFF :LD-OFF input

Measurement value
The measurement value is displayed in green if the judgement result is PASS.
Otherwise it is displayed in red.

Output number
The current output number is displayed.

Screen mode
Through:The waveform obtained by the Sensor is displayed without any changes.
Trigger :A still image of the waveform based on the hold mode trigger settings is displayed.
Zoom :Displayed if the waveform is enlarged.
NG :Displayed when the NG record is set to ON.

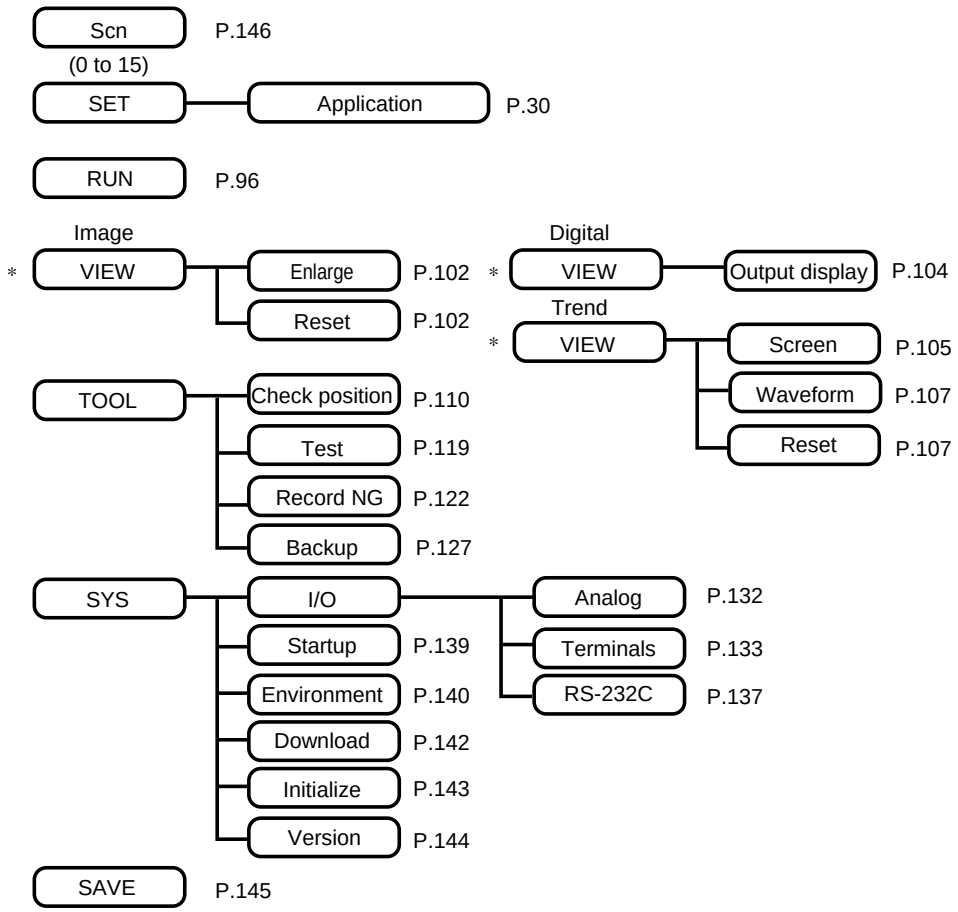
1-2 Searching from the Menu Tree

Explanations that apply to more than one item are grouped together.
Search for the desired reference page from the menu tree.

CHECK Menu Compatibility
In Expert Menu, it is possible to make fine adjustments to measurement conditions set in Application Menu. Conversely, condition settings changed in Expert Menu can be used in Application Menu.
The settings that were made last are enabled.

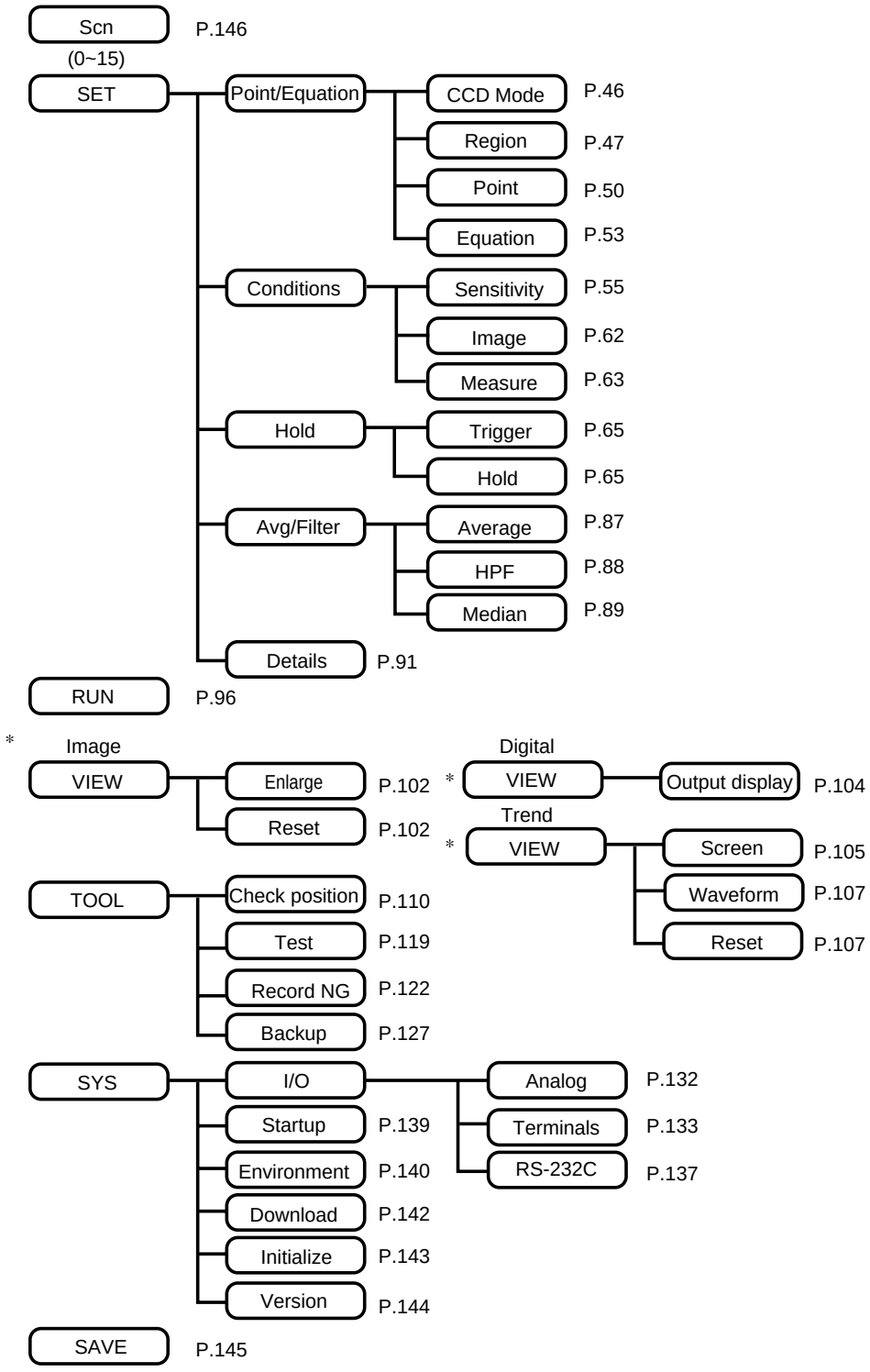
1-2-1 Application Menu

∗The hierarchy under Display Mode varies depending on the type of screen being displayed.



1-2-2 Expert Menu

∗The hierarchy under Display Mode varies depending on the type of screen being displayed.

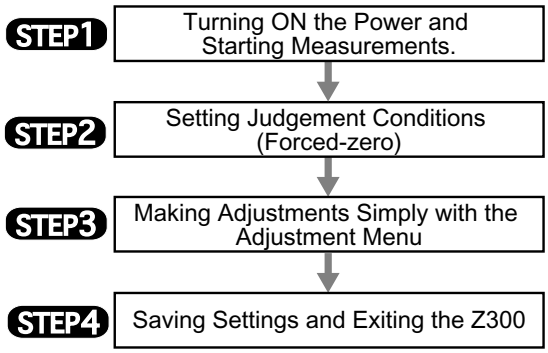


SECTION 2
Use the Z300 Straight Away!

Measurement can be started simply by turning ON the power supply.
In 2-1 Operational Flow, the flow of operations from turning ON the power supply to starting measurement is explained, taking surface displacement measurement as a representative example.
The Z300 has an Application Menu that allows easy setting of measurement conditions. In 2.2 Using the Application Menu, the flow of operations is explained, taking measurement of the maximum height as a representative example.

2-1 Operational Flow

Measurement and judgment of workpiece displacement can be performed with just the Z300.



STEP1 Turning ON the Power and Starting Measurements.

Procedure

1. Be sure that the basic Z300 components have been connected correctly.
   Refer to page 24, Setup Manual.

2. Turn ON the power supply to the monitor.

3. Turn ON the power supply to the Z300.
   Measurement of surface displacement starts.The screen can be displayed in any of the 3 ways shown below.
   Refer to page 12.

Image Monitor

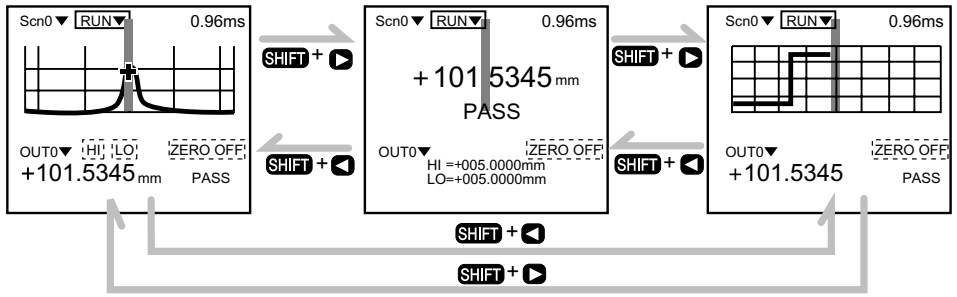
Laser beam images and their line brightness graphs are displayed, and the measurement point can be checked.

Digital Monitor

This screen is like a digital panel meter and can be used to check measurement values and judgement values at the same time.

Trend Monitor

Measurement values are displayed in chronological order. The shapes of the workpieces moving along the line can be checked.



STEP2 Setting Judgement Conditions (Forced-zero)

Set the measurement value of the reference used for workpiece judgment to 0, and set the judgment conditions for ± tolerance.
These settings can be performed from the image monitor, the digital monitor, or the trend monitor.

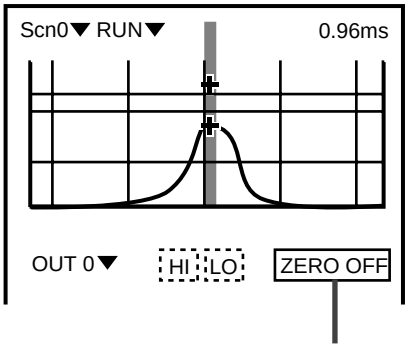
CHECK Offset values can also be set as reference values.
Refer to page 53.

Procedure

1. Place the workpiece to be used as reference in the measurement range.

2. Move the cursor to ***Zero's OFF*** and press the **ENT** Key.

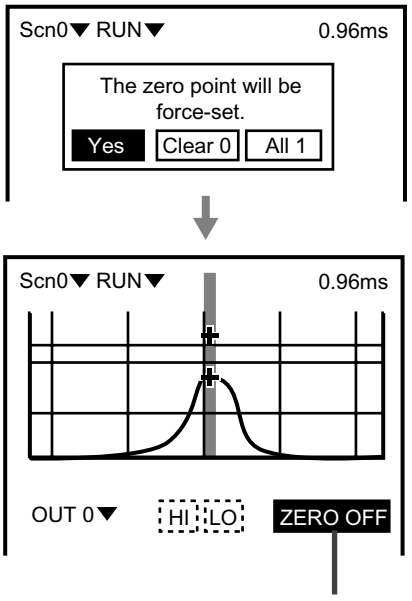
   A confirmation message will be displayed.



The selected item will be displayed with solid lines.

3. Select ***Yes***.

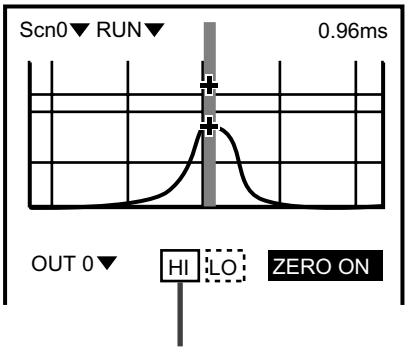
   Forced-zero will be executed for the output number currently displayed (OUT0 in this example).



Zero's OFF will be changed into ***Zero's ON***.

4. Move the cursor to ***HI*** to set upper limit and press the **ENT** Key.

   The upper limit will be displayed.



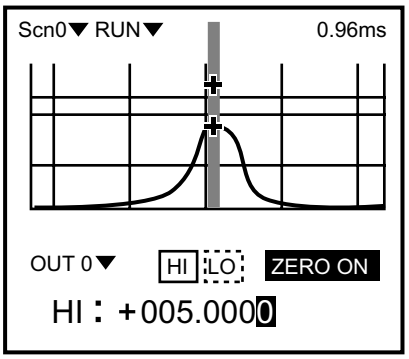
The selected item will be displayed with solid lines.

5. Press the **ENT** Key.

   The cursor will change to a cursor the size of a single digit.

   Move the cursor to the digit to be changed using the **Left** and **Right** Keys. Change the value using the **Up** and **Down** Keys.

   Press the **ENT** Key to confirm the setting.

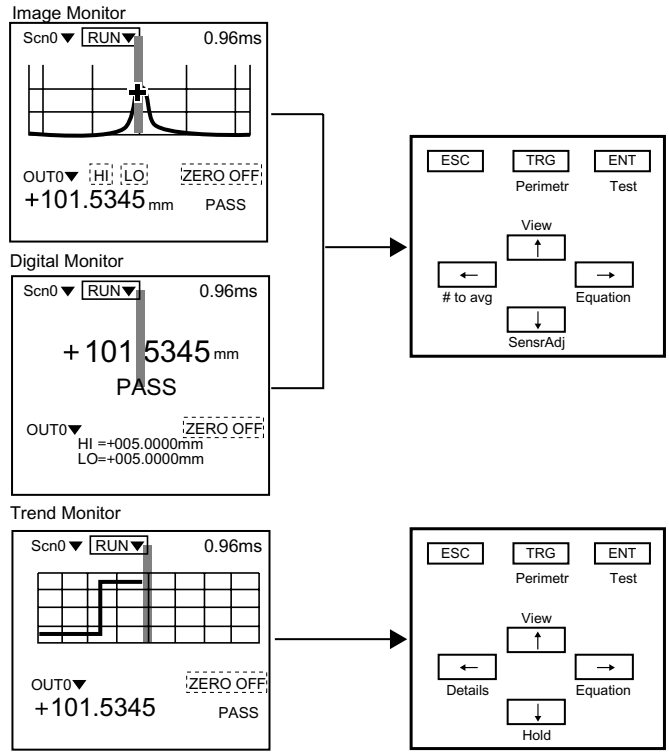


6. Move the cursor to ***LO*** to set lower limit and press the **ENT** Key.

   Follow steps 5 in the above procedure to set lower limit.

STEP3 Making Adjustments Simply with the Adjustment Menu

Conditions can be changed simply without leaving RUN Mode using the adjustment menu.



Key	Adjustment item	Description	Page
TRIG*	(When the Z300-S2T is connected) Surrounding image	Displays the surrounding image for the part that the laser beam strikes.	P.110
	(When a Sensor other than the Z300-S2T is connected) LD-OFF	Stops emission of the laser diode (LD).	—
ENT	Test measurement	Test measurement can be executed "stopwatch-style" on the Console by starting and stopping measurement. The measurement result is displayed on the screen only and is not output to external devices.	P.119
↑	Display menu	When using image monitor: The menu for enlarging and resetting the line brightness graph is displayed.	P.102
		When using digital monitor: The menu for selecting the number of displayed output numbers is displayed. (1 or 4)	P.104
		When using trend monitor: The menu for changing the screen display contents is displayed.	P.105
↓	Sensor adjustment	When using image monitor or digital monitor: The Sensor's sensitivity and calibration can be set.	P.55
	Hold function	When using trend monitor: The timing of measurement start can be specified and the hold conditions for measurement values can be set.	P.65
←	Average number of times	When using image monitor or digital monitor: The number of times used for averaging the measurement values to absorb any inconsistencies can be set.	P.87
	Detailed settings	When using trend monitor: The ***SET/Details*** screen is displayed, and detailed conditions can be set.	P.91
→	Equation	Equations can be changed.	P.53

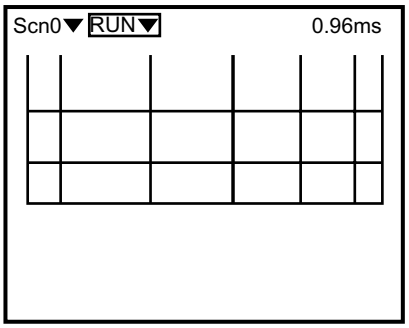
Note The adjustment items that are displayed vary with the Sensor model.

Example: When Using Image Monitor

Procedure

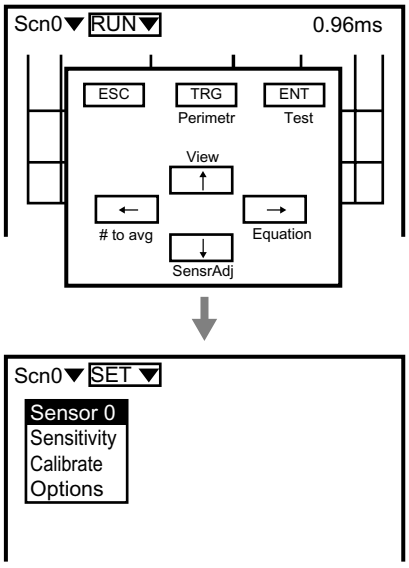
1. Press the **SHIFT** + **ENT** Keys
.

   The adjustment menu will be displayed.



2. Select the item to be changed.
3. Press the **ENT** Key.

   The setting screen for the selected item will be displayed.



STEP4 Saving Settings and Exiting the Z300

The save operation can be performed from any screen.

CHECK Flash memory data is loaded each time the Z300 is started up. Therefore, when setting have been changed, be sure to save to flash memory before turning the power OFF. If the power is turned OFF without saving, all of the setting changes will be lost. Images can not be saved in Flash Memory and will be cleared when the power is turned OFF. Images to be kept must be backed up to a personal computer.

Refer to page 127.

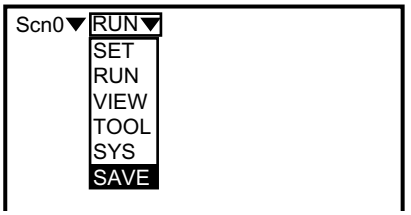
Procedure

1. Move the cursor to ***RUN*** ▼ and press the **ENT** Key.

   A list of mode will be displayed.

2. Select ***SAVE***.

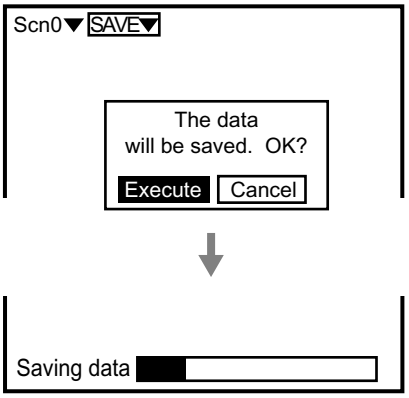
   A confirmation message will be displayed.



3. Select ***Execute***.

   A screen showing the saving progress will be displayed.

   When the saving has been completed, the screen in (2.) will return.



Notice Do not turn OFF the power or input a RESET signal while a message is being displayed in any save or load operation. Data in memory will be destroyed, and the Z300 may not operate correctly the next time it is started.

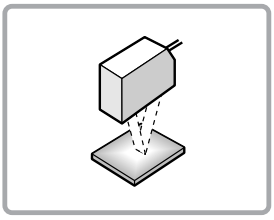
4. Turn OFF the power supply and exit the Z300.

2-2 Using the Application Menu

After selecting one of the applications displayed in the menu, the remaining operations can be performed using the guidance messages displayed on the screen. Measurement conditions can be set simply by following the guidance messages and inputting the required items. There are 7 types of applications available. Select the appropriate application.
The Z300 is equipped with 2 menus, the Application Menu and the Expert Menu. The Z300 is factory-set to startup from the Application Menu.

For the menu switching method, refer to page 140.

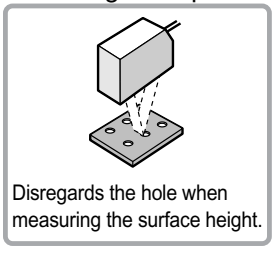
Measuring the Surface Height



Select ***Sf displace***.

The displacement within the laser beam path is averaged enabling stable measurement even if parts of the surface are uneven (e.g., hairlines).

Excluding Unrequired Parts from the Laser Beam Path

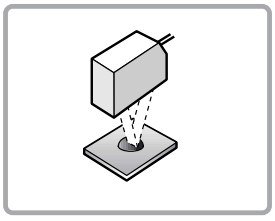


Disregards the hole when measuring the surface height.

Select ***Spot displace***.

The measurement range can be freely specified to enable "spot beam" measurement.

Measuring the Maximum Height

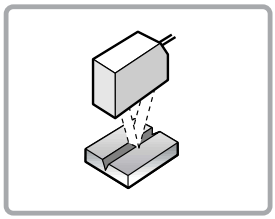


Select ***Max***. ***height***.

The highest position within the laser beam path is measured.

For operation examples, refer to page 32.

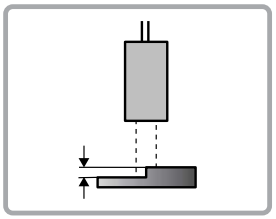
Measuring the Depth of Grooves or Indentations



Select ***Groove/dent***.

The lowest position within the laser beam path is measured.

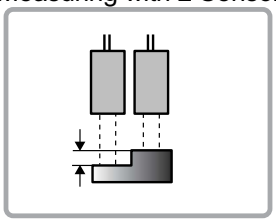
Measuring Level Differences



Select ***Step***.

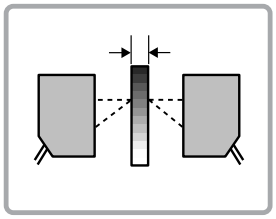
The difference between the peak and bottom positions within the laser beam path is measured.

Measuring with 2 Sensors



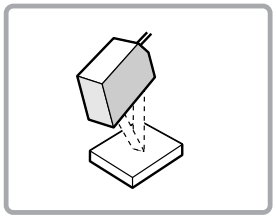
Select ***Step(2sensor)***.

Measuring the Thickness



Select ***Thik(2sensor).***

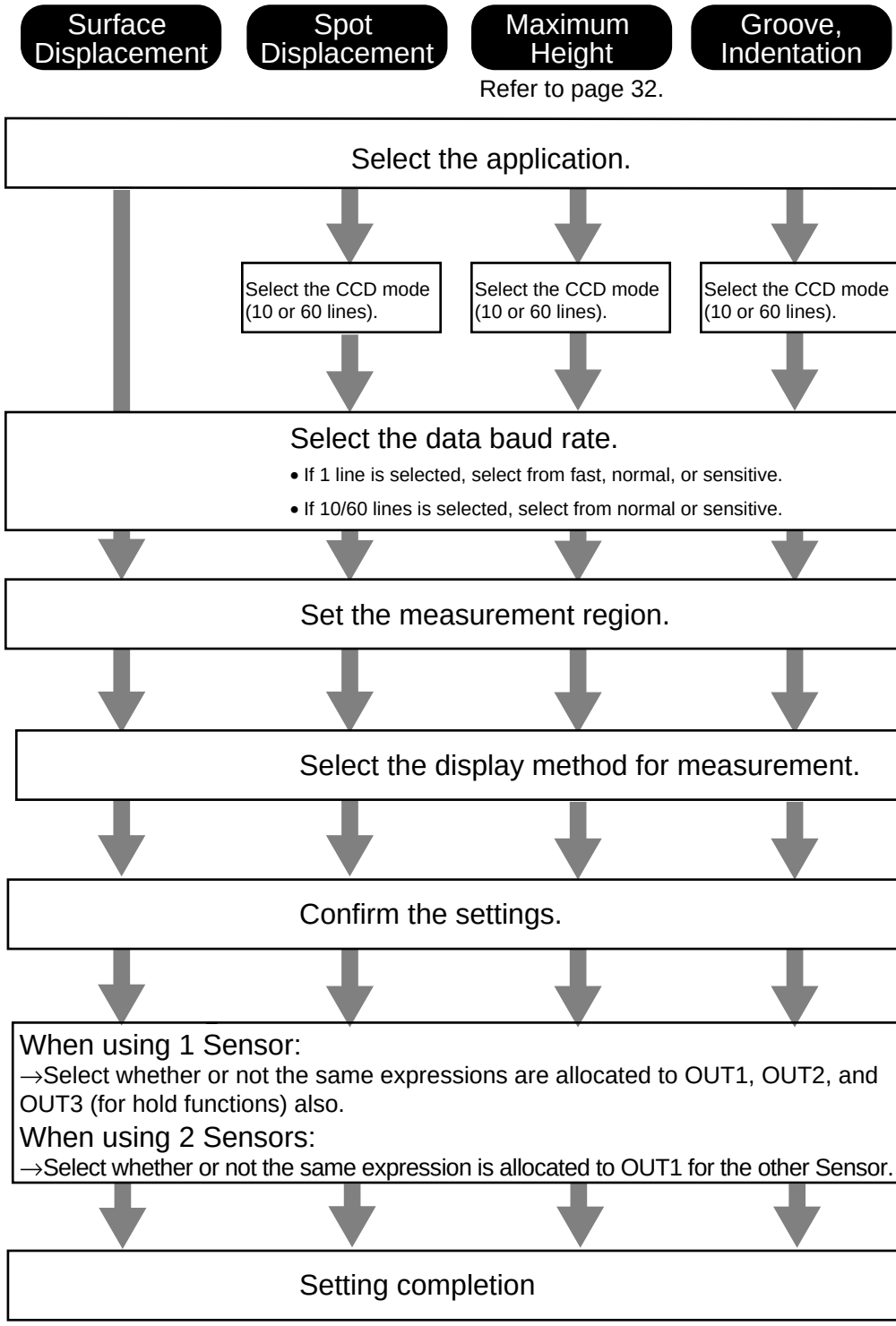
Measuring the Thickness of Transparent Workpieces

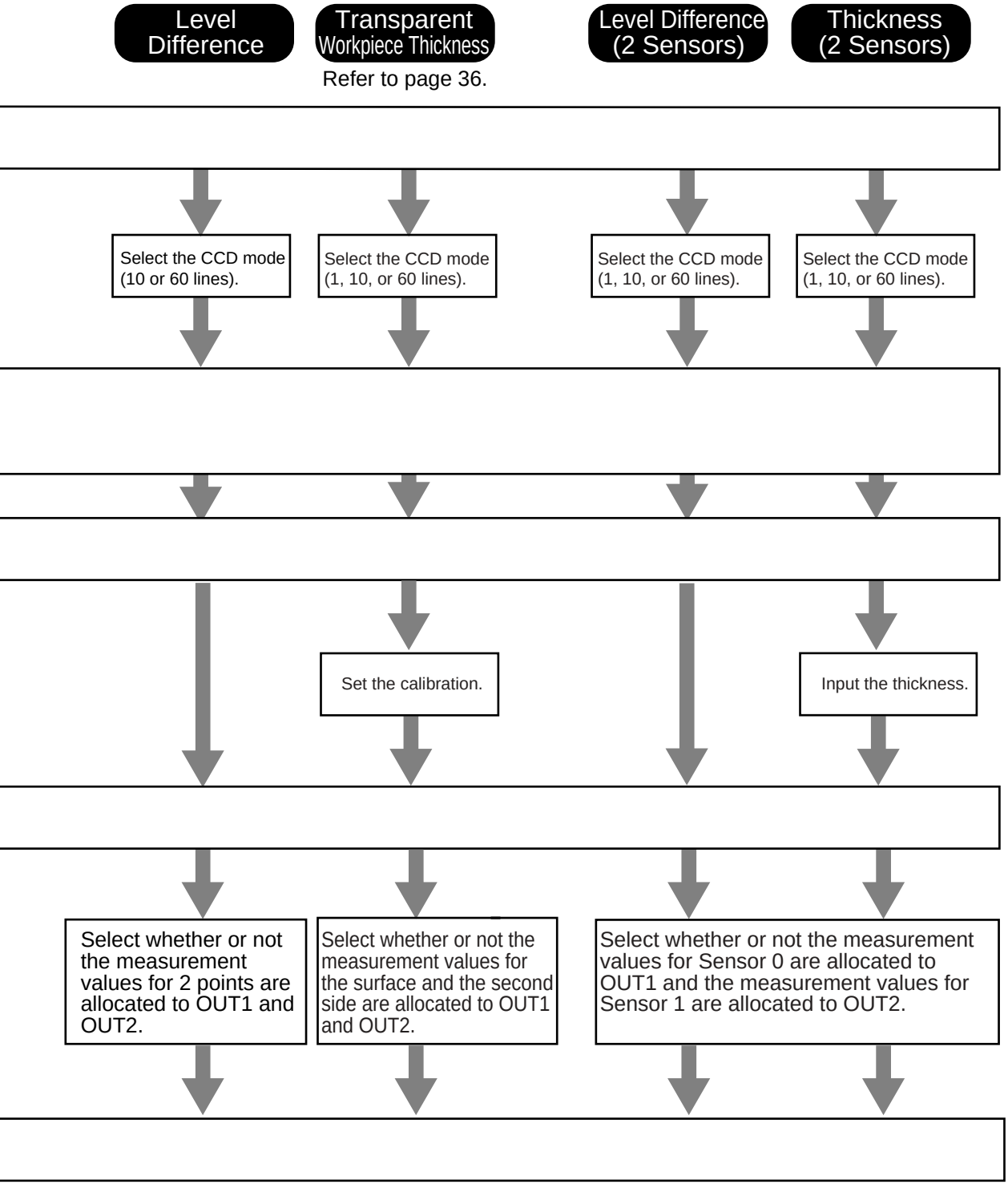


Select ***Transp thick***.

For operation examples, refer to page 36.

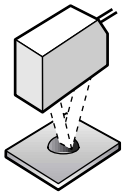
Operational Flow




Level Difference
Transparent Workpiece Thickness
Level Difference (2 Sensors)
Thickness (2 Sensors)
Refer to page 36.
Select the CCD mode (10 or 60 lines).
Select the CCD mode (1, 10, or 60 lines).
Select the CCD mode (1, 10, or 60 lines).
Select the CCD mode (1, 10, or 60 lines).
Set the calibration.
Input the thickness.
Select whether or not the measurement values for 2 points are allocated to OUT1 and OUT2.
Select whether or not the measurement values for the surface and the second side are allocated to OUT1 and OUT2.
Select whether or not the measurement values for Sensor 0 are allocated to OUT1 and the measurement values for Sensor 1 are allocated to OUT2.

Operation Example 1: Measuring the Maximum Height

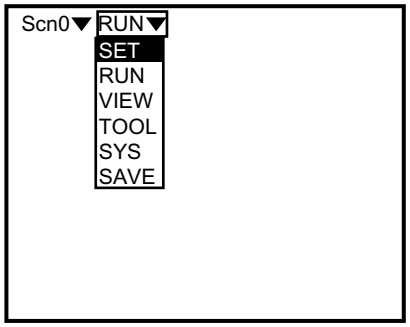
As an example, the setting procedure required for measuring the maximum height of the workpiece surface is explained below.



Procedure

1. Move the cursor to ***RUN*** ▼ and press the **ENT** Key.

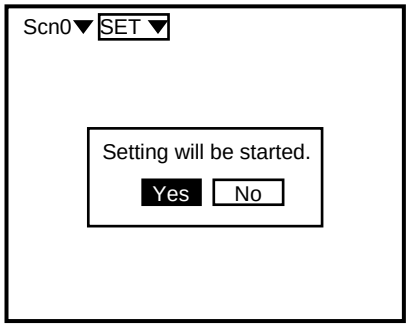
   A list of mode will be displayed.



2. Select ***SET***.

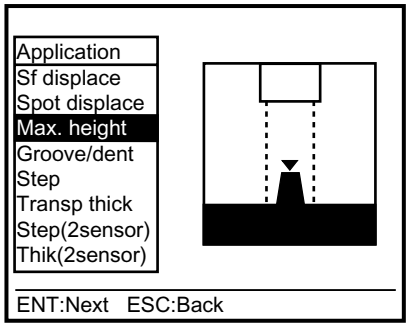
   The screen for starting the setting process will be displayed

3. Select ***Yes***.



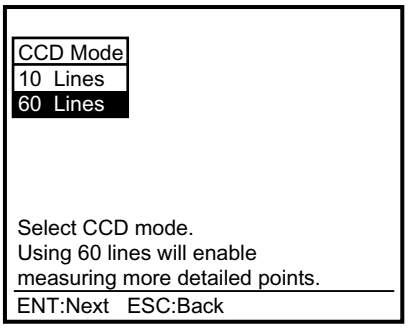
4. Select ***Max. height.***

   If 2 Sensors are being used, a screen for specifying which Sensor to use will be displayed.

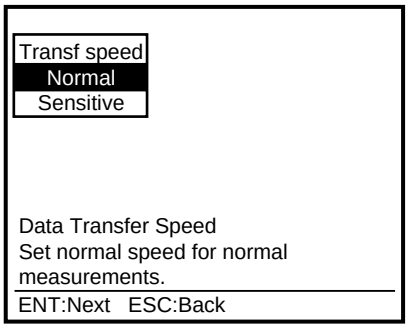


5. Select ***CCD Mode***.

   Select 10 lines for measurement at a high processing speed.
   Select 60 lines for measurement in greater detail.



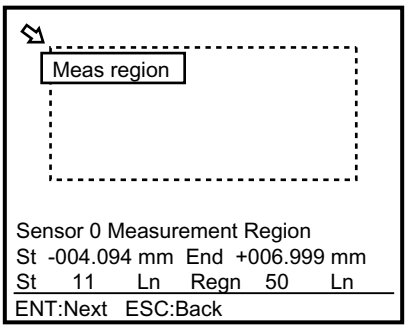
6. Select the data baud rate.



7. Specify the measurement region

   Areas can be omitted from the measurement region by reducing the region. Specify the top-left corner of the measurement region.

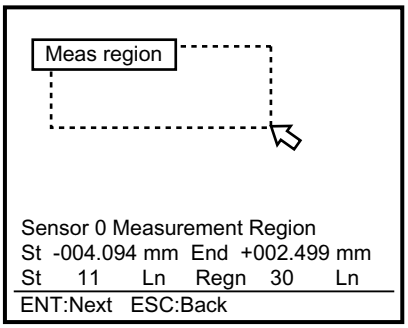
   Move the cursor with the Up, Down, Left, and Right Keys. Use these keys together with the **SHIFT** Key to move the cursor quickly. Press the **ENT** Key at the desired position.



8. Specify the bottom-right corner of the measurement region.

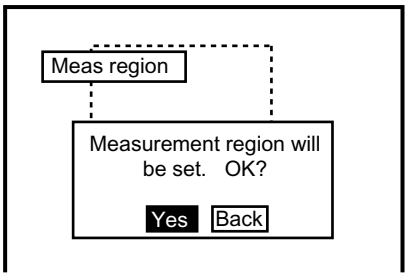
   Use the method described in (6).

   When the bottom-right corner is specified, a screen for confirming the setting will be displayed.



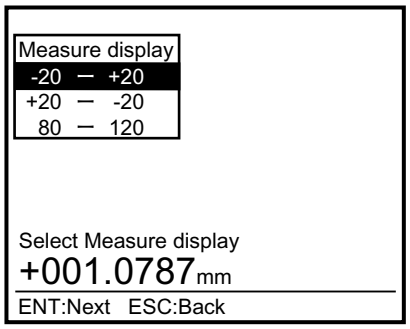
9. Select ***Yes***.

   A screen for setting the display method for measurement values will be displayed.



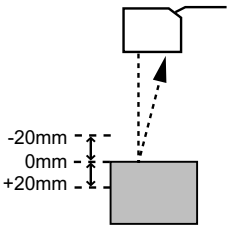
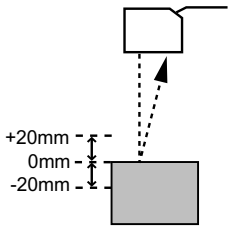
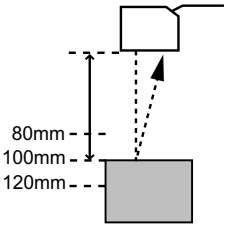
10. Select the display method for measurement values.

    A screen for confirming the settings will be displayed.



CHECK The contents will vary depending on the Sensor model connected.

Example: Z300-S10

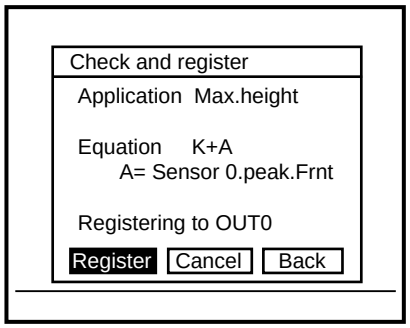
[-20 to + 20] *	[+20 to -20]	[80 to 120]
	 Select to output the height of the workpiece as a positive value.	 Select to output the distance from the Sensor.
Relative values with respect to the reference distance		

The asterisk (*) indicates the default setting.

11. Confirm the settings.

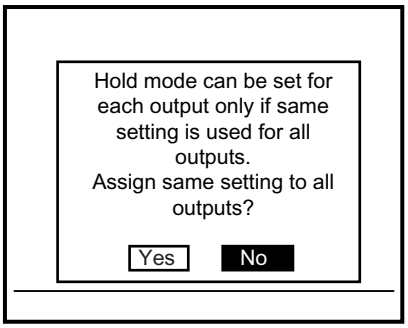
12. Select ***Register***.

    Go to step 13 if only 1 Sensor is connected.
    Go to step 14 if 2 Sensors are connected.



13. Select ***Yes*** to enable measurement values to be held independently for each output.

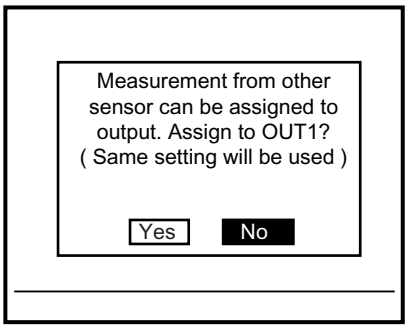
    The screen for completing the setting procedure shown in step 15 will be displayed.



CHECK Select ***Yes*** to set the same expressions for OUT1, OUT2, and OUT3.
Set the Hold method using the adjustment menu in measurement mode.
Refer to page 65.

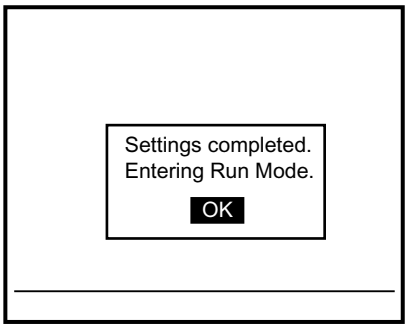
14. Select ***Yes*** to allocate the same expression to OUT1 for the other Sensor.

    The screen for completing the setting procedure shown in step 15 will be displayed.



15. Select ***OK***.

    The Z300 automatically enters measurement mode, and measurement starts.



Operation Example 2: Measuring the Thickness of Transparent Workpieces

As an example, the setting procedure required for measuring the thickness of transparent workpieces with 1 Sensor is explained below.

CEHCK Before making the settings, change ***Sensor*** in ***SYS/Environment*** to ***Mirror***.
Refer to page 140.

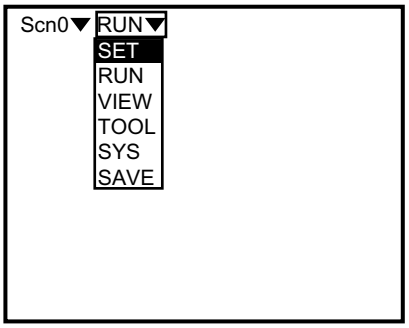
Procedure

1. Move the cursor to ***RUN*** ▼ and press the **ENT** Key.

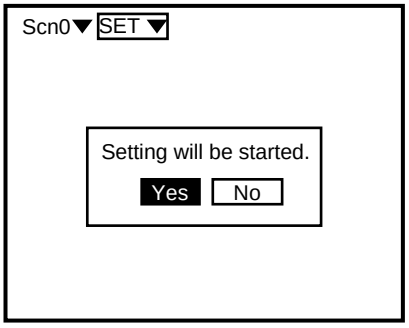
   A list of mode will be displayed.

2. Select ***SET***.

   The screen for starting the setting process will be displayed

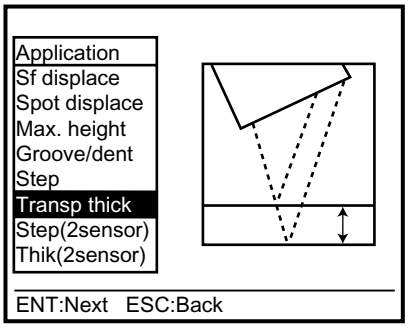


3. Select ***Yes***.



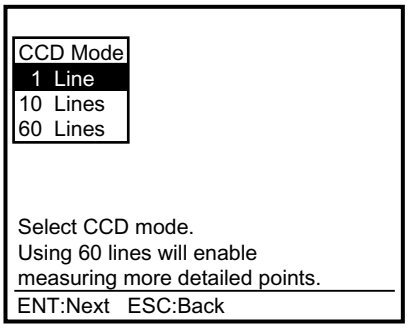
4. Select ***Transp thick***.

   If 2 Sensors are being used, a screen for specifying which Sensor to use will be displayed.



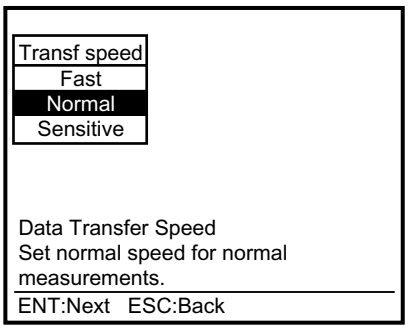
5. Select ***CCD Mode***.

   For normal measurement, use select ***1 line***. To specify features on the workpiece (e.g., peak position or bottom position) as the measurement points, select ***10 lines*** or ***60 lines***.



6. Select the data baud rate.

   Fast will be only displayed if the CCD mode is set to 1 line.

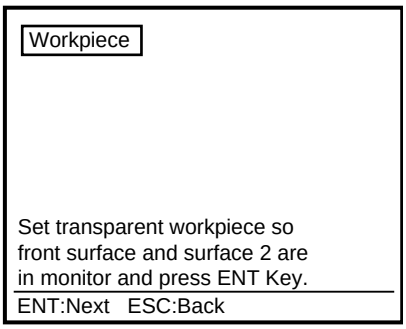


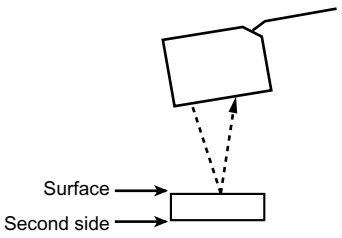
7. Set the reference workpiece.

   Set the workpiece so that the surface and the second side fit into the range of the screen.

8. Press the **ENT** Key.

   The screen for setting the measurement region will be displayed.

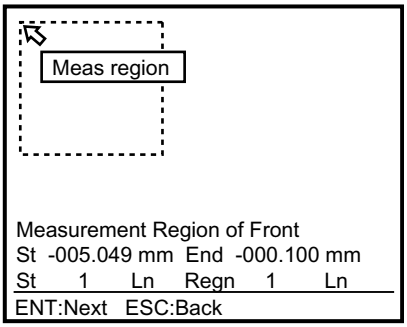




9. Specify the measurement region for the surface.

   Areas can be omitted from the measurement region by reducing the region. Specify the top-left corner of the measurement region.

   Move the cursor with the **Up**, **Down**, **Left**, and **Right** Keys. Use these keys together with the **SHIFT** Key to move the cursor quickly. Press the **ENT** Key at the desired positions.



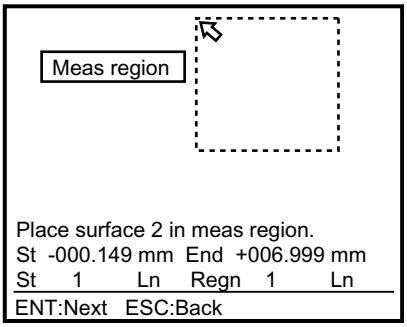
10. Specify the bottom-right corner of the measurement region.

    A screen for setting the measurement region for the second side is displayed.

11. Specify the top-left corner of the measurement region for the second side.

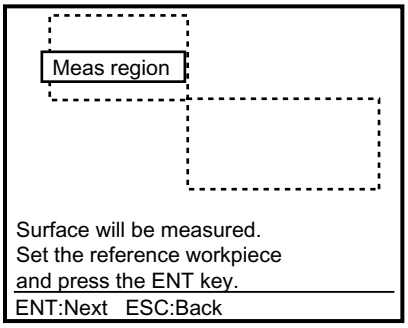
12. Specify the bottom-right corner.

    A screen for setting the calibration to compensate for light refraction will be displayed.



13. Press the **ENT** Key with the reference workpiece in position.

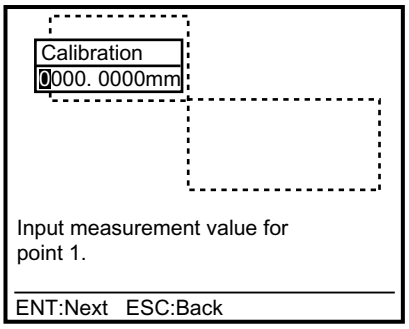
    Measurement will be executed for the workpiece surface.



14. Input the position of the surface.

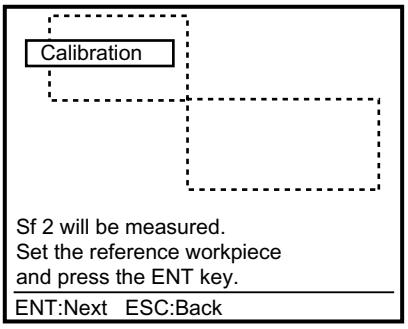
15. Press the **ENT** Key.

    The measurement screen for the second side will be displayed.



16. Press the **ENT** Key.

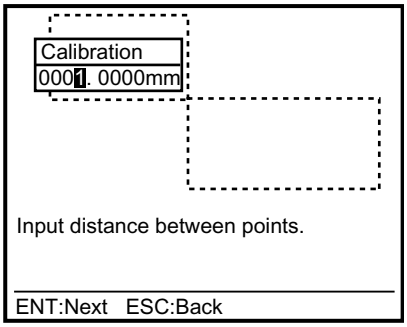
    Measurement will be executed for the second side.



17. Input the thickness.

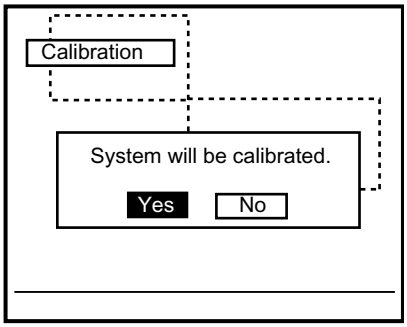
18. Press the **ENT** Key.

    A screen for confirming execution will be displayed.



19. Select ***Yes***.

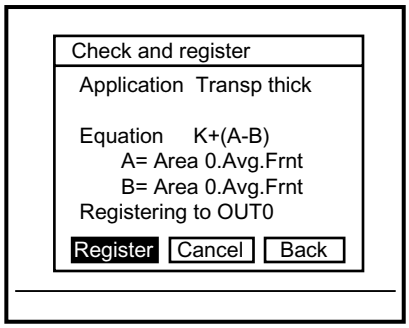
    The calibration will be set and a screen for confirming the settings will be displayed.



20. Confirm the settings,

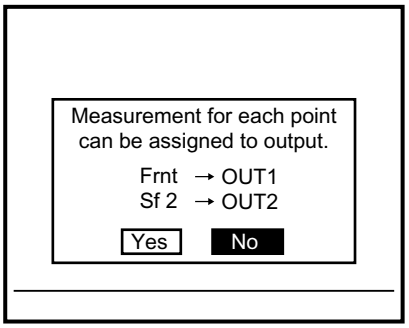
21. Select ***Register***.

    A screen for confirming whether or not to output the measurement values for the surface and the second side will be displayed.



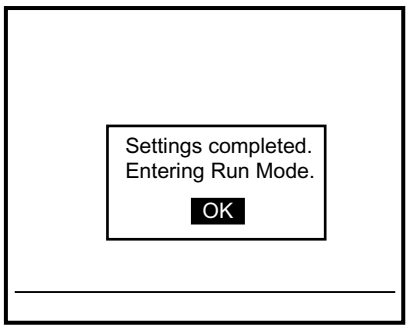
22. Select ***Yes*** to output the measurement values for the surface and the second side.

    A screen for confirming setting will be displayed.



23. Select ***OK***.

    The Z300 automatically enters measurement mode, and measurement starts.



SECTION 3
Functions and Operations

This section explains how to set measurement conditions using the Expert Menu and provides details on functions common to the Application Menu and Expert Menu, for example, in RUN Mode and VIEW Mode.

3-1 Setting Measurement Conditions (Expert Menu)

This section describes how to make measurement settings with the Expert Menu.

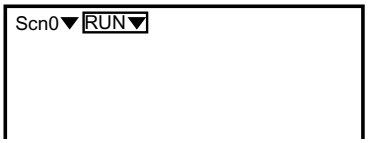
3-1-1 Starting Up Expert Menu and Entering SET Mode

CHECK Although the default setting is for surface displacement measurement, when switching from Application Menu to Expert Menu, the values set in Application Menu are still valid in Expert Menu.

Procedure

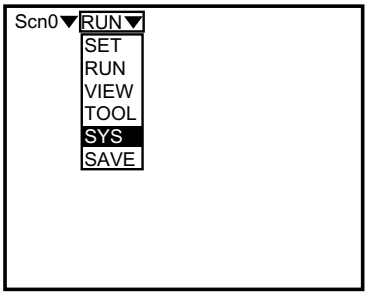
1. Move the cursor to ***RUN*** ▼ and press the **ENT** Key.

   A list of mode will be displayed.



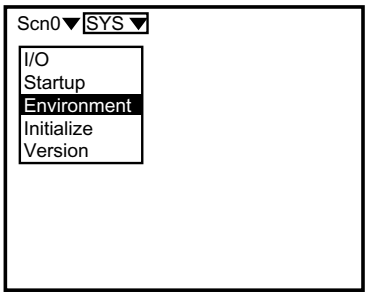
2. Select ***SYS***.

   The selections will be displayed.



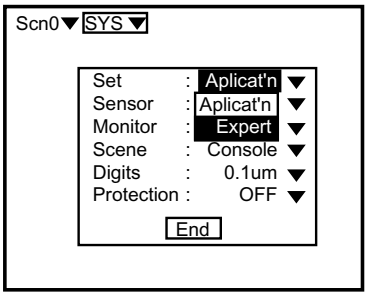
3. Select ***Environment***.

   A setting screen will be displayed.



4. Move the cursor to ***Aplicat'n*** and press the **ENT** Key.

5. Select ***Expert***.

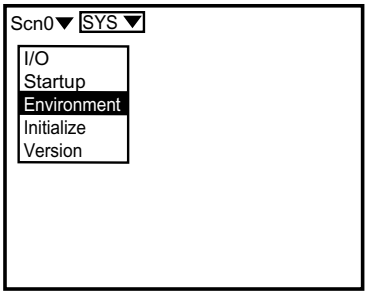


6. Select ***End***.

   The setting will be registered and the screen in (3.) will return.

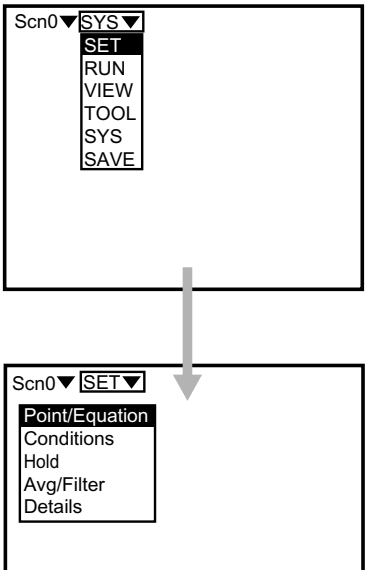
7. Press the **ESC** Key.

   The screen in (2.) will return.



8. Select ***SET***.

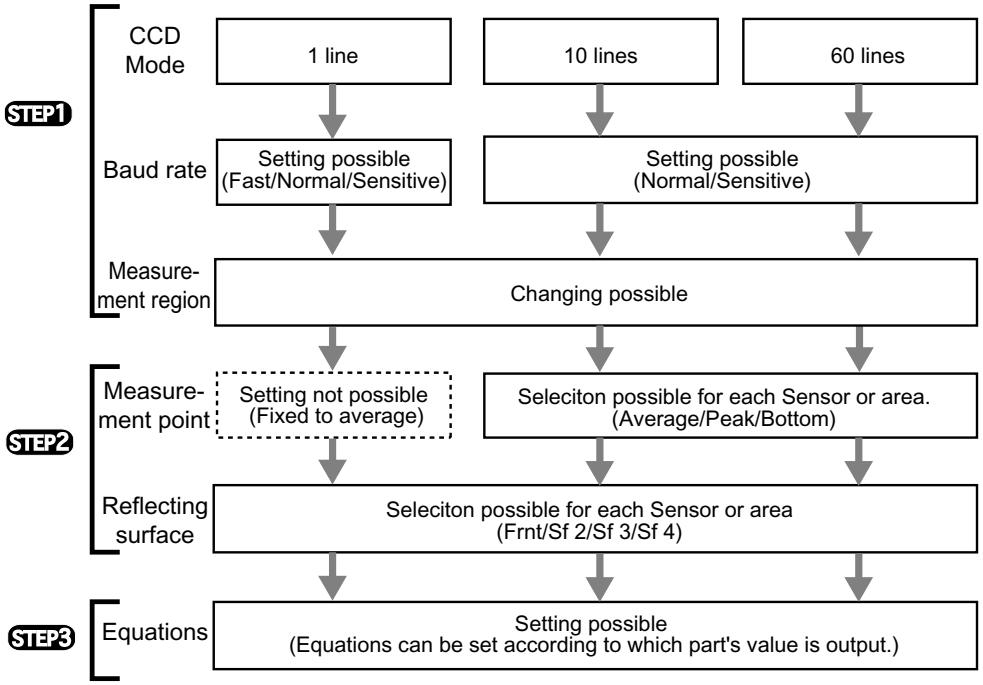
   The selections available with the Expert Menu's Set Mode will be displayed.



3-1-2 Specifying Measurement Points while Monitoring Images (Point/ Equation)

Basic settings required for measurement are described below.

Operational Flow

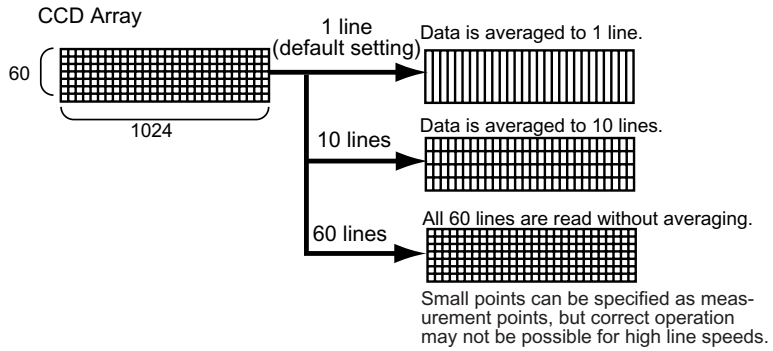


STEP 1 Selecting the Method of Data Transfer from the Light Receiving Part (CCD Mode)

First, select the method of data transfer from the Sensor's Receiver (CCD Mode). Subsequent setting items will vary depending on the CCD Mode selected.

- Selecting the CCD Mode

Select the method of data transfer from the Sensor's Receiver.
Change the CCD Mode to ***10 lines*** or ***60 lines*** to specify a feature (e.g., peak position or bottom position) on the workpiece as the measurement point, such as might be necessary for the measurement of level differences. With the CCD Mode set to ***1 line***, the data is averaged and so features on the workpiece cannot be specified as measurement points.



CHECK If the CCD mode is changed, the scene data returns to the default settings.

- Selecting the Data Baud Rate

Select the data baud rate from the Sensor's Receiver.

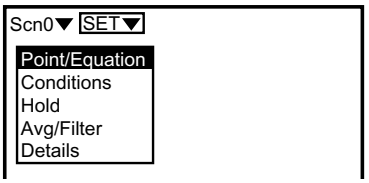
Selection	Rate	Sensitivity
Fast	Fast ↑ Slow	Low ↓ High
Normal (*)		
Sensitive		

The asterisk (*) indicates the default setting.
Fast is displayed only when the CCD mode is set to ***1 line***.

CHECK When measuring dark workpieces, setting the data baud rate to ***Sensitive*** will stabilize the measurement values.
The speed, however, will drop.

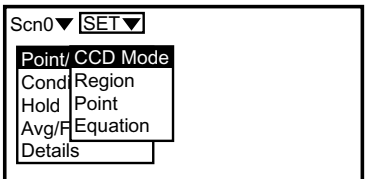
Procedure

1. Select ***Point/Equation***.



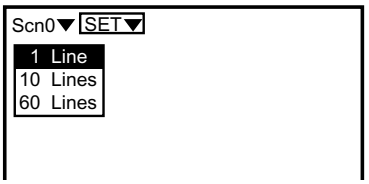
2. Select ***CCD Mode***.

   The selections will be displayed.



3. Select ***Item***.

   The screen for selecting the data baud rate will be displayed.



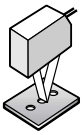
4. Select the data baud rate.

   The setting will be registered and the screen in (2.) will return.

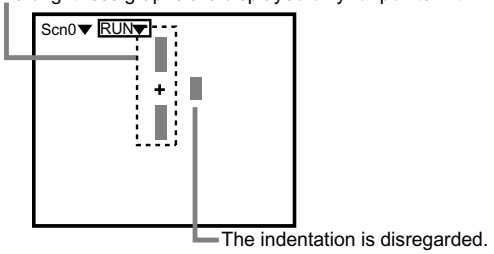
- Setting the Measurement Region

The region within the line beam that is measured can be changed. If there is a section within the line beam that should not be measured, make the measurement region smaller so that this section is excluded.
The default setting is to use the whole area within the laser beam as the measurement region.

Example: Performing measurement that disregards indentations on workpieces

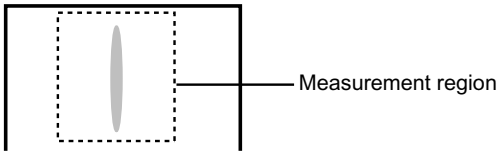


Measurement is performed for this area within the laser beam.
Line brightness graphs are displayed only for points within this region.

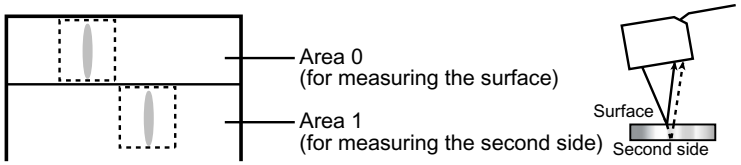


The procedure for setting the region and the screens displayed varies depending on the number of Sensors connected.

Setting Regions for 1 Sensor
Select the number of regions to be set.
1 region: Use the standard setting procedure.

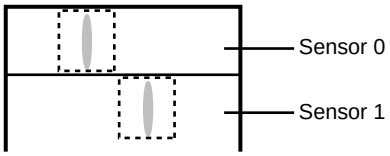


2 regions: The display is split vertically. A region can be set for each section. In the case of transparent workpieces, sensitivity adjustment is possible for the surface and the second side, allowing more precise measurement.



There is a mode, relative coordinate mode, where the distance moved by the workpiece is detected with area 0, and measurement is performed after area 1 is moved by the same distance.
Refer to page 94.

Setting Regions for 2 Sensors
If 2 Sensors of the same model are connected, the display is split vertically. Set the measurement region for each Sensor.

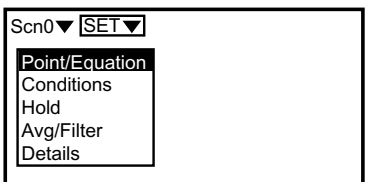


If Sensors of different models are connected, simultaneous measurement using both Sensors is not possible.
The Sensor that is used is determined by the scene.
Refer to page 146.
The operation method is the same as for 1 sensor.

CHECK Correct measurement may not be possible at the boundaries of the measurement regions. Leave space at the boundaries when setting the regions.

Procedure

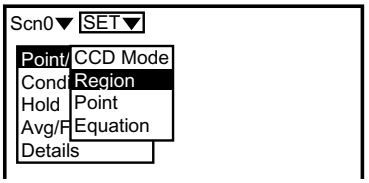
1. Select ***Point/Equation***.



2. Select ***Region***.

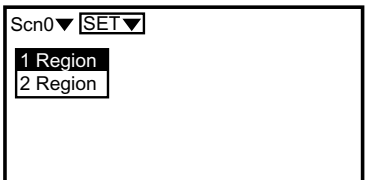
   If only 1 Sensor is connected, a screen that allows the number of regions to be set will be displayed.

   If 2 Sensors of the same model are connected, the screen in (4.) will be displayed.



3. Select the require number of regions.

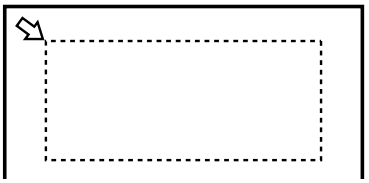
   The screen for drawing the regions will be displayed.



4. Specify the measurement region.

   Areas can be omitted from the measurement region by reducing the region. Specify the top-left corner of the measurement region.

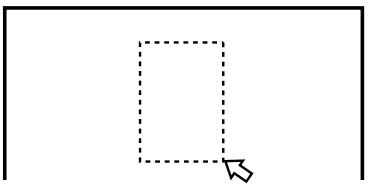
   Move the cursor with the **Up**, **Down**, **Left**, and **Right** Keys. Use these keys together with the **SHIFT** Key to move the cursor quickly. Press the **ENT** Key at the desired position.



5. Specify the bottom-right corner of the measurement region.

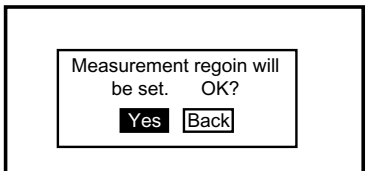
   If 2 regions are selected, the screen for drawing the measurement region for area 1 will be displayed next.

   If 2 Sensors are connected, the screen for drawing the measurement region for Sensor 1 will be displayed next. Draw the region using the procedure described in (4.) and (5.).



6. A confirmation screen will be displayed and select ***Yes***.

   The setting will be registered and the screen in (2.) will return.



STEP 2 Selecting the Measurement Point (Point)

Specify the measurement point.

Order of Display Items

Setting is performed by selecting items displayed on the screen in order. The display contents, however, will vary depending on the number of Sensors connected and the CCD Mode selected in STEP1.

	Selection
① Select the required Sensor number or area number. If 2 Sensors of the same model are connected, the screen for selecting the Sensor number will be displayed. If 2 regions are set for 1 Sensor, the screen for selecting the area number will be displayed.	Sensor 0* Sensor 1 or Area 0* Area 1

* The selections marked with an asterisk will vary depending on the way Sensors are connected.

	Selection
② Select the type of measurement point. This item is displayed only if 10 or 60 lines is set as the CCD Mode.	Average* Peak Bottom

	Selection
③ Select the reflecting surface. This function is effective when measuring transparent workpieces. Normally, the default setting (***Frnt***) can be used.	Frnt* Sf 2 Sf 3 Sf 4

The asterisk (*) indicates the default setting.

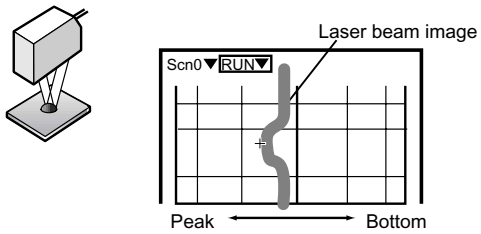
Measuring Point Types

Select the line beam measurement points. This function is effective when measuring features of the workpiece, such as the maximum height. Up to 4 measurement points (0 to 3) can be set.

Selection	Description
Average*	Measures the average of the peak position and bottom position within the laser beam.
Peak	Measures the peak position within the laser beam.
Bottom	Measures the bottom position within the laser beam.

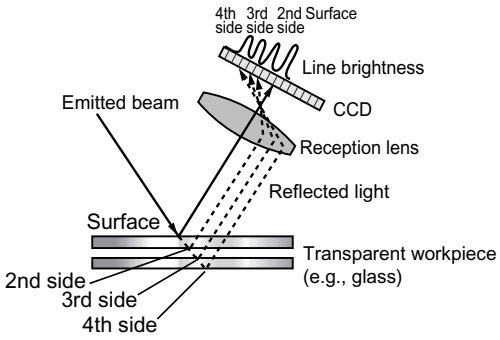
The asterisk (*) indicates the default setting.

Example: Measuring the Maximum Height of the Workpiece
Select Peak to measure the highest position.



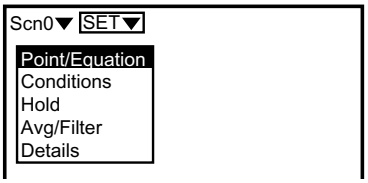
Reflecting Surface

This function is effective for measuring transparent workpieces.
With transparent workpieces, light reflected from both the surface and the bottom of the workpiece are received. Select which side to measure. With opaque workpieces, leave the setting at ***Frnt***.

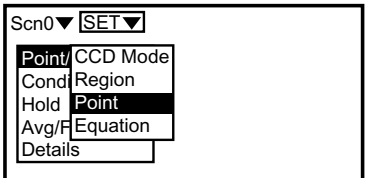


Procedure

1. Select ***Point/Equation***.



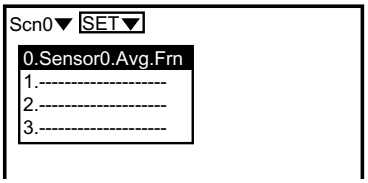
2. Select ***Point***.



3. Select the setting number.

   If ***10 lines*** or ***60 lines*** is selected as the CCD Mode, the screen for selecting measurement points will be displayed. Go to (4.).

   If ***1 line*** is selected, the screen for selecting the reflecting surface will be displayed. Go to (6.).

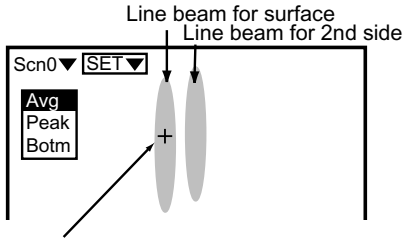


4. Select the measurement point.

   Select the required item using the **Up** and **Down** Keys.

   The measurement points on the line beam change according to the selection. Select while monitoring the screen.

Example: Glass Workpiece



5. Press the **ENT** Key.

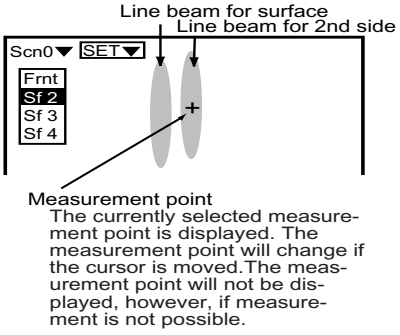
   The screen for setting the reflecting surface will be displayed.

6. Select the reflecting surface.

   Select using the **Up** and **Down** Keys.
   Leave set to **Frnt** if the workpiece is opaque.

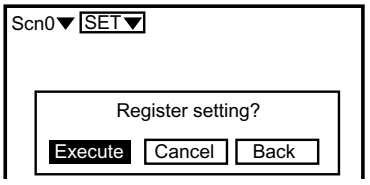
7. Press the **ENT** Key.

   A confirmation screen will be displayed.



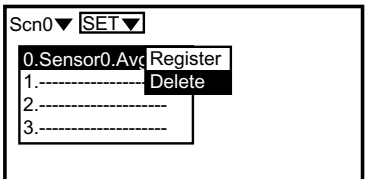
8. Select **Execute**.

   The setting will be registered and the screen in (2.) will return.



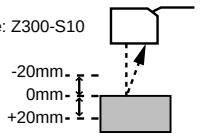
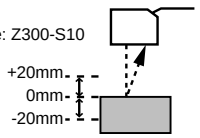
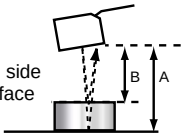
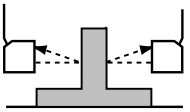
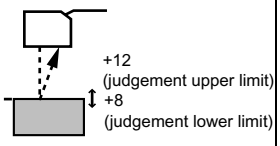
Deleting settings

When settings are deleted, the deleted number is selected in (3.) screen and select ***Delete***.



STEP 3 Assigning Measurement Points to Equations (Equation)

Set an equations for each output number.
Up to 4 equations (OUT0 to OUT3) can be set.

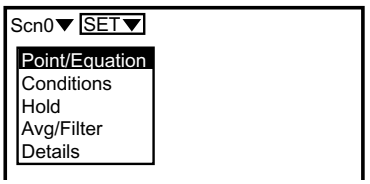
Item	Selection	Description
Equation	**----------**	Indicates that an equation has not been set.
	K+A	Select to output the value of input A. **Example**: Z300-S10 
	K-A	Select to output the value of input A. Select to output the height of the workpiece as a positive value. **Example**: Z300-S10 
	K+(A-B)	Select to add the values of input A and input B.
	K+(A-B)	Select to subtract the value of input B from the value of input A. Use this equation in applications such as measuring the thickness of transparent workpieces and measuring level differences. **Examples**: A: Sensor 0; Average; 2nd side B: Sensor 0; Average; Surface 
	K-(A+B)	Select to subtract the values of input A and input B from a fixed value. K can be set to any value. Use this equation in applications such as measuring the thickness of workpieces. 
A **B**	**Measurement points set in STEP2.**	Select the measurement points to be used for A and B in the equation.
K	**-**	Set to any value.
Zero	**-**	Set the offset value for Force-zero execution. Set the value to be added to 0. **Example**: Setting the height of an OK workpiece (10) as the offset value 
Judgement upper limit	**-**	Input the upper limit for a PASS judgement.
Judgement lower limit	**-**	Input the lower limit for a PASS judgement.

CHECK

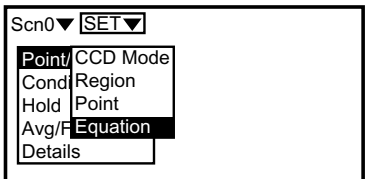
- The upper and lower limits for judgement can be set during measurement.
  Refer to page 96.
- An equation that uses the measurement results of OUT0, OUT1, and/or OUT2 can be set for OUT3.
  Refer to page 93.

Procedure

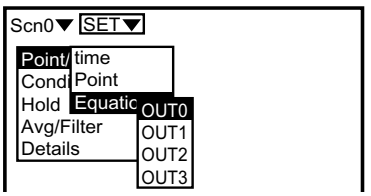
1. Select ***Point/Equation***.



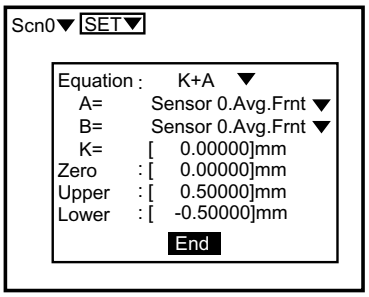
2. Select ***Equation***.



3. Select the output number for which the equation is set.



4. Make the settings for each item.



5. Select ***End***.

   The setting will be registered and the screen in (3.) will return.

3-1-3 Changing Measurement Conditions (Conditions)

Adjusting the Sensor Sensitivity (Sensitivity)

Adjust the sensitivity of the Sensor. The default setting is ***Auto***. With this setting, the sensitivity of the Sensor is automatically adjusted according to the reflection factor of the workpiece. Normally, this setting can be used.
If 2 regions are set for 1 Sensor, the sensitivity can be adjusted for each area.

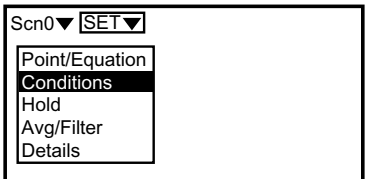
CHECK When set to ***Auto***, the response time will change with each measurement. When measuring workpieces with different reflection factors (e.g., part black and part white) at high speed, correct measurement may not be possible with this setting. In this case, select ***Fixed*** and adjust the sensitivity accordingly.

The sensitivity can be set to one of 31 levels ([LV 1] to [LV 31]).

Selection	Sensitivity	Color of workpiece
[LV 1]	Low	Light
⋮	↓	↑
[LV 31]	High	Dark

Procedure

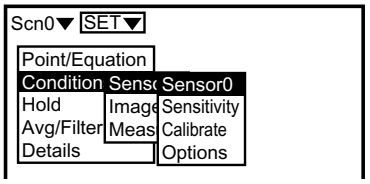
1. Select ***Conditions***.



2. Select ***Sensor***.

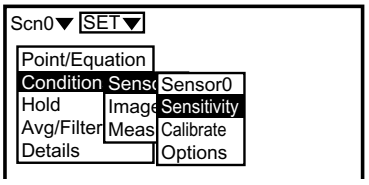
3. Select the Sensor number.

   Select the number of the Sensor for sensitivity adjustment. If 2 regions are set, select the area number.



4. Select ***Sensitivity***.

   The selection items will be displayed.



5. When selecting ***Auto***:

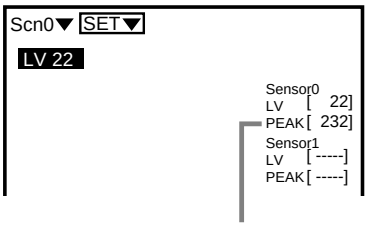
   The screen in (4.) will return.

   When selecting ***Fixed***:

   The screen for setting the sensitivity level will be displayed.
   Go to (6.).

6. Select the sensitivity level.

   The level displayed is the level selected by the Z300 for the workpiece being measured. Adjust the level using the **Up** and **Down** Keys while monitoring the line brightness graph and the peak value on the monitor.



PEAK: Maximum line brightness value
As a reference, adjust the sensitivity so that this value lies between 100 and 200. If setting is not possible, [---] will be displayed.

7. Press the **ENT** Key.

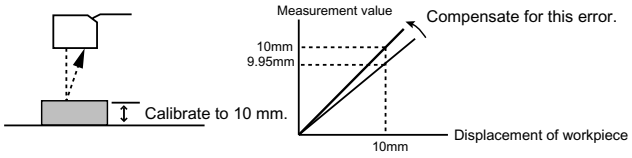
   The setting will be registered and the screen in (4.) will return.

Compensating for Errors in Measurement Values (Calibration)

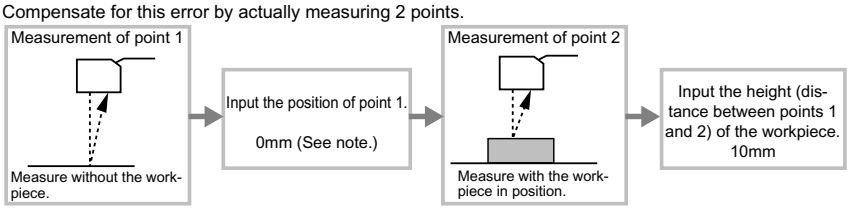
Use the procedure described below to compensate for differences between measurement values and actual dimensions due to the color or material of the measurement workpiece.

Example 1: Measuring Workpiece Height

Use the method shown below to calibrate workpieces so that a measurement value of 9.95 mm is measured as 10 mm.



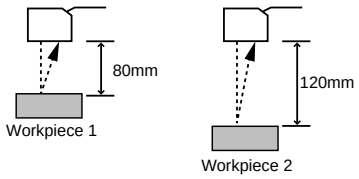
Compensate for this error by actually measuring 2 points.



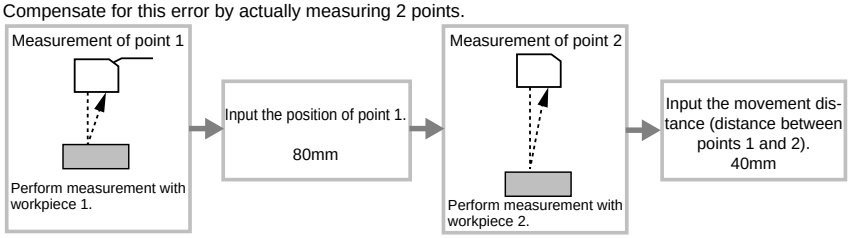
Note : Be sure to input 0 as the position of point 1 so that it is used as the reference position.

Example 2: Measuring Workpiece Position

Use the method shown below to perform calibration based on 2 points at measurement distances 80 mm and 120 mm.

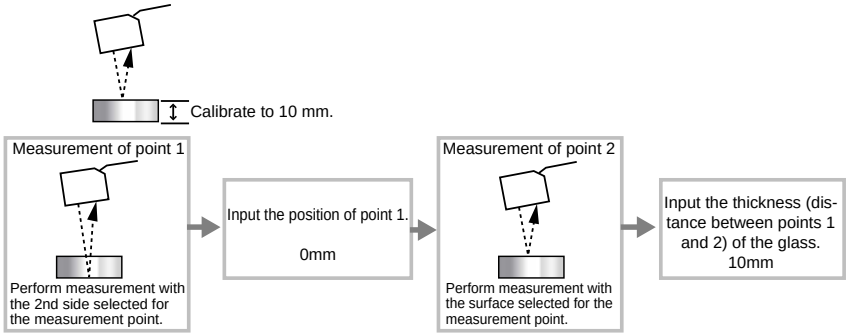


Compensate for this error by actually measuring 2 points.



Example 3: Measuring the Thickness of Glass

If the workpiece is a transparent object, perform measurement at 2 points in the following order.

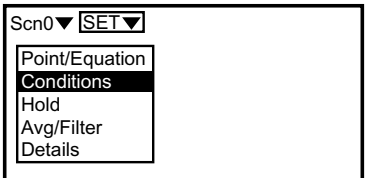


CHECK The measurement point must be set before performing calibration.
Refer to page 50.

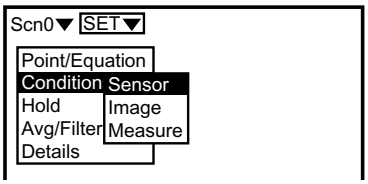
Calibration Procedure for Measuring Workpiece Height

Procedure

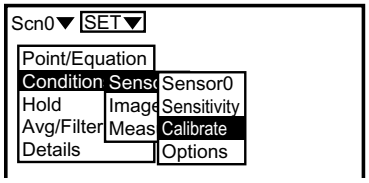
1. Select ***Conditions***.



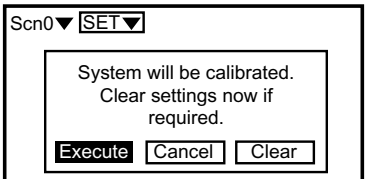
2. Select ***Sensor***.



3. Select ***Calibrate***.
A confirmation screen will be displayed.

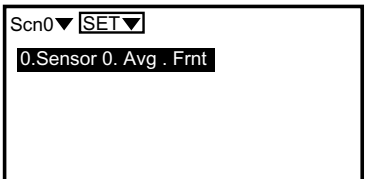


4. Select ***Execute***.



5. Select the measurement point for point 1.

   Select the measurement point used for calibration.

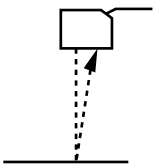


6. Press the **ENT** Key.

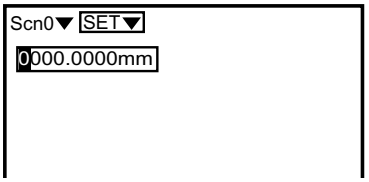
   The measurement screen for point 1 will be displayed.

7. Press the **ENT** Key without a workpiece in position.

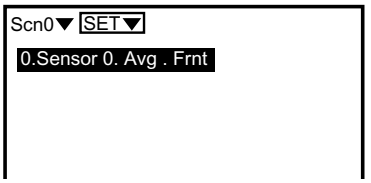
   Measurement for point 1 will be executed, and the screen for inputting the position will be displayed.



8. Input the position of point 1.



9. Select the measurement point for point 2.

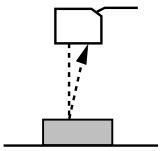


10. Press the **ENT** Key.

    The measurement screen for point 2 will be displayed.

11. Place the workpiece in the measurement position and press the **ENT** Key.

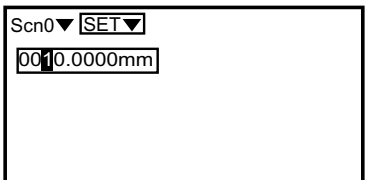
    Measurement for point 2 will be executed, and the screen for inputting the position will be displayed.



12. Input the distance between points 1 and 2 (i.e., the workpiece height).

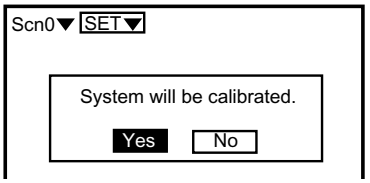
13. Press the **ENT** Key.

    A confirmation screen will be displayed.



14. Select ***Yes***.

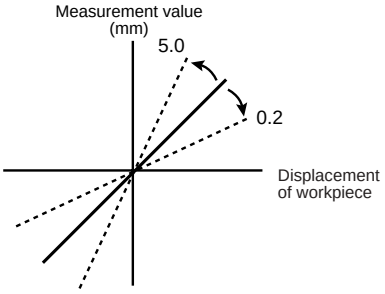
    Calibration will be executed and the screen in (3.) will return.

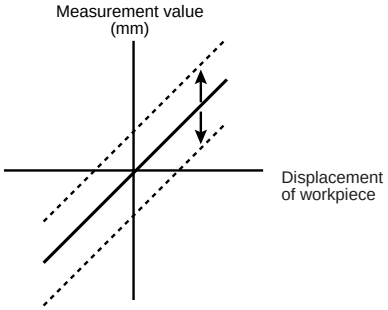


CHECK When calibration is executed, the span and the offset will be automatically set so that the measurement value for point 1 will be 0, and the error for the distance between the 2 points will also be 0.
The range for which calibration is possible is shown below. Calibration will not be executed for values/conditions that go beyond this range.

Span
A coefficient (the span) is set to compensate for incline in the Sensor characteristics.
Setting range: 0.2 to 5.0 (default setting: 1.0)

Offset
A fixed value (the offset) is added to or subtracted from measurement values.
Setting range: -999.9999 to 999.9999





After calibration, fine adjustment of the span and offset values is possible under ***Options***.
Refer to page 61.

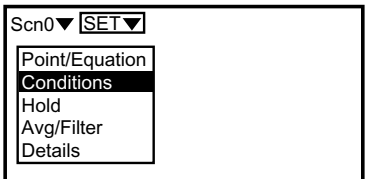
Fine Adjustment of the Sensitivity and Calibration (Options)

Item	Selection/Setting	Description
Sensitivity	Frnt* Sf 2 Sf 3 Sf 4	This function is effective for measuring transparent workpieces and allows the reflecting surface for which sensitivity adjustment is performed to be selected. Normally (i.e., when measuring opaque workpieces), this setting can be left as ***Frnt***. For details on reflecting surfaces, refer to page 51.
Auto upper level	1 to 31 (31*)	This function is effective when the Sensor's sensitivity adjustment method is set to ***Auto***. Take into consideration the optimum level displayed when ***Fixed*** was selected when setting the levels. If the set range is small, the response time for switching sensitivity will be short.
Auto lower level	1 to 31 (1*)	
Span	0.2 to 5.0 (1.0000*)	Set to make fine adjustments to measurement values after calibration. Refer to the information on calibration for details of settings. Refer to page 57.
Offset	-999.999 to 999.999mm (0.0000*)	

The asterisk (*) indicates the default setting.

Procedure

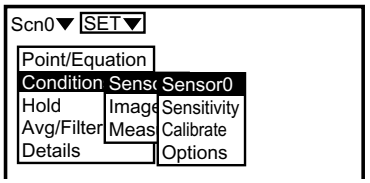
1. Select ***Conditions***.



2. Select ***Sensor***.

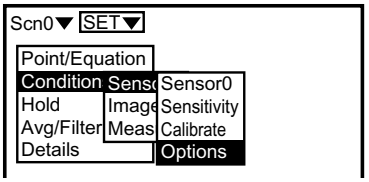
3. Select the Sensor number.

   Select the number of the Sensor for sensitivity adjustment. If 2 regions are set, select the area number.



4. Select ***Options.***

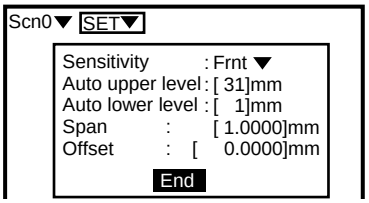
   A setting screen will be displayed.



5 Make the settings for each item.

6 Select ***End***.

   The setting will be registered and the screen in (4.) will return.



Adjusting Laser Beam Images (Image)

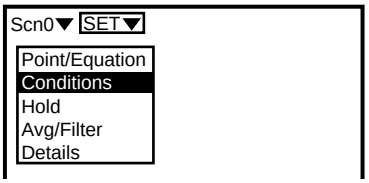
Use this function to adjust the image when stable measurement is not possible due to the influence of noise.
Normally, use with the default settings.

Item	Selection/Setting	Description
Smoothing	None*	No smoothing.
	Weak	Displays a smooth image with reduced noise. Select either weak or strong smoothing.
	Strong	
Noise	0 to 7 pixel* CCD Mode 1 line : 0 pixel* 10 lines : 2 pixel* 60 lines : 2 pixel*	Images with a pixel count lower than this setting will be regarded as noise and excluded from measurement.

The asterisk (*) indicates the default setting.

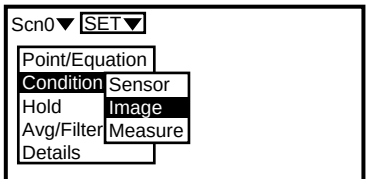
Procedure

1. Select ***Conditions***.



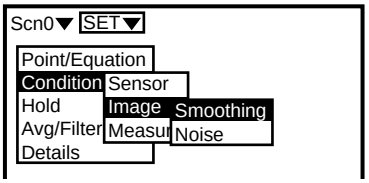
2. Select ***Image***.

   The selection items will be displayed.



3. Select the required type of adjustment.

   The available settings will be displayed.



4. If ***Smoothing*** is selected:

   The selections for the smoothing strength will be displayed.

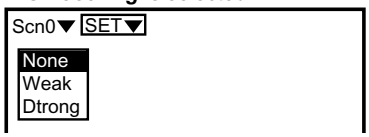
   Select the required strength using the **Up** and **Down** Keys.

   If ***Noise*** is selected:

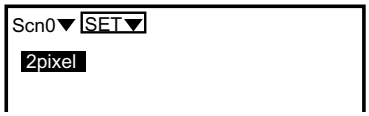
   The setting value will be displayed.

   Change the setting value using the **Up** and **Down** Keys.

If ***Smoothing*** is selected:



If ***Noise*** is selected:



5. Press the **ENT** Key.

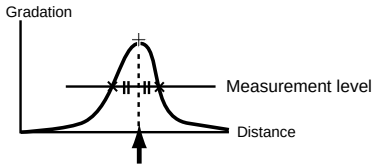
   The setting will be registered and the screen in (3.) will return.

Changing the Measurement Method (Position/Level)

Measurement Position

Select the position output as the measurement result.
The default setting is ***Edge center***. Normally, use this setting.

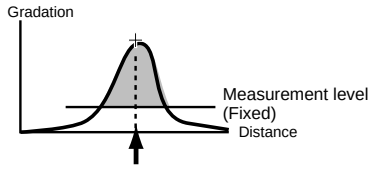
Edge center



Measurement result

The midpoint of the measurement level edges is output as the measurement result.

Center of gravity

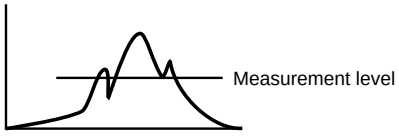


Measurement result

The position of the center of gravity of the shaded area is output as the measurement result.

CHECK If stable measurement is not possible with the ***Edge center*** setting, select ***Center of gravity***.

The waveform near the edges is unstable.

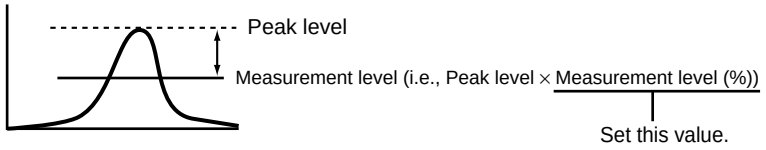


Measurement level

Set the measurement level (a percentage of the peak level of the line brightness).
This function is effective only when ***Edge center*** is selected for the measurement position. It is disregarded if the measurement position is set to ***Center of gravity.***
The default setting is 50.0%. Normally, use this setting.

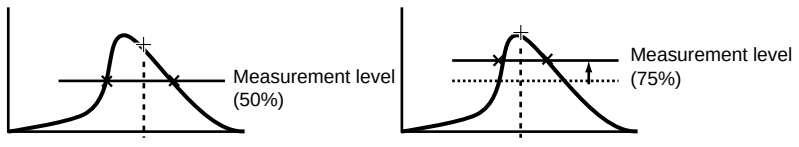
Selection	12.5, 25.0, 37.5, 50.0*, 62.5, 75.0, 87.5%

The asterisk (*) indicates the default setting.



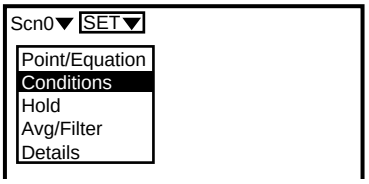
CHECK Measurement Level Setting Example

Set the measurement level in the way shown below if there are large discrepancies in the workpiece material.
The peak measurement position can be adjusted by raising the measurement level.



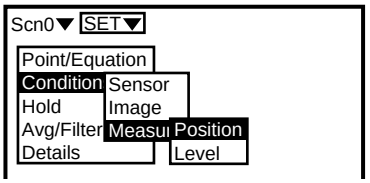
Procedure

1. Select ***Conditions***.



2. Select ***Measure***.

   The selection items will be displayed.

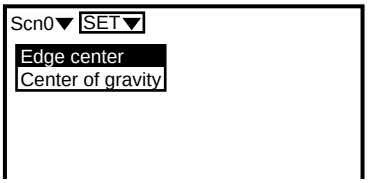


3. Select ***Position*** or ***Level***.

   Each setting screen will be displayed.

4. If ***Position*** is selected:

   Select ***Edge center*** or ***Center of gravity***.



   If ***Level*** is selected:

   Set the value.

   The value can be increased or decreased using the **Up** and **Down** Keys.
   This setting is effective only when the measurement position is set to ***Edge center***. If it is set to ***Center of gravity***, this setting will be disregarded.

5. Press the **ENT** Key.

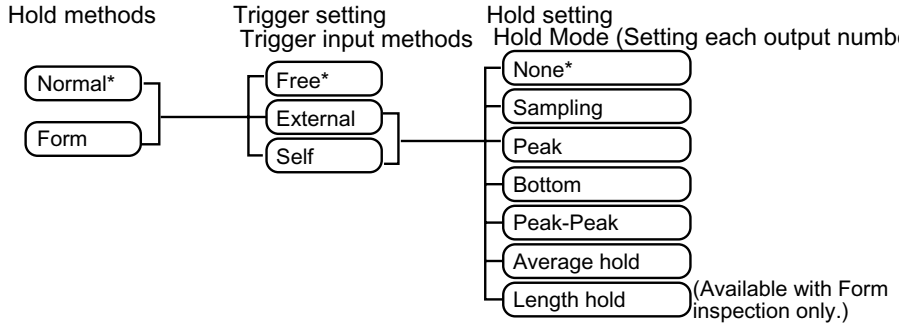
   The setting will be registered and the screen in (2.) will return.

3-1-4 Using the Hold Function (Hold)

Using the Hold function allows the timing with which measurements are made to be set. The Z300 has 2 types of Hold method, Normal inspection and Form inspection. Select the Hold method appropriate for the application.

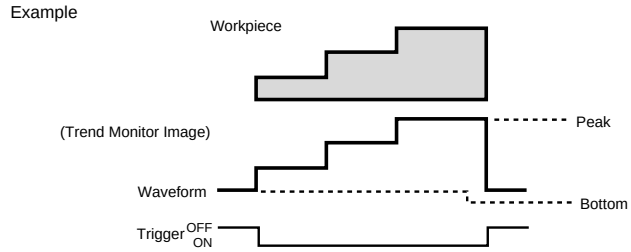
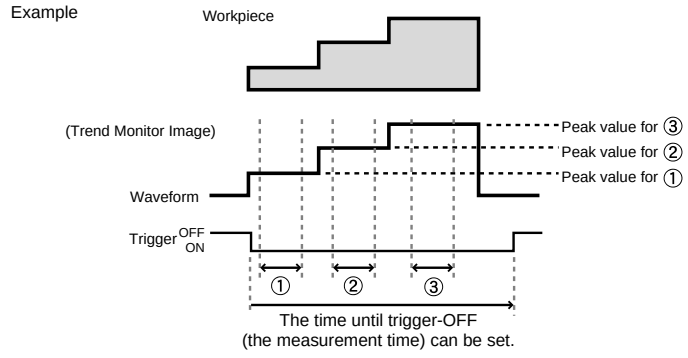
Hold Function List

Make the following 3 settings when using the Hold function.



The asterisk (*) indicates the default setting.

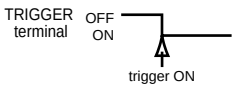
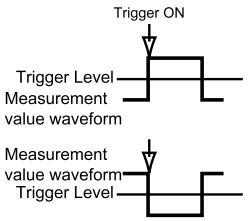
Hold Methods

Selection	Description
Normal*	The peak or bottom value (specified with the Hold setting) for the period while the trigger is ON is obtained. 
Form	A measurement timing based on the trigger-ON timing can be specified as required in the Controller. Up to 4 points can be set, and the peak or bottom values (specified with the Hold setting) can be obtained for each point. 

The asterisk (*) indicates the default setting.

Selecting the Trigger Input Method (Trigger setting)

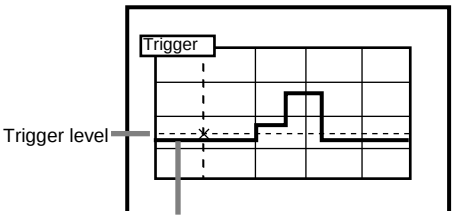
Select the trigger-ON method. The timing of trigger-OFF depends on the Hold method.

Selection	Description
Free*	Measurement is performed continuously. Hold measurement is not performed.
External	Select when using a sync sensor. The trigger turns ON at the same time as the TRIGGER terminal on the terminal block. 
Self	The trigger-ON timing is determined according to the measurement value. The trigger turns ON when the measurement value goes above (or below) the trigger level. If ***Self*** is selected, the screen for selecting the output number (for the trigger setting) and the trigger direction is displayed. Up Trigger* The trigger turns ON when the measurement value goes above the trigger level. Down Trigger The trigger turns ON when the measurement value goes below the trigger level. 

The asterisk (*) indicates the default setting.

CHECK -If ***Self*** is selected as the trigger setting

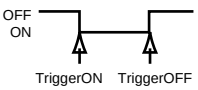
The trigger level can be set while monitoring the measurement value waveform.



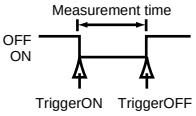
Measurement value waveform
(The displacement amount is displayed in chronological order.)

-Trigger-OFF Timing:

Normal
Turns OFF with the same timing as the set trigger.

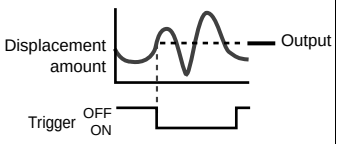
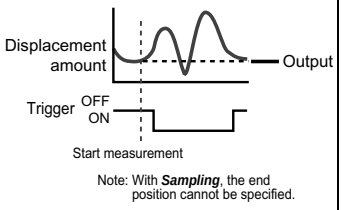
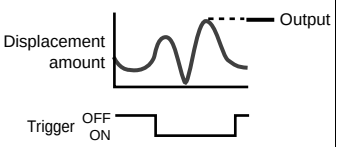
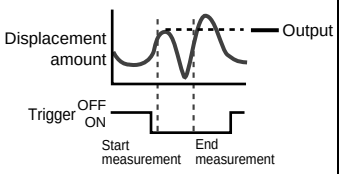
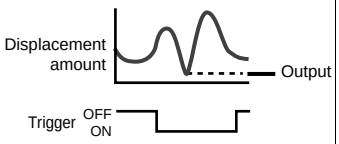
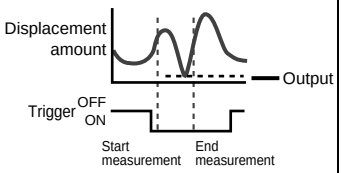
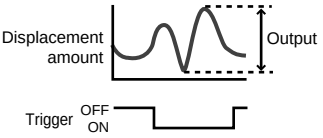
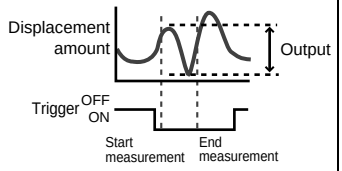
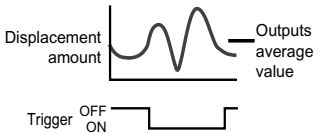
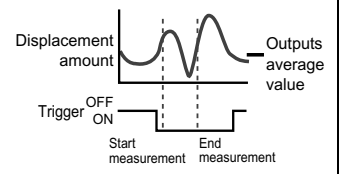
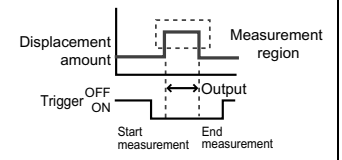


Form
After the trigger turns ON, the trigger turns OFF after a specified measurement time has elapsed.



Selecting the Hold Mode (Hold setting)

Select the timing with which measurement values are held.

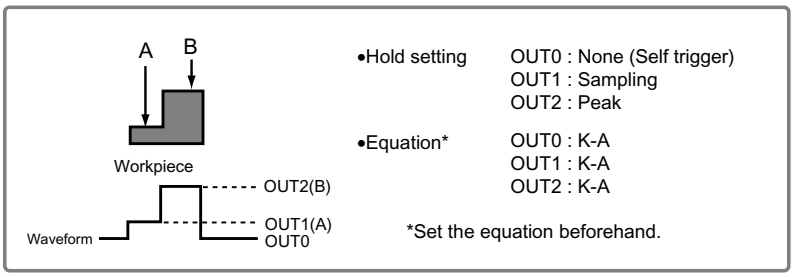
Selection	Description	Hold method	
		Normal	**Form**
None*	Hold measurement is not performed.	-	-
Sampling	The value at the start of measurement is held. Measurement can be set to start before the trigger turns ON only when sampling is selected. Measurement is, however, executed for the averaging number set in ***Avg/Filter*** in RUN Mode. Take the measurement time into consideration when specifying the measurement start position.		 Note: With ***Sampling***, the end position cannot be specified.
Peak	The highest value measured during measurement is held.		
Bottom	The lowest value measured during measurement is held.		
Peak-Peak	The difference between the highest and lowest values measured during measurement is held.		
Average	The average value for the measurement period is held.		
Length	The distance covered while the workpiece is in the measurement range is output. This hold mode can only be selected for form inspection.	-	

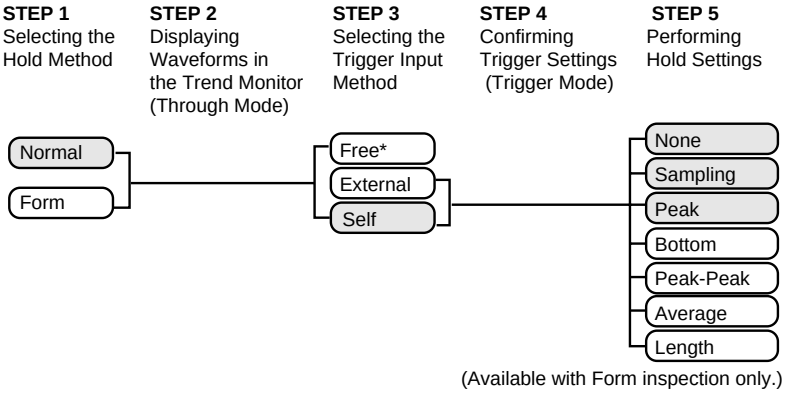
The asterisk (*) indicates the default setting.

Setting Method 1 (Normal)

The procedure for making Hold settings under the following conditions is explained below.

Example: Measuring Heights A and B Using the Hold Function





(Available with Form inspection only.)

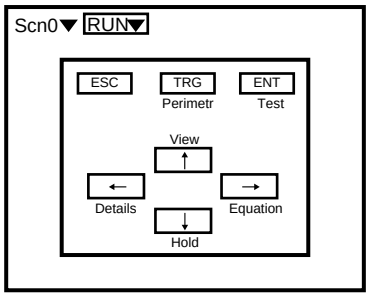
STEP 1 Selecting the Hold Method

Select the Hold method. Press the **SHIFT** + **Right** Keys to switch to Trend Monitor in advance.

Procedure

1. Press the **SHIFT** + **ENT** Keys.

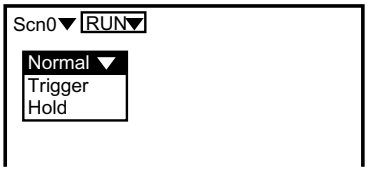
   The adjustment menu will be displayed.



2. Select ***Hold***.

   The selections will be displayed.

3. Select ***Normal***.



4. Press the **ESC** Key once.

   Trend Monitor will return.

STEP 2 Displaying Waveforms in the Trend Monitor (Through Mode)

Use the waveform to decide the trigger level and to set the measurement start position. First, pass a workpiece under the Sensor and display the waveform. When displaying waveforms, set the screen mode to ***Thru***.

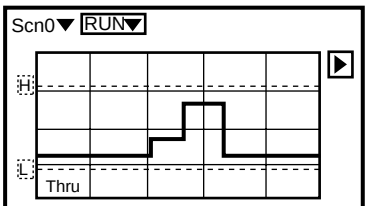
For details on how to change screens, refer to page 105.

Procedure

1. Pass the workpiece under the Sensor.

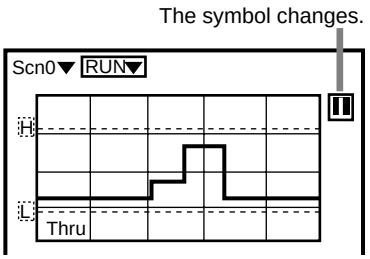
   The waveform will be displayed.

   Pass several workpieces under the Sensor and ensure that the waveform for the part to be measured is displayed on the monitor.



2. The instant the waveform representing the workpiece is displayed, press the **TRIG** Key.

   The symbol at the upper-right corner of the screen changes from ▶ to ❚❚ and the waveform display is fixed.



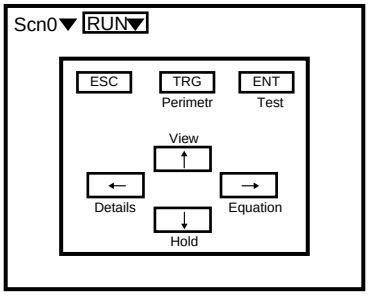
STEP 3 Selecting the Trigger Input Method

Select the trigger input method, and set the trigger position and the trigger level. The following example shows how to set ***Self*** as the trigger input method, and to set the OUT0's waveform as the reference for the trigger level. First, display the adjustment menu by pressing the **SHIFT** + **ENT** Keys. (The settings can be performed in the same way from RUN Mode.)

Procedure

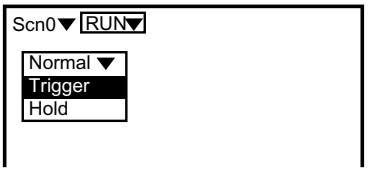
1. Select ***Hold***.

   The selections will be displayed.



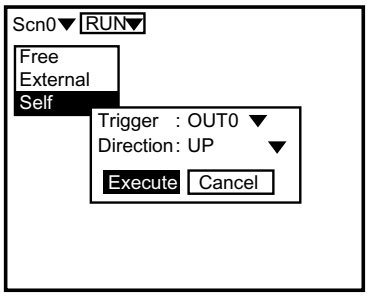
2 Select ***Trigger***.

   The selections will be displayed.



3. Select ***Self***.

   The selections will be displayed.



4. Select each item.

   Trigger : OUT0
   Direction: Up

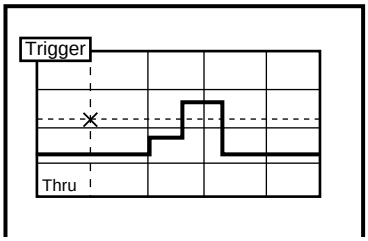
5. Select ***Execute***.

   The waveform fixed in STEP2 will be displayed.

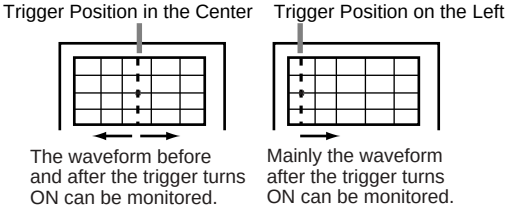
6. Specify the trigger position.

   Using the **Left** and **Right** Keys, move the cursor to the position where the waveform is displayed when the trigger is turned ON.

   Use the **Left** and **Right** Keys together with the **SHIFT** Key to move the cursor quickly.



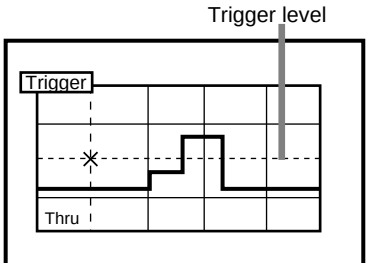
CHECK When the trigger turns ON, the waveform is displayed at a position based on the position set here.



7. Specify trigger level.

   Using the **Up** and **Down** Keys, move the cursor to an appropriate position while monitoring the waveform.

   Use the **Up** and **Down** Keys together with the **SHIFT** Key to move the cursor quickly.

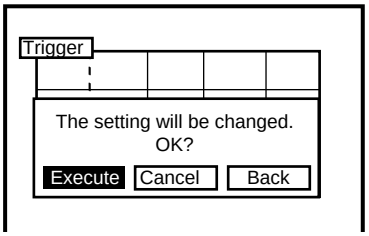


8. Press the **ENT** Key.

   A confirmation screen will be displayed.

9. Select ***Execute.***

   The settings will be registered and the screen in (2.) will return.



STEP 4 Confirming Trigger Settings (Trigger Mode)

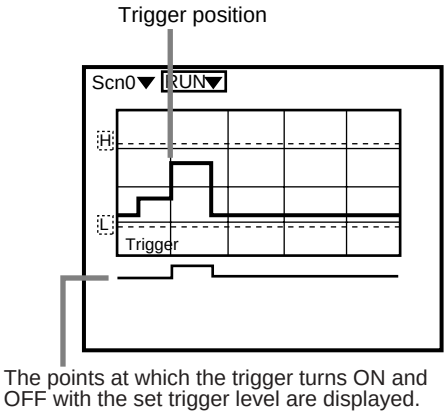
Check the contents of the trigger settings in STEP 3. Pass a workpiece under the Sensor again and display the waveform. First, switch the screen mode to Trigger.

For details on how to change the screen mode, refer to page 105.

Procedure

1. Pass the workpiece under the Sensor.

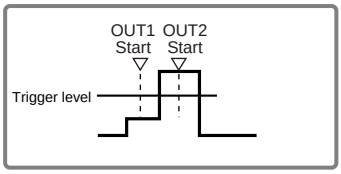
   The waveform will be displayed from the trigger position set in STEP3.
   Check whether or not the trigger turns ON at the optimum level.



If further adjustment is required, repeat the procedure explained in STEP3.

STEP 5 Performing Hold Settings

For each output number, set the Hold mode and the measurement start timing (trigger delay) for the waveform established in STEP 4.
In the example provided below, sampling is set for OUT1 and peak is set for OUT2.



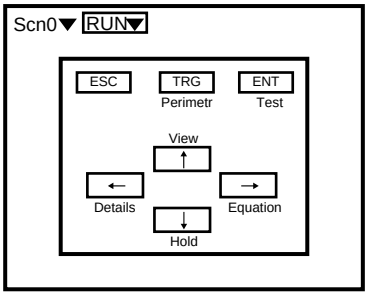
Press the **SHIFT** + **Right** Keys to switch to Trend Monitor in advance.

CHECK - Set an equation before making the Hold settings.
- If the measurement start timing is set, measurement is started a set time after the trigger turning ON and so stable measurement values can be output.
- Setting is easier if the waveform display is enlarged.

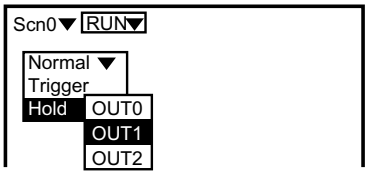
Procedure

1. Select ***Hold***.

   The selections will be displayed.

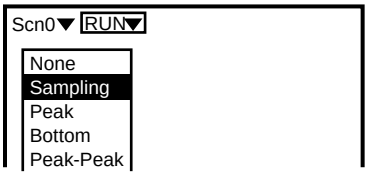


2. Select ***Hold/OUT1***.



3. Select ***Sampling***.

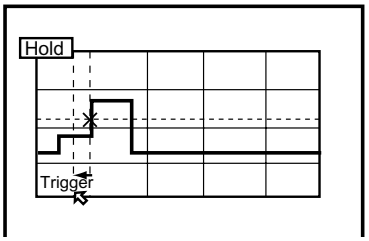
   The waveform will be displayed.



4. Specify the measurement start position.

   Move the cursor with the **Right** Key.

   Use the **Right** Key together with the **SHIFT** Key to move the cursor quickly.



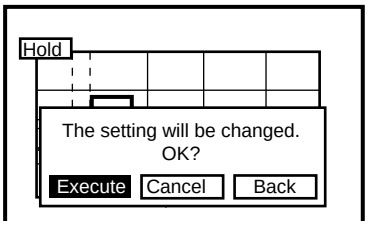
CHECK Measurement can be set to start before the trigger turns ON only when Hold Mode is set to Sampling. Even if the Hold is set to Sampling, however, measurement is executed for the averaging number set in ***Avg/Filter*** in RUN Mode. Take the measurement time into consideration when specifying the measurement start position.

5. Press the **ENT** Key.

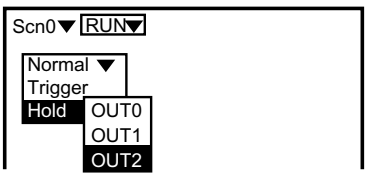
   A confirmation screen will be displayed.

6. Select ***Execute***.

   The settings will be registered and the screen in (2.) will return.

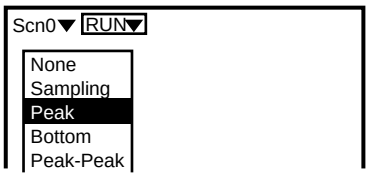


7. Select ***OUT2***.



8. Select ***Peak***.

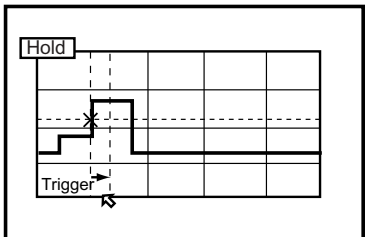
   The waveform will be displayed.



9. Specify a position starting measurement.

   Move the cursor with the **Right** Key.

   Use the **Right** Key together with the **SHIFT** Key to move the cursor quickly.

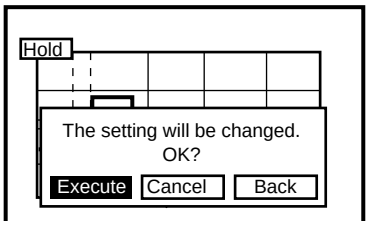


10. Press the **ENT** Key.

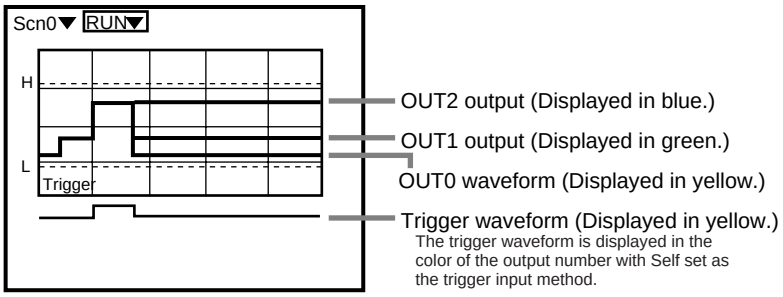
    A confirmation screen will be displayed.

11. Select ***Execute***.

    The settings will be registered and the screen in (2.) will return.



This completes the hold settings. Perform a workpiece measurement to check that measurement can be performed correctly.



CHECK Checking the Measurement Results Together

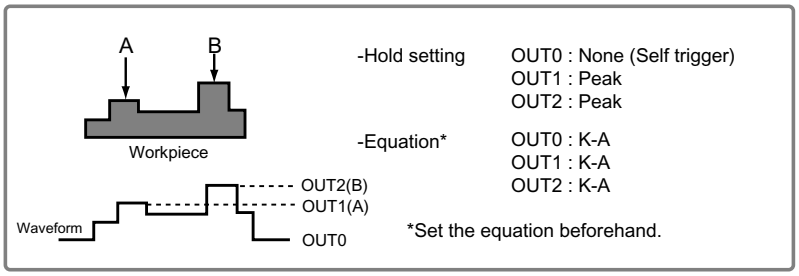
If the screen is switched to Digital Monitor and the display contents are set to ***All outputs***, the measurement results for all the output numbers can be checked at once.

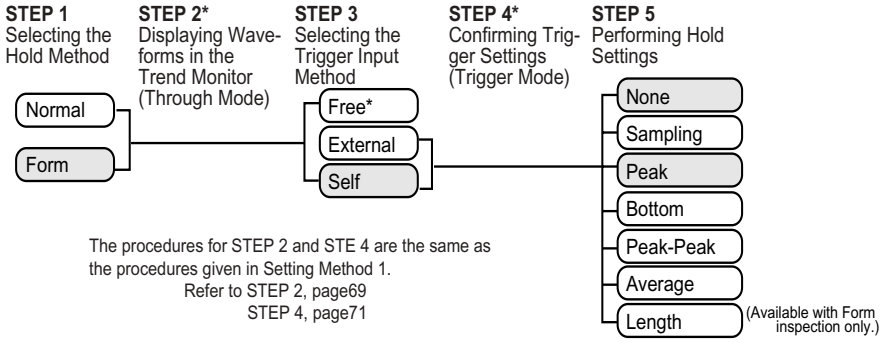
Refer to page 104.

Setting Method 2 (Form)

The procedure for making Hold settings under the following conditions is explained below.

Example: Measuring Heights A and B Using the Hold Function





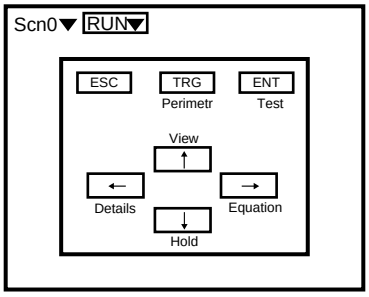
STEP 1 Selecting the Hold Method

Select the Hold method. Press the **SHIFT** + **Right** Keys to switch to Trend Monitor in advance.

Procedure

1. Press the **SHIFT** + **ENT** Keys.

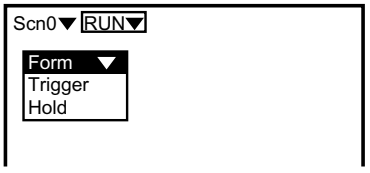
   The adjustment menu will be displayed.



2. Select ***Hold***.

   The selections will be displayed.

3. Select ***Form***.



4. Press the **ESC** Key once.

   Trend Monitor will return.

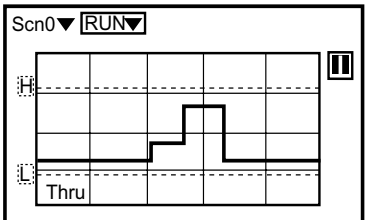
STEP 2 Displaying Waveforms in the Trend Monitor (Through Mode)

Use the waveform to decide the trigger level and to set the measurement start position. First, pass a workpiece under the Sensor and display the waveform. When displaying waveforms, set the screen mode to ***Thru***.

For details on how to change screens, refer to page 105.

The procedure is the same as the one given in Setting Method 1 and so refer to that.

Refer to page 69.



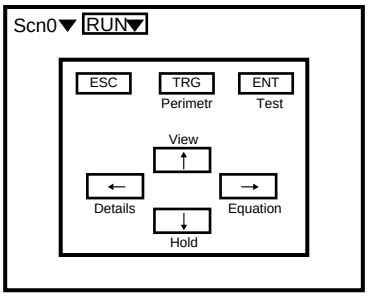
STEP 3 Selecting the Trigger Input Method

Select the trigger input method, and set the trigger position and the trigger level. The following example shows how to set ***Self*** as the trigger input method, and to set the OUT0's waveform as the reference for the trigger level. First, display the adjustment menu by pressing the **SHIFT** + **ENT** Keys. (The settings can be performed in the same way from SET Mode.)

Procedure

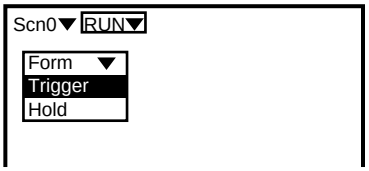
1. Select ***Hold***.

   The selections will be displayed.



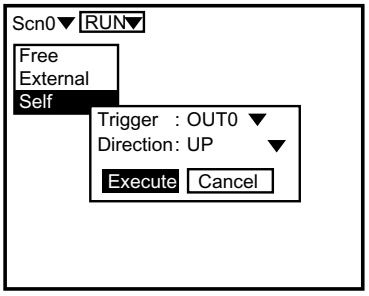
2. Select ***Trigger***.

   The selections will be displayed.



3. Select ***Self.***

   The selections will be displayed.



4. Select each item.

   Trigger : OUT0
   Direction: Up

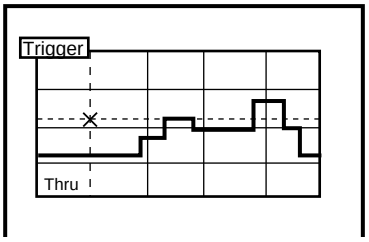
5. Select ***Execute***.

   The waveform fixed in STEP2 will be displayed.

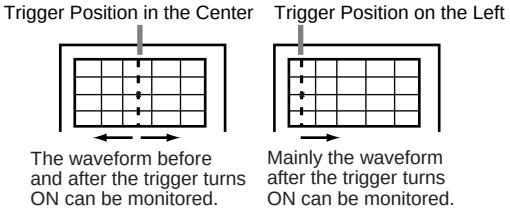
6. Specify the trigger position.

   Using the **Left** and **Right** Keys, move the cursor to the position where the waveform is displayed when the trigger is turned ON.

   Use the **Left** and **Right** Keys together with the **SHIFT** Key to move the cursor quickly.



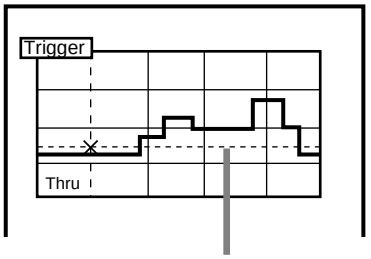
CHECK When the trigger turns ON, the waveform is displayed at a position based on the position set here.



7. Specify trigger level.

   Using the **Up** and **Down** Keys, move the cursor to an appropriate position while monitoring the waveform.

   Use the **Up** and **Down** Keys together with the **SHIFT** Key to move the cursor quickly.



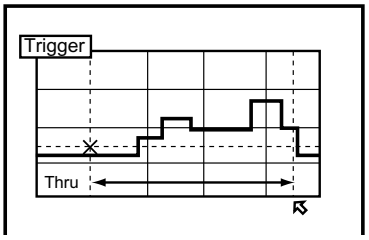
8. Press the **ENT** Key.

   The trigger-ON position and the trigger level will be set, and the cursor for setting trigger-OFF will be displayed.

9. Specify the trigger-OFF position.

   Move the cursor with the **Left** and **Right** Keys.

   Use the **Left** and **Right** keys together with the **SHIFT** Key to move the cursor quickly.

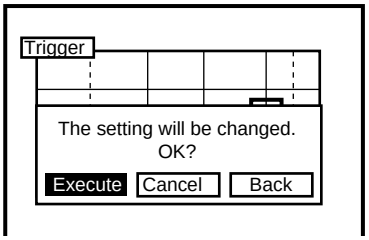


10. Press the **ENT** Key.

    The trigger-OFF position will be set, and a confirmation screen will be displayed.

11. Select **Execute**.

    The settings will be registered and the screen in (2.) will return.



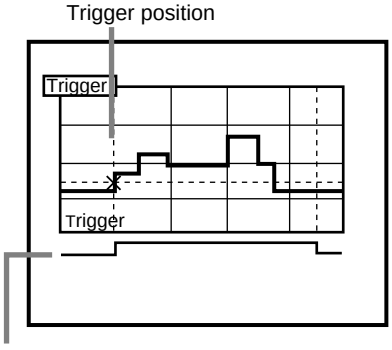
STEP 4 Confirming Trigger Settings (Trigger Mode)

Check the contents of the trigger settings in STEP 3. Pass a workpiece under the Sensor again and display the waveform. First, switch the screen mode to Trigger.

For details on how to change the screen mode, refer to page 105.

The procedure is the same as the one given in Setting Method 1 and so refer to that.

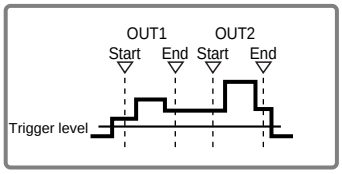
Refer to page 71.



The points at which the trigger turns ON and OFF with the set trigger level are displayed.

STEP 5 Performing Hold Settings

For each output number, set the Hold mode and the measurement start/end timing for the waveform established in STEP 4.
In the example provided below, peak is set for OUT1 and OUT2.



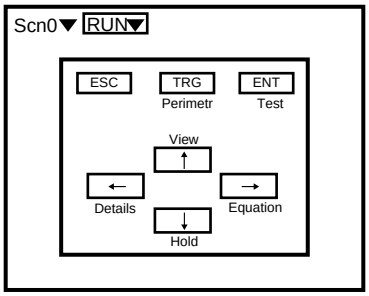
Press the **SHIFT** + **Right** Keys to switch to Trend Monitor in advance.

CHECK Set an equation before making the Hold settings.

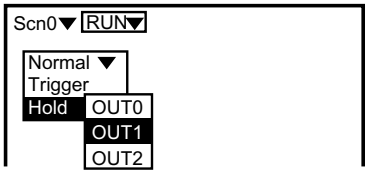
Procedure

1. Select ***Hold***.

   The selections will be displayed.

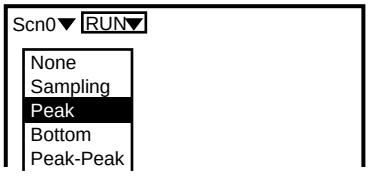


2. Select ***Hold***/***OUT1***.



3. Select ***Peak***.

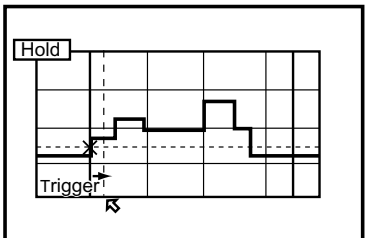
   The waveform will be displayed.



4. Specify a position starting measurement.

   Move the cursor with the **Right** Key.

   Use the **Right** key together with the **SHIFT** Key to move the cursor quickly.



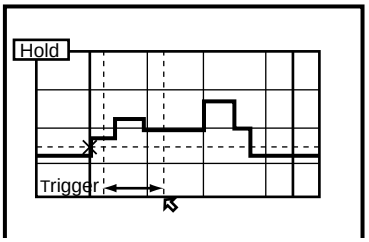
5. Press the **ENT** Key.

   The measurement start position will be set, and the cursor for setting the measurement end position will be displayed.

6. Specify a position ending measurement.

   Move the cursor with the **Right** Key.

   Use the **Right** key together with the **SHIFT** Key to move the cursor quickly.



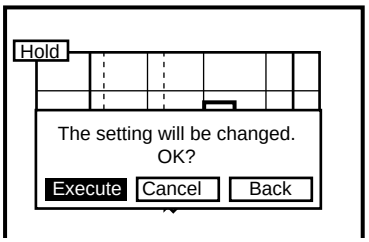
7. Press the **ENT** Key.

   The measurement end position will be set, and a confirmation screen will be displayed.

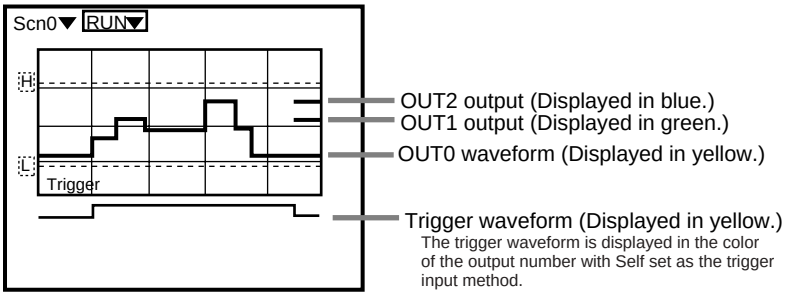
8. Select ***Execute***.

   The settings will be registered and the screen in (2.) will return.

   Set the measurement start position and end position for OUT2 by repeating steps (2.) to (7.).



This completes the Hold settings. Perform a workpiece measurement to check that measurement can be performed correctly.



CHECK Checking the Measurement Results Together

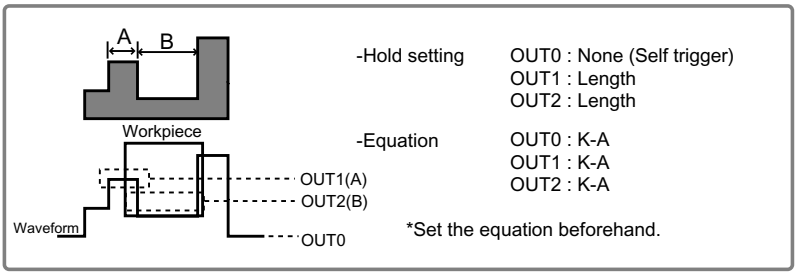
If the screen is switched to Digital Monitor and the display contents are set to ***All outputs***, the measurement results for all the output numbers can be checked at once.

Refer to page 104.

Setting Method 3 (Form, Length Hold)

The procedure for making Hold settings under the following conditions is explained below.

Example: Measuring Lengths A and B Using the Hold Function



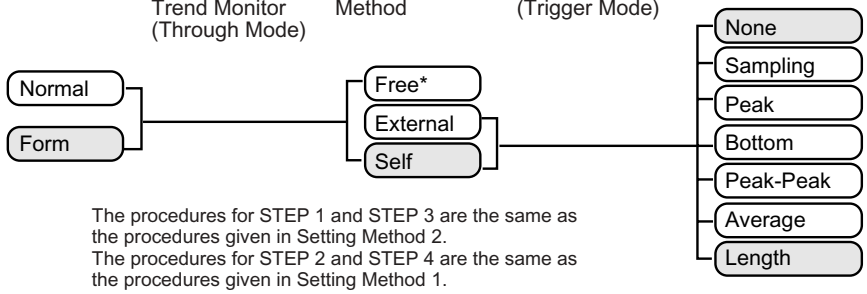
STEP 1* Selecting the Hold Method

STEP 2* Displaying Waveforms in the Trend Monitor (Through Mode)

STEP 3* Selecting the Trigger Input Method

STEP 4* Confirming Trigger Settings (Trigger Mode)

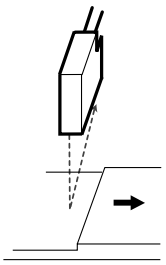
STEP 5 Performing Hold Settings



The procedures for STEP 1 and STEP 3 are the same as the procedures given in Setting Method 2.
The procedures for STEP 2 and STEP 4 are the same as the procedures given in Setting Method 1.

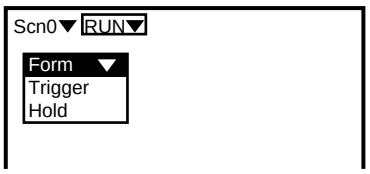
Refer to STEP 1, page75
STEP 2, page69
STEP 3, page76
STEP 4, page71

CHECK - Perform setting while moving the workpiece at the actual movement speed.
- Set the averaging number to a low number.
Refer to page 87.
- With the kind of setup shown on the right, reduce size of the measurement region in the line direction.
Refer to page 47.



STEP 1 Selecting the Hold Method

Select ***Form*** as the Hold method.
The operation procedure is the same as for Setting method 2.
Refer to page 75.



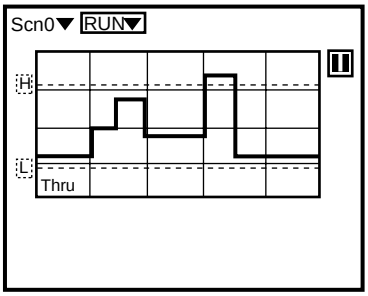
STEP 2 Displaying Waveforms in the Trend Monitor (Through Mode)

Use the waveform to decide the trigger level and to set the measurement start position. First, pass a workpiece under the Sensor and display the waveform. When displaying waveforms, set the screen mode to ***Thru***.

For details on how to change screens, refer to page 105.

The operation procedure is the same as for Setting method 1.

Refer to page 69.

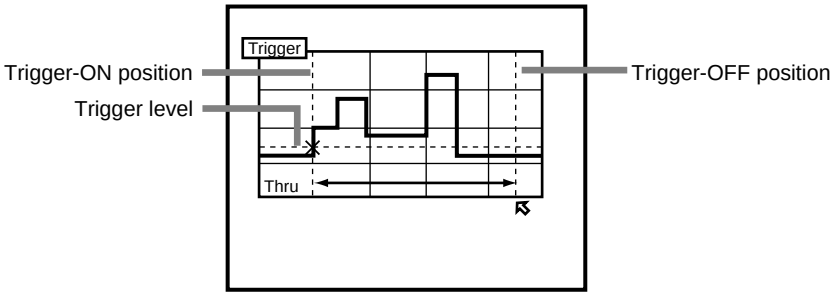


STEP 3 Selecting the Trigger Input Method

Select the trigger input method, and set the trigger position and the trigger level. The following example shows how to set ***Self*** as the trigger input method, and to set the OUT0's waveform as the reference for the trigger level.

The operation procedure is the same as for Setting method 2.

Refer to page 76.



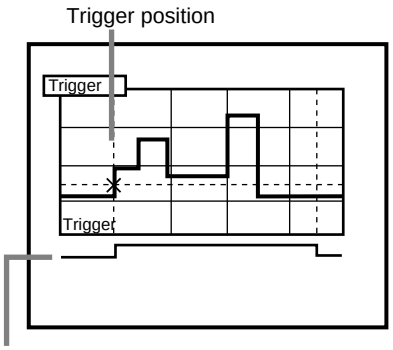
STEP 4 Confirming Trigger Settings (Trigger Mode)

Check the contents of the trigger settings in STEP 3. Pass a workpiece under the Sensor again and display the waveform. First, switch the screen mode to Trigger.

For details on how to change the screen mode, refer to page 105.

The operation procedure is the same as for Setting method 1.

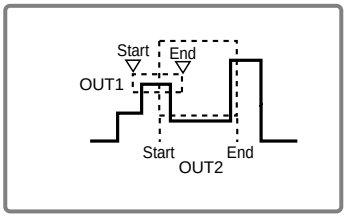
Refer to page 71.



The points at which the trigger turns ON and OFF with the set trigger level are displayed.

STEP 5 Performing Hold Settings

For each output number, set the Hold mode and the measurement start/end timing for the waveform established in STEP 4.
In the example provided below, length is set for OUT1 and OUT2.



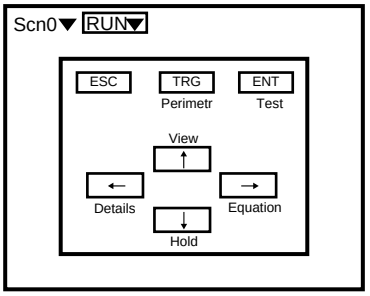
Press the **SHIFT** + **RIGHT** Keys to switch to Trend Monitor in advance.

CHECK Set an equation before making the Hold settings.

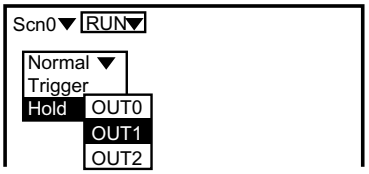
Procedure

1. Select ***Hold***.

   The selections will be displayed.

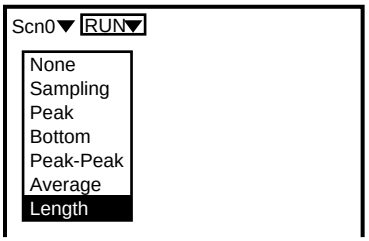


2. Select ***Hold***/***OUT1***.



3. Select ***Length***.

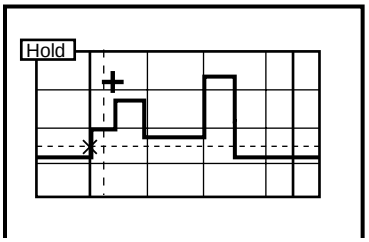
   The waveform will be displayed.



4. Specify the measurement start position (top-left coordinate).

   Move the cursor with the **Up**, **Down**, **Left** and **Right** Keys. Use these keys together with the **SHIFT** Key to move the cursor quickly.

   Press the **ENT** Key to confirm the position.



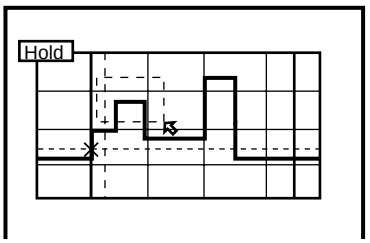
5. Press the **ENT** Key.

   The measurement start position will be set, and the cursor for setting the measurement end position will be displayed.

6. Specify a position ending measurement.

   Move the cursor with the **Up**, **Down**, **Left** and **Right** Keys. Use these keys together with the **SHIFT** Key to move the cursor quickly.

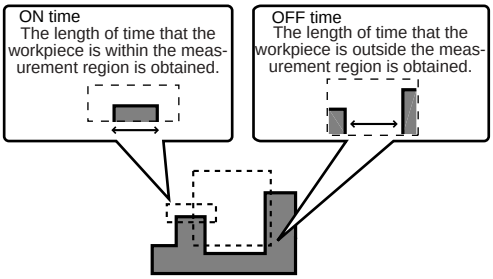
   Press the **ENT** Key to confirm the position.

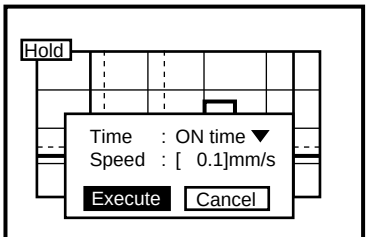


7. Press the **ENT** Key.

   The measurement end position will be set, and the screen for setting the measurement time and the workpiece movement speed will be displayed.

8. Select the time measured.





9. Set the workpiece movement speed.

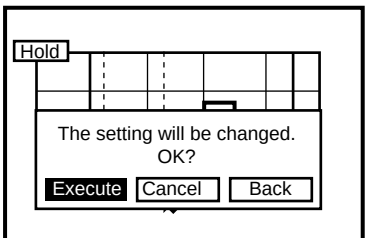
10. Select ***Execute***.

    A confirmation screen will be displayed.

11. Select ***Execute***.

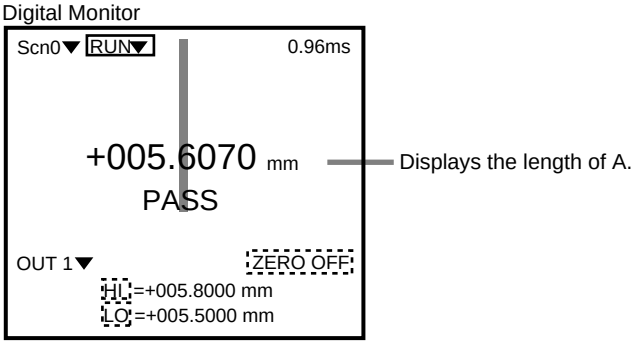
The setting will be registered and the screen in (2.) will return.

Set the measurement start position and end position for OUT2 by repeating steps (2.) to (11.).



This completes the Hold settings. Perform a workpiece measurement to check that measurement can be performed correctly.

Digital Monitor



CHECK **Checking the Measurement Results Together**

If the screen is switched to Digital Monitor and the display contents are set to ***All outputs***, the measurement results for all the output numbers can be checked at once.

Refer to page 104.

3-1-5 Using the Filtering Functions (Avg/Filter)

The Z300 has 2 types of Filter function. Both types can be used together.

Outputting Averaged Measurement Results (Average)

Use this function to disregard sudden changes in the waveform. Several measurements are made, and theses measurements are averaged by a set number and the result is output.

Selection	1, 4, 8, 16, 32, 64*, 128, 256, 512, 1024, 2048, 4096

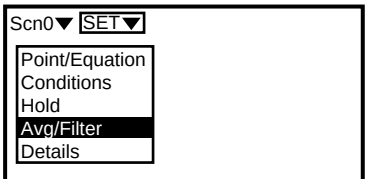
The asterisk (*) indicates the default setting.

The Relationship between the Averaging Number, the Measurement Time, and the Resolution

The averaging number	Measurement speed	Resolution
1 2 ⋮ 2048 4096	Fast ↕ Slow	Low ↕ High

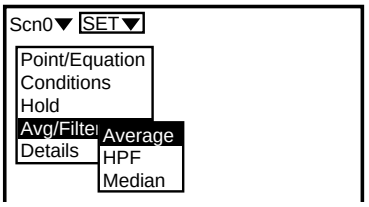
Procedure

1. Select ***Avg*/*Filte***r.



2. Select ***Average***.

   The setting screen will be displayed.

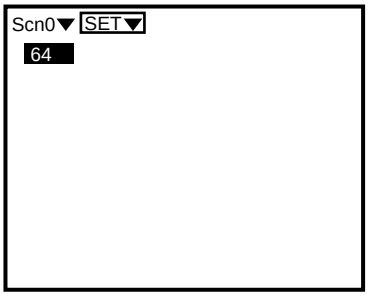


3. Specify the number of times.

   Change the values using the **Up** and **Down** Keys.

4. Press the **ENT** Key.

   The setting will be registered and the screen in (2.) will return.



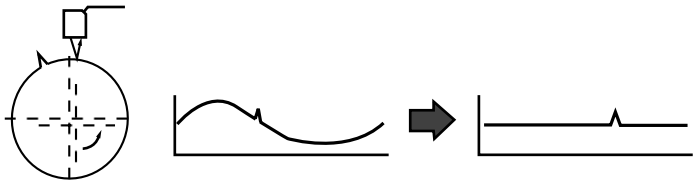
Setting High Pass Filter (HPF)

Use this function to remove a steadily fluctuating trend from sampled input signals.
Set for each output number. It is possible to set self-trigger for the waveform after filtering.

Selection	None*, 0.1, 0.2, 0.5, 1, 2, 5, 10, 20, 50, 100Hz

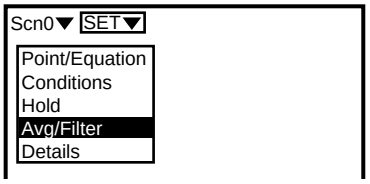
The asterisk (*) indicates the default setting.

Example: Removing the Eccentricity Component for a Rotating Circular Workpiece



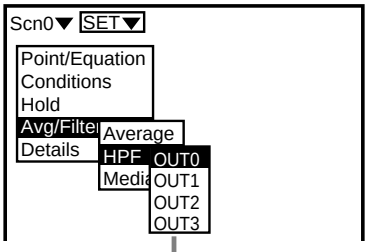
Procedure

1. Select ***Avg*/*Filter***.



2. Select ***HPF***.

3. Select the output number.



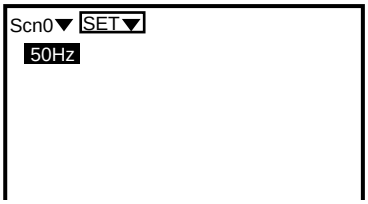
Only output numbers for which equations have been set are displayed.

4. Set the frequency.

   Select the frequency for the filter by pressing the **Up** and **Down** Keys.

5. Press the **ENT** Key.

   The setting will be registered and the screen in (2.) will return.



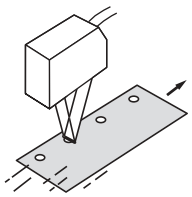
Setting Median Filter (Median)

The median value of those within the specified filter size is adopted as the measurement result.

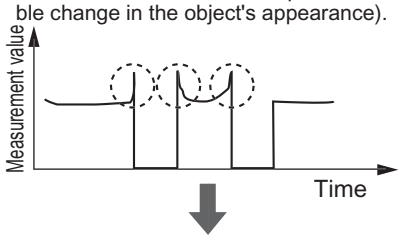
Selection	1, 9, 15

The asterisk (*) indicates the default setting.

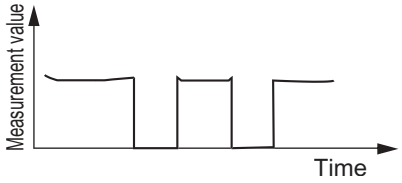
Example: Removing outliers (extreme values)



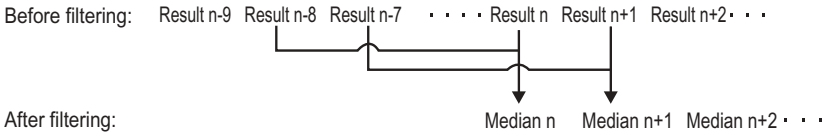
Extreme values (or outliers) shown below may be generated due to conditions in which a workpiece is measured (e.g., a remarkable change in the object's appearance).



Outliers can be removed by using the Median Filter.

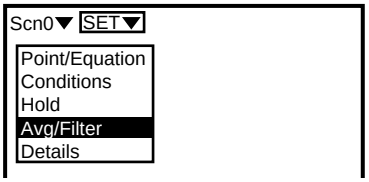


Example: Median with filter size ***9***



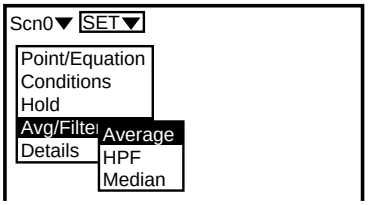
Procedure

1. Select ***Avg***/***Filter***.



2. Select ***Median***.

   A setting screen will be displayed.

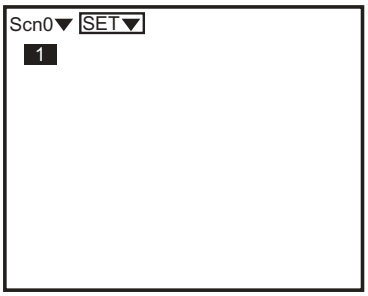


3. Select the filter size.

   Select the filter size by pressing the **Up** and **Down** Keys.

4. Press the **ENT** Key.

   The setting will be registered and the screen in (2.) will return.



3-1-6 More Detailed Settings (Details)

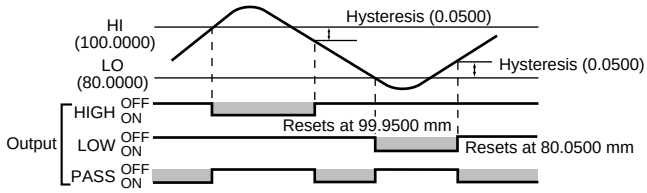
Setting the Hysteresis Width for Judgement Limits (Judgement width)

Set the hysteresis width for judgement values (HI, LO).

Setting range	0.0000 to 999.9999mm (0.0100mm*)

The asterisk (*) indicates the default setting.

Example: HI: 100.000 mm; LO: 80.000 mm; Judgement value hysteresis width: 0.05 mm



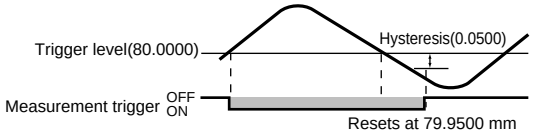
Setting the Hysteresis Width for the Trigger Level (Trigger width)

Set the hysteresis width for the trigger level. This function is effective only when Self is set for the Hold function trigger setting.
If stable operation is not possible with self-trigger, increase the hysteresis width.

Setting range	0.0000 to 999.9999mm (0.0100mm*)

The asterisk (*) indicates the default setting.

Example: Trigger level: 80.000 mm; Trigger level hysteresis width: 0.0500 mm



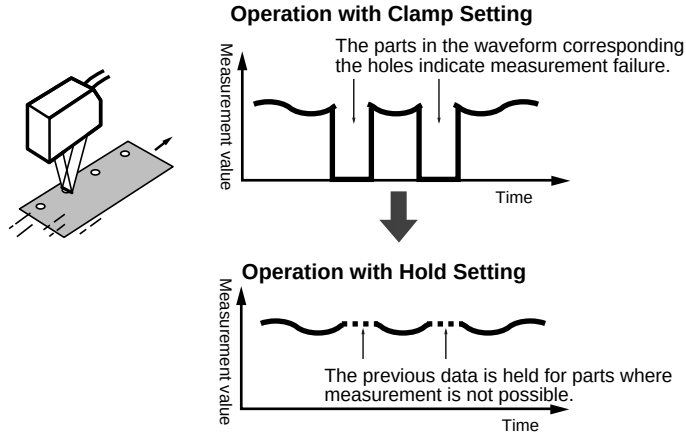
Selecting the Data Output Method for Measurement Failure (Data for no run)

In cases where the light density is temporarily excessive or insufficient (i.e., measurement is not possible) due to defects or holes in the workpiece, it is possible to set the Z300 to hold the previous data.

Selection	Description
Clamp (*)	An error is displayed and an error is output.
Hold	The value measured immediately before measurement became impossible is displayed and output.

The asterisk (*) indicates the default setting.

Example: Disregarding the Holes in a Workpiece



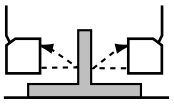
•Contents of Display and Output

Display/Output		Hold	Clamp
Measurement		The previous status is held.	--- is displayed.
Result			ERROR is displayed.
Trend Monitor			-999.9999 is plotted continuously.
Terminals	**Judgement(*)**		The ERROR terminal turns ON. The HIGH, PASS, and LOW terminals turn OFF.
	Equation		3FFFF is output.
RS-232C			ER is output.
Analog	**4 to 20mA**		22 mA min.
	±5V		6 V min.

(*)The numbers of the output terminals vary depending on the output numbers (OUT@).

Selecting the Timing for Measurement with 2 Sensors (2-sensor)

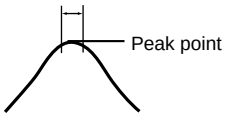
Select the measurement timing for when 2 Sensors are connected.

Selection	Description
Simul (*)	Select to perform calculating using 2 Sensors. Measurement is performed with the same timing. There is no difference in measurement times. Example: Thickness measurement 
Alternate	Select when using 2 Sensors and it is necessary to prevent mutual interference.

The asterisk (*) indicates the default setting.

Specifying the Measurement Width (Peak/btm width)

This function is effective only when the CCD Mode is set to 10 or 60 lines.
The average over a specified region with the peak or bottom at the center is output as the measurement value.
The region can be specified in pixel units. Setting a larger value will stabilize the measurement results.



CCD mode	Selection
10 lines	1pixel*, 3pixel, 5pixel
60 lines	1pixel, 5pixel*, 9pixel, 13pixel, 17pixel, 21pixel, 25pixel, 29pixel,

The asterisk (*) indicates the default setting.
(When 10 lines or 60 lines is set.)

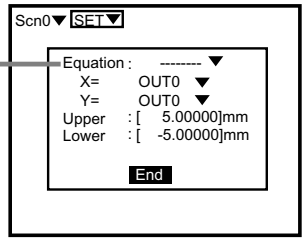
Using Outputs in Calculations (OUT3 definition)

Set to perform calculation using the measurement values output to OUT0, OUT1, and OUT2. OUT3 is the only output for which calculations can be defined using measurement values.

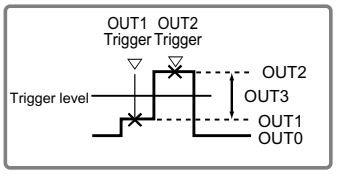
Selection	Description
Meas point (*)	Sets the measurement equation.
OUT	Performs calculation using the measurement values output to OUT0, OUT1, and OUT2.

The asterisk (*) indicates the default setting.

If this item is set to ***OUT***, the display of the screen for setting equations will change.
Select output numbers used in calculation as X and Y in the equation.
For details on setting equations, refer to page 53.



Selection	Description
X+Y	The output measurement values are added.
X-Y	Subtracts one output measurement from another. **Example**: Measuring Height Using the Hold function - Hold setting OUT0 : None (Self trigger) OUT1 : Sampling OUT2 : Peak - Equation OUT0 : K-A OUT1 : K-A OUT2 : K-A OUT3 : X-Y X : OUT2 Y : OUT1



Selecting the Force-zero Method (Force-zero)

Select the Force-zero method.

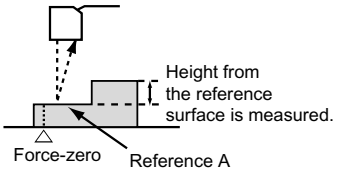
Selection	Description
Real-time (*)	The measurement value at the instant Force-zero is input is shifted to zero.
Hold	This function is effective when performing Hold measurement. The measurement value (Hold value) at the instant Force-zero is input is shifted to zero.

The asterisk (*) indicates the default setting.

Real-time Zero

-Measuring Height from the Reference Surface

The value (reference A) at the instant Force-zero is input is shifted to zero, and measurement is performed with that value as a reference.

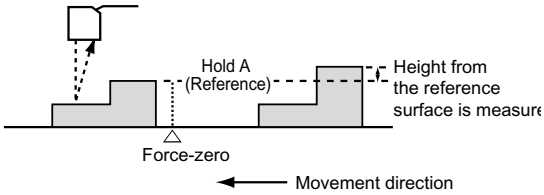


Hold Zero

-Outputting Measurement Differences for Reference Workpieces

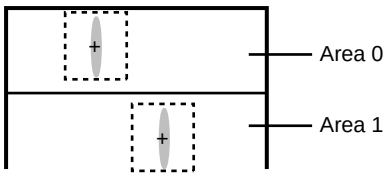
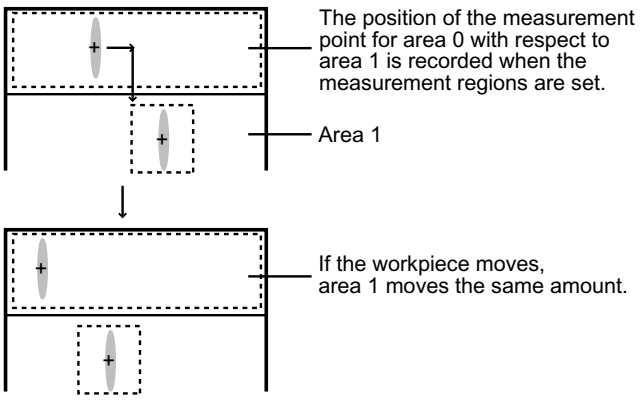
If the following hold setting is performed, measurement is performed with the Hold A value as reference.

If hold zero is executed for the reference workpiece, measurement differences can be output.



Selecting the Positional Relationship between 2 Regions (2-region)

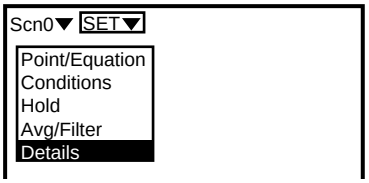
Select the relationship between the region positions for measurement with 1 Sensor and 2 measurement regions.

Selection	Description
Absolute (*)	Measurement is performed with area 0 and area 1 in the positions at which they were drawn. 
Relative	The distance moved by the workpiece is detected with area 0, and measurement is performed after area 1 is moved by the same distance.  Note:Change to relative coordinates after performing sensitivity adjustment and calibration.

The asterisk (*) indicates the default setting.

Procedure

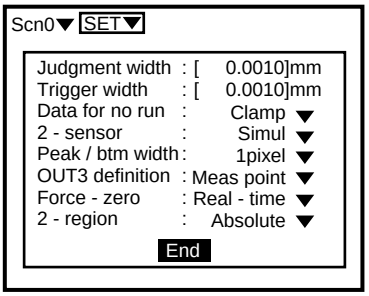
1. Select ***Details***.



2. Make the settings for each item.

3. Select ***End***.

   The setting will be registered and the screen in (1.) will return.



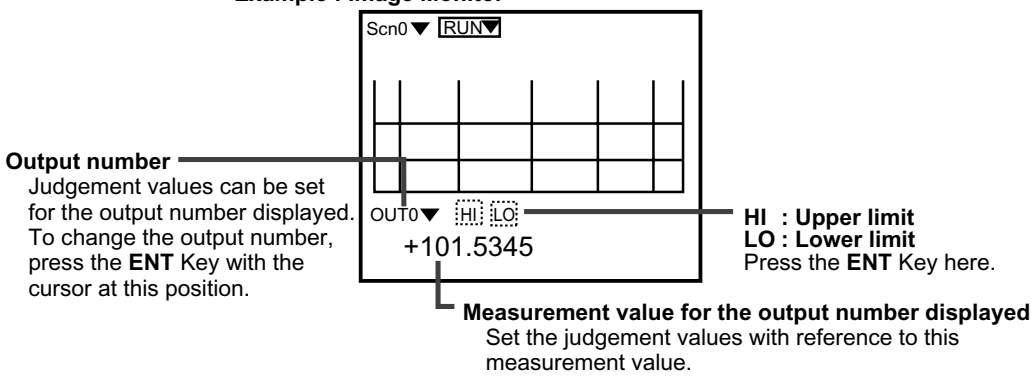
3-2 Performing Measurement

The Z300 starts measurement as soon as the power supply is turned ON.
The default setting is to perform surface displacement measurement.

3-2-1 Setting Judgement Values

Set the judgement values (upper limit and lower limit) while performing measurement. The settings can be performed in the Image Monitor, the Digital Monitor, or the Trend Monitor.
The judgement values for the outputs displayed can be set. Measurement continues during the setting procedure and so the judgement values can be set with reference to the measurement values displayed.

Example : Image Monitor



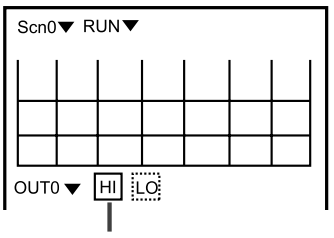
CHECK This operation is not possible if the Protection function is used.
Refer to page 140.

Setting the Judgement Upper Limit for OUT0

Procedure

1. Move the cursor to ***HI*** and press the **ENT** Key.

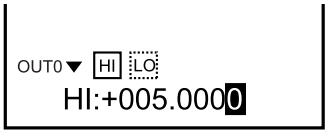
   The currently set upper limit will be displayed.



2. Change the value and press the **ENT** Key.

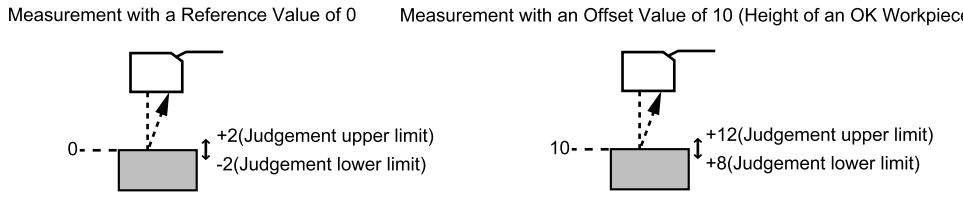
   The upper limit will be set.

   Move the cursor to ***LO*** and set the lower limit in the same way.



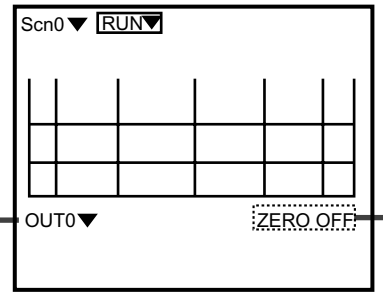
3-2-2 Executing Force-zero

Use the Force-zero function to register the measurement value of an OK product as a reference value and to perform measurement for ± tolerance with respect to this value.
An offset value can also be set as the reference value.
Refer to page 53.



Force-zero can be executed from the Image Monitor, the Digital Monitor, or the Trend Monitor. Measurement continues during the Force-zero execution.

Example : Image Monitor



Press the ENT Key here.
When Force-zero is executed, it changes to Zero's ON.

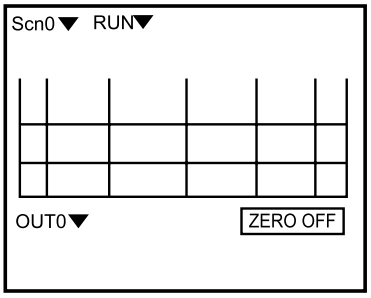
Output number
When ***Force-zero*** is executed, it is executed for the output number displayed. To change the output number, press the **ENT** Key with the cursor at this position. When ***All 0*** is executed, however, Force-zero is executed for all outputs regardless of the output number displayed.

CHECK
- Measurement is performed while confirmation messages are displayed.
- There are 2 methods that can be used for executing Force-zero, Real-time zero and Hold zero.
Refer to page 94.
- This operation is not possible if the Protection function is used.
Refer to page 140.

Procedure

1. Move the cursor to ***Zero's OFF*** and press the **ENT** Key.

   A confirmation message will be displayed.



2. **To execute Force-zero:**

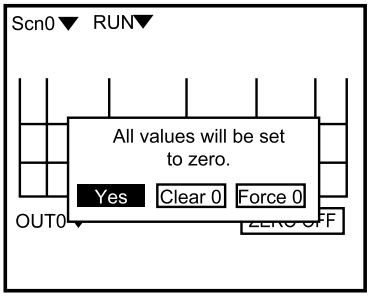
   Select ***Yes***.

   Force-zero is executed, and the screen display changes to ***Zero's ON.***

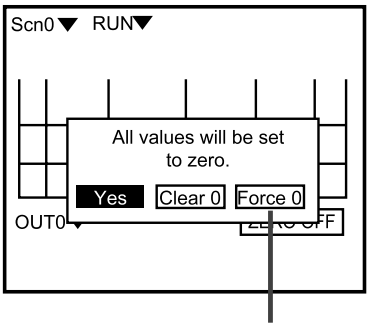
   To switch to All-zero:

   Select ***All 0***.

   A confirmation message will be displayed. Go to (3.).



3. Select ***Yes***.
   All-zero is executed, and the screen display changes to ***Zero's ON***.



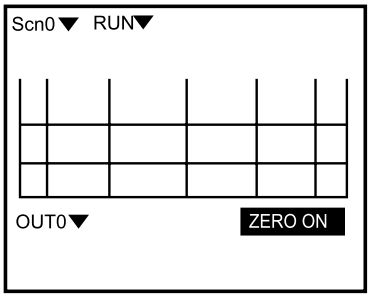
Select this item to change to Force-zero.

Clearing Method

Procedure

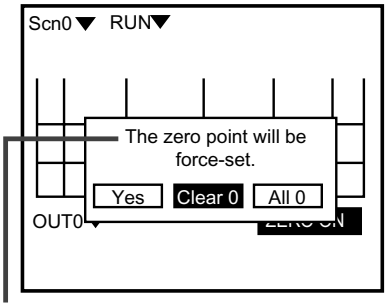
1. Move the cursor to ***Zero's ON*** and press the **ENT** Key.

   A confirmation message will be displayed.



2. Select ***Clear 0***.

   The Force-zero is cleared and the screen display changes to ***Zero's OFF***.



If ***All 0*** is executed, the message "Clear All 0" will be displayed.

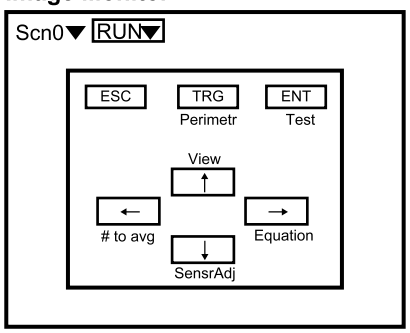
3-2-3 Adjusting Measurement Conditions in RUN Mode

Set and adjust measurement conditions in RUN mode. If the **SHIFT** + **ENT** Keys are pressed, the adjustment menu will be displayed and the measurement conditions for the output numbers displayed can be set or adjusted. Being able to make adjustments without changing the mode is a useful feature.
The adjustment menu displayed varies depending on the Sensor models connected and the type of screen.

CHECK Measurement will be interrupted while adjustments are made.

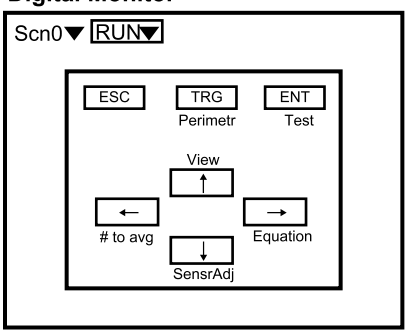
Image Monitor, Digital Monitor

Image Monitor



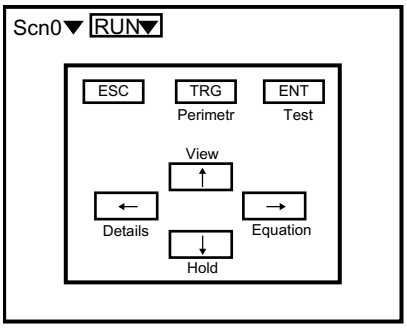
Refer to page 25 for a detailed explanation

Digital Monitor



Refer to page 25 for a detailed explanation

Trend Monitor

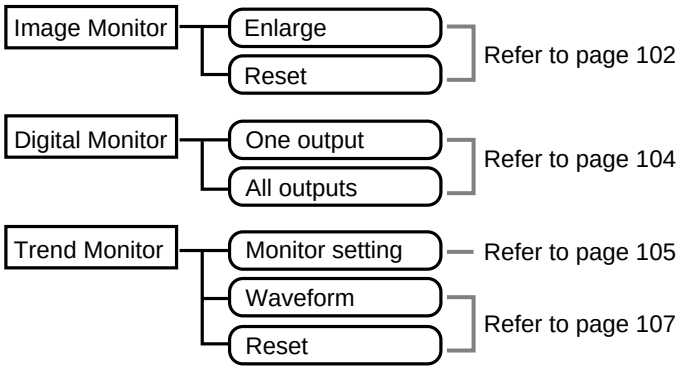


Refer to page 25 for a detailed explanation

3-3 Setting the Screen Display

Set the contents displayed on the screen.
The contents that can be set vary depending on the type of screen displayed.

Selections Listed by Screen



3-3-1 Entering Display Mode

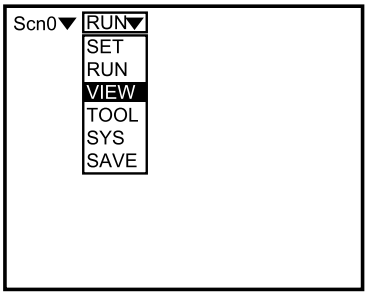
Procedure

1. Move the cursor to ***RUN*** ▼ and press the **ENT** Key.

   A Mode selections screen will be displayed.

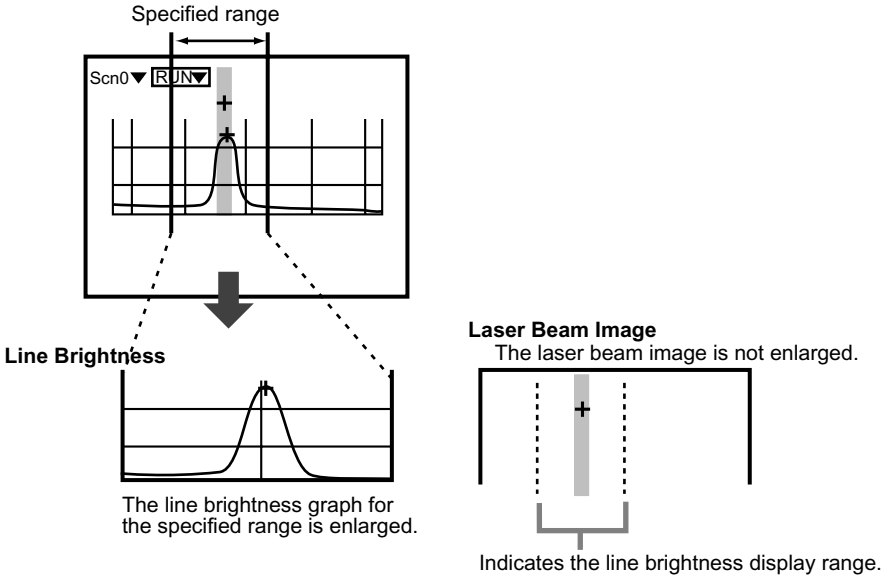
2. Select ***VIEW***.

   The selections for the currently displayed screen will be displayed.



3-3-2 Enlarging Line Brightness Graphs (*Enlarge*/*Reset*)

This setting is possible only when the Image Monitor is displayed.
The line brightness graph for a specified region is enlarged and so this is a useful function for checking measurement points.



Procedure

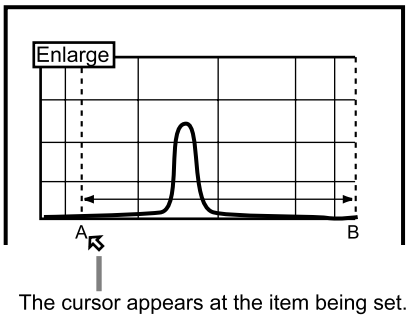
1. Select ***Enlarge***.

   The screen for setting the enlargement range will be displayed.

2. Specify edge A of the enlarged region.

   Move the cursor to the desired position using the **Right** and **Left** Keys.

   Use the **Right** and **Left** Keys together with the **SHIFT** Key to move the cursor quickly.



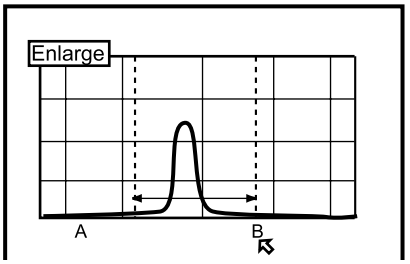
3. Press the **ENT** Key.

   Position A will be set and the screen for specifying edge B will be displayed.

   Specify the position of B by repeating the procedure described in (2.).

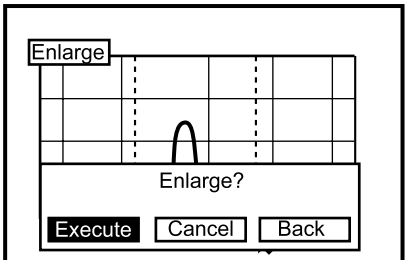
4. Press the **ENT** Key.

   Position B will be set and a confirmation screen will be displayed.



5. Select ***Execute***.

   The setting will be registered and the screen in (1.) will return.



6. Press the **ESC** Key twice.

   The enlarged line brightness graph will be displayed.

Enlargement Reset

Return the enlarged line brightness graph to its default setting.

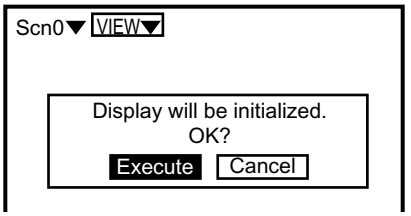
Procedure

1. Select ***Reset***.

   A confirmation screen will be displayed.

2. Select ***Execute***.

   The setting will be registered and the screen in (1.) will return.



3. Press the **ESC** Key twice.

   The default line brightness graph will be displayed.

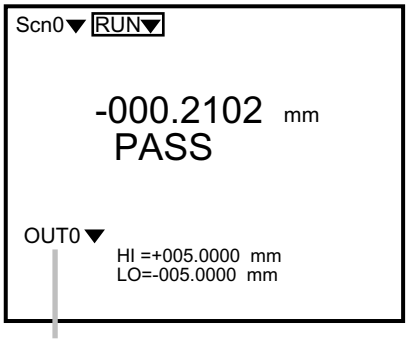
3-3-3 Changing the Number of Output Numbers Displayed

This setting is possible only when the Digital Monitor is displayed.
If it is set to ***All outputs***, all measurement values, judgement results, and judgement values for OUT0, OUT1, OUT2, and OUT3 are displayed. This is a useful feature for viewing the measurement status for all the output numbers.
When ***All outputs*** is selected, however, the values are displayed only. Judgement values cannot be changed.

Item	Description
One output*	The measurement value, judgement result, and judgement values for the output number selected are displayed.
All outputs	The measurement values, judgement results, and judgement values for OUT0, OUT1, OUT2, and OUT3 are displayed in list format.

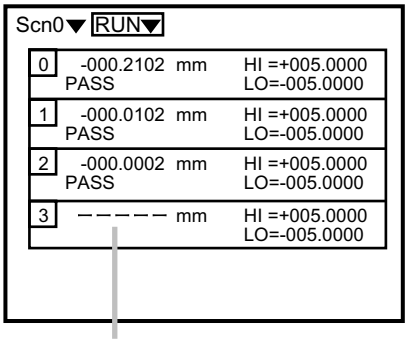
The asterisk (*) indicates the default setting.

Screen for One output



The contents for this output number are displayed.
Press the **ENT** Key and change the output number.

Screen for All outputs

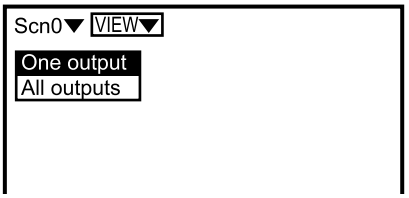


---is displayed for output numbers that have not been set.

Procedure

1. Select ***One output*** or ***All output***.

   Enter the View Mode and the selections will be displayed.



2. Press the **ENT** Key.

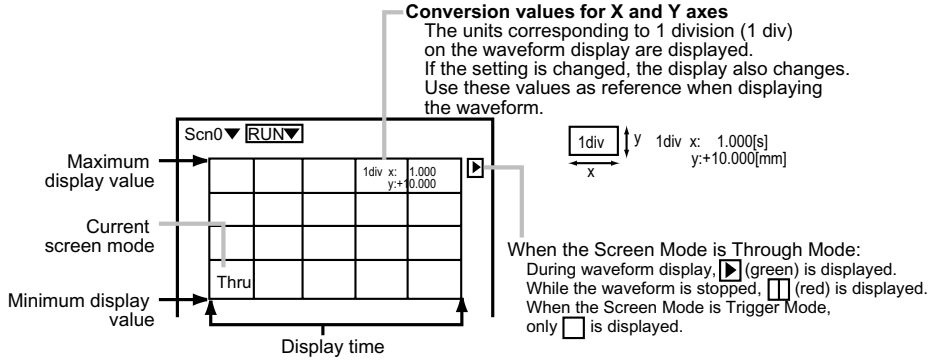
   The settings will be registered and the mode selection screen will be displayed.

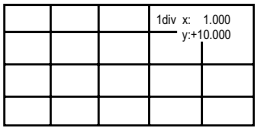
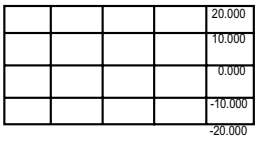
3. Press the **ESC** Key.

   The set contents will be displayed.

3-3-4 Changing the Trend Monitor's Display Contents (*Screen*)

This setting is possible only when the Trend Monitor is displayed.
Set the Screen Mode, the waveform display range, and the waveform display time.



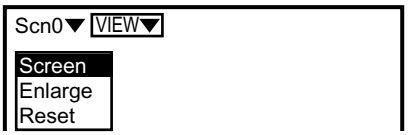
Item	Selection/Setting	Description
Mode	Thru	Displays the waveform obtained by the Sensor without any modifications. Select this to display the waveform for Trigger setting when making the Hold settings.
	Trigger	Displays a still waveform corresponding to the Trigger setting. (Updated when the trigger turns ON.) Select this mode when making Hold settings or checking the Trigger setting.
Maximum	-	Sets the upper limit of the displacement displayed on the screen. The default setting varies depending on the Sensor model connected.
Minimum	-	Sets the lower limit of the displacement displayed on the screen. The default setting varies depending on the Sensor model connected.
Time	0.05 to 30.00s (5.000s*) (If the CCD Mode is set to 1 line and the Fast Mode is set, the display time range is 0.05 to 16.87s.)	Sets the display time (X axis) for the waveform displayed on the screen.
Plot	Details*	Plots the waveform in more detail. This enables the waveform to be checked in more detail but the time required to update waveforms will increase.
	Simple	Plots the waveform at specified intervals. Less time is required to update waveforms than with the detailed plotting setting.
Z axis	DIV	The conversion value corresponding to 1 division is displayed. 
	Coord	The distance is displayed. 

The asterisk (*) indicates the default setting.

Procedure

1. Select ***Screen***.

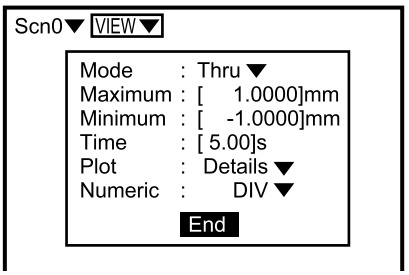
   A setting screen will be displayed.



2. Make the settings for each item.

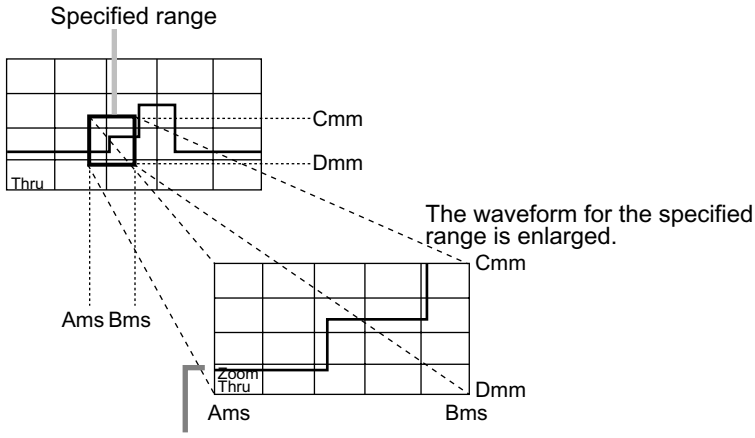
3. Select ***End***.

   The setting will be registered and the screen in (1.) will return.



3-3-5 Enlarging Waveforms in the Trend Monitor (*Waveform/Reset*)

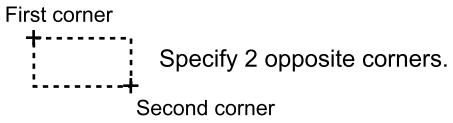
This setting is possible only when the Trend Monitor is displayed.
A specified range of the waveform is enlarged and so it is a useful feature for checking the waveform when making Hold settings.



While the waveform is enlarged, ***ZOOM*** is displayed.

Setting the Enlargement Range

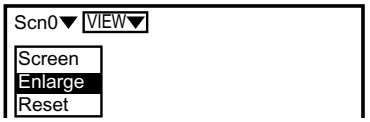
Specify a rectangle as the enlargement range.



Procedure

1. Select ***Waveform***.

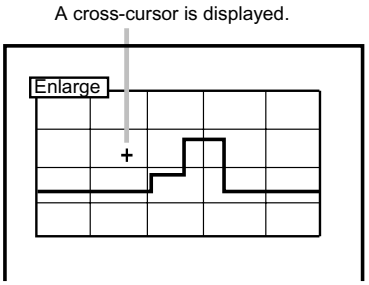
   The screen for setting the enlargement range will be displayed.



2. Specify the first corner (top-left) of the enlargement range.

   Move the cursor to the required position using the **Up**, **Down**, **Right**, and **Left** Keys.

   Use these keys together with the **SHIFT** Key to move the cursor quickly.



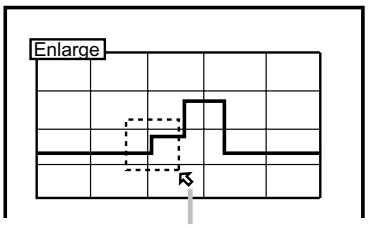
3. Press the **ENT** Key.

   The position of the first corner will be set and the screen for setting the second corner will be displayed.

   Specify the position of the second corner by repeating the procedure explained in (2.).

4. Press the **ENT** Key.

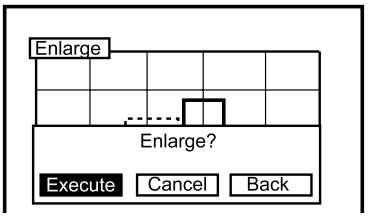
   The enlargement screen will be set and a confirmation screen will be displayed.



The cursor will change to an arrow at the second corner.

5. Select ***Execute***.

   The setting will be registered and the screen in (1.) will return.



6. Press the **ESC** Key twice.

   The enlarged waveform will be displayed.

Enlargement Reset

Return the enlarged waveform to its original setting.

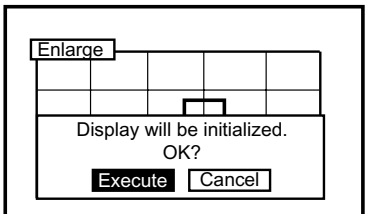
Procedure

1. Select ***Reset***.

   A confirmation screen will be displayed.

2. Select ***Execute***.

   The setting will be registered and the screen in (1.) will return.



3. Press the **ESC** Key twice.

   The default waveform will be displayed.

3-4 Useful Functions

3-4-1 Entering TOOL Mode

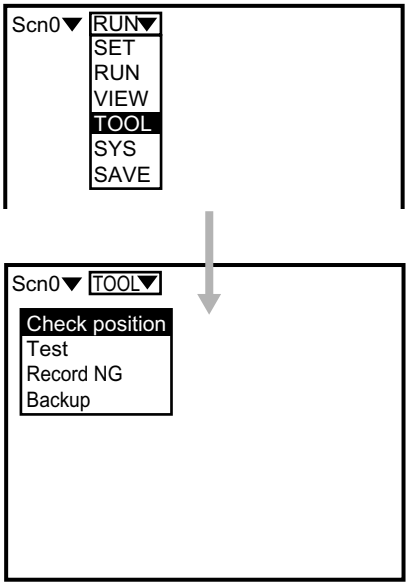
Procedure

1. Move the cursor to ***RUN*** ▼ and press the **ENT** Key.

   A mode selections screen will be displayed.

2. Select ***TOOL***.

   Tool mode selections will be displayed.



3-4-2 Checking the Sensor Mounting Status

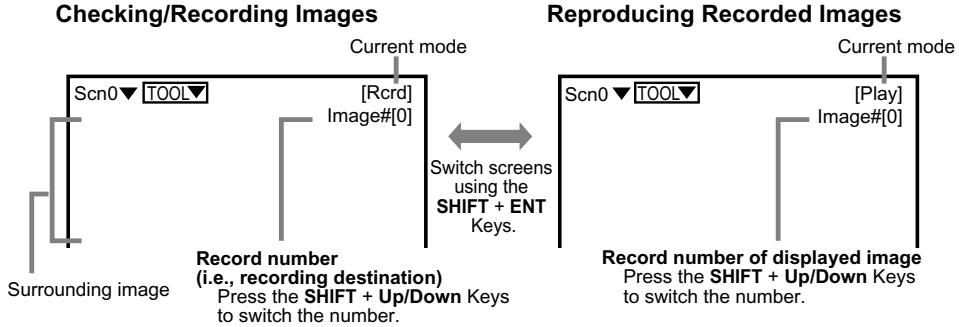
Information about the area the laser beam strikes can be displayed on screen, allowing confirmation of the Sensor's mounting conditions (i.e., whether or not it is mounted correctly).
Three items can be displayed, the surrounding images, the workpiece surface, and the workpiece brightness.
There is a function for recording the displayed image data for surrounding images and workpiece surfaces, and the data can be backed up to a computer.

Item	Number recorded	Backup	Description
Surrounding image	4	Supported	Displays images of the area surrounding the part that the laser beam strikes. Whether or not the laser beam strikes the part required for measurement can be checked on the screen.
Workpiece surface	4	Supported	Displays the state of the surface that the laser beam strikes. This function is effective when measuring features (i.e., the peak or bottom) of the workpiece. Whether or not the laser beam strikes the parts required for measurement can be checked on the screen.
Workpiece brightness	Not supported	Not supported	Displays the CCD reception amount. This function is effective for mirror reflection mounting. The Sensor can be mounted while monitoring the amount of light received.

Checking the Laser Beam Position *(Surrounding image)*

Displays images of the area surrounding the part that the laser beam strikes. Whether or not the laser beam strikes the part required for measurement can be checked on the screen.
This function is useful when the Sensor is mounted inside an installation and the measurement area cannot be checked directly.
Up to 4 images can be recorded (4 images in total for any of the 16 scenes). The recorded images can be backed up to a computer.

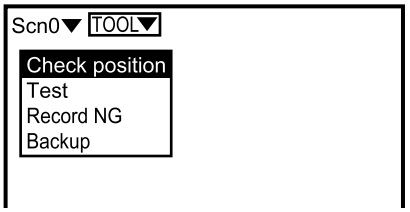
CHECK - If the Z300-S2T Sensor is connected, move the beam cover lever to the left.
Refer to page 27 in the *Setup Manual*.
- Recorded image data is cleared when the power supply is turned OFF. To save the data, back it up to a computer.
Refer to page 113.



Checking/Recording Images

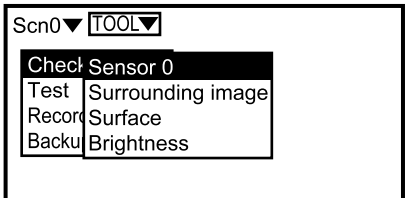
Procedure

1. Select ***Check position***.



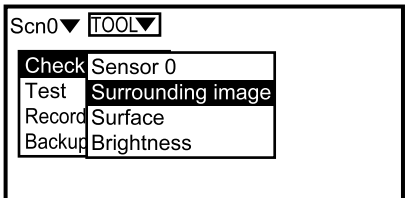
2. Select the Sensor number.

   Select the number of the Sensor for which the image is to be checked. This operation is unnecessary if there is only 1 Sensor connected.



3. Select ***Surrounding image***.

   The screen for recording images will be displayed.

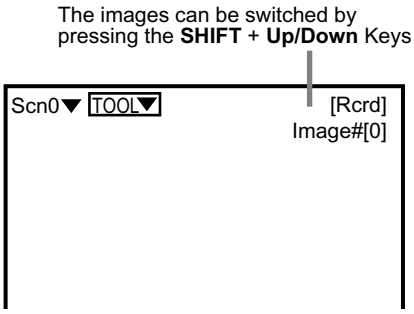


4. Select the (destination) record number.

   Press the **SHIFT** + **Up/Down** Keys to switch the number.

5. Press the **TRIG** Key.

   An image of the area surrounding the laser beam is displayed.



CHECK If the image is difficult to see clearly, change the shutter speed using the **Up** and **Down** Keys.
(Only effective in Recording Mode.)

Image ⟷ Lighter ⟷ Darker

Shutter time ⟷ 10S ⟷ 0.2S (Z300-S5T, Z300-S10, Z300-S60)
9S ⟷ 0.005S (Z300-S2T)

6. **When recording the image:**

   Press the **ENT** Key.

   The image will be recorded.
   To record more images, repeat (4.) to (6.) as appropriate.

   When not recording the image:

   After checking the image, go to (7.).

7. Press the **ESC** Key.

   The screen in (3.) will return.

Reproducing Recorded Images

Procedure

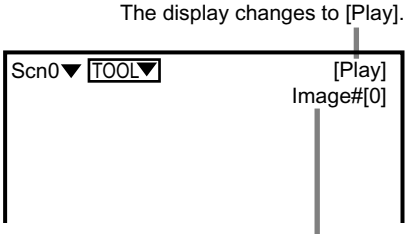
1. Perform the same operations as those described in (1.) to (3.) in the procedure for recording images.

2. Press the **SHIFT** + **ENT** Keys.

   The mode will switch to Play Mode.

3. Check the image.

   The images can be switched by pressing the **SHIFT** + **Up/Down** Keys.



4. Press the **ESC** Key.

   The screen in (3.) in the procedure for checking/recording images will return.

Backing Up Recorded Images to a Computer

Measurement images stored in memory can be saved to a personal computer in BMP format. Data is transferred using XMODEM (-CRC or -SUM) protocol. XMODEM(-1K) is not supported.
The settings and operation required at the computer are the same as those described in *3-4-5 Backing Up Data to a Computer*. The method for transferring data using Hyper Terminal is explained there as an example. Refer to that explanation if required.

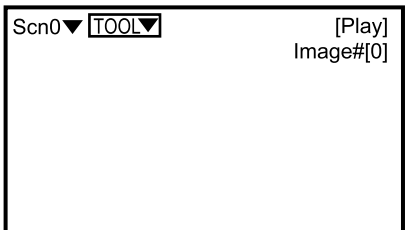
Refer to page 127.

CHECK The same communications settings must be used on both the Z300 and the modem on the personal computer.

Refer to page 137.

Procedure

1. Display the screen for Play Mode.

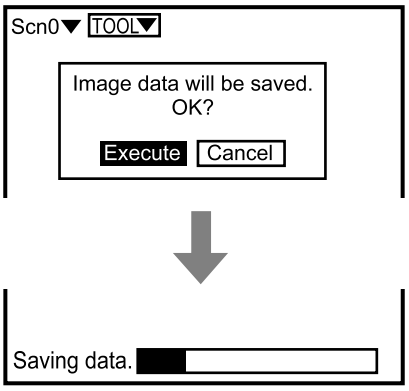


2. Display the image to be backed up.

   The images can be switched by pressing the **SHIFT** + **Up/Down** Keys.

3. Press the **ENT** Key.

   A confirmation screen will be displayed.



4. Select ***Execute***.

   A screen showing the transfer progress will be displayed.

5. Upload the data at the computer.

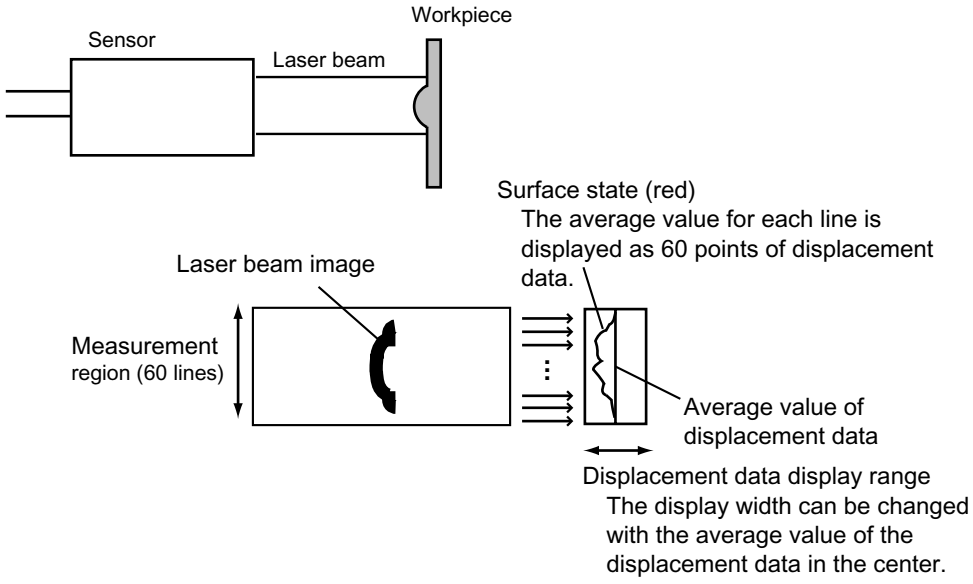
   Upload the data to the computer using Hyper Terminal or other communications software.

Monitoring the Workpiece Surface (Surface)

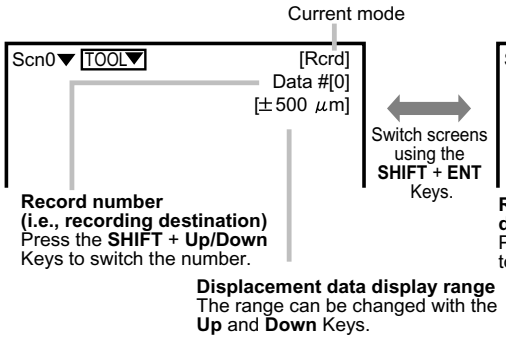
The state of the surface that the laser beam strikes can be displayed.
This function is effective when measuring features (i.e., the peak or bottom) of the workpiece. Whether or not the laser beam strikes the parts required for measurement can be checked on the screen.
Up to 4 images of displacement data can be recorded (4 images in total for any of the 16 scenes).
The recorded data can be backed up to a computer.

CHECK The recorded data is cleared when the power supply is turned OFF. To save the data, back it up to a computer.

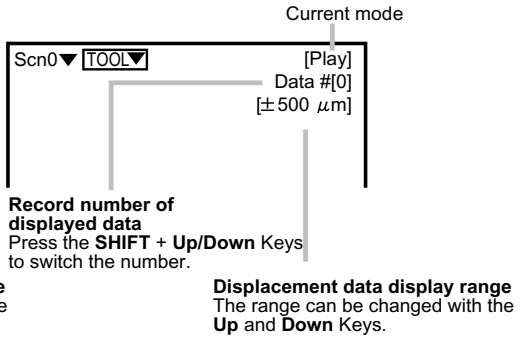
Refer to page 117.



Checking/Recording Data



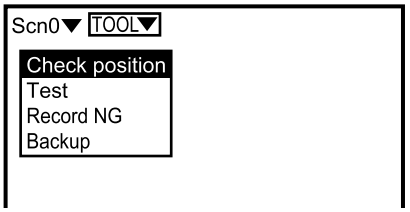
Reproducing Recorded Images



Checking/Recording Data

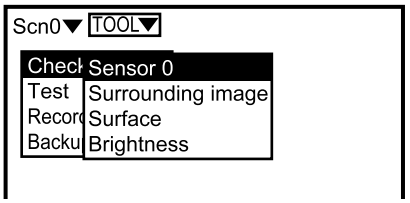
Procedure

1. Select ***Check position***.



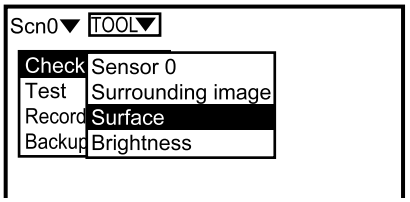
2. Select the Sensor number.

   Select the number of the Sensor for which the surface state is to be checked. This operation is unnecessary if there is only 1 Sensor connected.



3. Select ***Surface***.

   The displacement data will be displayed.



4. Select the (destination) record number.

   Press the **SHIFT** + **Up/Down** Keys to switch the number.

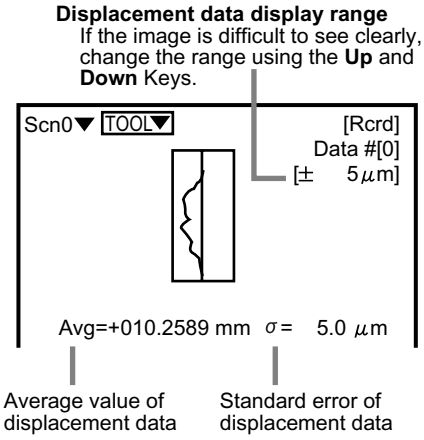
5. **When recording the data:**

   Press the **ENT** Key.

   The data will be recorded.
   To record more data, repeat (4.) to (6.) as appropriate.

   When not recording the data:

   After checking the data, go to (6.).



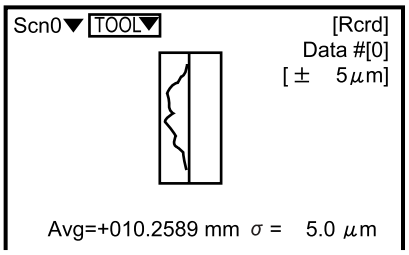
6. Press the **ESC** Key.

   The screen in (3.) will return.

Reproducing Recorded Images

Procedure

1. Perform the same operations as those described in (1.) to (3.) in the procedure for checking/recording data.

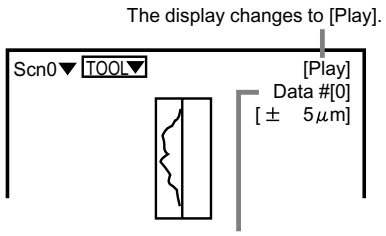


2. Press the **SHIFT** + **ENT** Keys.

   The mode will switch to Play Mode.

3. Check the data.

   Press the **SHIFT** + **Up/Down** Keys to switch data.



Record number for the currently displayed data
Press the **SHIFT** + **Up/Down** Keys to switch the number.

4. Press the **ESC** Key.

   The screen in (3.) in the procedure for checking/recording data will return.

Backing Up Recorded Data to a Computer

The workpiece surface state that is displayed, is obtained by plotting displacement data. If the displacement data is transferred to a computer and then converted into graph format, the state of the workpiece surface can be reproduced. Data transfer is performed in RS-232C no-protocol format.
The output format is shown below.

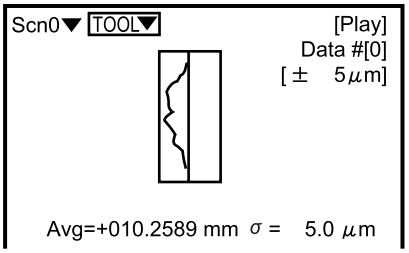
CHECK The same communications settings must be used on both the Z300 and the modem on the personal computer.
Refer to page 137.

Procedure

1. Display the screen for Play Mode.

2. Display the data to be backed up.

   Press the **SHIFT** + **Up/Down** Keys to switch data.

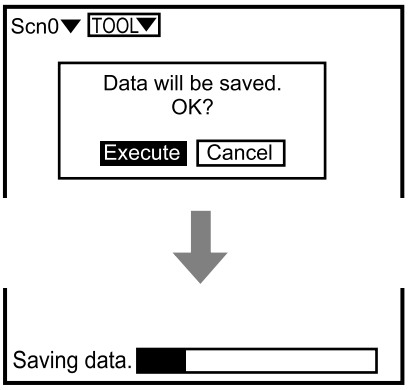


3. Press the **ENT** Key.

   A confirmation screen will be displayed.

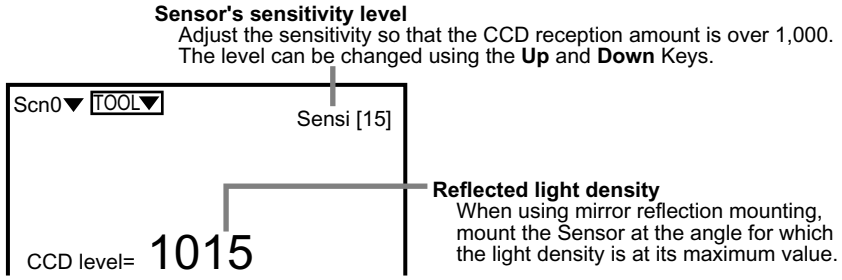
4. Select ***Execute***.

   A screen showing the transfer progress will be displayed.



Checking the Reflection Density of the Workpiece (Brightness)

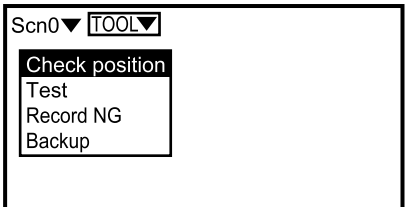
Displays the CCD reception amount. This function is effective for mirror reflection mounting. The Sensor can be mounted while monitoring the amount of light received.



CHECK When performing measurement with the mirror reflection mounting method, set ***Sensor*** mounting under ***SYS/Environment*** to ***Mirror***.
Refer to page 140.

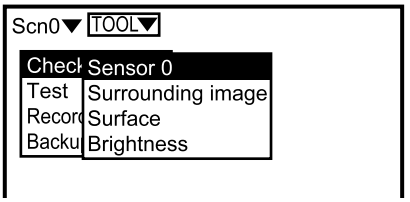
Procedure

1. Select ***Check position***.



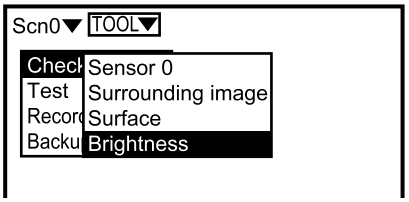
2. Select the Sensor number.

   Select the number of the Sensor for which the image is to be checked. This operation is unnecessary if there is only 1 Sensor connected.



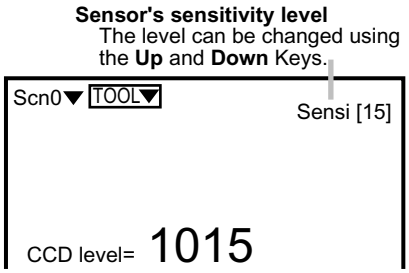
3. Select ***Brightness***.

   The reflected light density is displayed.



4. Adjust the angle at which the Sensor is mounted.

   While checking the monitor display, mount the Sensor at the angle for which the light density is at its maximum value.



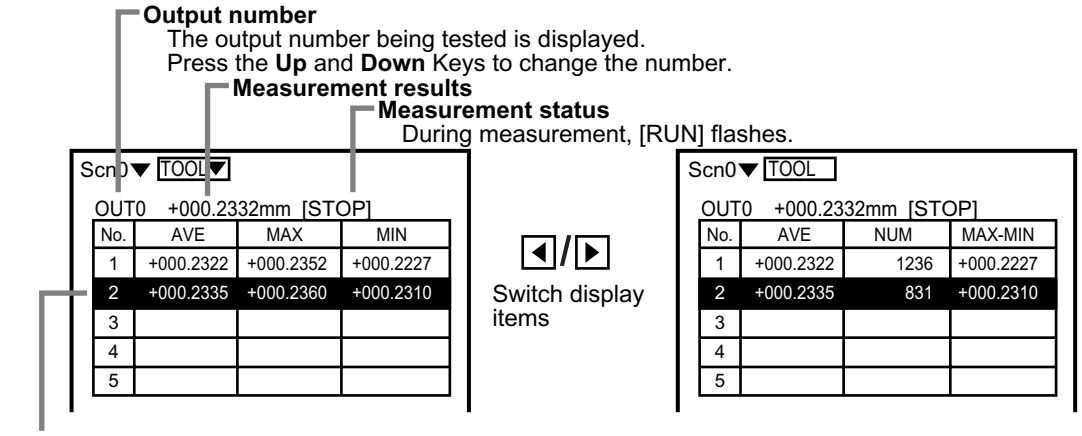
5. Press the **ESC** Key.

   The screen in (3.) will return.

3-4-3 Performing Test Measurement (*Test*)

Use the procedure described below to perform test measurement with the set measurement conditions.
Measurement can be started and stopped Ågstopwatch-styleÅh from the Console.

CHECK - Measurement values are only displayed. They cannot be output to external devices.
- During test measurement, settings for the Hold function and HPF are disabled.



Item	Description
AVE	Displays the average measurement value for the test measurement period.
MAX	Displays the maximum measurement value for the test measurement period.
MIN	Displays the minimum measurement value for the test measurement period.
NUM	Displays the number of measurements performed during the test measurement period.
MAX-MIN	Displays the difference between the maximum and minimum measurement values for the test measurement period.

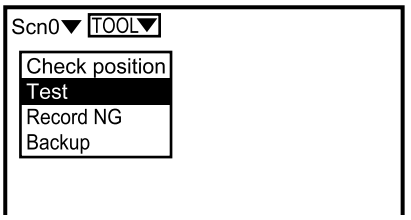
CHECK Up to 5 sets of measurement results can be displayed in list format. This feature is useful for the following.
– Comparing measurements for different items
– Comparing the still state and moving state
– Evaluating repeat accuracy

Procedure

1. Select ***Test***.

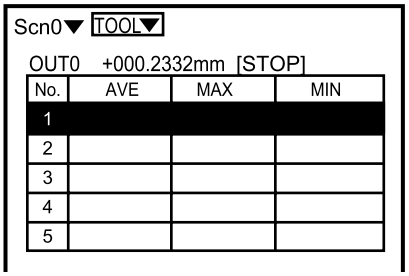
   The test measurement screen will be displayed.

   Place the workpiece to be tested.



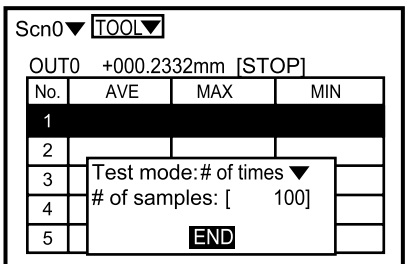
2. Press the **ENT** Key.

   The menu for setting the number of measurements will be displayed.



3. Set ***Test*** Mode to ***# of times***.

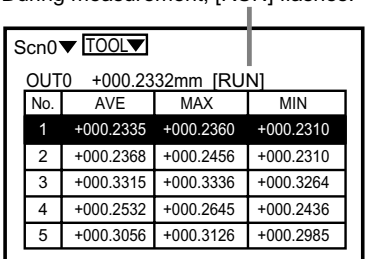
4. Make the required setting for ***# of samples*** and select ***End***.



5. Press the **TRIG** Key.

   Test measurement is performed for the number of times set.
   Press the **TRIG** Key again to stop test measurement before completion.

When measurement starts, the display changes from [STOP] to [RUN].
During measurement, [RUN] flashes.



Switch display items using the **Left** and **Right** Keys.

CHECK Press the **SHIFT** + **ESC** Keys to clear the test result display.

6. Press the **ESC** Key.

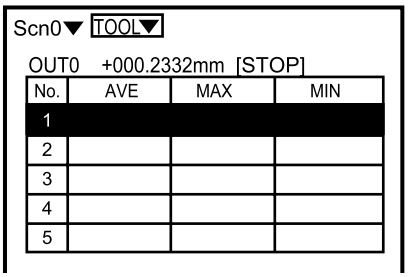
   The screen in (1.) will return.

Starting and Stopping Test Measurement Using the TRIG Key

1. Display the test measurement screen.

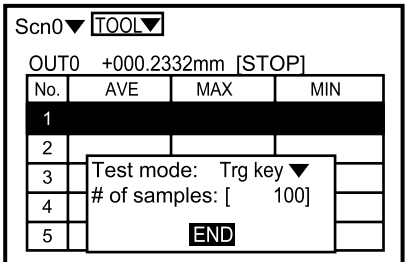
2. Press the **ENT** Key.

   The screen for selecting the Test Mode will be displayed.



3. Set the ***Test*** Mode to ***Trg key***.

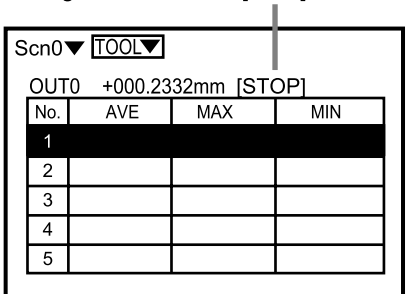
4. Select ***End***.



5. Press the **TRIG** Key.

   Measurement starts.

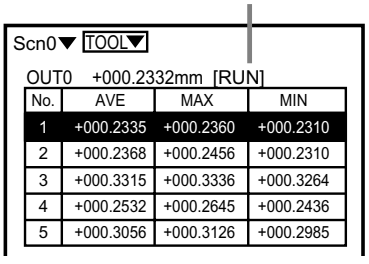
When measurement starts, the display changes from [STOP] to [RUN]. During measurement, [RUN] flashes.



6. Press the **TRIG** Key.

   Measurement will be stopped and the measurement results will be displayed.
   To continue testing, repeat (5.) and (6.).

When measurement ends, the display changes from [RUN] to [STOP].



Switch display items using the **Left** and **Right** Keys.

3-4-4 Recording NG Data

The Z300 has a function for recording up to 20 items (in total for any of the 16 scenes) of information (laser beam image and waveform) when an NG judgement (HIGH, LOW, or ERROR) occurs for a specified output number.

CHECK The recorded NG data is cleared when the power supply is turned OFF or the scene is changed. To save the data, back it up to a computer.
Refer to page 124.

Setting the Recording Conditions (*Set*)

Set the conditions for recording NG data.

Item	Selections	Description
NG record	**OFF***	No NG data is recorded.
	ON	NG data is recorded (when NG occurs).
Recorded output	**OUT0* OUT1 OUT2 OUT3**	Select the output number for which the NG data is recorded.
Recording method	**First NG ***	Starting from the first NG, 20 items are recorded. Any subsequent NGs are not recorded. Even if NGs continue to occur, the data for the first NG can still be reviewed.
	New NG	Data is recorded for all NGs that occur. Once 20 items have been recorded, previous items are overwritten in order. The data for the most recent NG can always be reviewed.

The asterisk (*) indicates the default setting.

CHECK
- If ***Record NG*** is set to ON, the measurement image and waveform for the item currently being measured will not be displayed. Instead, the most recently recorded NG image and its waveform will be displayed. The recorded waveform can be enlarged.
- Data is recorded at intervals equal to the display time in [***VIEW/Screen***] settings in the Trend Monitor. If NGs occur continuously, data is recorded at these intervals. When recording NG data, set this time to at least 1 s.
Refer to page 105.
- If the averaging number set in ***Avg/Filter*** in SET Mode is set to any value other than 1, averaged measurement values are output and so there may be inconsistencies between the measurement value at the time the NG occurred and the NG image.

Procedure

1. Select ***Record NG***.

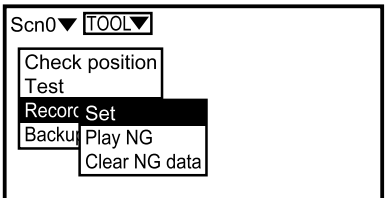
2. Select ***Set***.

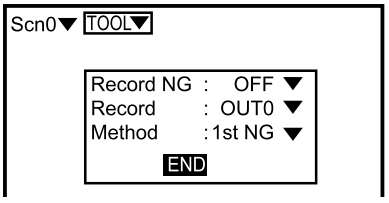
   A setting screen will be displayed.

3. Make the settings for each item.

4. Select ***End***.

   The setting will be registered and the screen in (2.) will return.

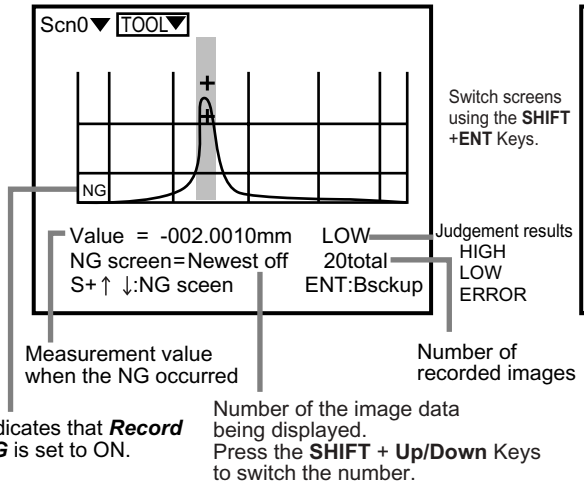




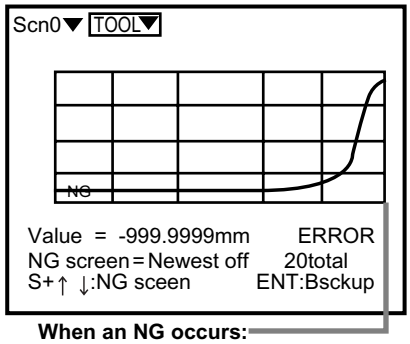
Displaying Recorded NG Images *(Play NG)*

By reproducing recorded NG images and their waveforms, the state when the NG occurred can be confirmed. Reproduced images and waveforms can also be backed up to a computer.

Image Monitor
The laser beam image and the line brightness graph when the NG occurred are displayed



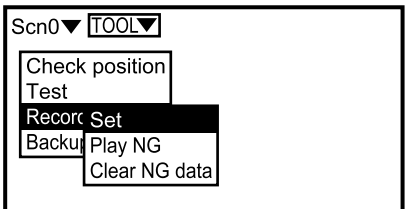
Trend Monitor
The waveform when the NG occurred is displayed



When an NG occurs:
Starting from the NG, the past waveform is displayed.
The display time is equal to the time set in the display settings set under **[*VIEW*/*Screen*]** in VIEW Mode.

Procedure

1. Select ***Record NG***.



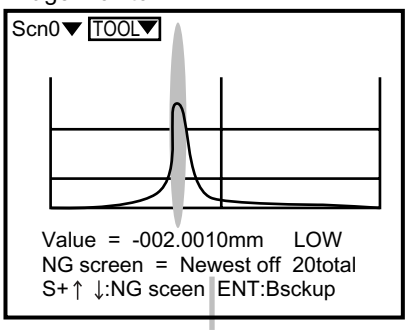
2. Select ***Play NG***.

   An NG image will be displayed.

3. Check the image.

   Images can be switched by pressing the **SHIFT** + **Up/Down** Keys.
   The screen type can be switched by pressing the **SHIFT** + **Left/Right** Keys.

Image Monitor



4. Press the **ESC** Key.

   The screen in (3.) will return.

Backing Up Recorded Images to a Computer

Measurement images stored in memory can be saved to a personal computer in BMP format. Data is transferred using XMODEM (-CRC or -SUM) protocol. XMODEM(-1K) is not supported. The settings and operation required at the computer are the same as those described in *3-4-5 Backing Up Data to a Computer*. The method for transferring data using Hyper Terminal is explained there as an example. Refer to that explanation if required.

Refer to page 127.

CHECK The same communications settings must be used on both the Z300 and the modem on the personal computer.

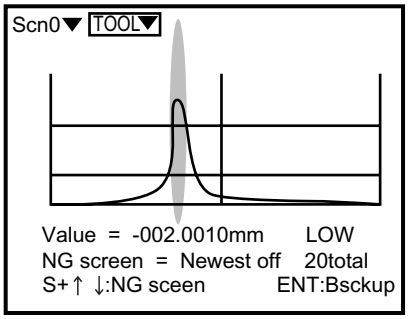
Refer to page 137.

Procedure

1. Display the Image Monitor in Play Mode.

2. Display the image to be backed up.

   Images can be switched by pressing the **SHIFT** + **Up/Down** Keys.

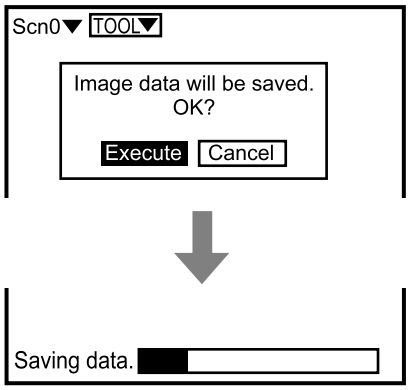


3. Press the **ENT** Key.

   A confirmation message will be displayed.

4. Select ***Execute***.

   A screen showing the transfer progress will be displayed.



5. Upload the data at the computer.

   Upload the data to the computer using Hyper Terminal or other communications software.

Backing Up NG Waveforms to a Computer

Waveforms are created by plotting measurement values in chronological order. If all the measurement points are transferred to a computer and converted in graph format, the waveform can be reproduced at the computer.
Data transfer is performed in RS-232C no-protocol format.
The output format is shown below.

Number of data items *delimiter*
Display time *delimiter*
Measurement result *delimiter*
- (Data items)

Judgement result *delimiter*
OK *delimiter*

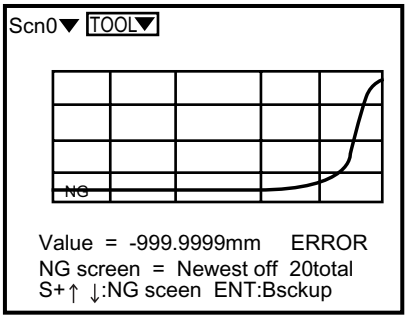
CHECK The same communications settings must be used on both the Z300 and the modem on the personal computer.
Refer to page 137.

Procedure

1. Display the Trend Monitor for Play Mode.

2. Display the image to be backed up.

   Images can be switched by pressing the **SHIFT** + **Up/Down** Keys.

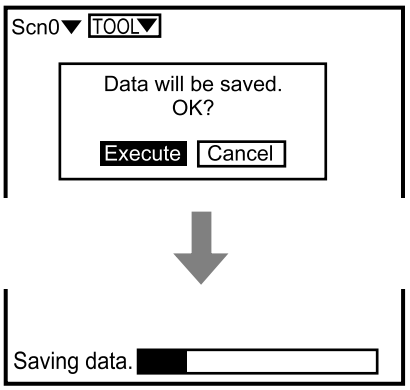


3. Press the **ENT** Key.

   A confirmation message will be displayed.

4. Select ***Execute***.

   A screen showing the transfer progress will be displayed.

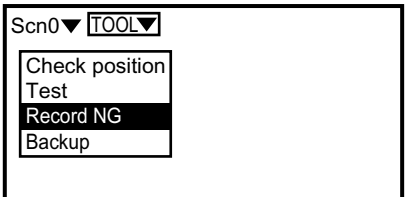


Clearing Recorded NG Data (*Clear NG data*)

All of the recorded NG data is cleared.

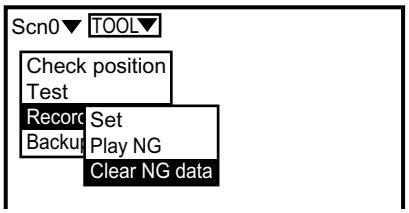
Procedure

1. Select ***Record NG***.



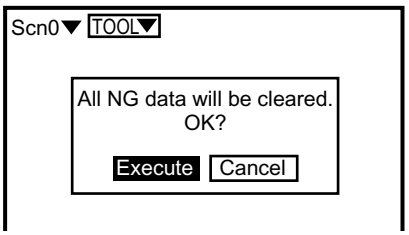
2. Select ***Clear NG data***.

   A confirmation screen will be displayed.



3. Select ***Execute***.

   The data will be cleared and the screen in (2.) will return.

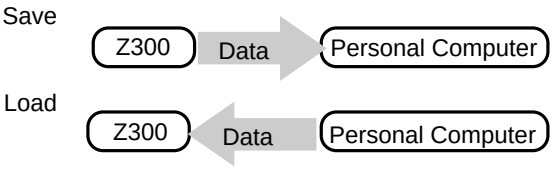


3-4-5 Backing Up Data to a Computer *(Backup)*

Saving/Loading Settings to/from a Computer

Settings for the 3 categories shown below can be saved to or loaded from a computer.
This is a useful function for making the same settings on another device. Also, as a countermeasure against data corruption and equipment failure, it is recommended that settings are backed up to a computer.

Selection	Description
Scene	Saves or loads the settings under SET in scene units.
System	Saves or loads the settings under SYS in scene units.
System + Scene	Saves or loads both system and scene data (0 to 15) together.



Example of Operation at the Computer

This section describes data transfer procedures, using Hyper Terminal, a standard tool for Windows 95/98 and Windows NT4.0.
This example is based on the presumption that an RS-232C cable has been connected to the COM1 port on the personal computer. Make the necessary adjustments when the cable is connected to a different port. If using different communications software, refer to the relevant manual.
Data is transferred using XMODEM (-CRC or -SUM) protocol. XMODEM (-1K) is not supported.

Notice Do not turn OFF the power or input a RESET signal while a message is being displayed in any save or load operation. Data in memory will be destroyed, and the Z300 may not operate correctly the next time it is started.

CHECK **Saving/Loading When 2 Sensors of Different Models are Connected**

Saving

There are restrictions on the scenes that can be used and so assign file names so that the scene numbers can be identified.

Loading

Load data for scenes with even numbers to scenes with even numbers and load data for scenes with odd numbers to scenes with odd numbers, otherwise loading will not be possible.

Example 1: Saving Scene Data to a Computer

Number of scene to be saved: Scene 0

Procedure

1. Connect the RS-232C cable to the COM1 port on the personal computer and the RS-232C port on the Z300.

2. Start the Hyper Terminal program on the computer and make the following communications settings.

   The same communications settings must be used on both the Z300 and the modem on the computer.

Item	Setting
Speed (B)	38400 (bps)
Data bits (D)	8 (bit)
Parity bit	None
Stop bits	1 (bit)
Flow control	None (Xmodem protocol is used.)

3. Make the Z300 communications settings.

   The default communications settings are as shown in the following table. These settings can normally be used.
   Refer to page 137.

Item	Setting
Baud rate	38400 (bps)
Data length	8 (bit)
Parity bit	None
Stop bits	1 (bit)
Delimiter	CR

4. Select ***Backup***.

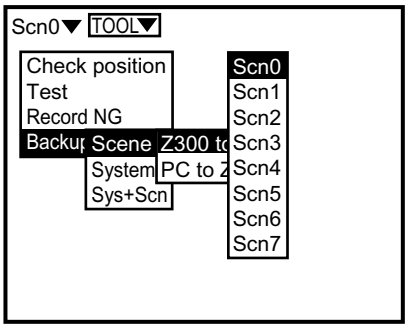
   The selections will be displayed.

5. Select ***Scene***.

   The selections will be displayed.

6. Select ***Z300 to PC***.

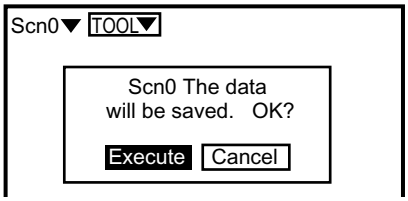
   The selections will be displayed.



7. Select ***Scn 0***.

   A confirmation message will be displayed.

8. Select ***Execute***.



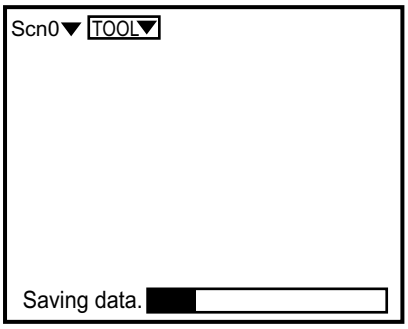
9. Select ***Transfer/Receive File*** from

   the Hyper Terminal menu on the computer.

   - Specify where the file is to be saved.
   - Set the protocol to ***Xmodem***.

10. Click ***Receive*** and input the file name.

    A screen showing the transfer progress will be displayed. When saving has been completed, the screen in (4.) will return.



CHECK During communications, the Z300 will generate a timeout error if there is no response from the external device for more than 110 s. An error message will be displayed on the screen.

Example 2: Loading Scene Data from a Computer

Number of scene to be loaded to: Scene 2

Procedure

1. Follow steps 1 to 3 in the above procedure to connect the Z300 and the personal computer.

2. Select ***Backup***.

   The selections will be displayed.

3. Select ***Scene***.

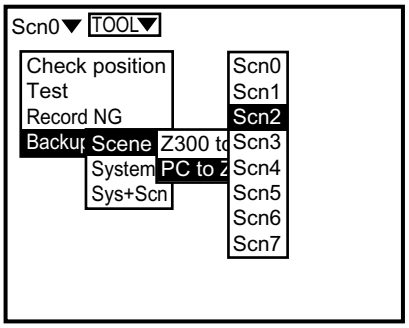
   The selections will be displayed.

4. Select ***PC to Z300***.

   The selections will be displayed.

5. Select ***Scn 2***.

   A confirmation message will be displayed.



6. Select ***Transfer/Send File*** from the Hyper Terminal menu on the computer.

   •Select the file to be loaded.

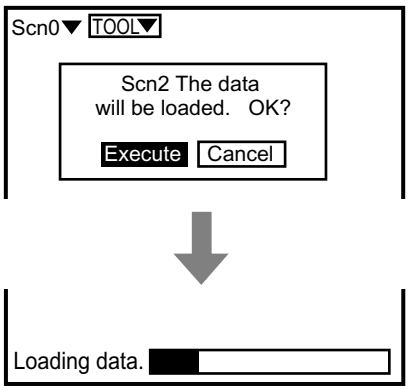
   •Set the protocol to ***Xmodem***.

7. Click ***Send***.

   The data transfer screen will be displayed.

8. Select ***Execute*** on the Z300.

   A screen showing the transfer progress will be displayed. When loading has been completed, the screen in (2.) will return.



CHECK During communications, the Z300 will generate a timeout error if there is no response from the external device for more than 130 s. An error message will be displayed on the screen.

3-5 System Settings

This section describes how to set conditions related to the system environment.

3-5-1 Entering System Mode

To set conditions related to the system environment, it is necessary to enter System Mode.

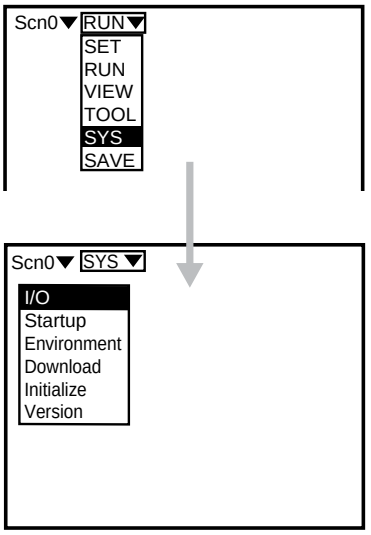
Procedure

1. Move the cursor to ***RUN*** ▼ and press the **ENT** Key.

   A list of mode will be displayed.

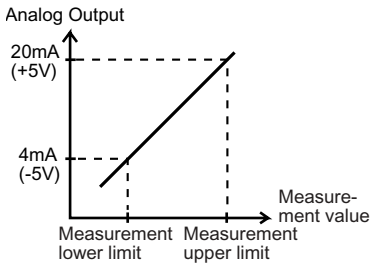
2. Select ***SYS***.

   The System Mode selections will be displayed.



3-5-2 Setting the Range for Analog Outputs *(Analog)*

Use the procedure explained below to set the measurement values corresponding to the upper limit (20 mA/5 V) and lower limit (4 mA/-5 V) for analog output. This setting enables output to be scaled (e.g., 1 mm corresponds to 1 mA) as required.
Set both the analog output and judgement values so that the upper limit is greater than the lower limit.

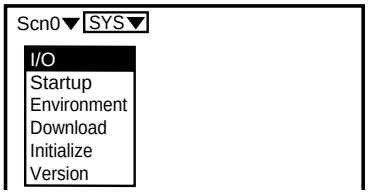


Item	Selection/Setting	Description
Output	OUT0 to OUT3 (OUT0*)	Selects the output number to be set.
4mA (-5V)	-999.999 to 999.999mm	Sets the lower limit for the analog output measurement range. The default setting varies depending on the Sensor model connected.
20mA (+5V)	-999.999 to 999.999mm	Sets the upper limit for the analog output measurement range. The default setting varies depending on the Sensor model connected.

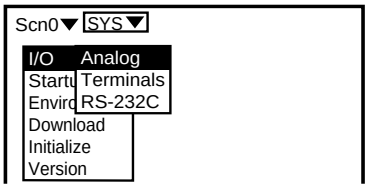
The asterisk (*) indicates the default setting.

Procedure

1. Select ***I/O***.



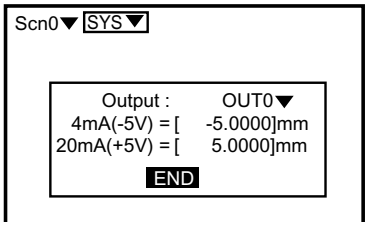
2. Select ***Analog***.



3. Make the settings for each item.

4. Select ***End***.

   The setting will be registered and the screen in (2.) will return.



3-5-3 Outputting Judgement Results to the Terminal Block *(Terminals-Judgement)*

With the Z300, judgement results and measurement values can be output via the terminal block.
The settings and procedure required for outputting judgement results are explained below. The settings are enabled for all output numbers.

For details on terminal block outputs, refer to page 150.

Output

Judgement results (HIGH, PASS, Low or ERROR) for the measurement values of OUT0, OUT1, OUT2, and OUT3 are output.

Settings

The same communications settings must be used on both the Z300 and the external device.

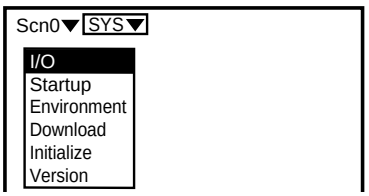
Item	Selection	Description
OFF Delay	0 to 99999 (0*)	Set the OFF delay time N (sampling time × N). Set a time that allows the external device to input the result.
GATE ON delay (#)	1.0 to 1000.0ms (1.0ms*)	Set the time from when the result is output to the terminals to when the GATE signal is turned ON.
GATE ON time (#)	1.0 to 1000.0ms (5.0ms*)	Set the length of time that GATE signal remains ON. Set a value so that the external device can obtain the measurement result.

The asterisk (*) indicates the default setting.

(#) The GATE signal is output only when the Hold function is set.
If the Hold function is not set, the GATE signal will always stay OFF regardless of the settings of the GATE ON delay and GATE ON time.

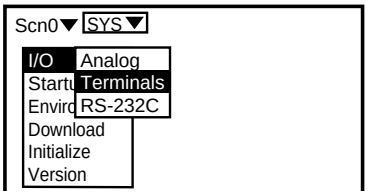
Procedure

1. Select ***I/O***.



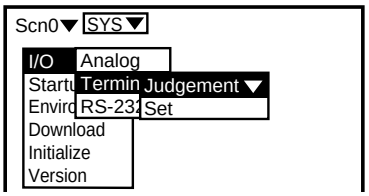
2. Select ***Terminals***.

   The selections will be displayed.



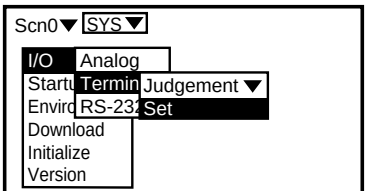
3. Confirm that ***Judgement*** is selected.

   If ***Measurement*** is selected, change the selections. The selections can be displayed by moving the cursor to ▼ and pressing **ENT** Key.



4. Select ***Set***.

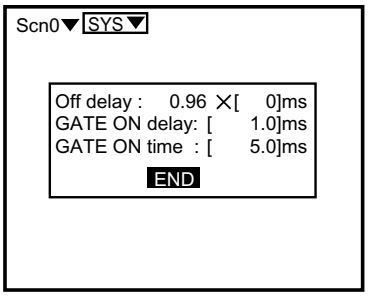
   A setting screen will be displayed.



5. Make the settings for each item.

6. Select ***End***.

   The setting will be registered and the screen in (4.) will return.



3-5-4 Outputting Measurement Values to the Terminal Block *(Terminals- Measurement)*

With the Z300, judgement results and measurement values can be output via the terminal block.
The settings and procedure required for outputting measurement values are explained below.

For details on terminal block outputs, refer to page 146.

Output

The measurement results for OUT0, OUT1, OUT2, and OUT3 are output.

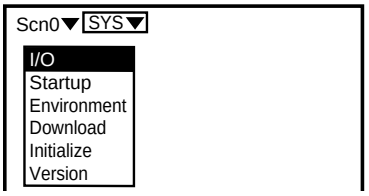
Settings

Item	Selection	Description
Number	Consecutive	Continuously outputs the measurement values for output numbers for which equations are set. The output order is: OUT0→OUT1→OUT2→OUT3.
	OUT0* OUT1 OUT2 OUT3	Outputs the measurement values for the selected output number.
Period	1 to 9999 (20*)	Set the period N for outputting the measurement value (Sampling time x N). Set a value that is greater than the "Gate ON delay + GATE ON time + 3 ms."
Digits	XXXX.X XXX.XX XX.XXX X.XXXX	Specify the number of digits of the output measurement value. The items displayed and the default setting vary depending on the Sensor model connected. With the Z300, 5 digits out of the 7 digits displayed on the monitor can be output in signed binary format. Set which 5 digits are output in relation to the decimal point. Example: Measurement value: +123.4567 Digit specification : XXX.XX→+123.45 is output. XX.XXX→+23.456 is output. X.XXXX→+3.4567 is output.
GATE ON delay	1.0 to 1000.0ms (1.0ms*)	Set the time from when the measurement value is output to the terminals to when the GATE signal is turned ON.
GATE ON time	1.0 to 1000.0ms (5.0ms*)	Set the length of time that the GATE signal remains ON. Set a value so that the external device can obtain the measurement result.

The asterisk (*) indicates the default setting.

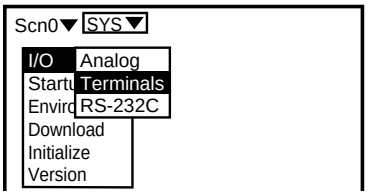
Procedure

1. Select ***I/O***.



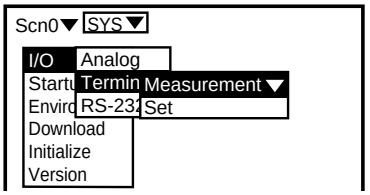
2. Select ***Terminals***.

   The selections will be displayed.



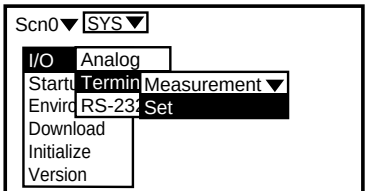
3. Confirm that ***Measurement*** is selected.

   If ***Judgement*** is selected, change the selection. The selections can be displayed by moving the cursor to ▼ and pressing **ENT** Key.



4. Select ***Set***.

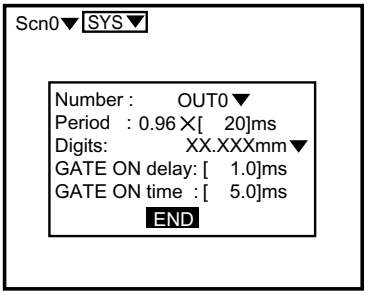
   A setting screen will be displayed.



5. Make the settings for each item.

6. Select ***End***.

   The setting will be registered and the screen in (4.) will return.



3-5-5 Setting Communications Specifications (RS-232C)

This section describes the communications settings used for the RS-232C port. The same communications settings must be used on both the Z300 and the external device.

For details on I/O Format, refer to page 157.

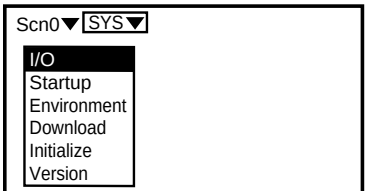
Item	Selection	Description
Baud rate	2400, 4800, 9600, 19200, 38400* bps	Set the same settings that are set in the personal computer.
Data length	7, 8* bit	
Parity bit	None*, even, odd	
Stop bits	1*, 2 bit	
Delimiter	CR*, LF, CR+LF	
Flow control	None*	Flow control is not performed.
	RS/CS	Flow control performed by the hardware. Use a cable that connects the Z300 and the RS signals and CS signals from the external device. Data is sent when the CS signal from the external device is ON.
	Xon/Xoff	Flow control performed by the software. Data is sent in accordance with the Xon/Xoff code sent from the external device.
Out on Hold	None*	The result for the RS-232C command input is output to RS-232C. If the Hold function is used, nothing is output.
	Value	If the Hold function is used, measurement results are output to RS-232C with the trigger-OFF timing. The output format is the same as the MEASURE command. Refer to page 166.
	Result	If the Hold function is used, judgement results are output to RS-232C with the trigger-OFF timing. The output format is the same as the JUDGE command. Refer to page 165.
	Value+Result	If the Hold function is used, judgement results and measurement results are output to RS-232C with the trigger-OFF timing. The output format is as follows. If ***Number*** is set to ***OUT0***, ***OUT1***, ***OUT2***, or ***OUT3***: Judgement result, measurement result delimiter If ***Number*** is set to ***OUT 0 to 3***: 0, judgement result, measurement result delimiter 1, judgement result, measurement result delimiter 2, judgement result, measurement result delimiter 3, judgement result, measurement result delimiter Judgement results are output using the figure below: PASS : 0 HI : 1 LOW : 2 ERROR : 3
OUT setting	OUT0*	If the Hold function is used, select the output number(s) for which the result is output to RS-232C.
	OUT1	
	OUT2	
	OUT3	
	OUT0 to 3	

The asterisk (*) indicates the default setting.

- ***Out on Hold*** is set to anything other than ***None***, RS-232C commands will not be received.
- If the trigger turns OFF while the results are being sent, it will not be possible to return the result properly. Ensure that the trigger turns OFF after the result has been received.

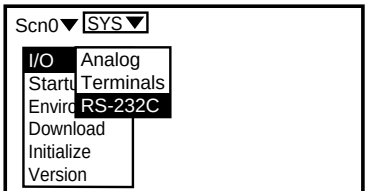
Procedure

1. Select ***I/O***.



2. Select ***RS-232C***.

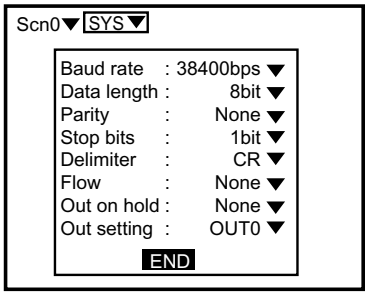
   A setting screen will be displayed.



3. Make the settings for each item.

4. Select ***End***.

   The setting will be registered and the screen in (2.) will return.



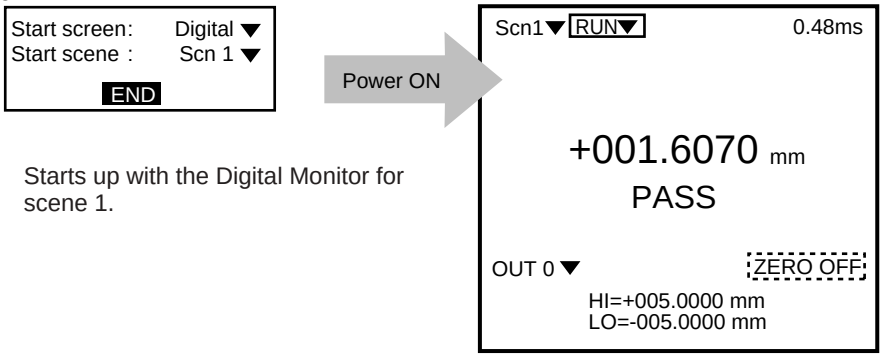
3-5-6 Setting Startup Conditions *(Startup)*

The scene number and the type of screen that are displayed when the power supply is turned ON can be set.

Item	Selections
Startup screen	Image Monitor*, Digital Monitor, Trend Monitor
Startup scene	Scene 0 to 15 (Default: 0)

The asterisk (*) indicates the default setting.

Example



Starts up with the Digital Monitor for scene 1.

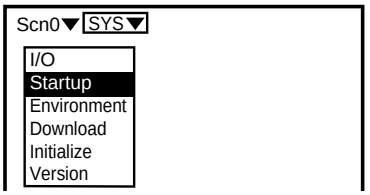
CHECK The startup scene setting is enabled when ***Environment/Scene*** is set to ***Console***. It is disabled if the setting is ***Terminals***.

For details on setting methods, refer to page 140.

Procedure

1. Select ***Startup***.

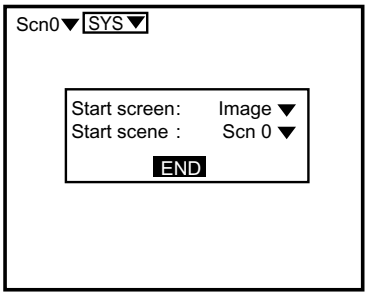
   A setting screen will be displayed.



2. Make the settings for each item.

3. Select ***End***.

   The setting will be registered and the screen in (1.) will return.



3-5-7 Environment Settings

Environment settings for the Z300's system can be made using the items shown below.

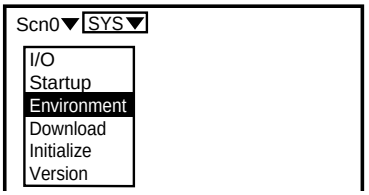
Item	Selection	Description
SET menu	Application* Expert	Select the menu used to set the measurement conditions.
Sensor	Diffuse* Mirror	Select the Sensor mounting method. Select the item that corresponds to the mounting method used for the Sensor connected.
Monitor	Color* Mono	Select the type of monitor connected.
Scene	Console* Terminals	Select whether scene changing is performed on the Console or using the terminal block.
Digit	0.01µm 0.1µm 1µm 10µm 100µm 1mm	Select the lowest digit of measurement values displayed on the monitor. This setting applies to the monitor display only, and has no influence on the digits output to the terminal block or RS-232C. The selections displayed and the default setting vary depending on the Sensor model connected.
Protection	OFF* ON	Applies protection for operations performed on the Image Monitor, Digital Monitor, and Trend Monitor screens. If this setting is set to ON, the following operations are not possible. •Selecting output numbers •Setting judgement values (HI, LO) •Execution of Force-zero
Download	ON OFF*	The Z300 acquires information from the sensor at startup. The startup time can be shortened by downloading this information into the controller and storing it. •ON The information stored inside the controller is acquired at startup. The startup time will be shortened by comparison to when the OFF function is used. •OFF Information is acquired via the sensor connection at startup. The startup time will be longer (default setting) than when the ON function is used. ***Notice*** To replace the sensor for connection to the controller, perform the following procedure: 1. Turn OFF the download function. 2. Replace the sensor. 3. Download the new sensor information. 4. Turn ON the download function. If the sensor is replaced when the download function is ON, measurements cannot be taken correctly with the new sensor, because the old sensor information (such as the measurement range) is still stored. Also, perform the above procedure when a sensor of the same model is used to replace the existing sensor.
Sensor 0 extension cable	0 to 18 (0*)	This item is displayed only when the Z300-S60 is connected. Set the length of the extension cable used for each Sensor number displayed. Set it to 0 m if extension cables are not used.
Sensor 1 extension cable		

The asterisk (*) indicates the default setting.

Procedure

1. Select ***Environment***.

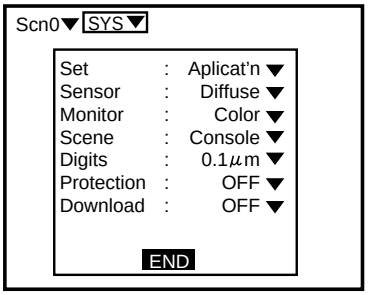
   A setting screen will be displayed.



2. Make the settings for each item.

3. Select **End**.

   The setting will be registered and the screen in (1.) will return.

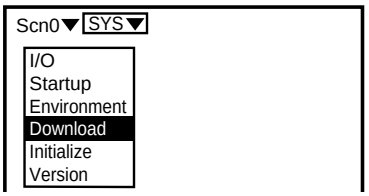


3-5-8 Downloading the Sensor Information to the Controller

When the download function is ON, download the sensor information to the controller in advance.

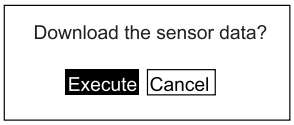
1. Enter the System Mode and select ***Download***.

   A confirmation screen will be displayed.



2. Select ***Execute***.

   Download is executed, and the screen in (1.) will return.



3-5-9 Initializing the Z300 *(Initialize)*

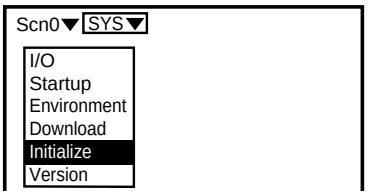
Use the procedure shown below to return the Z300 to its default settings.
For details on how to clear measurement conditions in scene unit, refer to page 148.

CHECK When the Z300 is initialized, all the settings return to their default values. To save the settings, back them up to a computer before performing initialization.
Refer to page 127.

Procedure

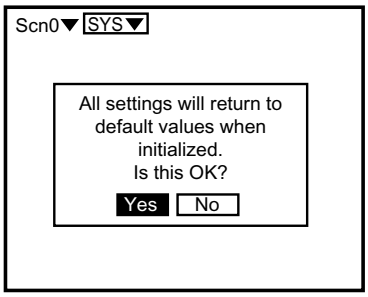
1. Select ***Initialize***.

   A confirmation message will be displayed.



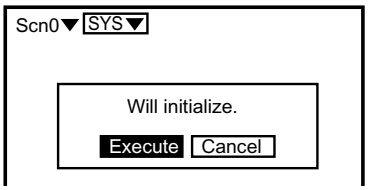
2. Select ***Yes***.

   A confirmation message will be displayed.



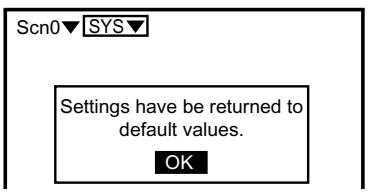
3. Select ***Execute***.

   The system will be initialized and another confirmation message will be displayed.



4. Select ***OK***.

   The screen in (1.) will return.

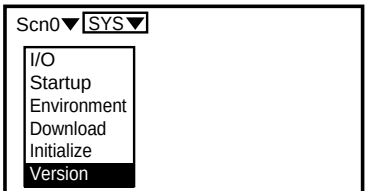


3-5-10 Checking the System Version (*Version*)

Use the following procedure to display the Controller model number, the software version, and the model numbers of the Sensors connected.

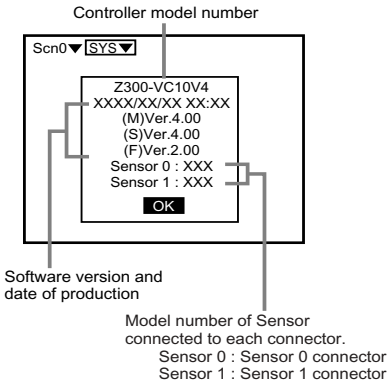
Procedure

1. Select ***Version***.



2. Select ***OK***.

   The screen in (1.) will return.



3-6 Saving to the Flash Memory

The setting data will be saved to the flash memory.

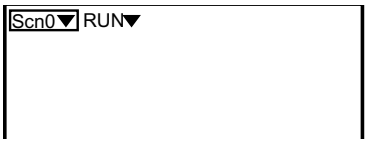
For details on backing up to computer, refer to page 127.

CHECK Flash memory data is loaded each time the Z300 is started up. Therefore, when settings have been changed, be sure to save to flash memory before turning the power OFF. If the power is turned OFF without saving, all of the setting changes will be lost.

Procedure

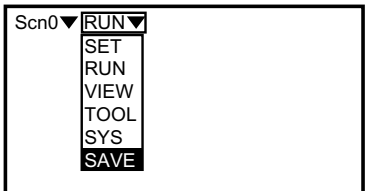
1. Move the cursor to **RUN ▼** and press the **ENT** Key.

   A list of mode will be displayed.



2. Select ***SAVE***.

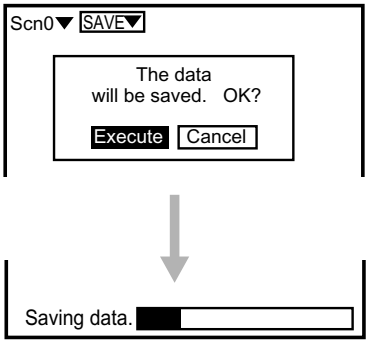
   A confirmation message will be displayed.



3. Select ***Execute***.

   The execution status will be displayed at the bottom of the screen.

   When the data has been saved, the screen in (2.) will return.



Notice Do not turn OFF the power while saving the data. The data may be destroyed, and the Z300 may not operate correctly the next time it is started.

3-7 Changing Scenes

The different situations in which measurements are performed are called "scene" and the measurement conditions set in Set Mode are called "scene data."The Scene function can be used to set 16 types of measurement conditions.
If detection conditions change, simply switch to change to a different measurement setup.
The methods used to switch, copy, and clear scenes are explained below.

3-7-1 Setting Measurement Conditions for Different Products *(Changing Scenes)*

The Z300 is factory set to start up in scene 0. In addition to this, however, there are other scenes, scenes 1 to 15, making a total of 16 scenes that can be set.
The method for switching the scene on the Console is explained below.
The command for switching scenes can also be input from the terminal block or via RS-232C.

For details on input from the terminal block, refer to page 150.
For details on input from RS-232C, refer to page 158.

CHECK **When using 2 Sensors of different models:**

Scenes are allocated in the following way.
Sensor connected to the Sensor 0 connector: Even scenes
Sensor connected to the Sensor 1 connector: Odd scenes

- When switching scenes from the terminal block, select ***Terminals*** in ***Environment/Scene***.

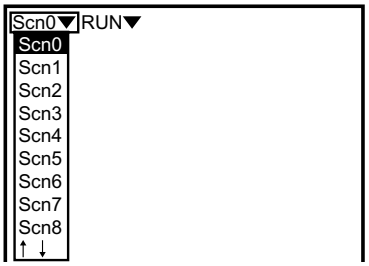
Refer to page 140.

- The scene switching time is approximately 4 seconds.

Procedure

1. Move the cursor to ***Scn*** @ and press the **ENT** Key.

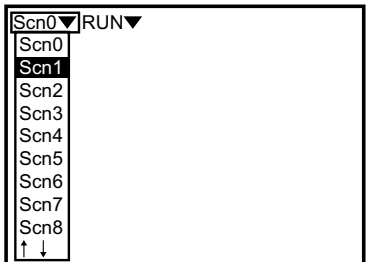
   The Scene 0 to Scene 8 options will be displayed. Use the **Down** Key to display the scene numbers 9 to 15.



2. Move the cursor to the scene number to be switched to.

3. Press the **ENT** Key.

   The selected scene will be displayed.



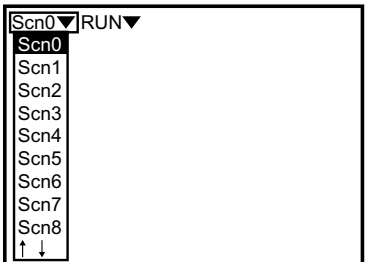
3-7-2 Copying Measurement Conditions to Other Scenes *(Copying Scene Data)*

This function is useful for creating new scenes by copying scene data from another scene and changing some settings to suit the new requirements.

Procedure

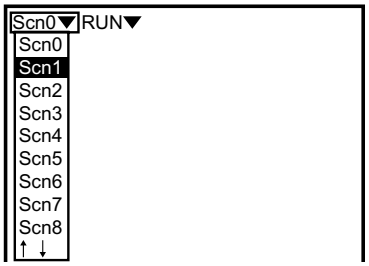
1. Move the cursor to ***Scn*** @ and press the **ENT** Key.

   The Scene 0 to Scene 8 options will be displayed. Use the **Down** Key to display the scene numbers 9 to 15.



2. Move the cursor to the desired scene number and press the **SHIFT**+**ESC** Keys.

   The selections will be displayed.



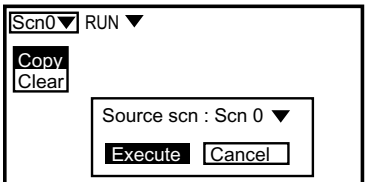
3. Select ***Copy***.

   A setting screen will be displayed.

4. Select the original scene number.

5. Select ***Execute***.

   The scene will be copied and the screen in (2.) will return.



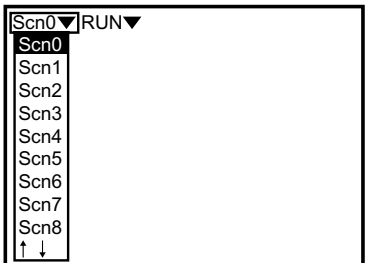
3-7-3 Clearing Scene Measurement Conditions *(Clearing Scenes)*

Use the following procedure to clear measurement conditions set in SET Mode, and to return scenes to their default settings. This section explains the procedure performed separately for each scene.

Procedure

1. Move the cursor to ***Scn*** @ and press the **ENT** Key.

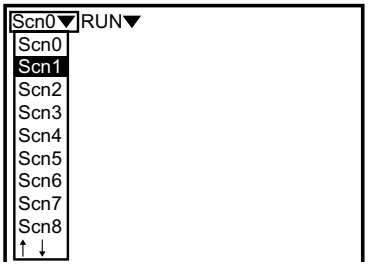
   The Scene 0 to Scene 8 options will be displayed. Use the **Down** Key to display the scene numbers 9 to 15.



2. Move the cursor to the number of the scene to be cleared.

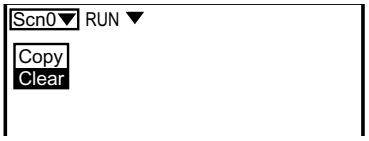
   Press the **SHIFT**+**ESC** Keys.

   The selections will be displayed.



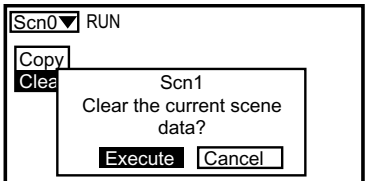
3. Select ***Clear***.

   A confirmation message will be displayed.



4. Select ***Execute***.

   The scene will be cleared and the screen in (2.) will return.



SECTION 4
I/O Format

This section provides details on the inputs and outputs used for communications with external devices via terminal blocks or RS-232C.

4-1 Terminal Blocks

Details on terminal functions and timing for communications with external devices via terminal blocks are provided below.

4-1-1 Input Terminals

The following types of input are available from the terminal blocks in RUN Mode.

Terminal	Function
$\overline{\text{RESET}}$	When this terminal is turned ON, measurement values and settings that have not been saved are cleared. The Z300 restarts after the data and settings have been cleared.
$\overline{\text{TRIGGER}}$	Used as a timing trigger for the Hold function. It is effective when the Hold function trigger is set to ***External***. For details on the Hold function, refer to page 65.
$\overline{\text{HOLD-RESET}}$	When this terminal is turned ON, the Z300 goes into a "no-measurement" state*. Use this terminal to clear the Hold status. * No-measurement state Terminal blocks: All output terminals turn OFF. Analog output : 3 mA max. (-6 V) For details on the Hold function, refer to page 65.
$\overline{\text{LD-OFF}}$	When this terminal is turned ON, the laser diode is turned OFF.
$\overline{\text{ALL-ZERO}}$	When this terminal is turned ON, Force-zero is performed for all output numbers. To reset Force-zero, turn this terminal ON for at least 1 s.
$\overline{\text{ZERO0}}$	When this terminal is turned ON, Force-zero is performed for OUT0. To reset Force-zero, turn this terminal ON for at least 1 s.
$\overline{\text{ZERO1}}$	When this terminal is turned ON, Force-zero is performed for OUT1. To reset Force-zero, turn this terminal ON for at least 1 s.
$\overline{\text{DI0}}$ to $\overline{\text{DI3}}$	Used in combination to switch scenes. The scene switching time is approximately 4 seconds. DI3 DI2 DI1 DI0 Scene 0: 0 0 0 0 Scene 1: 0 0 0 1 ⋮ Scene 14: 1 1 1 0 Scene 15: 1 1 1 1 0: OFF 1: ON

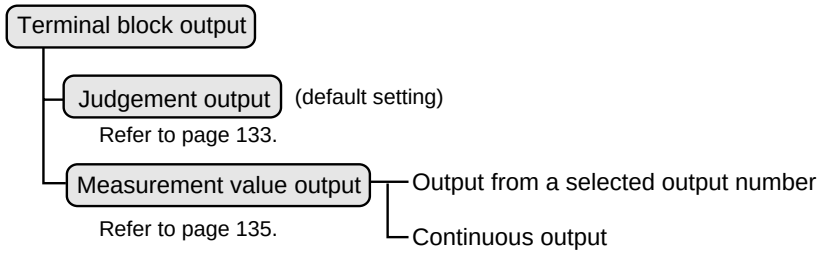
CHECK

–To enable scenes to be changed from the terminal blocks, change the setting of ***Environment/Scene*** to ***Terminals***.
For details on the setting method, refer to page 140.

–In Non-visual Mode, only the $\overline{\text{LD-OFF}}$ terminal can be used.

4-1-2 Output Terminals

The contents that can be output to the terminal blocks are shown below. The terminal block allocation depends on the output contents.



Judgement Output

Judgement results (HIGH, PASS, LOW, or ERROR) for the measurement values of OUT0, OUT1, OUT2, and OUT3 are output to terminals DO0 to DO15.

Output contents		Output terminal	Meaning
OUT0	HIGH	$\overline{\text{DO0}}$	HIGH : Judgement upper limit < Measurement value: Turns ON PASS : Judgement lower limit ≦ Measurement value ≦ Judgement upper limit: Turns ON LOW : Measurement value < Judgement lower limit: Turns ON ERROR : Turns ON if the Sensor cannot perform measurement, for example, because the workpiece is outside the measurement range or because the light density is excessive or insufficient.
	PASS	$\overline{\text{DO1}}$	
	LOW	$\overline{\text{DO2}}$	
	ERROR	$\overline{\text{DO3}}$	
OUT1	HIGH	$\overline{\text{DO4}}$	
	PASS	$\overline{\text{DO5}}$	
	LOW	$\overline{\text{DO6}}$	
	ERROR	$\overline{\text{DO7}}$	
OUT2	HIGH	$\overline{\text{DO8}}$	
	PASS	$\overline{\text{DO9}}$	
	LOW	$\overline{\text{DO10}}$	
	ERROR	$\overline{\text{DO11}}$	
OUT3	HIGH	$\overline{\text{DO12}}$	
	PASS	$\overline{\text{DO13}}$	
	LOW	$\overline{\text{DO14}}$	
	ERROR	$\overline{\text{DO15}}$	
Not used.		$\overline{\text{DO16}}$	–
SYS-ERR		$\overline{\text{DO17}}$	Turns ON if a system error occurs.
RUN		$\overline{\text{DO18}}$	Turns ON during measurement.
BUSY		DO19	Turns ON during trigger measurement. Use this terminal to confirm whether or not the trigger is operating normally when self-trigger is set as the trigger input method.

Measurement Value Output

The measurement values and error codes of OUT0, OUT1, OUT2, and OUT3 are output to DO0 to DO17.
Five digits (with sign) out of the seven digits (with sign) in measurement results are output as 18-bit binary data. The 5 digits that are output are specified in ***Terminals*** in ***SYS/I/O***. The default setting is ±[XX.XXX]mm.

For details on the setting method, refer to page 135.

Examples of Outputs to Terminals (for the Default Settings)

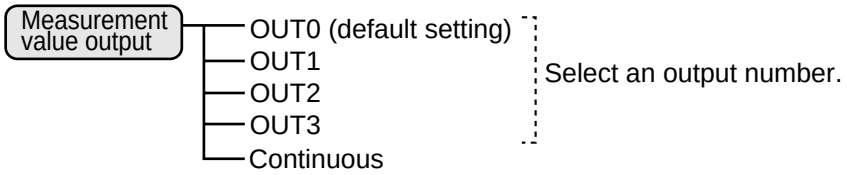
		Sign	Output terminal																
		DO(*)	DO(**)																
		17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Measurement value	00.000mm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	+00.001mm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	+20.000mm	0	0	0	1	0	0	1	1	1	0	0	0	1	0	0	0	0	0
	-00.100mm	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	0	0
	-10.000mm	1	0	0	0	1	0	0	1	1	1	0	0	0	1	0	0	0	0
Error code		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

(*) 0: + 1: - (**) 0: OFF 1: ON

Output Contents and Terminal Allocation

There are 2 methods for outputting measurement values: outputting from selected output numbers, and continuously outputting from all output numbers for which equations have been defined.
The terminal allocation varies depending on the settings.

For details on setting output contents, refer to page 135.



If an Output Number (OUT0 to OUT3) is Selected:

The measurement value for the selected output number is output. If the Hold function is used, obtain the data when the GATE signal turns ON.

If *Consecutive* is Selected:

The measurement values of the output numbers for which equations have been defined are output continuously.
The output order is: OUT0→OUT1→OUT2→OUT3.
The output numbers are identified using DO18 and DO19.

	DO0 to DO17	DO18	DO19
Select an output number	18-bit binary format output	-	BUSY
Consecutive	18-bit binary format output	Output number identification*	

Output number identification *

	DO18	DO19
OUT0	0	0
OUT1	0	1
OUT2	1	0
OUT3	1	1

0:OFF 1:ON

CHECK
- All output terminals turn OFF when the mode is switched from RUN Mode to another mode.
- The initial signal of the output terminals is OFF. The terminals, however, may turn ON for approximately 0.5 s when the power is turned ON. Ensure that these outputs are not treated as actual signals at external derices.

4-1-3 Timing Charts

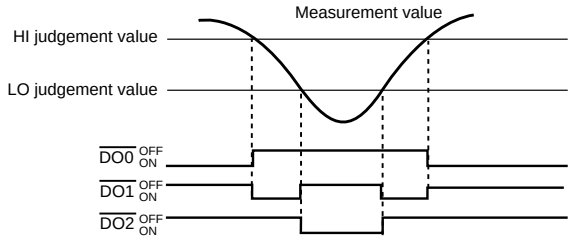
Judgement Output

Timing charts for the following 3 types of operation are given below.

- Judgement output
  - (1) Operation without OFF delay
  - (2) Operation with OFF delay
  - (3) Operation using the Hold function

(1) Operation without OFF delay

Example: Output terminal for OUT0



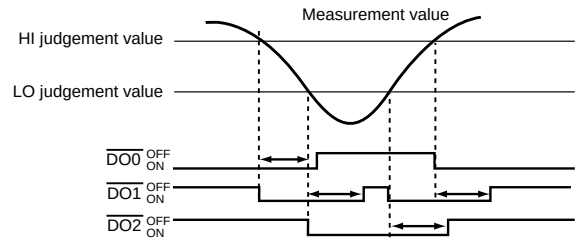
The GATE signal is always OFF.

Output terminals

Terminal	Function
DO0	Functions as a HIGH terminal for OUT0.
DO1	Functions as a PASS terminal for OUT0.
DO2	Functions as a LOW terminal for OUT0.

(2) Operation with OFF delay

Example: Output terminal for OUT0



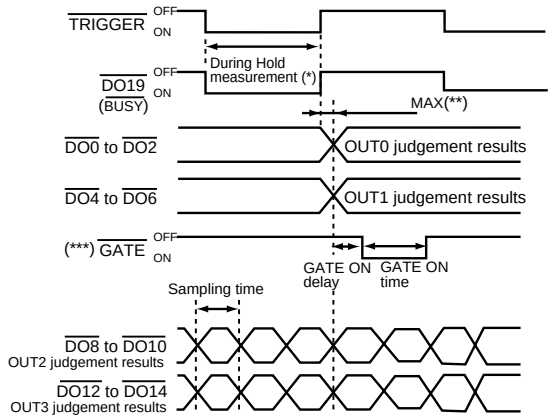
OFF delay time
The GATE signal is always OFF.

Output terminals

Terminal	Function
DO0	Functions as a HIGH terminal for OUT0.
DO1	Functions as a PASS terminal for OUT0.
DO2	Functions as a LOW terminal for OUT0.

(3) Operation Using the Hold function

Example: If Hold is set for some but not all outputs
Settings: OUT0 and OUT1: Hold set
OUT2 and OUT3: Hold not set



(*) If self-trigger is set as the trigger input method, output continues while the trigger is enabled.
(**) Sampling time × 2 ms max.
(***) The GATE signal is output only for the terminals of output numbers for which Hold is set.

Output terminals

Terminal	Function
DO19	Functions as a BUSY signal. Indicates that the Z300 is performing Hold measurement. If self-trigger is set as the trigger input method, this terminal can be used to confirm trigger operation.
DO0	Functions as a HIGH terminal for OUT0.
DO1	Functions as a PASS terminal for OUT0.
DO2	Functions as a LOW terminal for OUT0.
DO4	Functions as a HIGH terminal for OUT1.
DO5	Functions as a PASS terminal for OUT1.
DO6	Functions as a LOW terminal for OUT1.
GATE	Used to control the timing with which measurement results are obtained by the external device. Turns ON for a time set so that the external device can obtain the judgement results of the output numbers for which Hold is set.
DO8	Functions as a HIGH terminal for OUT2.
DO9	Functions as a PASS terminal for OUT2.
DO10	Functions as a LOW terminal for OUT2.
DO12	Functions as a HIGH terminal for OUT3.
DO13	Functions as a PASS terminal for OUT3.
DO14	Functions as a LOW terminal for OUT3.
DO3, DO7 DO11, DO15	Function as error terminals for OUT0, OUT1, OUT2, and OUT3 respectively.

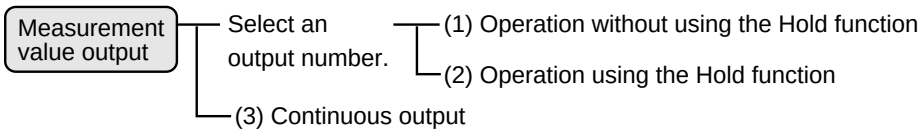
Input terminals

Terminal	Function
TRIGGER	Inputs the measurement trigger from a sync sensor such as a photoelectric sensor.

Notice Ensure that the TRIGGER turns ON while the GATE signal is OFF. If the TRIGGER turns ON while the GATE signal is ON (including at GATE ON Delay time), outputs may not operate properly.

Measurement Value Output

Timing charts for the following 3 types of operation are given below.

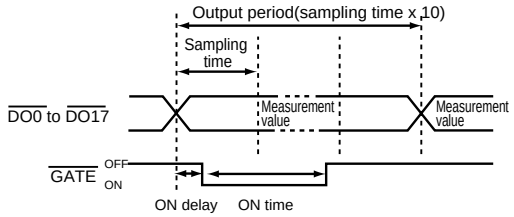


(1) Select an Output Number (Operation without Using the Hold function).

Output Period

Measurement values for the selected output numbers can be output according to the output period.

Example: Operation with an output period set
Settings: Sampling time = 0.96 ms
Output period = 0.96 ms × 10

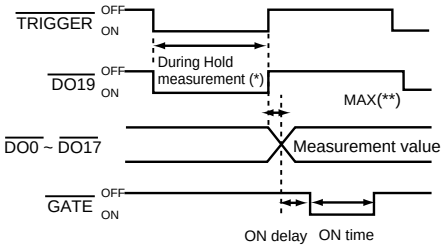


Output terminals

Terminal	Function
DO0 to DO17	Output the measurement values for the specified output numbers. Output error codes when errors occur.
GATE	Used to control the timing with which measurement results are obtained by the external device. Turns ON for a time set so that the external device can obtain the measurement results.

(2) Select an Output Number (Operation Using the Hold function).

Example: OUT0



(*) If self-trigger is set as the trigger input method, output continues while the trigger is enabled.
(**) Sampling time × 2 ms max.

Output terminals

Terminal	Function
DO19	Functions as a BUSY signal. Indicates that the Z300 is performing Hold measurement.
DO0 to DO17	Output the measurement values for OUT0. Output error codes when errors occur.
GATE	Used to control the timing with which measurement results are obtained by the external device. Turns ON for a time set so that the external device can obtain the judgement results of the output numbers for which Hold is set.

Input terminals

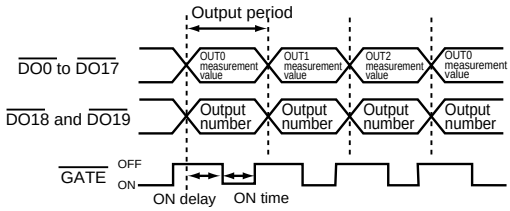
Terminal	Function
TRIGGER	Inputs the measurement trigger from a sync sensor such as a photoelectric sensor.

Notice Ensure that the TRIGGER turns ON while the GATE signal is OFF. If the TRIGGER turns ON while the GATE signal is ON (or during the GATE ON delay time), outputs may not operate properly.

(3) Continuous Output

Measurement values of output numbers for which equations are set are output continuously in the order OUT0, OUT1, OUT2, OUT3 irrespective of Hold timing.

Operation when Equations are Set for OUT0, OUT1, and OUT2



*There is no equation set for OUT3 and so there is no corresponding output.

Input terminals

Terminal	Function
DO0 to DO17	Output measurement values for OUT0, OUT1, and OUT2 in order. Output error codes when errors occur.
DO18 and DO19	Indicates the output number for which the measurement value is output.
GATE	Used to control the timing with which measurement results are obtained by the external device. Turns ON for a time set so that the external device can obtain the measurement results.

4-2 RS-232C

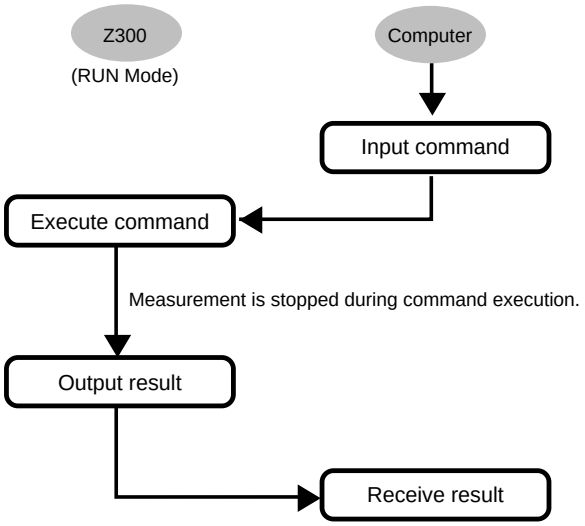
4-2-1 Communications Overview

The Z300 can perform no-protocol communications with an external device, such as a personal computer, via RS-232C. The same communications settings must be used on both the Z300 and the external device.

For details on Setting Communications Specifications, refer to page 137.

CHECK

- Commands can be input only when the Z300 is in RUN Mode.
- Do not use the terminal blocks for input or output during command execution.
- At least 100 ms is required to output a measurement result after receiving a command via RS-232C.



4-2-2 Command Formats

The following commands can be input from the host device to the Z300. Common commands have abbreviations that are shown in parentheses.

Commands that Obtain or Change Current Settings

Use the following commands to change settings or specify operations while reading the Z300 settings on the host side.

Command	Function	Page
AVE	Obtains or changes the averaging number.	159
JUDPARA	Obtains or changes the judgement upper limit and judgement lower limit.	160
SCENE	Obtains the scene number currently displayed.	162
	Changes the scene to be measured.	162
SENS	Sets the sensitivity adjustment to ***Auto*** and obtains the optimum sensitivity for the workpiece.	163
	Changes the Sensor's sensitivity level or turns OFF the laser.	163
ZERO	Executes or resets Force-zero.	164

Commands that Obtain Measurement Results

Command	Function	Page
JUDGE(J)	Obtains the most recent judgement result.	165
MEASURE(M)	Obtains the most recent measurement result.	166
TREND(T)	Obtains past measurement results stored in the Z300 (specify number).	167
PLOTDATA(P)	Obtains the plotting points (measurement results) of the currently displayed waveform.	168

Commands that Save and Load Data

Command	Function	Page
DATASAVE	Saves all data to flash memory.	170
SCNLOAD	Loads scene data from the host device.	170
SCNSAVE	Saves scene data to the host device.	171
SYSLOAD	Loads system data from the host device.	171
SYSSAVE	Saves system data to the host device.	172

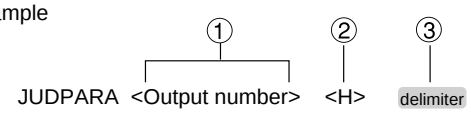
Other

Command	Function	Page
VERGET	Obtains the system's version information.	172

Input Format

The commands are listed in alphabetical order. Input the commands in ASCII code.
Either upper-case or lower-case characters can be input.

Example



(1) Set numerical values for the items in < > brackets.

(2) Input a space between each parameter. (A space is not needed before the delimiter.)

(3) Input the delimiter at the end of the command.

Commands that Obtain or Change Current Settings

AVE

Function 1 Obtains the averaging number.

Input **AVE** *delimiter*

Output Data obtained correctly : **Number** *delimiter*
Command not executed correctly : **ER** *delimiter*

Example
Input : **AVE** *delimiter*
Output : **4** *delimiter*
The averaging number is 4.

Function 2 Changes the averaging number.

Input **AVE** <**Number**> *delimiter*

Output Command executed correctly : OK *delimiter*
Command not executed correctly : ER *delimiter*

Example
Input : **AVE 8** *delimiter*
The average number is changed to 8.
Output : **OK** *delimiter*

JUDPARA

Function 1 Obtains the judgement upper limit and the judgement lower limit.

Input **JUDPARA** <**Output number**> <**Parameter**> *delimiter*
- Specify an output number between 0 and 3.

Output number	Meaning
0	OUT0
1	OUT1
2	OUT2
3	OUT3

- The meaning of the parameters are as follows:

Paramter	Meaning
H	Judgement upper limit
L	Judgement lower limit

Output Data obtained correctly : **Judgement value** *delimiter*
Command not executed correctly : **ER** *delimiter*

Example
Input : **JUDPARA 0 H** *delimiter*
Obtains the judgement upper limit for OUT0.
Output : **5.0000** *delimiter*
The upper limit is set to 5.0000.

CHECK The judgement upper limit and judgement lower limit for the currently displayed scene are obtained using this command. Display the required scene before execution.

Function 2 Changes the judgement upper limit and judgement lower limit.

Input **JUDPARA <Output number> <Judgement upper limit> <Judgement lower limit>** *delimiter*

- Specify an output number between 0 and 3.

Output number	Meaning
0	OUT0
1	OUT1
2	OUT2
3	OUT3

- Set the limits so that the judgement upper limit is greater than the judgement lower limit. The setting range is -999.9999 to 999.9999.

Output Command executed correctly : **OK** *delimiter*
Command not executed correctly : **ER** *delimiter*

Example

Input : **JUDPARA 0 10.0000 -10.0000** *delimiter*
Changes the judgement upper limit for OUT0 to 10.0000 and the judgement lower limit to -10.0000.
Output : **OK** *delimiter*

CHECK The judgement upper limit and judgement lower limit for the currently displayed scene are changed using this command. Display the required scene before execution.

SCENE

Function 1 Obtains the scene number of the scene being displayed.

Input **SCENE** *delimiter*

Output Command executed correctly : **Scene number** *delimiter*
Command not executed correctly : **ER** *delimiter*

Example
Input : **SCENE** *delimiter*
Output : **0** *delimiter*
In this example, scene 0 is being displayed.

Function 2 Switches the scene number to be measured.

Input **SCENE** <**Scene number**> *delimiter*
- Specify a scene number between 0 and 15.

Output Command executed correctly : **OK** *delimiter*
Command not executed correctly : **ER** *delimiter*

Example
Input : **SCENE 2** *delimiter*
In this example, the scene is switched to scene 2.
Output : **OK** *delimiter*

CHECK - If ***Environment/Scene*** in System Mode is set to ***Terminals***, scenes cannot be switched using RS-232C commands. (ER is output.)
- The scene switching time is approximately 4 seconds.

SENS

Function 1 Sets the sensitivity adjustment to ***Auto*** and obtains the optimum sensitivity for the workpiece.

Input **SENS** <**Sensor number**> *delimiter*
- Specify either 0 or 1 as the Sensor number.
If 2 regions are set for 1 Sensor, specify the area number.

Output Command executed correctly : **Sensitivity level (1 to 31)** *delimiter*
Command executed correctly : **ER** *delimiter*

Example
Output: **SENS 0** *delimiter*
Sets the sensitivity for Sensor 0 to ***Auto***.
Output: **17** delimiter
The sensitivity is set to ***Auto***. The optimum sensitivity is 17.

Function 2 Changes the Sensor's sensitivity level or turns OFF the laser.

Input **SENS** <**Sensor number**> <**Sensitivity level A**> <**Sensitivity level B** > *delimiter*
- Specify either 0 or 1 as the Sensor number.
If 2 regions are set for 1 Sensor, specify the area number.
- Specify values between 0 and 31 for sensitivity level A and sensitivity level B.
The sensitivity is set to the optimum level between A and B. Do not set A to a value larger than B.
If the same value is set for A and B, the sensitivity will be fixed at that level.
If both A and B are set to 0, the laser will turn OFF.

CHECK Laser OFF Delay Time
The total time required for turning OFF the laser is less if terminal block input is used.
If the laser must be turned OFF instantaneously, use the LD-OFF input terminal.
For details, refer to page 150.

Output Command executed correctly : **OK** *delimiter*
Command not executed correctly : **ER** *delimiter*

Example
Use the following procedure to fix the sensitivity at its optimum level.
Output: **SENS 0** *delimiter*
Obtains the optimum sensitivity.
Output: **21** *delimiter*
The optimum sensitivity is 21.
Input: **SENS 0 18 24** *delimiter*
The sensitivity level is automatically adjusted within the range 18 to 24.
Output: **OK** *delimiter*

ZERO

Function 1 Executes Force-zero.

Input **ZERO 0** <**Output number**><**Offset value**> *delimiter*
-Specify an output number between 0 and 4.

Output number	Meaning
0	OUT0
1	OUT1
2	OUT2
3	OUT3
4	All zero

- Set the offset value used for Force-zero execution. Set the value to be added to 0 in the range -999.9999 to 999.9999. If this setting is omitted, the offset value that is already set will be used.

Output Command executed correctly : **OK** *delimiter*
Command not executed correctly : **ER** *delimiter*

Example
Input : **ZERO 0 1** *delimiter*
Force-zero is executed for OUT1.
Output : **OK** *delimiter*

Function 2 Resets Force-zero.

Input **ZERO 1** <**Output number**> *delimiter*
Specify an output number between 0 and 4.

Output number	Meaning
0	OUT0
1	OUT1
2	OUT2
3	OUT3
4	All zero

Output Command executed correctly : **OK** *delimiter*
Command not executed correctly : **ER** *delimiter*

Example
Input : **ZERO 1 1** *delimiter*
Force-zero for OUT1 is reset.
Output : **OK** *delimiter*

Commands that Obtain Measurement Results

JUDGE (or J)

Function Obtains the most recent judgement result.

Input **JUDGE** (or **J**) <**Output number**>
Specify an output number between 0 and 4

Output number	Meaning
0	OUT0
1	OUT1
2	OUT2
3	OUT3
4	OUT0 to 3

Output
Output number set to 0, 1, 2, or 3: **Judgement result** *delimiter*
Output number set to 4 : **0**, **Judgement result** *delimiter*
1, **Judgement result** *delimiter*
2, **Judgement result** *delimiter*
3, **Judgement result** *delimiter*
OK *delimiter*
Command not executed correctly: **ER** *delimiter*
Measurement not possible : **ER** *delimiter*
Hold reset : **RST** *delimiter*

The following judgement result will be output from the Z300.
0: PASS
1: HIGH
2: LOW
3: ERROR

Example
Input : **J 1** *delimiter*
The judgement result for OUT1 is obtained.
Output: **0** *delimiter*
The judgement result is within the judgement value range (PASS).

CHECK The most recent judgement result for the currently displayed scene is output.

MEASURE (or M)

Function Obtains the most recent measurement result.

Input **MEASURE** (or **M**) <Output number> *delimiter*
Specify an output number between 0 and 4

Output number	Meaning
0	OUT0
1	OUT1
2	OUT2
3	OUT3
4	OUT0 to 3

Output

Output number set to 0, 1, 2, or 3	: **Measurement result** *delimiter*
Output number set to 4	: **0**, **Measurement result** *delimiter* **1**, **Measurement result** *delimiter* **2**, **Measurement result** *delimiter* **3**, **Measurement result** *delimiter* **OK** *delimiter*
Command not executed correctly	: **ER** *delimiter*
Measurement not possible	: **ER** *delimiter*
Hold reset	: **RST** *delimiter*

Example

Input : **M 1** *delimiter*
The most recent measurement result for OUT1 is obtained.
Output : **111.1111** *delimiter*
The measurement result is 111.1111.

CHECK - The number of output digits has no relation to the setting for the minimum number of display digits. (Only negative results are output with a sign.)
- The most recent measurement result for the currently displayed scene is output.

TREND (or T)

Function Obtains past measurement results stored in the Z300 (specify number).

Input **TREND** (or **T**) <**Output number**> <**Number of items**> *delimiter*
Specify an output number between 0 and 3.

Output number	Meaning
0	OUT0
1	OUT1
2	OUT2
3	OUT3

- Specify a value in the range 1 to 20,000 as the outputs number.
From the time that the command is received, the set number of items of past measurement values are output continuously.

Output Command executed correctly: **Measurement result** *delimiter*
-
- (Number of items)
-

Measurement result *delimiter*r
OK *delimiter*
Command not executed correctly : **ER** *delimiter*
Measurement not possible : **ER** *delimiter*
Hold reset : **RST** *delimiter*

Example
Input : **TREND 0 9** *delimiter*
The previous 9 measurement results for OUT0 are obtained.
Output : **111.1111** *delimiter*
-222.2222 *delimiter*
333.3333 *delimiter*
-444.4444 *delimiter*
555.5555 *delimiter*
-666.6666 *delimiter*
777.7777 delimiter
-888.8888 *delimiter*
999.9999 *delimiter*
OK *delimiter*

PLOTDATA (or P)

Function Obtains the plotting points (measurement results) of the currently displayed waveform.

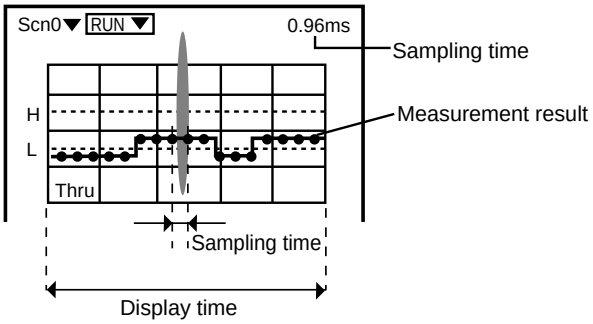
CHECK The plotting points for the waveform displayed on the Trend Monitor can be output. If these points are represented at a computer in graph format, the same waveform can be created and saved on the computer.
The plotting points cannot, however, be output if the waveform is not still. Make the following settings before using this command.
- Switch the display screen to Trend Monitor. (The data cannot be output with other screens.)
- Set the trigger input method to ***Self*** or ***External***, and set the screen display to ***Trigger***.
or
- Set the screen display to ***Thru***, and press the ***TRIG*** Key to stop the waveform.

For details on trigger setting, refer to page 66.
For details on screen display, refer to page 105.

Input **PLOTDATA** (or **P**) <**Output number**> <**Output coefficient**> *delimiter*
- Specify an output number between 0 and 3.

Output number	Meaning
0	OUT0
1	OUT1
2	OUT2
3	OUT3

- The output coefficient is the number of intervals between measurements that are output.
Specify an output coefficient between 1 and 20,000.
The number of data items that will be output can be calculated using the formula below. (The number is rounded down to the nearest integer.)
Display time ÷ Sampling time = Number of measurements
Number of measurements ÷ Output coefficient = Number of data items output



(The display time can be changed with the Trend Monitor screen settings.)

Output Command executed correctly : **Number of data items** *delimiter*
Display time (s) *delimiter*
Measurement result *delimiter*
•
• (Number of data items)
•
Measurement result *delimiter*
OK *delimiter*

Command not executed correctly : **ER** *delimiter*

Example

The following example is for a display time of 1,000 ms, a sampling time of 0.96 ms, and an output coefficient of 2.

Input : **PLOTDATA 0 2** *delimiter*
The measurement results (the plotting points of the currently displayed waveform) for OUT0 are obtained.

Output : **521** *delimiter* --- Number of data items
1.0 *delimiter* --- Display time (s)
253.5311 *delimiter*
497.5789 *delimiter*
•
•
•
369.9789 *delimiter*
OK *delimiter*

1,000 ms ÷ 0.96 ms ÷ 2 = 521 measurement results are output.

Commands that Save and Load Data

DATASAVE: Data Save

Function DATASAVE is used to save all data to flash memory.

Input **DATASAVE** *delimiter*

Output

Data correctly saved	: **OK** *delimiter*
Data not correctly saved	: **ER** *delimiter*

Do not turn OFF the Z300's power until a response has been received.

SCNLOAD: Scene Load

Function SCNLOAD is used to load scene data from the host device to the Z300.

Input **SCNLOAD** <**Scene number**> *delimiter*
- Specify a scene number between 0 and 15. If no scene number is specified, the data is loaded to the currently displayed scene.
- The data transfer is performed with XMODEM (-CRC or SUM) protocol. (The XMODEM(-1K) protocol is not supported.)
- The Z300 sends a READY signal to the host device when the Z300 has completed its initialization. Wait for the READY signal to be received at the host device before starting the data transfer.

Output

Data correctly loaded	: **OK** *delimiter*
Data not correctly loaded	: **ER** *delimiter*

Example

Input : **SCNLOAD 2** *delimiter*
Data will be loaded to scene 2 from a host device.
Output : **OK** *delimiter*

CHECK **Loading when 2 Sensors of Different Models are Connected**

Load data for scenes with even numbers to scenes with even numbers and load data for scenes with odd numbers to scenes with odd numbers, otherwise ER will be output.

SCNSAVE: Scene Save

Function SCNSAVE is used to save scene data to a host device.

Input **SCNSAVE** <**Scene number**> *delimiter*
- Specify a scene number between 0 and 15. If no scene number is specified, the data is loaded to the currently displayed scene.
- The data transfer is performed with XMODEM(-CRC or SUM) protocol. (The XMODEM(-1K) protocol is not supported.)
- When the Z300 is ready to send data, it sends a READY signal to the host device before transferring the data.

Output

Data correctly saved	: **OK** *delimiter*
Data not correctly saved	: **ER** *delimiter*

Example

Input : **SCNSAVE 2** *delimiter*
This example saves the scene 2 scene data to the host device.
Output : **OK** *delimiter*

CHECK **Saving when 2 Sensors of Different Models are Connected**

There are restrictions on the scenes that can be used. Assign file names so that the scene numbers can be identified.

SYSLOAD: System Load

Function Loads system data from a host device to the Z300.

Input **SYSLOAD** *delimiter*
- The data transfer is performed with XMODEM (-CRC or SUM) protocol. (The XMODEM(-1K) protocol is not supported.)
- The Z300 sends a READY signal to the host device when the Z300 has completed its initialization. Wait for the READY signal to be received at the host device before starting the data transfer.

Output

Data correctly saved	: **OK** *delimiter*
Data not correctly saved	: **ER** *delimiter*

Example

Input : **SYSLOAD** *delimiter*
This example loads the system data from the host device.
Output : **OK** *delimiter*

SYSSAVE: System Save

Function Saves system data to a host device.

Input **SYSSAVE** *delimiter*
- The data transfer is performed with XMODEM (-CRC or SUM) protocol. (The XMODEM(-1K) protocol is not supported.)
- When the Z300 is ready to send data, it sends a READY signal to the host device before transferring the data.

Output

Data correctly saved	: **OK** *delimiter*
Data not correctly saved	: **ER** *delimiter*

Example

Input : **SYSSAVE** *delimiter*
This example saves the system data to the host device.
Output : **OK** *delimiter*

Other

VERGET

Function Obtains the system's version information.

Input **VERGET** *delimiter*

Output

Data obtained correctly	: **Version information** *delimiter*
Data not obtained correctly	: **ER** *delimiter*

Example

Input : **VERGET** *delimiter*
The system's version information is obtained.
Output: **Z300-VC10V2(M)VerX.XX (S) VerX.XX (F)VerX.XX** *delimiter*

4-3 Analog Output

Measurement results can be output as current in the range 4 to 20 mA and as voltage in the range -5 to 5 V.

For details on setting output ranges, refer to page 132.

CHECK Output During Reset Input

During restart (approx. 20 s after power is turned ON), 0 V and 12 mA are output to the analog output terminals. Ensure that these outputs are not treated as actual signals at external devices.

SECTION 5
Troubleshooting

This section lists the errors that may occur during Z300 operation. If an error occurs, check the items described in this section before consulting your OMRON representative.

5 Troubleshooting

The CCD mode was changed.
All scene data will be cleared.

Data integration cannot be ensured when the CCD mode is changed. All settings for scene data are returned to their default settings.

You are in Non-visual Mode.
Change the DIP switch setting to Visual Mode

[Change the DIP switch setting to VISUAL.]

No equation is defined.
Define one or more.
(Equation is cleared when measurement point for A or B is cleared.

No equations are set for any output number, or a measurement point used in an equation has been cleared.
[Define at least 1 equation in ***Point/Equation***.]
[Set measurement points in ***Point/Equation***.]

No measurement point is defined for this sensor.

No measurement points have been specified for the Sensor selected.
[Specify measurement points in ***Point*** under ***Point/Equation***.]

System error EXXX (Each X represents a number.)

[Turn OFF the power supply and then restart the Z300. If the same error occurs, it is possible that the Z300 is broken.]
Make a note of the error code (EXXX) and consult your OMRON representative.

There is no Sensor connected.
Turn OFF the power and connect the sensor(s).

There is no Sensor connected.
[Turn OFF the power supply, and then restart the Z300 after connecting a Sensor.]

Sensor connection status has changed. Click Continue and all settings will be set to their default values.

The connection status of the Sensors (e.g., type and number) has changed since the last time settings were saved.
[To return to the previous connection status:]
Turn OFF the power supply, and then restart the Z300 after confirming the following points.
- Check that the same type of Sensors are connected.
- Check that the same number of Sensors are connected.

[To change the connection status:]
Select ***Continue***. The settings are initialized.

Relative coordinates cannot be used. Define area 0 at measurement point P0.

[In relative coordinate mode, the measurement point of area 0 is required as a reference point so it must be defined.]

Relative coordinates cannot be used because a reference point could not be set.

Reference point data for specifying area 0 could not be obtained.
[Perform region specification again.]

Downloaded data is invalid. Data will be loaded from sensor.

Although the download function is ON, the sensor information has not been downloaded to the controller.
Download the sensor information using ***System/Download***.

Measurement is not possible. Reset the reference workpiece.

A measurement error occurred during workpiece measurement for calibration.
[Check whether or not the workpiece is inside the measurement range.]

Adjustment range exceeded. Calibration is not possible.

The span and offset are beyond the range for which compensation is possible and calibration cannot be performed.
[Perform calibration again so that the span and offset are within the range for which compensation is possible.]

Communication error.

Transfer between the Z300 and an external device was interrupted because a communications error occurred. Turn OFF the power supply, and attempt transfer again after confirming the following items.
[Check that the RS-232C cable is wired correctly.]
[Check that the communications settings are the same as those of the external device.]

If the same error occurs after confirming the above items, it is possible that the Z300 is broken. Consult your OMRON representative.

Communication data is wrong.

There was an error in the data transferred between the Z300 and an external device.
Turn OFF the power supply, and attempt transfer again after confirming the following item.
[Check that the RS-232C cable is wired correctly.]

If the same error occurs after confirming the above items, it is possible that the Z300 is broken. Consult your OMRON representative.

Free run is set for the trigger.
Set another trigger to use the Hold function.

If the ***Trigger*** for the Hold function is set to ***Free***, measurements are executed continuously and so measurement values cannot be held.
[To use the Hold function, set the trigger setting to ***External*** or ***Self***.]

Insufficient memory. -Work Memory-

Working memory is insufficient and operation cannot be continued.
[Save any data required, and then restart the Z300.]

The region settings have changed.
All scene data but CCD Mode will be cleared.

Data integration cannot be ensured when the region specification is changed and so, with the exception of the CCD mode setting, all settings for scene data are returned to their default settings.

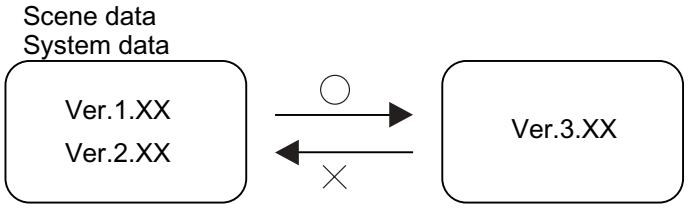
SECTION 6
Differences between Versions

This section describes changes made to functions with version upgrades and data compatibility with between versions.

6 Differences between Versions

This section describes changes made to functions with version upgrades and data compatibility with between versions.
The software version can be confirmed in ***SYS/Version***.
Refer to page 144.

Data Compatibility



Ver3.00→Ver3.20

Changes/Additions Made with Upgrade from Ver. 3.00 to Ver. 3.20

Item	Contents
The model numbers of the Sensors connected can be checked.	The model numbers of the Sensors connected are displayed in ***SYS/Version***. Refer to page 143.
Sensor information download function is added.	The controller startup time can be shortened by downloading the sensor information to the controller in advance. Refer to page 142.
New output allocations are made for un-used terminals.	SYS-ERR signal is output to terminal DO17, and RUN signal is to DO18. Refer to page 151.

Ver2.XX→Ver3.00

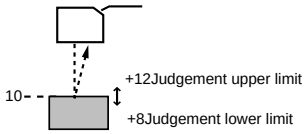
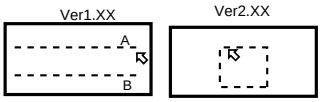
Changes/Additions Made with Upgrade from Ver. 2.XX to Ver. 3.00

Item	Contents
More Sensors can be connected.	In addition to the Z300-S5T, Z300-S10 and Z300-S60, the Z300-S2T and the Z300-S2T/S5T can also be connected.
Display and judgement possible up to 999 mm (with the Z300-S60 connected).	The additional items and functions that can be input or selected are as follows: Judgement values for equations, offset K, zero value Refer to page 53. Digit specification for measurement value output Refer to page 135. Thickness input for ***Thik(2sensor)*** in Application Menu Refer to page 31.
The Sensor mounting conditions can be checked in greater detail (with the Z300-S2T connected).	By switching the Sensor's beam cover, the Sensor can be used like a camera to continuously display surrounding images. Refer to page 110.
Less time is required to display surrounding images.	Images can be displayed in almost the same time as the set shutter time. Refer to page 110.

Item	Contents
Measurement values can be displayed and output in 0.01-μm units (when the Z300-S2T is connected).	The selection 0.01μm is available as the smallest digit setting for displaying measurement values. Refer to page 140. The RS-232C MEASURE command can be used to output measurement values in 0.01μm units. Refer to page 166.

Ver1.XX→Ver2.XX

Changes/Additions Made with Upgrade from Ver. 1.XX to Ver. 2.XX

Item	Contents
More Sensors can be connected.	In addition to the Z300-S5T and Z300-S10, the Z300-S60, which enables long-distance measurement, can also be connected.
An offset value can be set as the reference value for force-zero.	The height (10) of OK workpieces can be set as the offset value.  Refer to pages 53 and 97. (Execution also possible using RS-232C commands.)
There are more items that can be adjusted in RUN Mode.	The laser can be turned OFF, test measurement can be performed, and the detailed setting screen can be displayed without leaving RUN Mode. Refer to page 25.
More functions are available in the Application Menu.	Item for measuring the thickness of transparent workpieces was added. Refer to page 36.
	The CCD mode and the data baud rate can be set. Refer to page 30.
The measurement region setting method was changed.	Previously, adjustment was possible only for the line beam direction. Now, however, the displacement direction can also be changed. This means that the measurement region can be changed even when the CCD Mode is set to 1 line.  Also, the measurement region can be split into 2 regions that are set independently (when only 1 Sensor is connected). With transparent workpieces, regions can be set for the surface and a second side, and sensitivities set for each side. Refer to page 47. The positional relationship between the 2 regions can also be selected. (Absolute coordinates/relative coordinates) Refer to page 94.

Item	Contents
The calibration setting method was changed.	The distance between the position of one point and another point can be input. Calibration can be performed with the measurement distance between two points. Refer to page 57.
Two hold modes were added.	An average hold function, for holding average values, and a length hold function, for measuring lengths, were added. Refer to page 67.
Distance can be displayed on the Trend Monitor.	Either the conventional division display (displaying the conversion values corresponding to 1 division) or coordinate display (displaying distances) can be selected as the display method. Refer to page 105.
Test measurement can be performed a specified number of times.	Previously, test measurement was started and stopped using the Trigger. Now, however, it is possible to specify the number of measurements and use the Trigger just to start measurement. Refer to page 119.
Hold function output is possible from RS-232C.	When the Hold function is used, measurement results can be output to RS-232C with the trigger-OFF timing. Refer to page 137.
A high-sensitivity setting is available for 10-line and 60-line CCD Modes.	10-line and 60-line measurement is possible even for dark workpieces. Refer to page 46.
The calibration range (the span value) is larger.	The span value range has increased from 0.5 to 2 to 0.2 to 5. Refer to page 61.

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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
01	October 2001	Original production
01A	April 2002	Page 176:Using Ver 3.XX, you can determine the model numbers of the connected Sensors indicated on the ***SYS/ Version***.
02	March 2003	Median filtering and sensor information download function are added.

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