No. 99MCA083A1
SERIES No. 198

QM-Data

QM-Data 300

3D Data Processing Unit

User's Manual [Software Guide (2)]

Read this User's Manual thoroughly
before operating the instrument. After reading,
retain it close at hand for future reference.

Mitutoyo

CONVENTIONS USED IN THIS MANUAL

Safety Precautions

To ensure that instruments are operated correctly and safely, Mitutoyo manuals use various safety symbols (Signal Words and Safety Alert Symbols) to identify and warn against hazards and potential accidents.

The following signs indicate **general** warnings:

DANGER

Indicates an imminently hazardous situation which, if not avoided, will result in serious injury or death.

WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in serious injury or death.

CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury or property damage.

The following signs indicate **specific** warnings or prohibited actions, or indicate a mandatory action:

Alerts the user to a specific hazardous situation. The given example means “Caution, risk of electric shock”.

Prohibits a specific action. The given example means “Do not disassemble”.

Specifies a required action. The given example means “Ground”.

CONVENTIONS USED IN THIS MANUAL

Types of Notes

The following types of **notes** are used in this manual to help the operator obtain reliable measurement data through correct instrument operation.

IMPORTANT

- An *important note* provides information essential to the completion of a task. You cannot disregard this note to complete the task.
- An *important note* is a type of precaution, which if neglected could result in a loss of data, decreased accuracy or instrument malfunction/failure.

NOTE A *note* emphasizes or supplements important points of the main text. It also supplies information about specific situations (e.g., memory limitations, equipment configurations, or details that apply to specific versions of a program).

TIP A *tip* is a type of note that helps the user apply the techniques and procedures described in the text to his or her specific needs.
It also provides reference information associated with the topic being discussed.

CONTENTS

7 PROBE SETTING FUNCTION

This chapter describes the probe setting function.

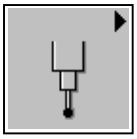
The probe setting function includes the commands listed below.

The data set by the probe setting commands described in this chapter is retained when the power is switched off and can be reused when the QM-Data is switched on again. Note that, however, the auto-dummy distance is reset to the default value at startup.

1) Designate probe tip number
2) Calibrate probe tip position
3) Key in probe tip diameter
4) Key in probe tip position relative to the first tip
5) Probe information
6) Clear probe information
7) Store probe data
8) Recall probe data
9) Register reference origin
10) Key in master ball diameter
11) Register sub-reference origin position
12) Key in auto-dummy distance

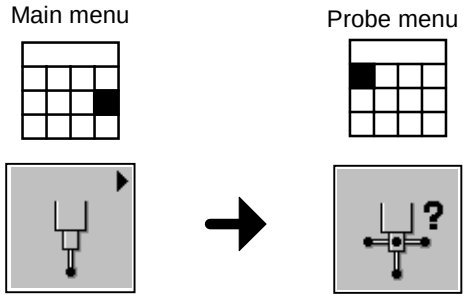
[Key operations to access Probe setting function]

Main menu



7.1 Designating Probe Tip Number

[Key Operation]



[Function]

This command is used to designate the probe tip number to be used.

[Procedure]

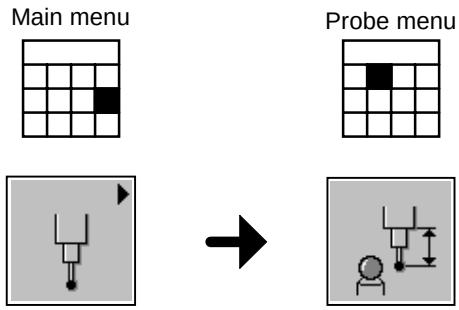
1) Select this command from the menu.
2) Designate the probe tip number to be used.
   - ➢ The probe tip number is set.

NOTE

- If there is no diameter or position data for the designated probe tip, a warning message is displayed. If this occurs, commands such as “Keying in probe tip diameter command (see Section 7.3)” or “Calibrating probe tip position command (see Section 7.2)” must be used to obtain probe information.
- Probe tip number is in the range of 1 to 30.

7.2 Calibrating Probe Tip Position

[Key Operation]



[Function]

This command is used to measure the master ball and calibrate the probe.

[Procedure]

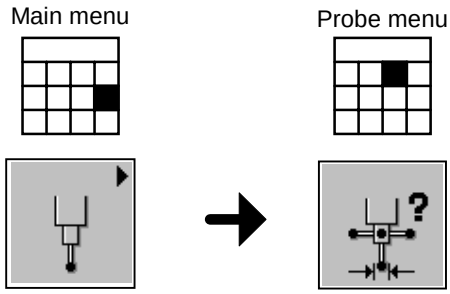
1) Select this command from the menu.
2) Select the master ball to be used.
   0: Reference origin 1: Sub-reference origin No. 1
   2: Sub-reference origin No. 2 3: Sub-reference origin No. 3
3) Touch the probe tip to the master ball so as to take measurements at four or more points.
4) When you have completed the measurements, press the F4 ( ) key.
   - The probe tip position is calibrated.

NOTE
- Register the reference origin (see Section 7.9) beforehand.
- If you are using a sub-reference origin, use the “Registering sub-reference origin position command (see Section 7.11)” to obtain the sub-reference origin position beforehand.

TIP
- This command calibrates the probe tip diameter as well as the probe tip position.

7.3 Keying in Probe Tip Diameter

[Key Operation]



[Function]

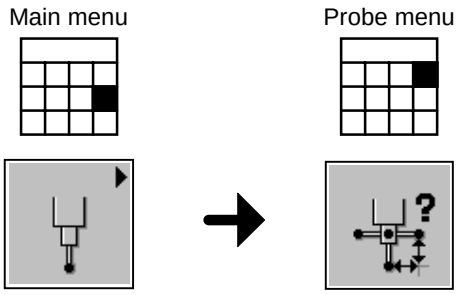
This command is used to key in the probe tip diameter for the probe used.

[Procedure]

1) Select this command from the menu.
2) Enter a value for the probe tip diameter.
   - ➢ The probe tip diameter is set.

7.4 Keying in Probe Tip Position Relative to the First Tip

[Key Operation]



[Function]

This command is used to key in the position data (coordinate values from the reference position) for the probe tip used.

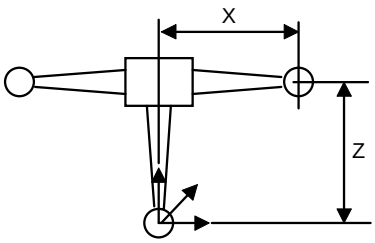


Figure 7-1

[Procedure]

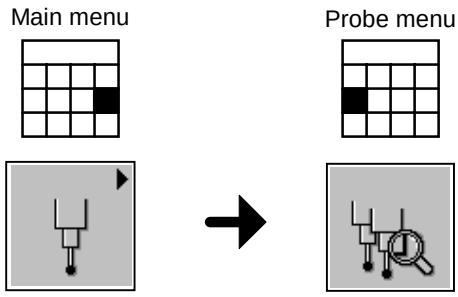
1) Select this command from the menu.
2) Enter the tip position data for the probe tip used.
   - ➢ The probe tip position data is set for the tip used.

TIP

- For more information on probe tip position data, see Section 7.9.
- Use this command when you are using a probe such as a microscopic probe that cannot be calibrated using the master ball. If the probe tip position is not registered correctly, volumetric error compensation for the coordinate measuring machine (CMM) is not performed correctly and errors will result.

7.5 Probe Information

[Key Operation]



[Function]

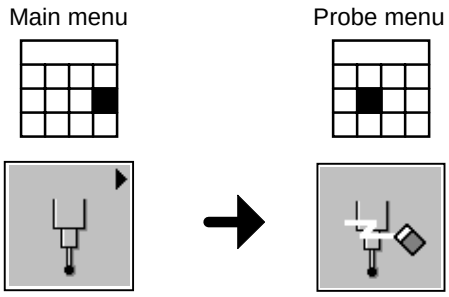
This command is used to display the probe information.

[Procedure]

1) Select this command from the menu.
2) Select the items of probe information (current probe information, probe information file and master ball).
3) When you select the probe information file, specify the drive (RAM or FD) and the file name.
   ➢The probe information is displayed.

7.6 Clearing Probe Information

[Key Operation]



[Function]

This command is used to clear the probe information.

[Procedure]

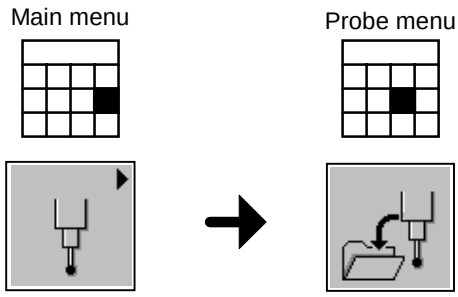
1) Select this command from the menu.
2) Clear the probe information as directed by the on-screen guidance messages.
   ➢The probe information is cleared.

TIP

- This command resets the probe tip position and probe tip diameter to 0. However, the probe information in the probe data file is not cleared.

7.7 Storing Probe Data

[Key Operation]



[Function]

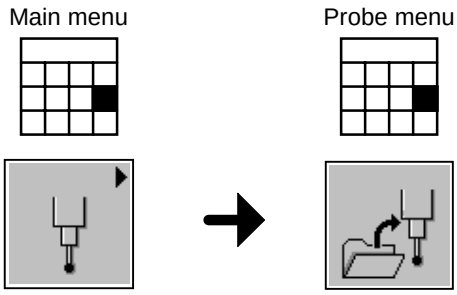
This command is used to store the probe data in the probe data file.

[Procedure]

1) Select this command from the menu.
2) Store the probe data by specifying the drive (RAM or FD) and the probe data file name to be used for storing the data.
   - The probe data is stored in the specified probe data file.

7.8 Recalling Probe Data

[Key Operation]



[Function]

This command is used to recall the probe data from the probe data file.

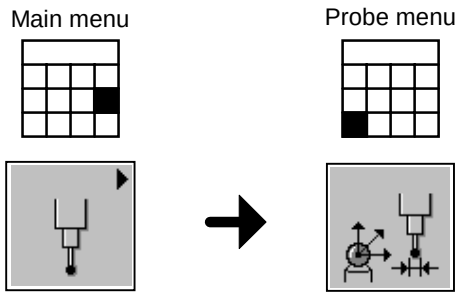
[Procedure]

1) Select this command from the menu.
2) Recall the probe data by specifying the drive (RAM or FD) and the probe data file name to be recalled.
   - ➢ The probe data is recalled.

NOTE • All the probe data for probe tip numbers 1 to 30 is recalled.

7.9 Registering Reference Origin

[Key Operation]



[Function]

This command is used to register the master ball position as the reference origin by measuring at least four points on the master ball. This command also registers the probe tip position (or stylus location) and the probe location used in volumetric error compensation.

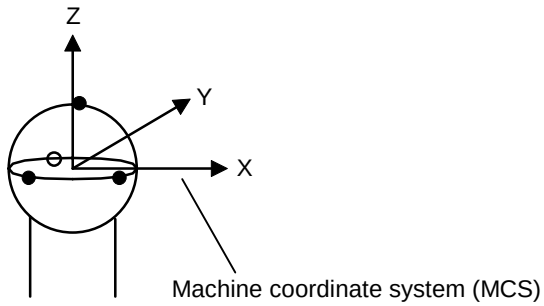


Figure 7-2

[Procedure]

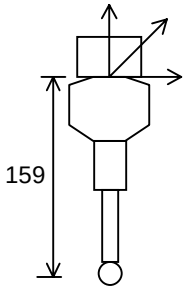
1) Select this command from the menu.
2) Enter the probe tip position (or stylus location) for the current probe and the probe location (only for CMMs with volumetric error compensation function) and select whether or not probe tip diameter calibration should be performed.
3) Touch the probe to the master ball so as to take measurements at four or more points.
4) When you have completed the measurements, press the **F4** (✔) key.
   - The reference origin and the probe data for use in volumetric error compensation is registered.

NOTE • Register the master ball diameter (see Section 7.10) beforehand.

Supplementary Information

- The probe location entered here is the position of the probe tip relative to the probe base (the bottom end of the Z spindle). The probe location is a vector value.
- This vector value (probe location) is used in volumetric error compensation for the coordinate measuring machine (CMM). While the probe location error of up to 1 mm does not have any adverse effects, care should be taken so that the error size does not increase since this will lead to loss of measuring accuracy in the coordinate measuring machine.

<Example>



probe location = (0, 0, -159)

TIP

- Up to four master balls can be used. Of these four, the master ball used as the reference is called the reference origin while the remaining three are referred to as sub-reference origins.

[Stylus location (Probe tip position)]

The stylus location shows the positional relationships when multiple styli (or probe tips) are used or when the probe direction is changed.

This “Registering reference origin” command sets the reference position for the stylus location.

Figure 7-3 shows an example of stylus location.

In this example, the “Registering reference origin” command is used to specify (0, 0, -40) for the stylus location and stylus “A” in Figure 7-3 is used to measure the master ball. Thereby, the reference position is set to the position “B”, relative to which the location of stylus “A” is (0, 0, -40).

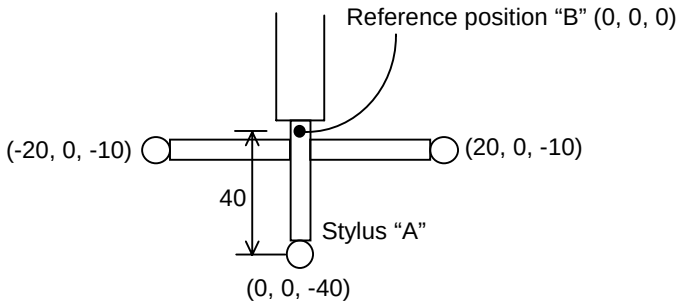
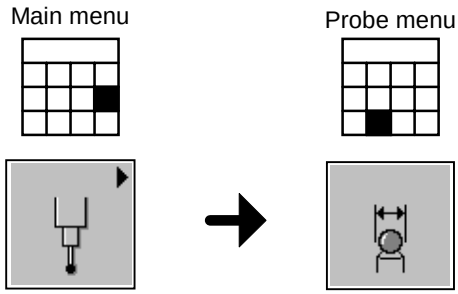


Figure 7-3

7.10 Keying in Master Ball Diameter

[Key Operation]



[Function]

This command is used to key in the diameter of the master ball.

[Procedure]

1) Select this command from the menu.
2) Enter the reference origin number and the master ball diameter.
   - ➢ The master ball diameter is set.

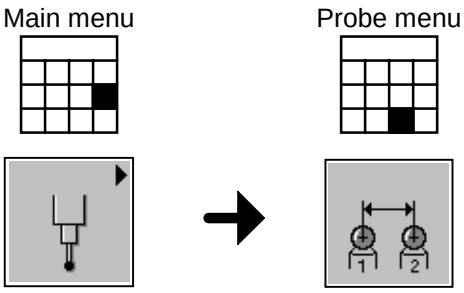
<Reference origin No.>

0: Reference origin	1: Sub-reference origin No. 1
2: Sub-reference origin No. 2	3: Sub-reference origin No. 3

TIP • Up to 4 master balls can be used. Set diameter values for each of the master balls used.

7.11 Registering Sub-reference Origin Position

[Key Operation]



[Function]

This command is used to register a sub-reference origin position in relation to the reference origin (origin of machine coordinate system (MCS)).

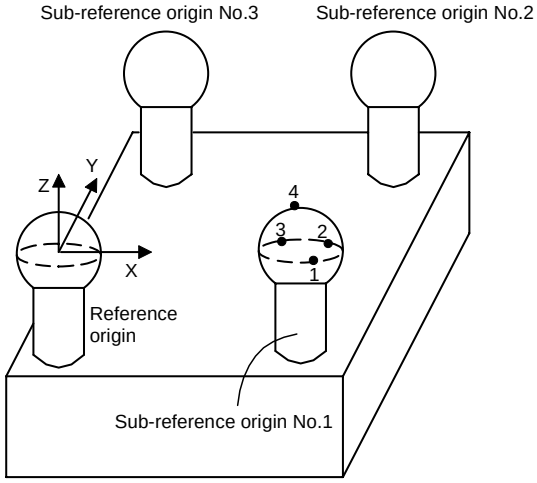


Figure 7-4

[Procedure]

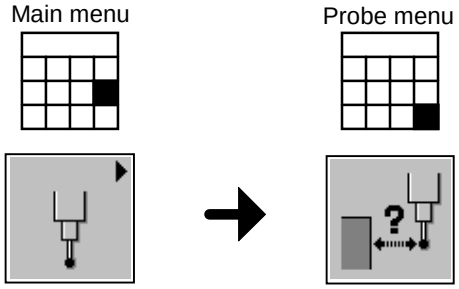
1) Select this command from the menu.
2) Select the number of the sub-reference origins to be set (1 to 3).
3) Touch the probe to the master ball so as to take measurements at four or more points.
4) When you have completed the measurements, press the F4 ( ) key.
   - ➢ The sub-reference origin position is calculated and registered.

NOTE
- For the measurement, use a probe with correctly registered stylus location (or probe tip position).
- Register the master ball diameter (see Section 7.10) beforehand.

TIP • Up to three sub-reference origins can be registered.

7.12 Keying in Auto-dummy Distance

[Key Operation]



[Function]

This command is used to key in the distance from the workpiece at which a dummy measurement point is automatically input for determining the direction for the probe tip radius compensation.

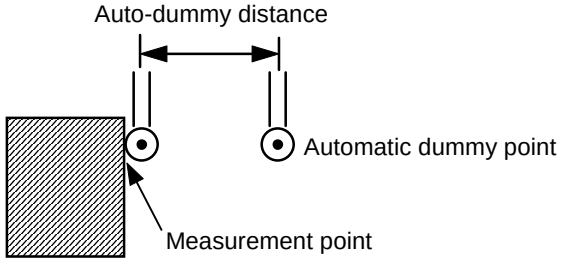


Figure 7-5

[Procedure]

1) Select this command from the menu.
2) Enter the Auto-dummy distance.
   - ➢ The Auto-dummy distance is changed.

TIP

- Distances between 0 and 10 mm can be specified.
- If the Auto-dummy distance is set to 0 mm, the measurement point no longer has a measurement direction (or approach direction) and probe tip radius compensation is no longer performed.
- The default value of Auto-dummy distance is 2 mm.

8 COORDINATE SYSTEM SETTING FUNCTION

This chapter describes the functions used for setting or aligning coordinate systems, namely establishing relationship between the part coordinate system (PCS) and the machine coordinate system (MCS).

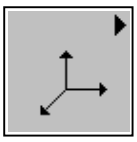
The coordinate system provides the reference from which a variety of calculations are performed for coordinate-based measurements.

The coordinate system setting functions include the following commands:

1) Align reference plane
2) Align origin
3) Align reference axis
4) Align reference axis with offset values
5) Rotate coordinate system
6) Align reference plane with offset values
7) Reset coordinate system
8) Store coordinate system
9) Recall coordinate system
10) Designate projection plane for rotational projection
11) Create auxiliary inclined plane
12) Designate reference plane

[Key operations to access Coordinate system setting function]

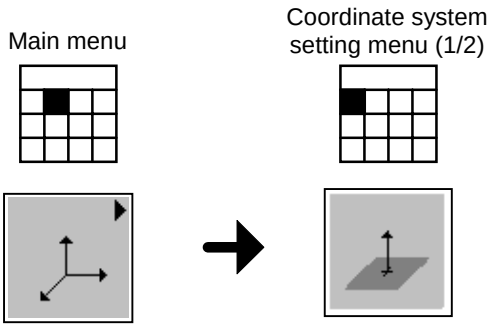
Main menu



Note: To view the next page menu of coordinate system setting function, press the function key corresponding to the  icon.

8.1 Aligning Reference Plane

[Key Operation]



[Function]

This command is used to align or set the reference plane so that the line component of the recalled feature forms the specified axis.

Where a plane feature is recalled, the normal direction of the plane becomes the specified axis.

When “Yes” is selected in the origin setting, the origin is translated to the position of the position component (or point component) of the recalled feature.

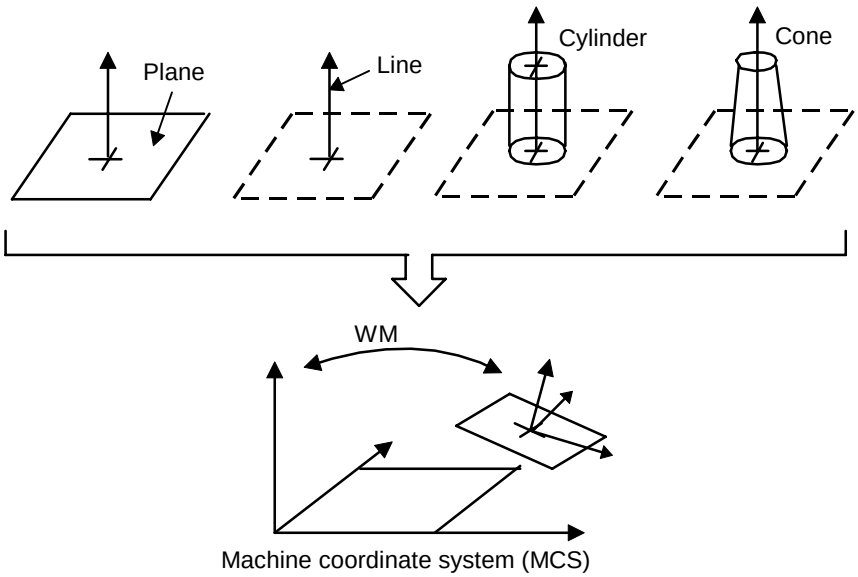


Figure 8-1

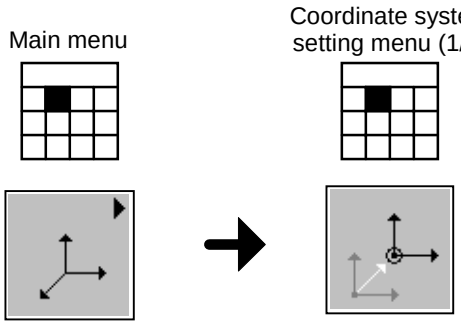
[Procedure]

1) Select this command from the menu.
2) Select the reference axis from the parameters (Automatic, X, -X, Y, -Y, Z, -Z).
3) Select the origin setting condition from the parameters (Yes, No).
4) Recall the feature.
   - The reference plane is aligned or set.

TIP
- The reference plane is set perpendicular to the specified reference axis.
- If you select “Automatic” in the reference axis selection, the label (X, Y, or Z) of the machine coordinate system’s axis closest to the recalled feature direction is used as the label of the reference axis.
- The angle (WM) formed between the machine coordinate system (MCS) third axis and the defined part coordinate system (PCS) third axis is displayed.

8.2 Aligning Origin

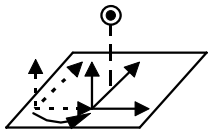
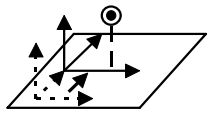
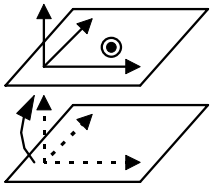
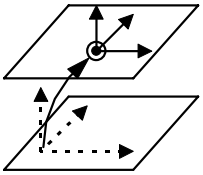
[Key Operation]



[Function]

This command is used to recall a feature to align or set the origin. The origin for the specified axis is then translated to the position of the position component (or point component) of the recalled feature.

Table 8-1. Examples

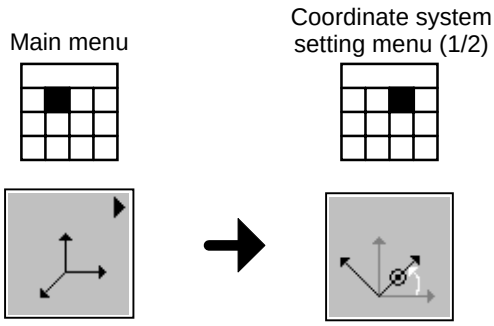
X: Origin translation	
Y: Origin translation	
Z: Origin translation	
X: Origin translation Y: Origin translation Z: Origin translation	

[Procedure]

1) Select this command from the menu.
2) Designate whether or not to perform origin translation for each of X, Y, and Z axes.
3) Recall the feature.
   - ➢ The origin is aligned or set.

8.3 Aligning Reference Axis

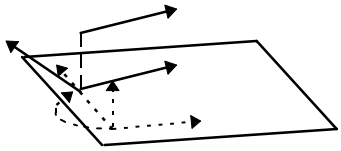
[Key Operation]



[Function]

This command is used to recall a feature from the feature memory and then align the reference axis.

<For a feature having a line component>



<For a feature having a point or position component>

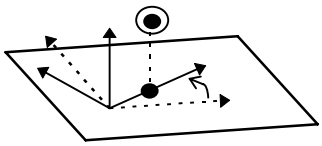


Figure 8-2

[Procedure]

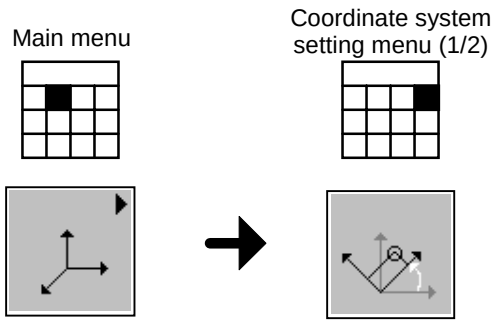
1) Select this command from the menu.
2) Select the reference axis from the parameters (Automatic, X, -X, Y, -Y, Z, -Z).
3) Select the origin setting condition from the parameters (Yes, No).
4) Recall the feature.
   - ➢ The reference axis is aligned or set.

TIP

- When the recalled feature is a line component feature (straight line, cylinder or cone), the coordinate system (the first and second axes) is aligned so that the specified reference axis direction coincides with the recalled feature's direction (line component). On the other hand, when the recalled feature is a point component feature (point, circle, ellipse or sphere), the coordinate system (the first and second axes) is aligned so that the specified reference axis passes through the position component (point component) of the recalled feature.
- When "Yes" is selected as the origin setting condition, the origin for whichever of the first and second axes was not specified in the reference axis selection is translated to the position component (point component) of the recalled line component feature.
- If you select "Automatic" in the reference axis selection, the label (X, Y, or Z) of the first or second axis of the machine coordinate system (MCS) which is closer to the recalled feature direction is used as the label of the reference axis.

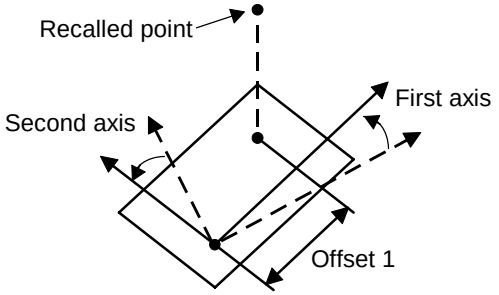
8.4 Aligning Reference Axis with Offset Values

[Key Operation]

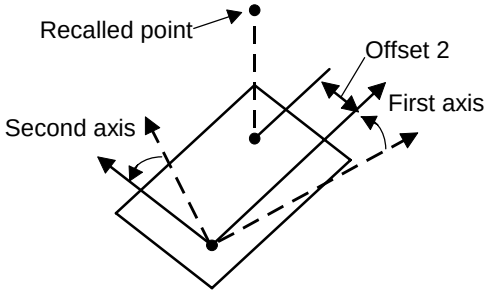


[Function]

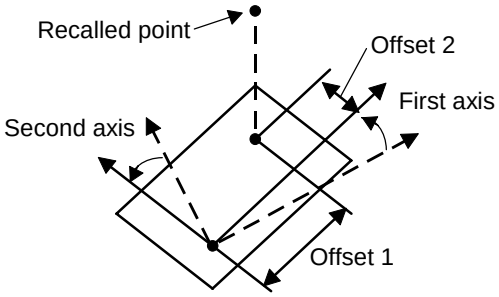
This command is used to recall a point component feature (circle, sphere or ellipse) and rotate the coordinate system so that the coordinates of the first and second axes for the recalled feature match the specified offset values.



<Offset axis: First axis>



<Offset axis: Second axis>



<Offset axis: Both axes>

Figure 8-3

[Procedure]

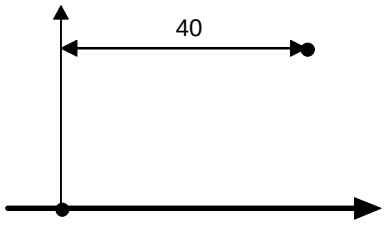
1) Select this command from the menu.
2) Select the offset axes from the parameters (First axis, Second axis, Both axes).
3) Enter the offset values.
4) Recall the feature.
   - ➢ The reference axes are aligned.

TIP

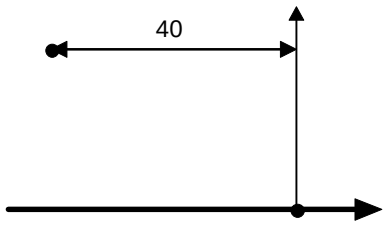
- When both axes are selected, they are rotated so as to minimize the sum of the square of the deviations.
- If the first axis is selected, specify the positive or negative direction of the second axis. Similarly, if the second axis is selected, specify the positive or negative direction of the first axis.

<Examples of offset values designation>

1) Offset axis: First axis
   Offset value for first axis: 40
   Offset value for second axis: <positive direction>

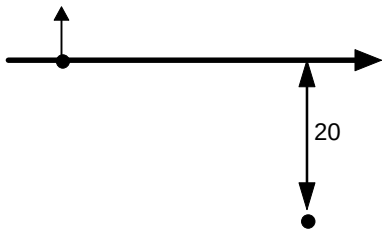


2) Offset axis: First axis
   Offset value for first axis: -40
   Offset value for second axis: <positive direction>

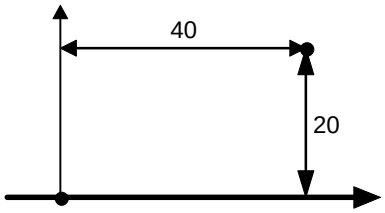


3) Offset axis: Second axis
   Offset value for first axis: <positive direction>
   Offset value for second axis: 20

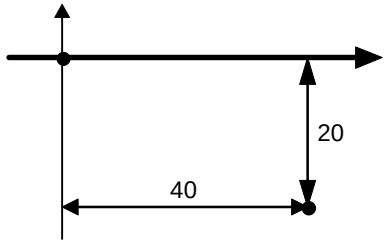
4) Offset axis: Second axis
   Offset value for first axis: <positive direction>
   Offset value for second axis: -20



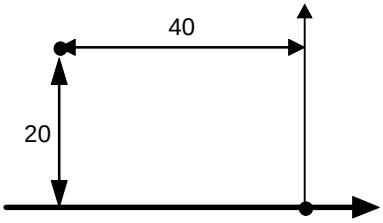
5) Offset axis: Both axes
   Offset value for first axis: 40
   Offset value for second axis: 20



6) Offset axis: Both axes
   Offset value for first axis: 40
   Offset value for second axis: -20



7) Offset axis: Both axes
   Offset value for first axis: -40
   Offset value for second axis: 20



8) Offset axis: Both axes
   Offset value for first axis: -40
   Offset value for second axis: -20

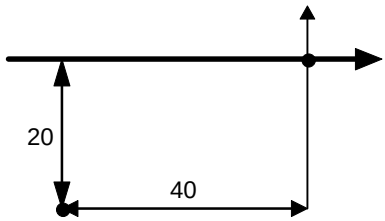
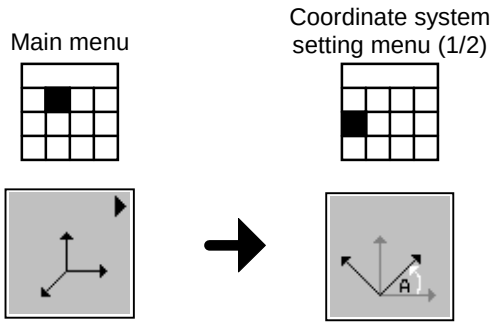


Figure 8-4

8.5 Rotating Coordinate System

[Key Operation]



[Function]

This command is used to specify the rotation axis and rotation angle and then rotate the coordinate system.

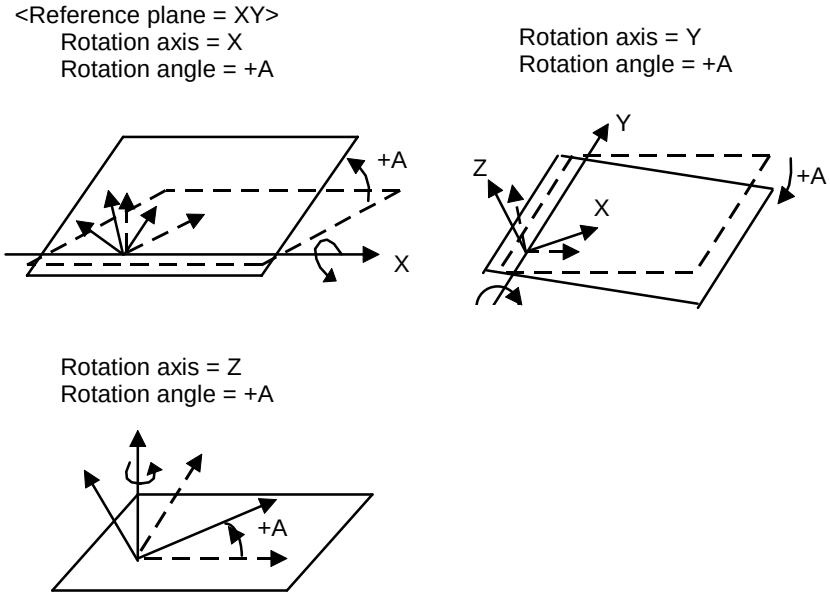


Figure 8-5

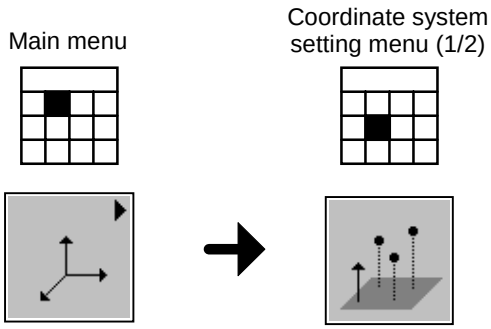
[Procedure]

1) Select this command from the menu.
2) Specify the rotation axis and enter the rotation angle.
   - The coordinate system is rotated.

TIP • Rotation angle in the range of -360° to 360° can be specified.

8.6 Aligning Reference Plane with Offset Values

[Key Operation]



[Function]

This command is used to measure three side planes of known heights and align the reference plane.

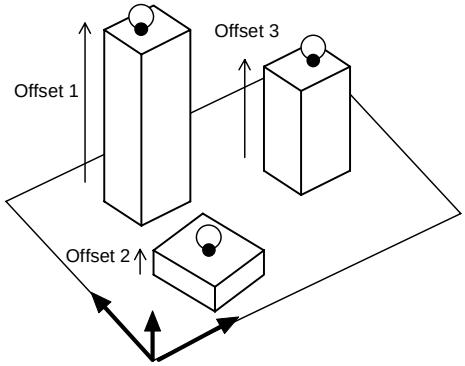


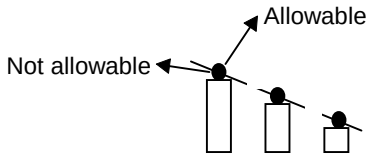
Figure 8-6

[Procedure]

1) Select this command from the menu.
2) Select the reference axis from the parameters (X, -X, Y, -Y, Z, -Z).
3) Enter the offset values.
4) Measure the three side planes of known heights.
   - The reference plane is aligned.

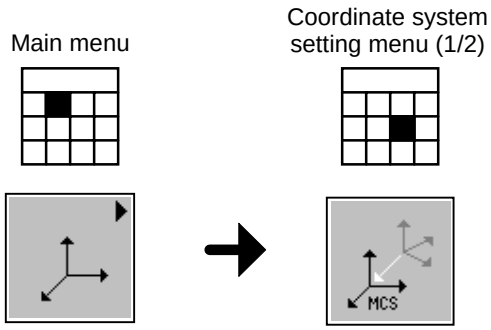
NOTE

- The side planes must be measured in the order in which their offset values are entered.
- The axis positive and negative directions and the direction for probe tip radius compensation are determined by the direction of automatic probe tip radius compensation for a plane that passes through the three measurement points. Consequently, care must be taken with the direction of probe movement following measurement of the last measurement point.



8.7 Resetting Coordinate System

[Key Operation]



[Function]

This command is used to clear the coordinate system set currently and restore the default settings as shown below.

<Default settings>

Reference plane: XY

Inclined plane: None

Coordinate system: Same as machine coordinate system (MCS)

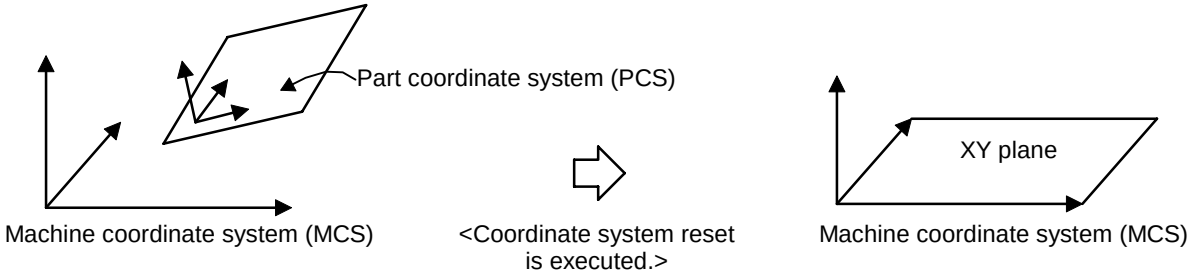


Figure 8-7

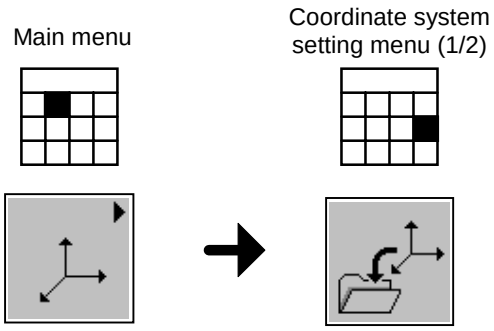
[Procedure]

1) Select this command from the menu.
2) Execute the command as directed by the on-screen guidance messages.
   - The coordinate system is cleared and the default settings are restored.

TIP • The coordinate system returns to the same position and orientation as the machine coordinate system.

8.8 Storing Coordinate System

[Key Operation]



[Function]

This command is used to store the current part coordinate system (PCS) (origin coordinates, direction cosine and reference plane designation) in the coordinate system memory.

[Procedure]

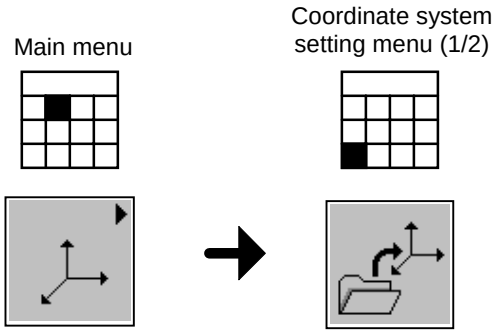
1) Select this command from the menu.
2) Designate a coordinate system memory number (1 to 20).
   - The current part coordinate system information is stored in the coordinate system memory.

TIP

- There are 20 storage areas in coordinate system memory.
- Data stored in the coordinate system memory is maintained when the measurement program is terminated and can be re-used at the next time the program is launched.

8.9 Recalling Coordinate System

[Key Operation]



[Function]

This command is used to recall coordinate system data from the coordinate system memory and set it as the current part coordinate system.

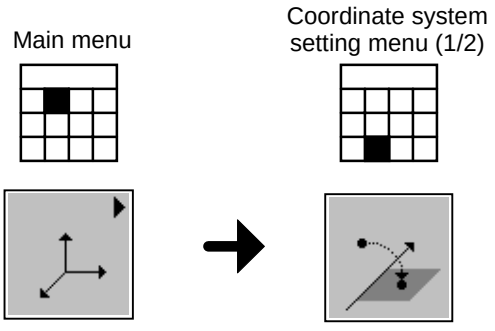
[Procedure]

1) Select this command from the menu.
2) Designate the coordinate system memory number.
   - ➢ The coordinate system stored in the coordinate system memory is set as the current part coordinate system.

TIP • When coordinate system data is recalled from the coordinate system memory, the reference plane also changes in the same way.

8.10 Designating Projection Plane for Rotational Projection

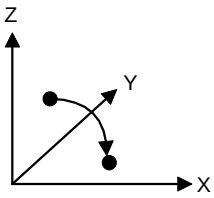
[Key Operation]



[Function]

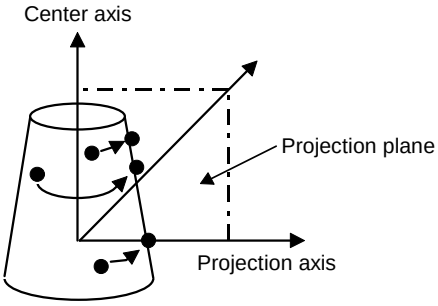
This command is used to designate the projection plane used in rotational projection processing for measurement of a point with approach direction or a projected line.

Given the following conditions:
Center axis = Y
Projection axis = X
Projection direction = 1 (positive direction)



<When a rotational projection plane is designated for a cone>

[Projection direction:
1 (positive direction)]



[Projection direction:
2 (positive & negative directions)]

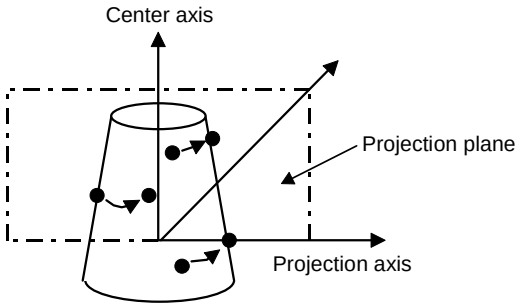


Figure 8-8

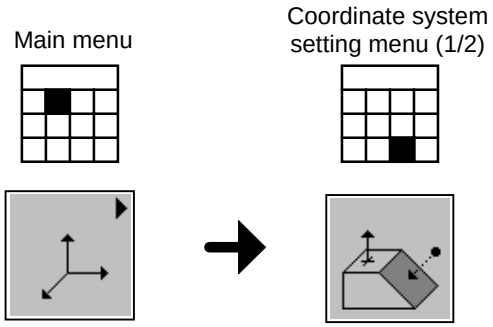
[Procedure]

1) Select this command from the menu.
2) Designate the center axis (X, Y, Z).
3) Designate the projection axis (X, Y, Z, -X, -Y, -Z).
   - The rotational projection plane is set.

TIP • The feature to be rotationally projected is rotated and projected on the plane created using the center axis and projection axis.

8.11 Creating Auxiliary Inclined Plane

[Key Operation]



[Function]

This command is used to set an inclined plane used to project a measured feature onto the inclined plane at circle, ellipse or projected line measurement.

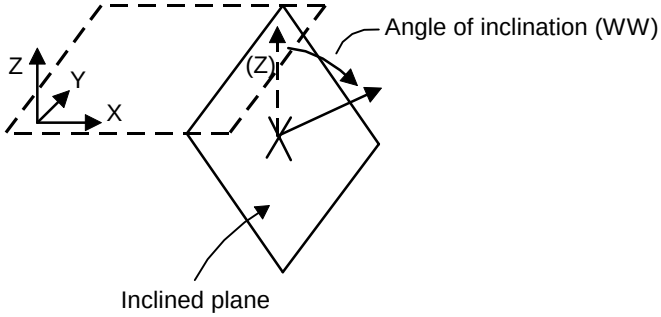


Figure 8-9

[Procedure]

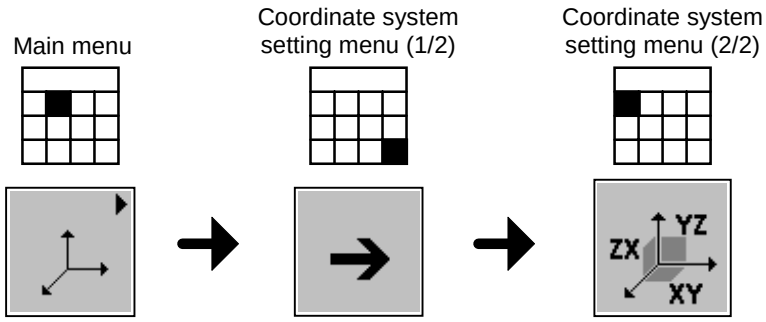
1) Select this command from the menu.
2) Recall the feature (straight line, plane, cylinder, or cone feature).
   - ➢ The inclined plane is set.

TIP

- A straight line, plane, cylinder, or cone feature can be used to set the inclined plane.
- The angle of inclination (WW) between the third axis for the reference plane and the normal line of the inclined plane is displayed.

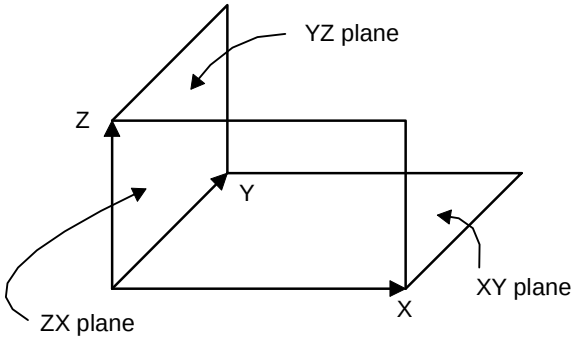
8.12 Designating Reference Plane

[Key Operation]



[Function]

This command is used to designate the reference plane for the current part coordinate system.



	First axis	Second axis	Third axis
XY plane	X	Y	Z
YZ plane	Y	Z	X
ZX plane	Z	X	Y

Figure 8-10

[Procedure]

1) Select this command from the menu.
2) Designate the reference plane for the current coordinate system.
   - The reference plane is switched.

9 MACRO FUNCTION FOR ALIGNING COORDINATE SYSTEM

This chapter describes the macro functions used for automatically aligning the part coordinate systems (PCS).

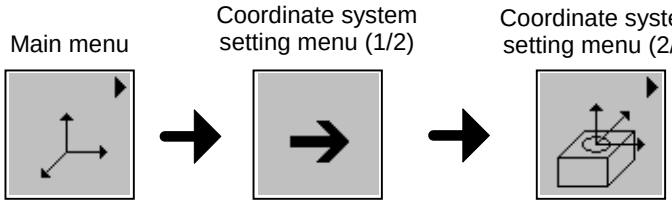
Twelve handy macro commands for aligning or setting the part coordinate system have been registered.

The part coordinate system can be aligned or set automatically by selecting the appropriate alignment macro for the workpiece and taking the measurements.

The coordinate system alignment macro function includes the following commands:

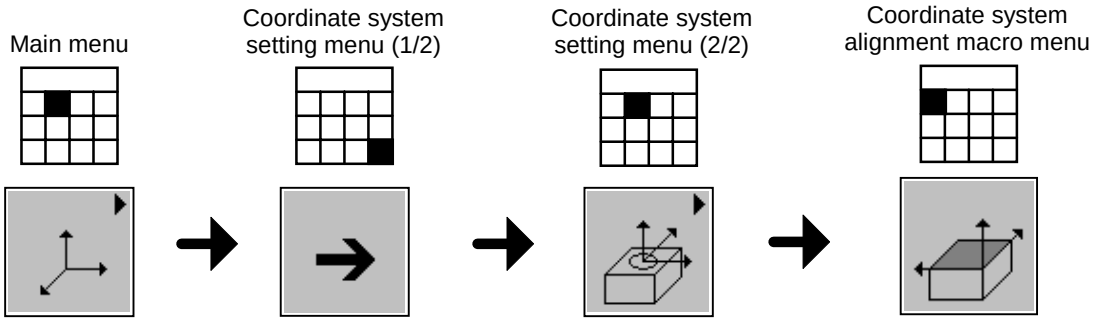
1) Coordinate system alignment macro No. 1
   (4-point plane, 2-point line, 1-point side plane)
2) Coordinate system alignment macro No. 2
   (4-point plane, 2-point line, 4-point circle)
3) Coordinate system alignment macro No. 3
   (4-point plane, 4-point circle, 4-point circle)
4) Coordinate system alignment macro No. 4
   (4-point plane, 4-point circle, 4-point circle)
5) Coordinate system alignment macro No. 5
   (4-point plane, 2-point line, 2-point line)
6) Coordinate system alignment macro No. 6
   (4-point plane, 4-point circle, 4-point circle)
7) Coordinate system alignment macro No. 7
   (4-point plane, 4-point circle, 4-point circle, 4-point circle)
8) Coordinate system alignment macro No. 8
   (4-point plane, 2-point line, 1-point side plane, 1-point side plane, 1-point side plane)
9) Coordinate system alignment macro No. 9
   (8-point cylinder, 1-point side plane, 4-point circle)
10) Coordinate system alignment macro No. 10
   (8-point cylinder, 1-point side plane, 2-point bisection)
11) Coordinate system alignment macro No. 11
   (8-point cylinder, 1-point side plane, 2-point line)
12) Coordinate system alignment macro No. 12
   (8-point cylinder, 8-point cylinder)

[Key operations to access Coordinate system alignment macro function]



9.1 Coordinate System Alignment Macro No. 1 (4-point plane, 2-point line, 1-point side plane)

[Key operation]



[Function]

Sets or aligns the part coordinate system with a plane as the reference plane and a workpiece corner as the origin.

[Procedure]

1) Select this command from the menu.
2) Take the measurements using the procedure shown below.
   - ➢ The part coordinate system is set or aligned.

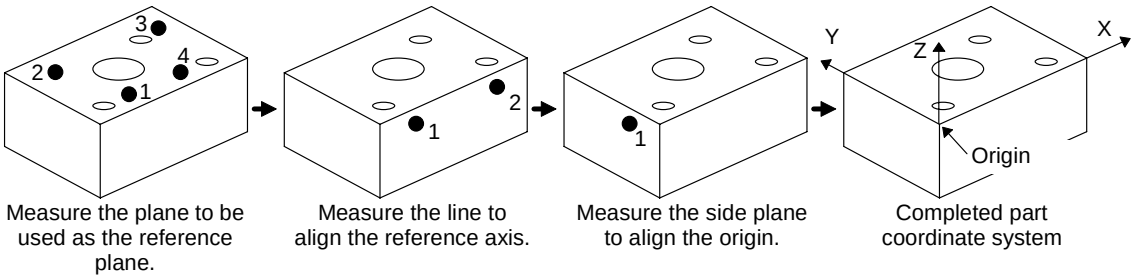


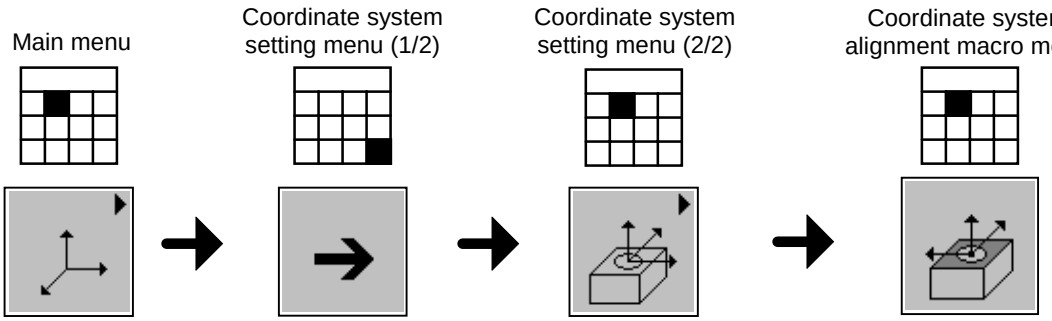
Figure 9-1

NOTE • In coordinate system alignment macro measurement, the target coordinate system is not set until the final point is measured. Consequently, if the measurement is interrupted before completion, the previous coordinate system remains valid.

TIP • The X-axis direction is determined by the positional relationship between the points measured in line measurement. For this reason, care should be taken with the positions of the points measured during line measurement.

9.2 Coordinate System Alignment Macro No. 2 (4-point plane, 2-point line, 4-point circle)

[Key operation]



[Function]

Sets or aligns the part coordinate system with a plane as the reference plane and the center of a circle on the reference plane as the origin.

[Procedure]

1) Select this command from the menu.
2) Take the measurements using the procedure shown below.
   - The part coordinate system is set or aligned.

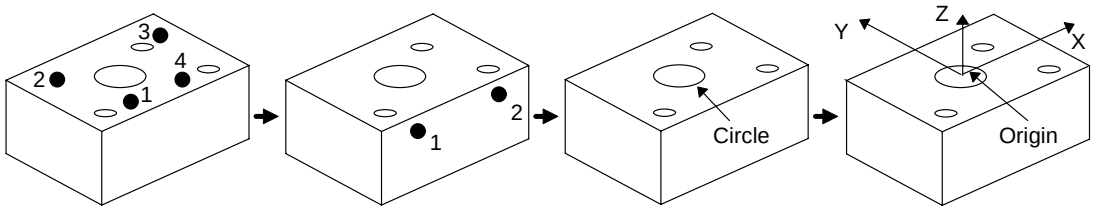


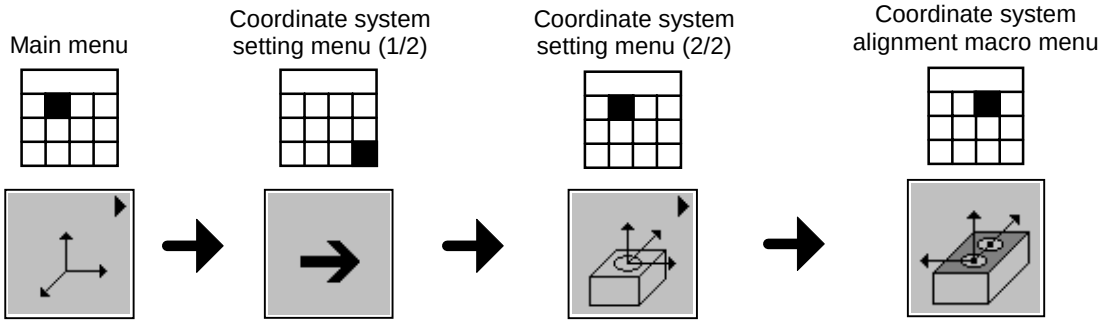
Figure 9-2

NOTE • In coordinate system alignment macro measurement, the target coordinate system is not set until the final point is measured. Consequently, if the measurement is interrupted before completion, the previous coordinate system remains valid.

TIP • The X-axis direction is determined by the positional relationship between the points measured in line measurement. For this reason, care should be taken with the positions of the points measured during line measurement.

9.3 Coordinate System Alignment Macro No. 3 (4-point plane, 4-point circle, 4-point circle)

[Key operation]



[Function]

Sets or aligns the part coordinate system with the center of circle (1) as the origin and the straight line passing through the center of circle (2) as the reference axis.

[Procedure]

1) Select this command from the menu.
2) Take the measurements using the procedure shown below.
   - The part coordinate system is set or aligned.

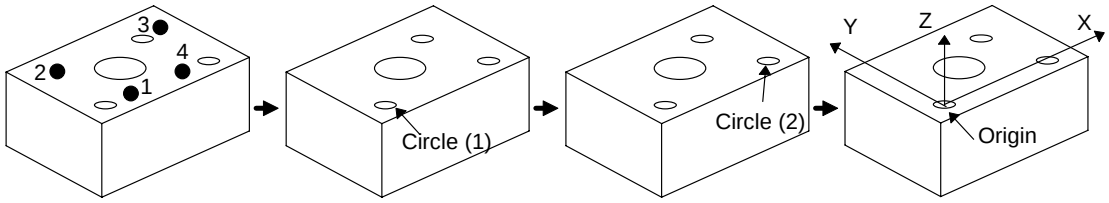


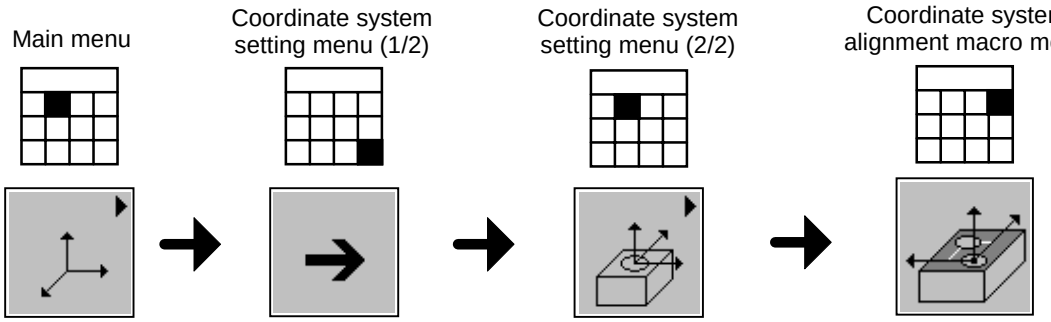
Figure 9-3

NOTE • In coordinate system alignment macro measurement, the target coordinate system is not set until the final point is measured. Consequently, if the measurement is interrupted before completion, the previous coordinate system remains valid.

TIP • The X-axis direction is positive in the direction running from the center of circle (1) to the center of circle (2).

9.4 Coordinate System Alignment Macro No. 4 (4-point plane, 4-point circle, 4-point circle)

[Key operation]



[Function]

Sets or aligns the part coordinate system with the center of circle (1) as the origin and in which the reference axis is aligned using the center of circle (2) with offset values “h1” and “h2”.

[Procedure]

1) Select this command from the menu.
2) Take the measurements using the procedure shown below.
   - The part coordinate system is set or aligned.

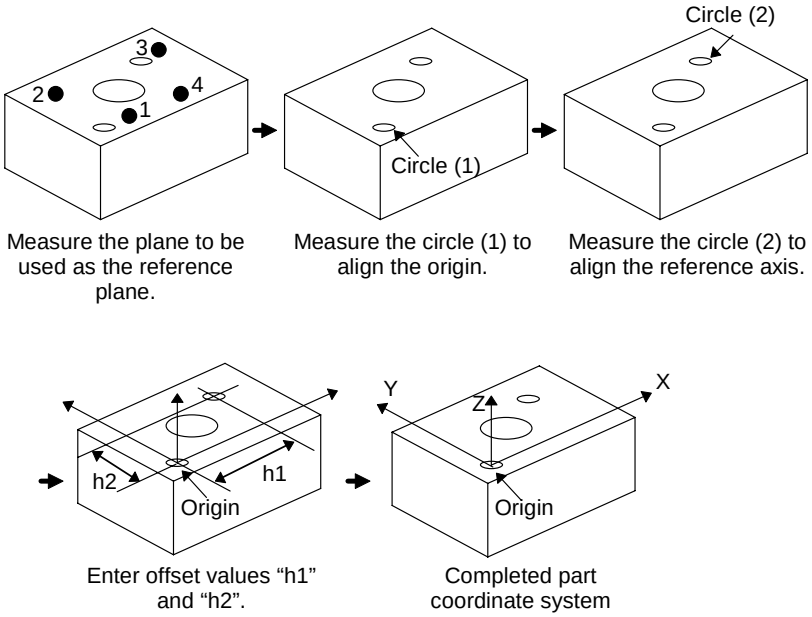
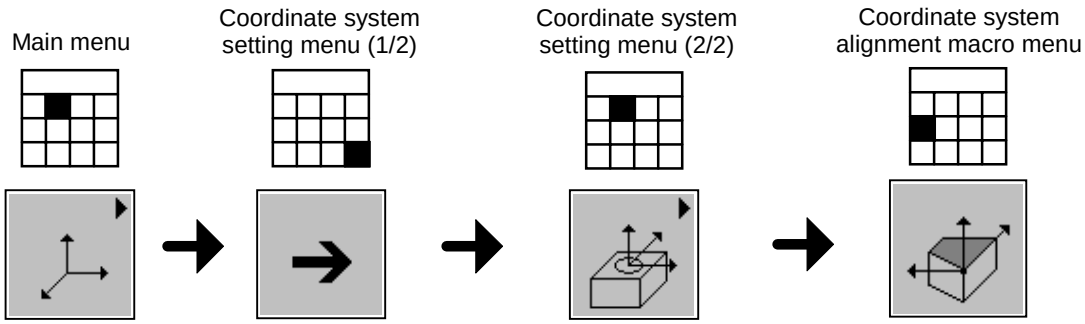


Figure 9-4

9.5 Coordinate System Alignment Macro No. 5 (4-point plane, 2-point line, 2-point line)

[Key operation]



[Function]

Sets or aligns the part coordinate system with the intersection point of two straight lines projected on the reference plane as the origin and one of the straight lines projected on the reference plane as the reference axis.

[Procedure]

1) Select this command from the menu.
2) Take the measurements using the procedure shown below.
   - ➢ The part coordinate system is set or aligned.

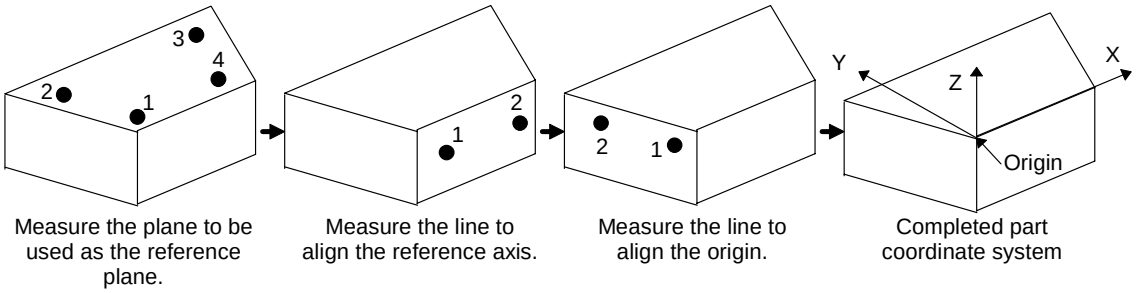


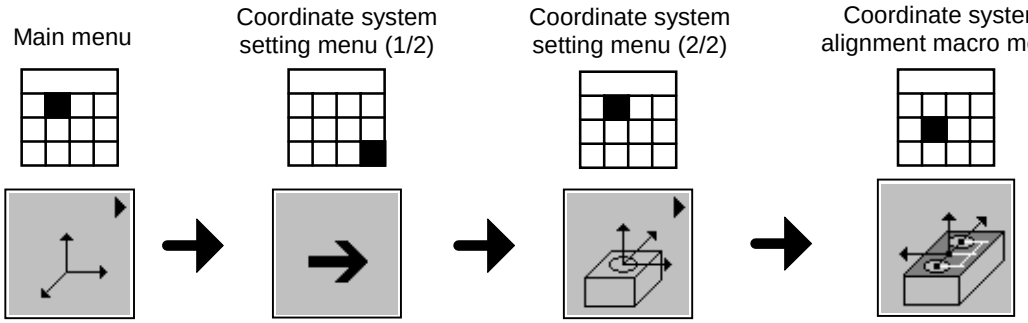
Figure 9-5

NOTE • In coordinate system alignment macro measurement, the target coordinate system is not set until the final point is measured. Consequently, if the measurement is interrupted before completion, the previous coordinate system remains valid.

TIP • The X-axis direction is determined by the positional relationship between the points measured in line measurement for the reference axis alignment. For this reason, care should be taken with the positions of the points measured during line measurement for the reference axis alignment.

9.6 Coordinate System Alignment Macro No. 6 (4-point plane, 4-point circle, 4-point circle)

[Key operation]



[Function]

Sets the reference axis that passes through two circles and sets the origin at the bisection point of the two circles.

[Procedure]

1) Select this command from the menu.
2) Take the measurements using the procedure shown below.
   - The part coordinate system is set or aligned.

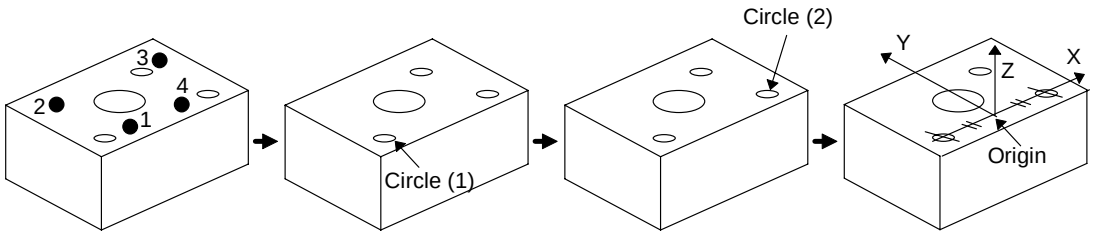


Figure 9-6

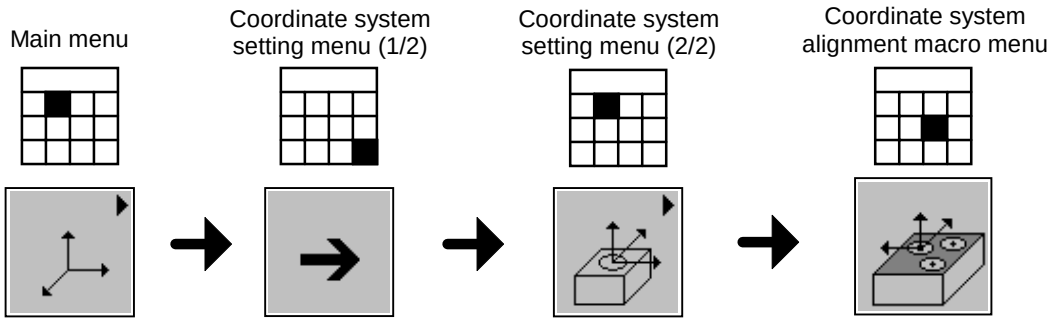
NOTE • In coordinate system alignment macro measurement, the target coordinate system is not set until the final point is measured. Consequently, if the measurement is interrupted before completion, the previous coordinate system remains valid.

TIP • The X-axis direction is positive in the direction running from the center of circle (1) to the center of circle (2).

• This command also calculates the center coordinates and diameters of the two circles.

9.7 Coordinate System Alignment Macro No. 7 (4-point plane, 4-point circle, 4-point circle, 4-point circle)

[Key operation]



[Function]

Uses two circles to align the reference axis and uses a third circle to align the origin.

[Procedure]

1) Select this command from the menu.
2) Take the measurements using the procedure shown below.
   - ➢ The part coordinate system is set or aligned.

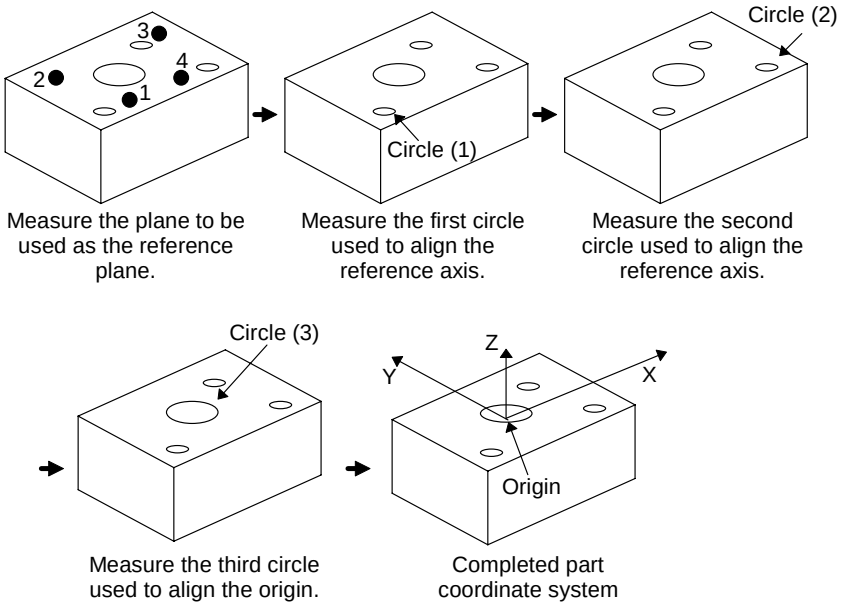


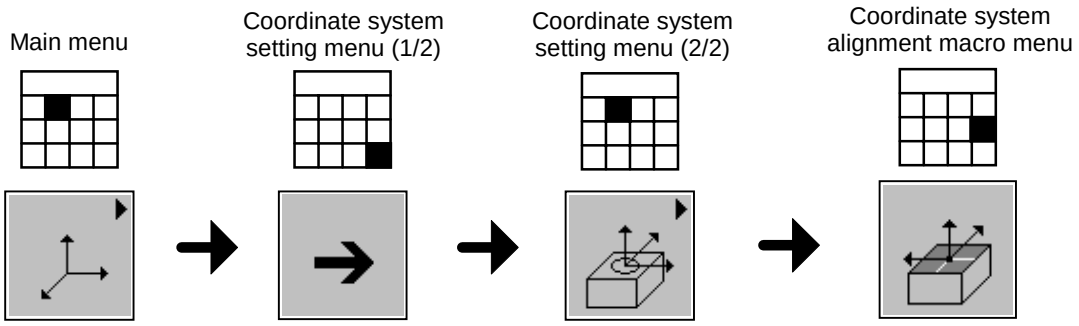
Figure 9-7

NOTE
- In coordinate system alignment macro measurement, the target coordinate system is not set until the final point is measured. Consequently, if the measurement is interrupted before completion, the previous coordinate system remains valid.

TIP
- The X-axis direction is positive in the direction running from the center of circle (1) to the center of circle (2).
- This command also calculates the center coordinates and diameters of the three circles.

9.8 Coordinate System Alignment Macro No. 8 (4-point plane, 2-point line, 1-point side plane, 1-point side plane, 1-point side plane)

[Key operation]



[Function]

Sets or aligns the part coordinate system with the center of a rectangle as the origin.

[Procedure]

1) Select this command from the menu.
2) Take the measurements using the procedure shown below.
   ➢The part coordinate system is set or aligned.

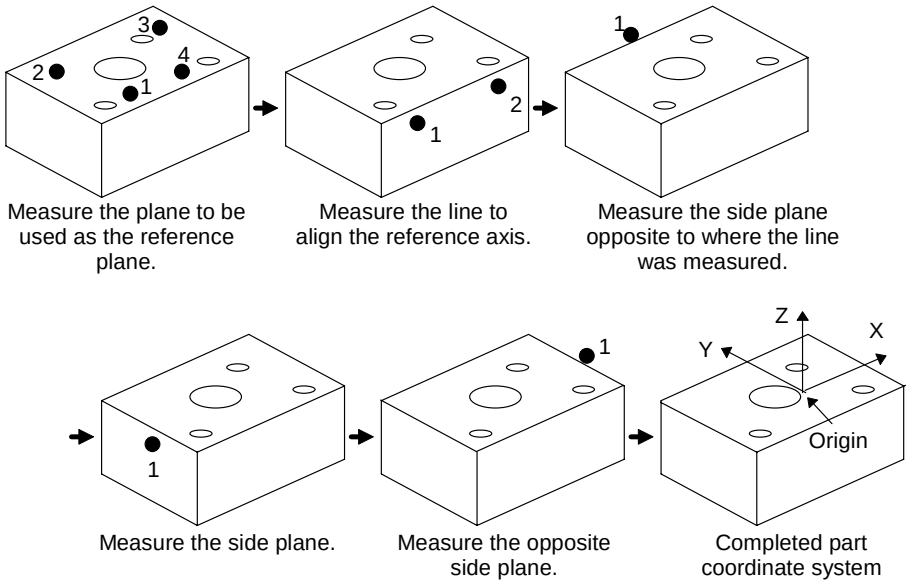
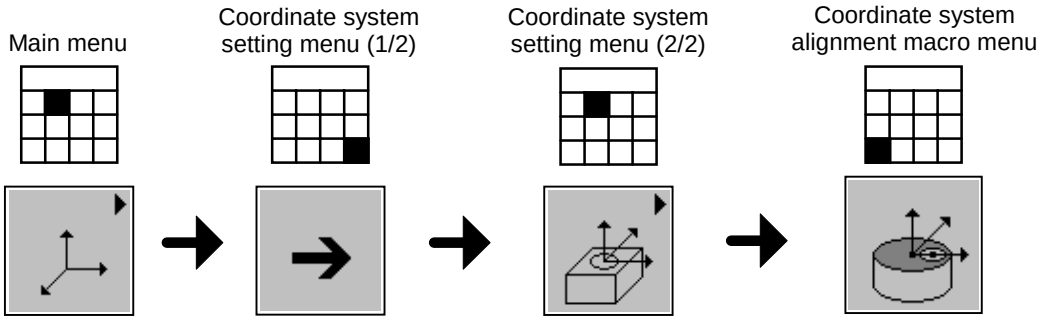


Figure 9-8

NOTE • In coordinate system alignment macro measurement, the target coordinate system is not set until the final point is measured. Consequently, if the measurement is interrupted before completion, the previous coordinate system remains valid.

9.9 Coordinate System Alignment Macro No. 9 (8-point cylinder, 1-point side plane, 4-point circle)

[Key operation]



[Function]

Sets or aligns the part coordinate system with the central axis of a cylinder as the Z-axis and the straight line passing through the center of a circle as the X-axis.

[Procedure]

1) Select this command from the menu.
2) Take the measurements using the procedure shown below.
   - The part coordinate system is set or aligned.

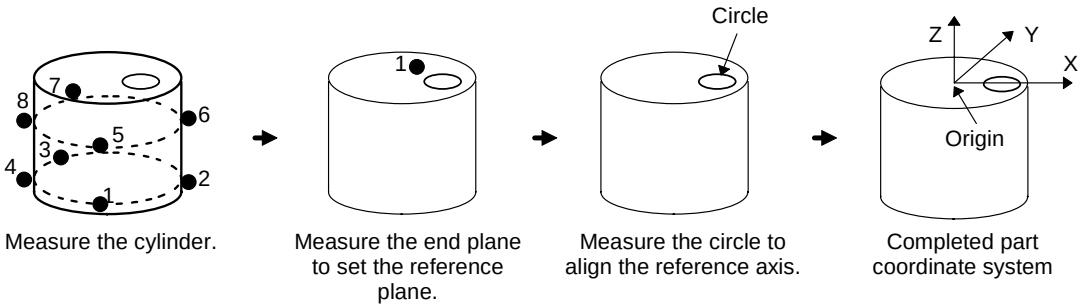
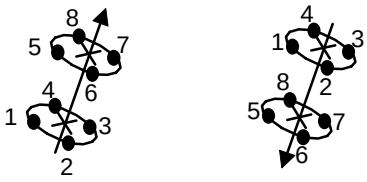


Figure 9-9

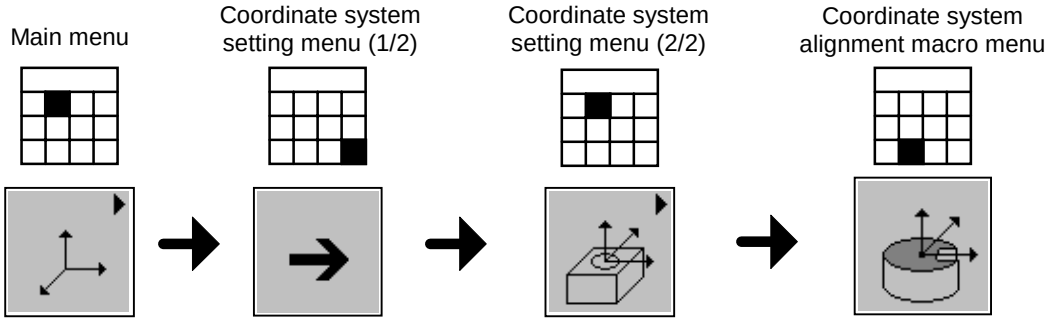
TIP • The Z-axis direction runs from the first four points (1-4) in cylinder measurement towards the second four points (5-8) in cylinder measurement.



• In this command, it is possible to use a normal cylinder or a stepped cylinder as the cylinder necessary for aligning the coordinate system.

9.10 Coordinate System Alignment Macro No. 10 (8-point cylinder, 1-point side plane, 2-point bisection)

[Key operation]



[Function]

Sets or aligns the part coordinate system where the central axis of a cylinder is the Z-axis and the X-axis is aligned using the bisection point of two parallel planes.

[Procedure]

1) Select this command from the menu.
2) Take the measurements using the procedure shown below.
   ➢The part coordinate system is set or aligned.

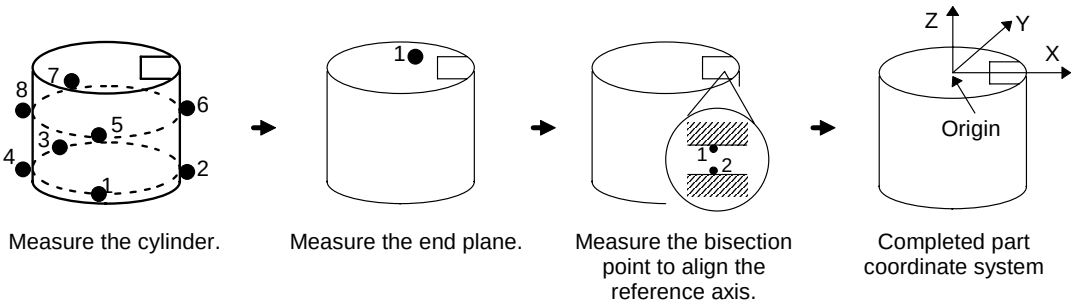
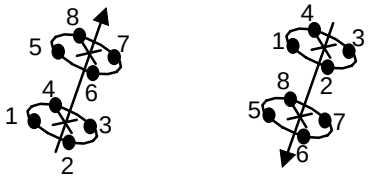


Figure 9-10

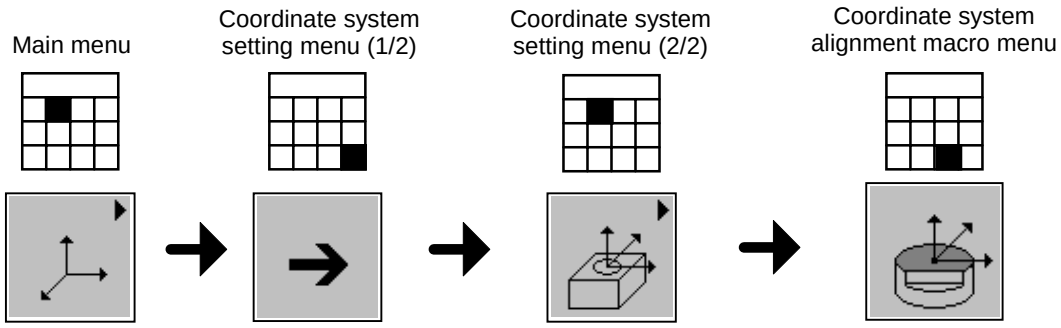
TIP • The Z-axis direction runs from the first four points (1-4) in cylinder measurement towards the second four points (5-8) in cylinder measurement.



• In this command, it is possible to use a normal cylinder or a stepped cylinder as the cylinder necessary for aligning the coordinate system.

9.11 Coordinate System Alignment Macro No. 11 (8-point cylinder, 1-point side plane, 2-point line)

[Key operation]



[Function]

Sets or aligns the part coordinate system where the central axis of a cylinder is the Z-axis and the X-axis is aligned using line measurement.

[Procedure]

1) Select this command from the menu.
2) Take the measurements using the procedure shown below.
   - The part coordinate system is set or aligned.

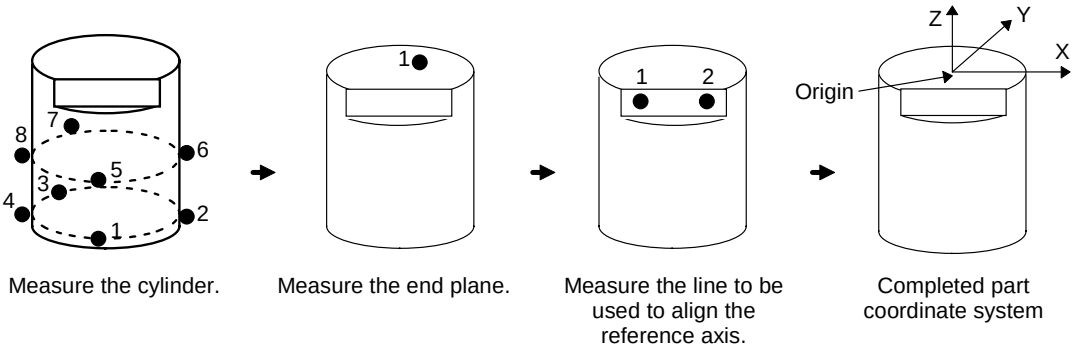
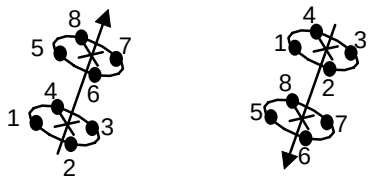


Figure 9-11

TIP

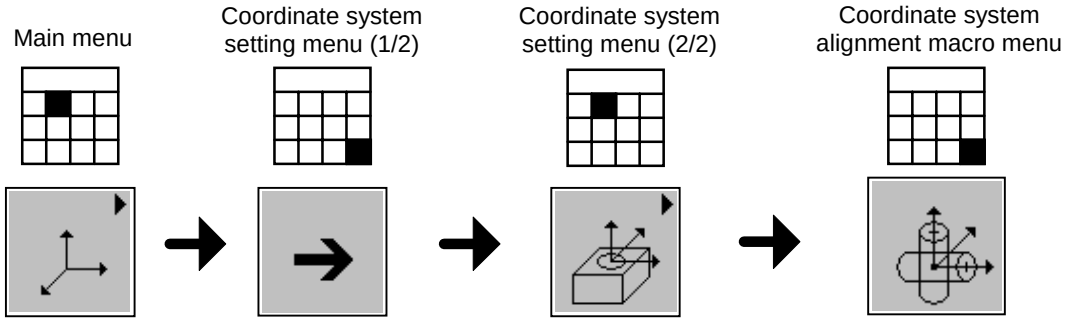
- The Z-axis direction runs from the first four points (1-4) in cylinder measurement towards the second four points (5-8) in cylinder measurement.



- The X-axis direction is determined by the positional relationship between the points measured in line measurement. For this reason, care should be taken with the positions of the points measured during line measurement.
- In this command, it is possible to use a normal cylinder or a stepped cylinder as the cylinder necessary for aligning the coordinate system.

9.12 Coordinate System Alignment Macro No. 12 (8-point cylinder, 8-point cylinder)

[Key operation]



[Function]

Sets or aligns the part coordinate system with the central axis of the first cylinder as the Z-axis and the central axis of the second cylinder as the X-axis.

[Procedure]

1) Select this command from the menu.
2) Take the measurements using the procedure shown below.
   - ➢ The part coordinate system is set or aligned.

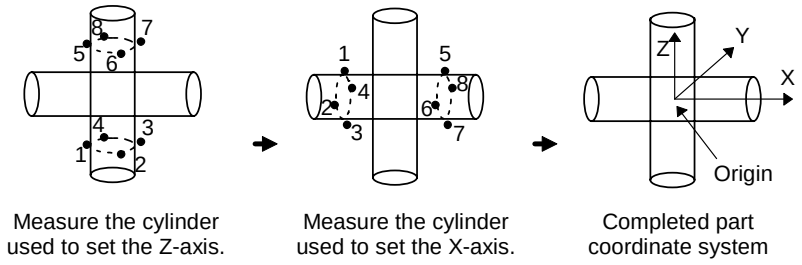
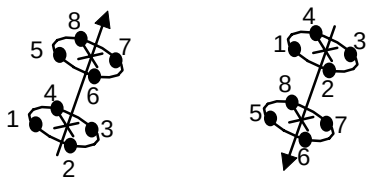


Figure 9-12

TIP

- The Z-axis or X-axis direction runs from the first four points (1-4) in cylinder measurement towards the second four points (5-8) in cylinder measurement.



- In this command, it is possible to use a normal cylinder or a stepped cylinder as the each cylinder necessary for aligning the coordinate system.

MEMO

10 SUPPLEMENTARY OUTPUT FUNCTIONS

This chapter describes the supplementary output functions such as screen display and printer output.

The supplementary output functions include the following commands:

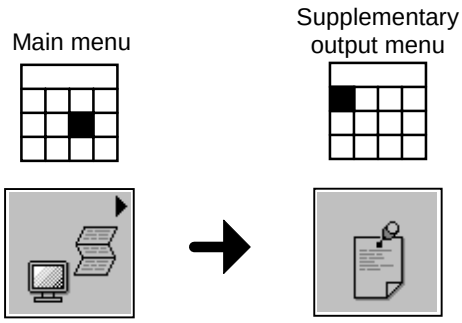
1) Outputting comment
2) Displaying date & time
3) Tolerance heading output
4) Line feed or page feed
5) Displaying stored feature
6) Displaying raw data
7) Calculating mean, maximum and minimum

[Key operations to access supplementary output functions]

Main menu

10.1 Outputting Comment

[Key Operation]



[Function]

Displays a comment on the screen (LCD).

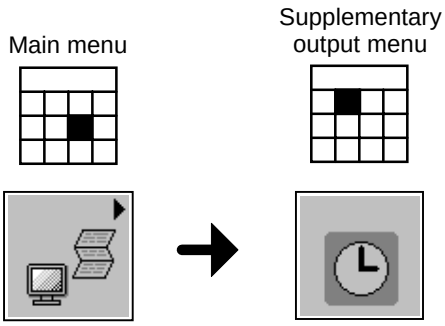
[Procedure]

1) Select this command from the menu.
2) Enter a comment.
   - ➢ The comment is displayed on the screen.

TIP • Comments up to 68 characters long can be entered.

10.2 Displaying Date & Time

[Key Operation]



[Function]

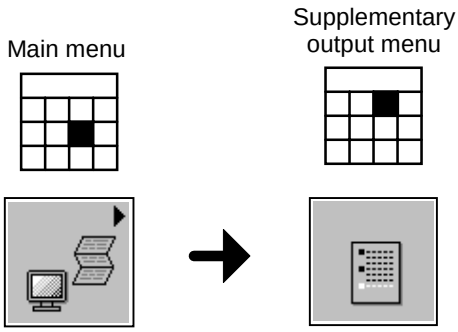
Displays the current date and time.

[Procedure]

1) Select this command from the menu.
2) Designate the information to be displayed. Parameters for the information to be displayed are as follows:
   1: Date and time
   2: Date only
   3: Time only
   - The current date and/or time is displayed on the screen.

10.3 Tolerance Heading Output

[Key Operation]



[Function]

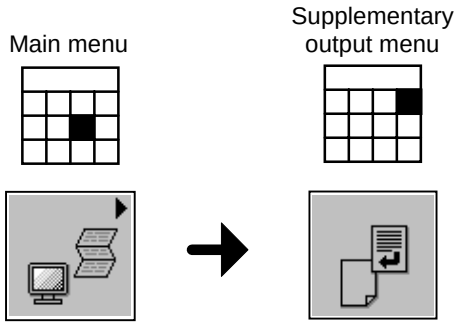
Displays the tolerance heading.

[Procedure]

1) Select this command from the menu.
   - The tolerance heading is displayed.

10.4 Line Feed or Page Feed

[Key Operation]



[Function]

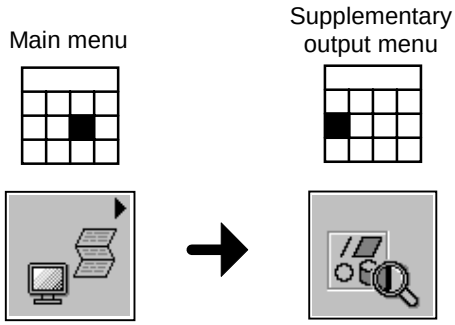
Performs a printer line feed or page feed.

[Procedure]

1) Select this command from the menu.
2) Select line feed or page feed, and specify the number of lines or pages.
   - The printer feeds the specified number of lines or pages.

10.5 Displaying Stored Feature

[Key Operation]



[Function]

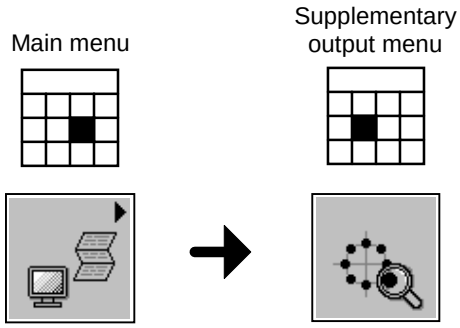
Displays the contents of the specified memory, automatic memory, or raw data memory in which the feature is stored.

[Procedure]

1) Select this command from the menu.
2) Designate the type of memory and the memory number.
   - The contents of the designated memory are displayed.

10.6 Displaying Raw Data

[Key Operation]



[Function]

Displays the deviations between the each measured raw data and the obtained feature. This command also displays the maximum deviation (MAX.), minimum deviation (MIN.), and the deviation range (RANG = MAX. - MIN.).

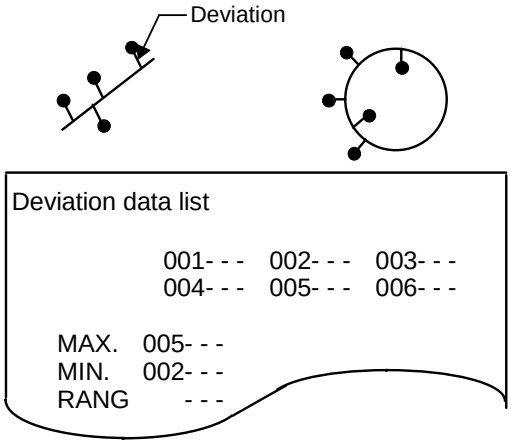


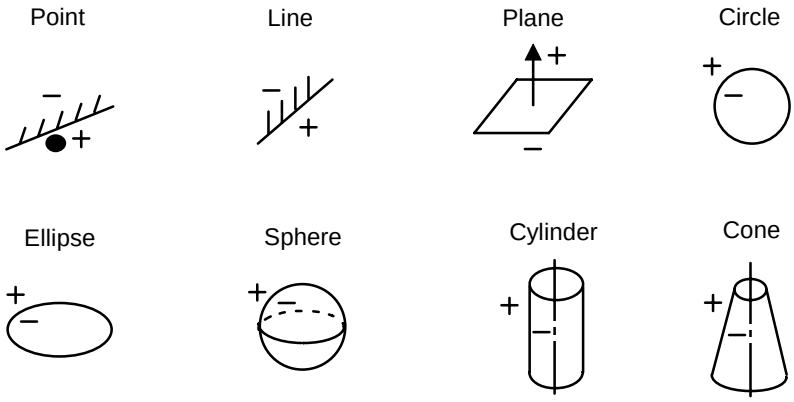
Figure 10-1

[Procedure]

1) Select this command from the menu.
   - The deviation data are displayed.

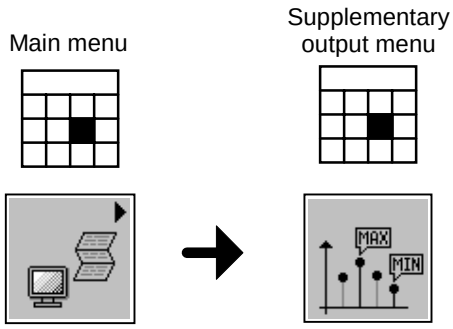
TIP

- Use this function immediately after measurement.
- The next measurement command cancels this command.
- The negative and positive signs of the deviation data are as shown below.



10.7 Calculating Mean, Maximum and Minimum

[Key Operation]



[Function]

Calculates the maximum, minimum and mean values for a designated output item (one only item) from recalled features.

Example of mean, maximum and minimum calculation for Y coordinate

Where “A” to “D” are stored in Nos. 1 to 4 in memory:

Maximum value (MAX) : 25.000
Minimum value (MIN) : 7.000
Mean value (AVE) : 16.500

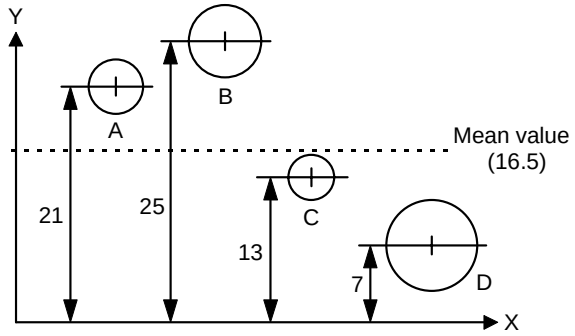


Figure 10-2

[Procedure]

1) Select this command from the menu.
2) Designate only one output item.
3) Recall multiple features for calculation.
   - The maximum, minimum and mean values are calculated.

NOTE

- The recalled features must all be the same type of feature.
- For angles close to 0°, angle data are converted so that all the converted angle data are within a range of the first angle data ±180°, then the maximum value, the minimum value, and the mean value are calculated.

[Example of angle calculation]

Angle data		Internally converted angle			
0.3°		0.3°		Maximum	0.3°
0.1°	→	0.1°	→	Minimum	359.9°
359.9°		-0.1°		Mean	0.0°
359.8°		-0.2°			

TIP

If the feature data includes probe tip diameter data, the feature data is compensated by the probe tip radius along the measurement direction.

11 SUPPLEMENTARY SETTING FUNCTION

This chapter describes the supplementary setting functions.

The following supplementary setting functions are provided.

1) Condition settings for overall coordinate measurement
2) Continuous storage settings
3) General tolerance settings
4) File management

11.1 Condition Settings for Overall Coordinate Measurement

The following commands can be used to set the conditions for overall coordinate measurement:

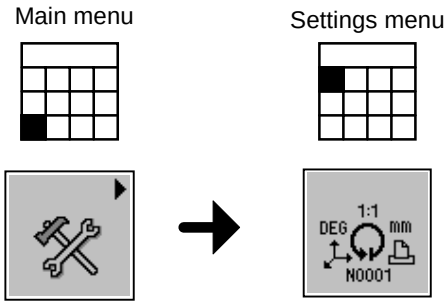
1) Parameter reset
2) Change measurement number
3) Unit setting
4) Key in scale factor
5) Switch printing function ON/OFF

[Key operations to access Condition setting function for overall coordinate measurement]

Main menu

11.1.1 Parameter Reset

[Key operation]



[Function]

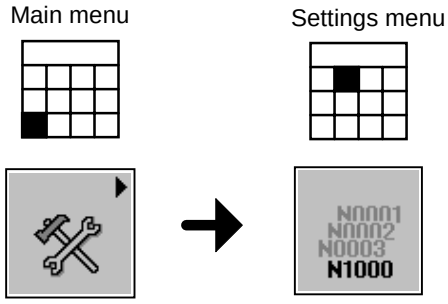
This command is used to reset the measurement number, coordinate system, reference plane and printer output ON/OFF parameters to the initial default settings.

[Procedure]

1) Select this command from the menu.
2) Execute the command as directed by the on-screen guidance messages.
   - The measurement number, coordinate system, reference plane and printer output ON/OFF parameters are set to the initial default settings.

11.1.2 Changing Measurement Number

[Key operation]



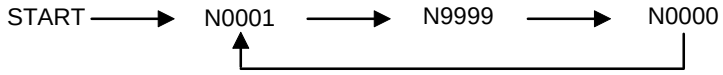
[Function]

This command is used to change the measurement number displayed with the measurement result. In subsequent measurement results, measurement numbers are assigned using the modified number sequence.

[Procedure]

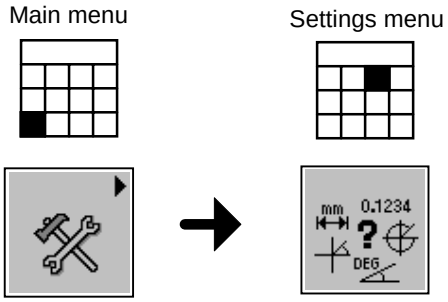
1) Select this command from the menu.
2) Specify the new measurement number.
   - ➢ As of the next measurement result output, measurement results are displayed along with measurement numbers starting from the specified new measurement number.

TIP • The ordinarily allowable measurement number range is from N0001 to N9999. Once the measurement number reaches N9999, the next measurement number becomes N0000 and then returns to N0001.



11.1.3 Unit Setting

[Key operation]



[Function]

This command is used to set the following parameters:

Length: Unit, number of decimal places, and resolution

Angle: Unit, number of decimal places, resolution, and range

[Procedure]

1) Select this command from the menu.
2) Specify the unit (mm or inch), number of decimal places and resolution for length; or the unit (decimal notation (degree) or sexagesimal notation (degree-minute-second)), number of decimal places, resolution and range (0 to 360°, or -180° to 180°) for angle.
   - ➢ The specified unit and parameters are set.

TIP • The valid range of the number of decimal places is as follows:

mm:	0 to 4
inch:	0 to 5
Decimal angles:	0 to 4

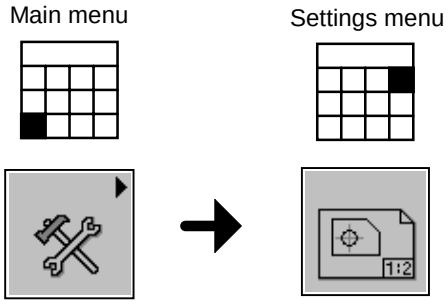
• If five or more decimal places are specified for the [mm] unit, the value is internally truncated to four decimal places.

• For sexagesimal angles, the number of decimal places is fixed at four.

30.	30	00	• • • • • • • 30°30'00" (= 30.5°)
Degrees	Minutes	Seconds	

11.1.4 Keying in Scale Factor

[Key operation]

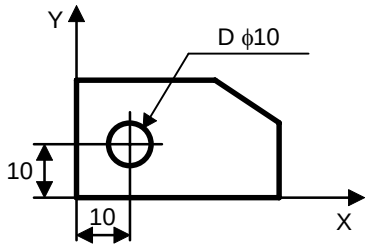


[Function]

This command is used to set the scale factor value. By setting the scale factor, when measuring a workpiece that is uniformly magnified or reduced from the correct dimensions, the measurement result obtained shows the desired and correct dimensions.

In addition, the scale factor is typically used when measuring a die. The scale factor is a factor by which the measured value should be multiplied when measuring a die. The scale factor can be used to form a shrink scale. By incorporating the scale factor, shrinkage or elongation of products manufactured by the die can be taken into consideration.

Model workpiece (1/2 scale)



- No scale factor applied:
  X = 5.000 Y = 5.000 D = 5.000
- Scale factor applied:
  Scale factor: 2
  X = 10.000 Y = 10.000 D = 10.000

Figure 11-1

[Procedure]

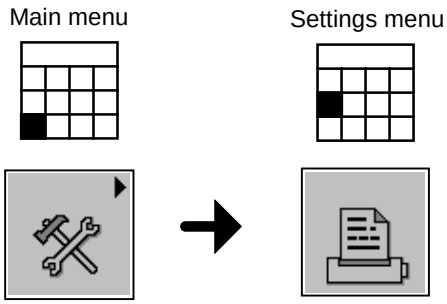
1) Select this command from the menu.
2) Enter the scale factor.
   - ➢ The calculated measurement results show the original workpiece dimensions.

TIP

- The scale factor is applied to all three axes. The scale factor cannot be applied to only one or two axes.
- The scale factor can be any value greater than 0 and less than 100.

11.1.5 Switching the Printing Function ON/OFF

[Key operation]



[Function]

This command is used to set printer output to ON or OFF.

[Procedure]

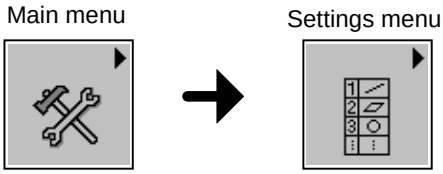
1) Select this command from the menu.
2) Specify the printer output contents from the parameters ("None", "Out-of-tol. only", "Results only", or "All").
   "None" means no print-out; "Out-of-tol. only" means printing out only the measurement results that are out of tolerance; "Results only" means printing out the measurement results only; and "All" means printing out all the measurement results and operation procedures.
   - The results can be output to the printer.

11.2 Continuous Storage Settings

The following commands can be used to control the continuous storing function:

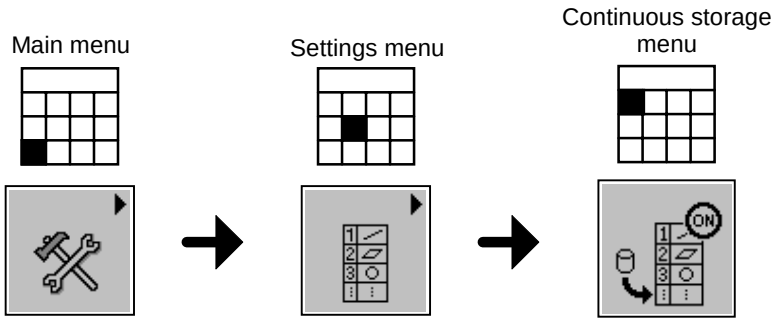
1) "Continuous storage ON"
2) "Continuous storage OFF"

[Key operations to access Continuous storage setting function]



11.2.1 "Continuous Storage ON"

[Key operation]



[Function]

Sets the program so that measured features are automatically stored in the specified memory (see Section 3.2.3).

[Procedure]

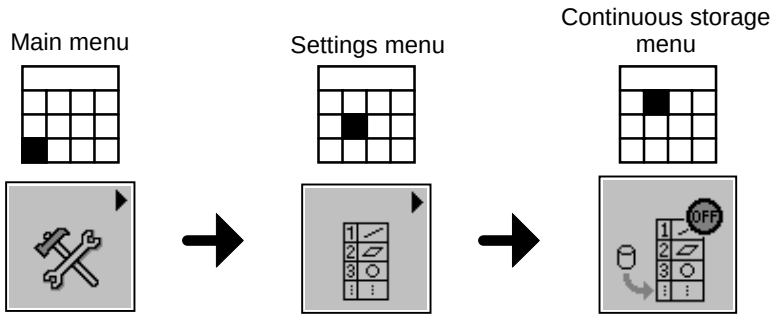
1) Select this command from the menu.
2) Designate the specified memory numbers (starting and ending memory numbers or addresses).
   - Features measured subsequently are automatically stored in the specified memory.

TIP

- If you omit entering the ending number for the specified memory, the ending memory number is set to 1,000.
- Measured features are stored in the specified memory sequentially from the designated starting number to the designated ending number. When the ending number is reached, feature storage returns to the starting number and continues.
- When this command has been executed, a measured feature can still be stored at an arbitrary memory address (or memory number) of the specified memory using the function key corresponding to the  icon in the Main menu.

11.2.2 "Continuous Storage OFF"

[Key operation]



[Function]

Stops the continuous storage started by the "Continuous storage ON" command (see Section 11.2.1).

[Procedure]

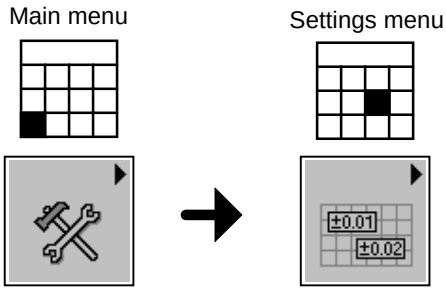
1) Select this command from the menu.
   - ➢ The continuous storage is stopped.

11.3 General Tolerance Settings

The following commands are used to set the general tolerance:

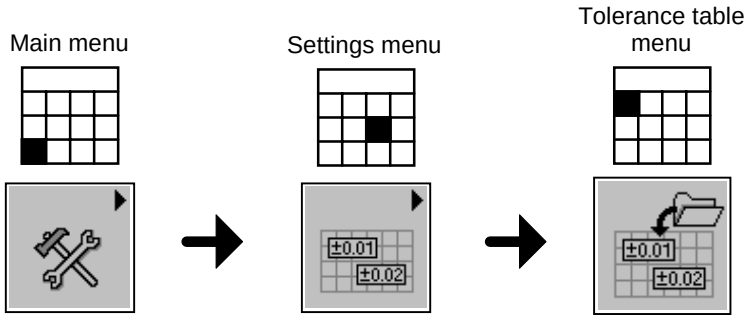
1) "Tolerance table registration"
2) Displaying tolerance table data

[Key operations to access General tolerance setting function]



11.3.1 "Tolerance Table Registration"

[Key operation]



[Function]

Registers a tolerance file as a tolerance table.

[Procedure]

1) Select this command from the menu.
2) Specify the file name, the tolerance number (1-20) and the tolerance symbol.
   - ➢ The specified tolerance file is registered as a tolerance table.

NOTE

- Create tolerance files in the specified format.
- Add the ".TOL" extension to the file name. The file name (excluding the extension) should be no longer than eight characters.
- Always execute this command when the tolerance files are modified.
- As the tolerance symbol, enter between one and four alphanumeric characters starting with a capital letter of the alphabet.

TIP

- If there is no corresponding nominal length range (or angle range) in the tolerance table specified in the tolerance judgment process, only the deviation is calculated.
- If a tolerance symbol is duplicated, the tolerance table with the smaller tolerance number is valid.
- If the nominal value is negative, the absolute value of the nominal value is used to locate the corresponding tolerance.

  <Example>

  [Range of nominal value] [Tolerance zone]

  0 ~ 10 0.1 -0.1

  10 ~ 20 0.1 -0.2

  20 ~ 30 0.2 -0.3

  When a nominal value of (-13) is entered, a tolerance zone of (0.1, -0.2) is used.

1) How to use the tolerance table?

In order to perform tolerance judgment (or compare the deviation and the tolerance) using the tolerance values recorded in a registered tolerance table, enter a tolerance symbol in the column of upper tolerance when inputting tolerance data. Note that the tolerance symbol is a symbol which is designated when registering a tolerance table. The "QM-Data" searches for the upper and lower tolerances corresponding to the nominal value from the tolerance table corresponding to the entered tolerance symbol, and perform the necessary tolerance judgment.

Item	Nominal value	Upper tolerance	Lower tolerance
X	35	T1	
Y	-60	T2	
D	15		

Contents of tolerance table corresponding to tolerance symbol "T1"

```
ϟ
30 50 / 0.025 0.0
50 80 / 0.030 0.0
ϟ
```

2) Note to be applied when nominal value is negative

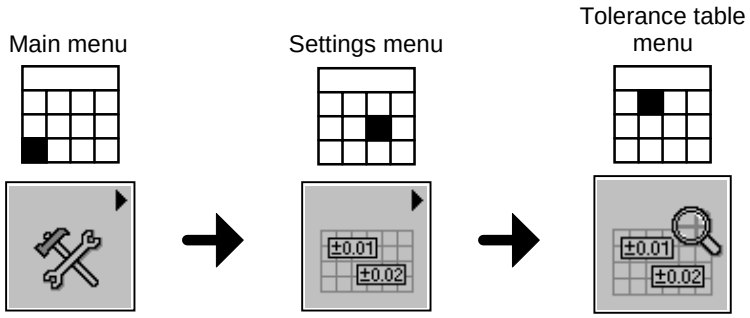
When the nominal value is negative, the upper and lower tolerances corresponding to the absolute value of the negative nominal value are recalled. For example, for the nominal value (-60) of the item “Y” in the above example, the upper and lower tolerances (0.030 and 0.0) for the nominal value range of 50 to 80 are recalled. Note that if the absolute value of the upper tolerance and the absolute value of the lower tolerance are not equal, problems may occur. In that case, create a tolerance table for negative nominal values as shown below and use it.

Contents of tolerance table
corresponding to tolerance symbol “T2”

```
      ϟ
30 50 / 0.0 -0.025
50 80 / 0.0 -0.030
      ϟ
```

11.3.2 Displaying Tolerance Table Data

[Key operation]



[Function]

Displays a list of the tolerance symbols and tolerance data in the registered tolerance table.

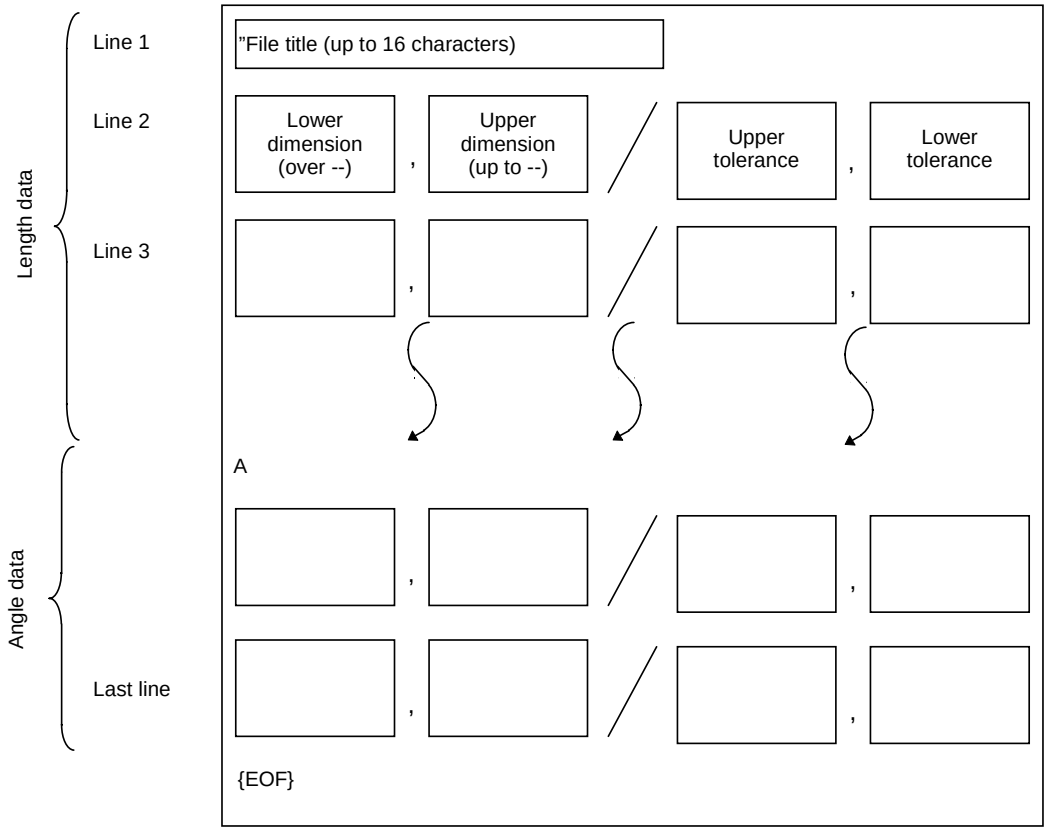
[Procedure]

1) Select this command from the menu.
2) Select the information to be listed. In addition, when you want to display the list of the tolerance data, specify the tolerance symbol.
   - The specified data is displayed as a list.

[Tolerance file]

Tolerance files hold either “fit tolerance” or “general tolerance” data. By creating these tolerance files on your PC (Personal Computer) and registering them (see Section 11.3.1), this tolerance data can be used in tolerance judgment process.

• File format



NOTE

- The file title can be omitted. If you enter the file title, enter up to 16 characters with ”(double quotation mark) as the first character.
- When you enter angle data, enter A followed by the angle data (for general tolerance only).
- The maximum line number of a tolerance file, excluding the file title line and the angle data delimiter (“A”) line, must not exceed 24.
- As fit tolerance, enter the hole-basis system of fits (for example, H7). For your information, the shaft-basis system of fits (for example, h7) is internally processed by inverting the upper and lower tolerances in tolerance judgment process.
- The units for the input data of a tolerance file must be [mm] for length and [degree-minute-second] for angle.
- To import a tolerance file created on your PC into the QM-Data, the optional floppy disk drive (“FD-1”) is required.

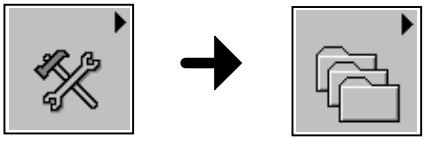
11.4 File Management

The following commands are used for the file management functions:

1) Part programs management
2) Probe file management
3) Tolerance file management
4) Contour point cloud file management
5) Statistical data file management
6) External output file management

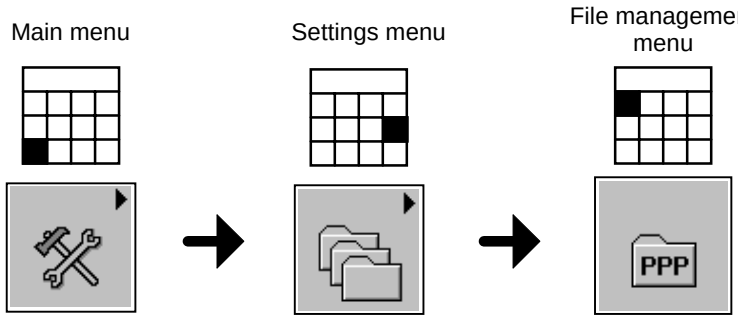
[Key operations to access File management functions]

Main menu → Settings menu



11.4.1 Part Programs Management

[Key operation]



[Function]

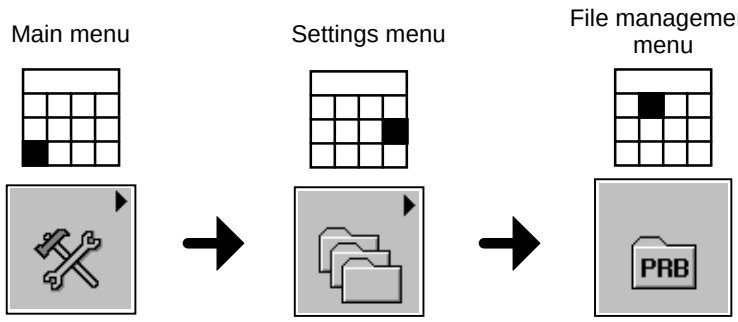
Manages part program files (xxxxxxxx.PPP).

[Procedure]

1) Select this command from the menu.
2) Specify the processing to be performed.
3) If you have specified "Name display", specify the drive (RAM or FD); and if you have specified "Delete", specify the drive (RAM or FD) and the part program name. Also, if you have specified “Backup” or “Restore”, specify the output directory or the read-in source (FD or RS232C).
   - ➢ The specified processing is performed.

11.4.2 Probe File Management

[Key operation]



[Function]

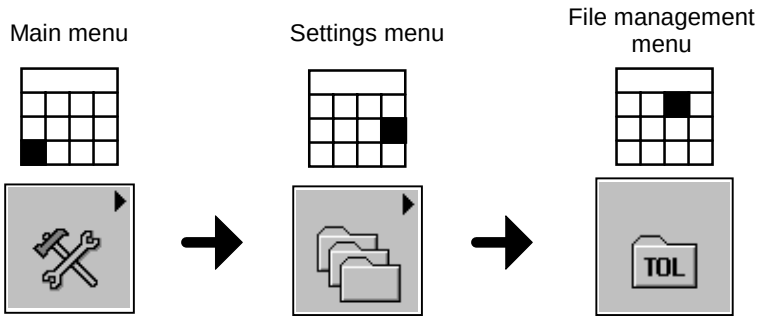
Performs file management for probe files (xxxxxxxx.PRB) created using the “Store probe data” command (see Section 7.7).

[Procedure]

1) Select this command from the menu.
2) Specify the processing to be performed.
3) If you specified "Name display", specify the drive (RAM or FD); and if you specified "Contents display" or "Delete", specify the drive (RAM or FD) and the probe file name.
   - The specified processing is performed.

11.4.3 Tolerance File Management

[Key operation]



[Function]

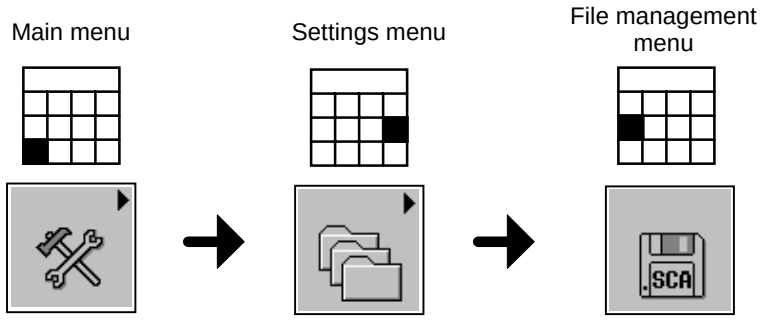
Manages tolerance files (xxxxxxxx.TOL).

[Procedure]

1) Select this command from the menu.
2) Specify the processing to be performed.
3) If you specified "Name display", specify the drive (RAM or FD); and if you specified "Contents display" or "Delete", specify the drive (RAM or FD) and the tolerance file name.
   - The specified processing is performed.

11.4.4 Contour point cloud file management

[Key operation]



[Function]

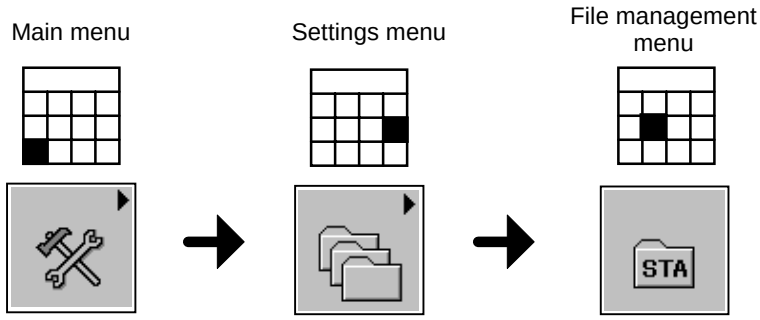
Manages contour point cloud files (xxxxxxxx.SCA).

[Procedure]

1) Select this command from the menu.
2) Specify the processing to be performed.
3) If you have specified "Name display" and "Delete", specify the Contour point group file name.
   - ➢ The specified processing is performed.

11.4.5 Statistical data file management

[Key operation]



[Function]

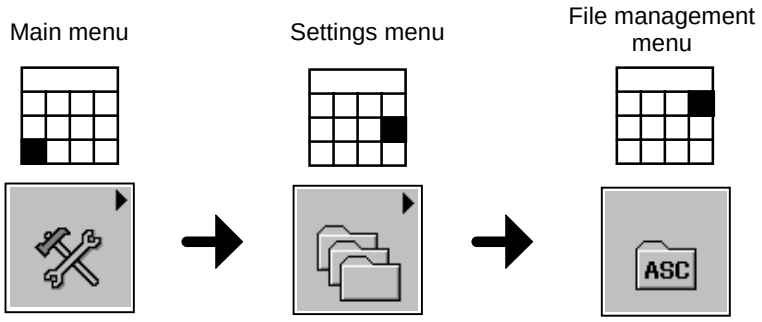
Manages statistical data files (xxxxxxxx.STA).

[Procedure]

1) Select this command from the menu.
2) Specify the processing to be performed.
3) If you have specified "Name display", specify the drive (RAM or FD); and if you have specified "Delete", specify the drive (RAM or FD) and the statistical data files.
   - ➢ The specified processing is performed.

11.4.6 External output file management

[Key operation]



[Function]

Manages external output file (xxxxxxxx.ASC).

[Procedure]

1) Select this command from the menu.
2) Specify the processing to be performed.
3) If you have specified "Name display", specify the drive (RAM or FD); and if you have specified "Delete", specify the drive (RAM or FD) and the external output file name.
   - The specified processing is performed.

12 PART PROGRAM FUNCTIONS

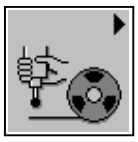
This chapter describes functions of creating, executing, and editing the part program.

The part program functions include the following commands:

1) Repeat mode
2) Learn mode
3) Edit mode
4) Exit from part program

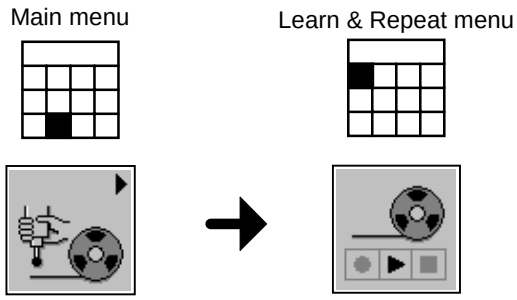
[Key operations to access part program functions]

Main menu



12.1 Repeat Mode

[Key Operation]



[Function]

Recalls the operation steps sequentially from a part program file and executes the steps.

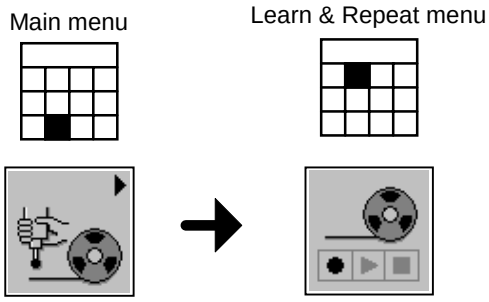
[Procedure]

1) Select this command from the menu.
2) Select the part program file.
   - ➢ The part program is executed.

TIP • In Repeat mode, you can stop program execution using the F1 (✗) key.

12.2 Learn Mode

[Key Operation]



[Function]

Starts storing the operation steps for each command sequentially in a part program file.

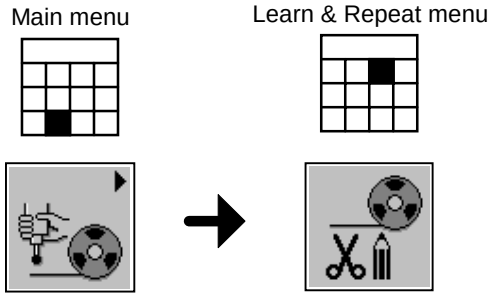
[Procedure]

1) Select this command from the menu.
2) Enter the part program file name and title.
   - ➢ Commands executed subsequently are stored in the part program file.

TIP • Use the “Exit from part program” command to exit from Learn mode (see Section 12.4).

12.3 Edit Mode

[Key Operation]



[Function]

Activates a simple editing program so that a part program file can be edited.

[Procedure]

1) Select this command from the menu.
2) Select and execute a part program file.
   - ➢ The Simple Editor screen opens and the part program can be edited.

[Description of Simple Editor]

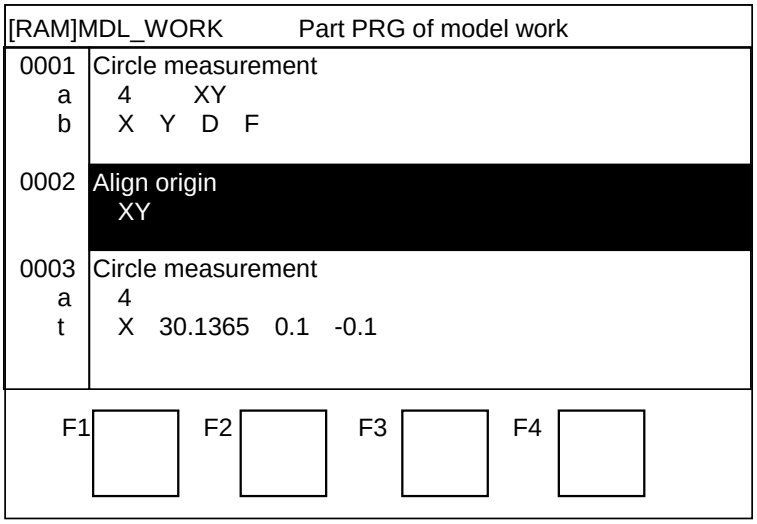


Figure 12-1

[F1] key (Delete) : Deletes the highlighted command.
[F2] key (Insert) : Inserts a command before the highlighted command. Select a command from the Command menu.
[F3] key (Modify) : Modifies the content of the highlighted command.
[F4] key (Close) : Closes the Editor.
Up/Down cursor keys : Move the cursor up and down.

1) File selection screen

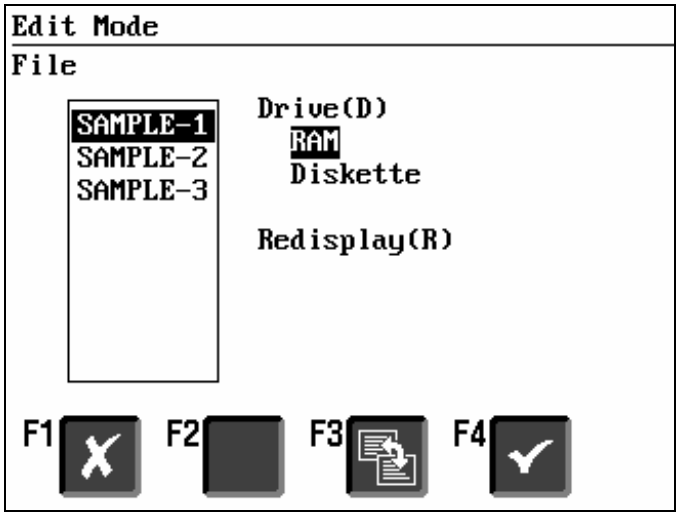


Figure 12-2

(1) File

The list of part program files created in Learn mode is displayed.

(2) Drive (D)

Press the [D] key to switch the storage media between RAM and Diskette (floppy disk).

(3) Redisplay (R)

Press the [R] key to refresh the display of the list of the part program files.

(4) [F1] key

Press the [F1] key to cancel the file selection and exit from Edit mode.

(5) [F3] key

The [F3] key is not available in this screen.

(6) [F4] key

Press the [F4] key to start the editing operation of the highlighted part program file.

2) Part program's editing screen

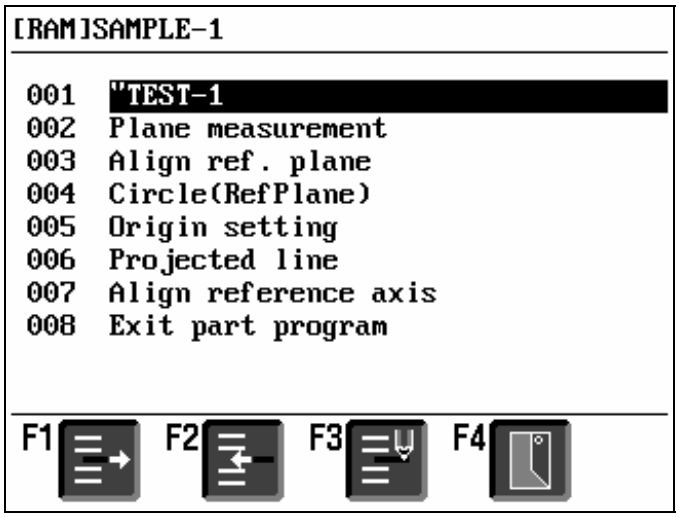


Figure 12-3

(1) [F1] key: Deletes the highlighted command.
(2) [F2] key: Inserts a command before the highlighted command.
(3) [F3] key: Modifies the contents of the highlighted command.
(4) [F4] key: Exits from Edit mode.

3) Deleting a command

Press the [F1] key to delete the highlighted command.

4) Inserting a command

Press the [F2] key to insert a command before the highlighted command. After pressing the [F2] key, select an appropriate command from the command menu displayed on the LCD.

5) Modifying a command

Press the [F3] key to modify the contents of the highlighted command.

6) Displaying parameter of a command

Press the rightward and leftward cursor keys to display the parameters of the highlighted command.

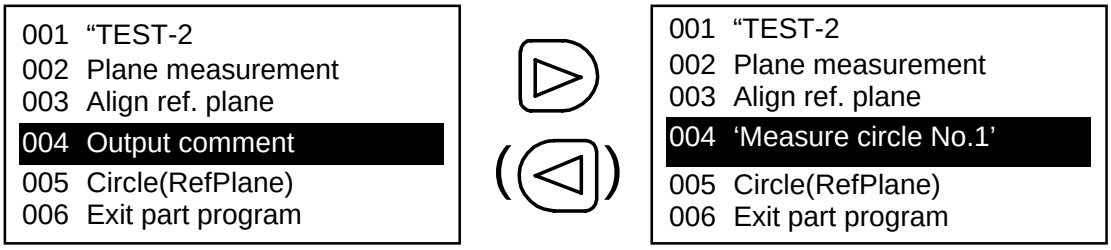


Figure 12-4

7) Exiting from Edit mode

If the [F4] key is pressed in the part program’s editing screen, the screen for confirming whether or not to save the part program.

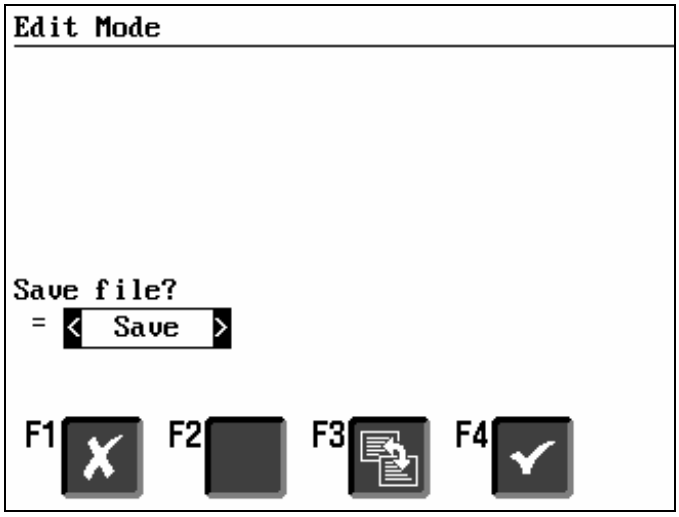


Figure 12-5

(1) [F1] key

Press the [F1] key to return to the part program’s editing screen.

(2) [F4] key

• In the case of “Save”:

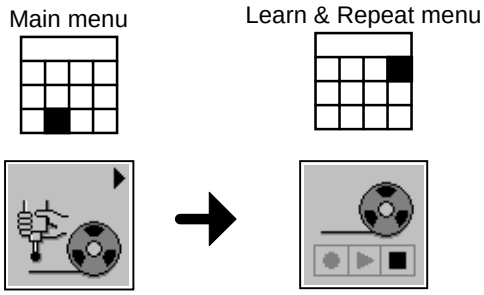
If the [F4] key is pressed, the edited contents are saved and the editing operation of the part program is terminated.

• In the case of “Abandon”:

If the [F4] key is pressed, the edited contents are abandoned and the editing operation of the part program is terminated.

12.4 Exiting from Part Program

[Key Operation]



[Function]

Exits from Learn mode and return to Normal measurement mode.

[Procedure]

1) Select this command from the menu.
   - ➢ Learn mode ends and the program returns to Normal measurement mode.

MEMO

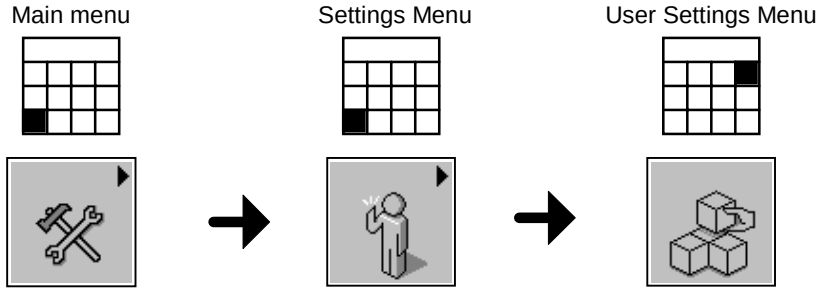
13 MACRO FUNCTIONS

This chapter explains macro management functions including macro registration and deletion.

The macro functions are used to execute multiple commands sequentially after they have been registered.
With these functions, complicated measurements and combined calculations can be called and executed by a single key.
The following commands are provided for macro management functions.

1)Macro registration
2)Macro listing
3)Macro deletion
4)Macro saving
5)Macro loading

[Key Operations to access macro management function]



NOTE

・To register a macro, a part program needs to be created beforehand.
・To save or delete a macro, a floppy disk drive unit must be prepared separately.

13.1 Registering a Macro

[Function]

The macro function is registered with a part program as its contents which has been created in the Learn mode.

A maximum of 100 macros can be registered by appending ID numbers between 1 and 100.

[Operation]

1)Select [Registration] from the parameters of macro management.

2)Specify an ID number (1 to 100) for the registration.

3)Select the part program file to be registered.

4)The attribute setup screen is displayed. The following two kinds of attributes are provided. For detailed information, refer to [About attributes] in the next page.

1.Specification of the presence or absence of the output item selection screen

2.Specification of the presence or absence of parameter entry

5)Enter a comment.

6)Select [Yes] for macro registration.

➢The macro function is registered according to the contents of the part program.

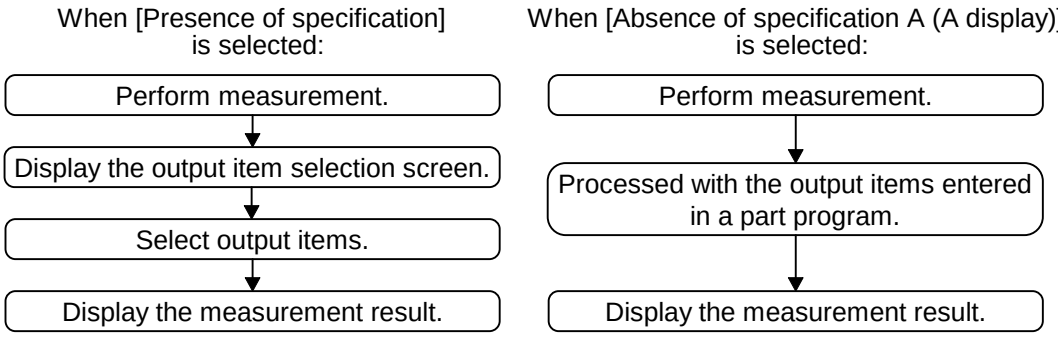
[About attributes]

Some macro functions require the selection of output items or the entry of parameters.

The entry method of the output items or parameters can be selected from the following two methods, and this selecting option is referred to as an attribute.

- The values specified in the original part program are used.
- The values are specified each time a macro is executed.

Example: Attributes of the output item selection screen



This program has the attributes of A, B, C, and non-display for the output item selection screen, and the attributes of P display and non-display for parameter entry.

1.Attributes of the presence or absence of the output item selection screen

<Presence of specification (non-attribute display)>

The desired output items are selected in the output item selection screen that appears.

<Absence of specification A (attribute A display)>

The specified output items are outputted without tolerancing.

An extended specification for a projected plane, etc., also complies with the macro registration contents.

<Absence of specification B (attribute B display)>

The specified output items are outputted without tolerancing.

An extended specification, except for the reference plane, also complies with the macro registration contents.

The current reference plane is used as the reference plane.

<Absence of specification C (attribute C display)>

The specified output items are outputted without tolerancing.

An extended specification, except for the reference plane, also complies with the macro registration contents.

The reference plane is automatically designated for the auto-designation command, with and the current reference plane is designated for other commands.

2.Attributes of the presence or absence of parameter entry

<Absence of specification (non-attribute display)>

The parameters registered in a part program are used.

<Presence of specification (attribute P display)>

The parameters are entered in the usual way.

[Attribute specification screen]

Set the attributes on the following screen.

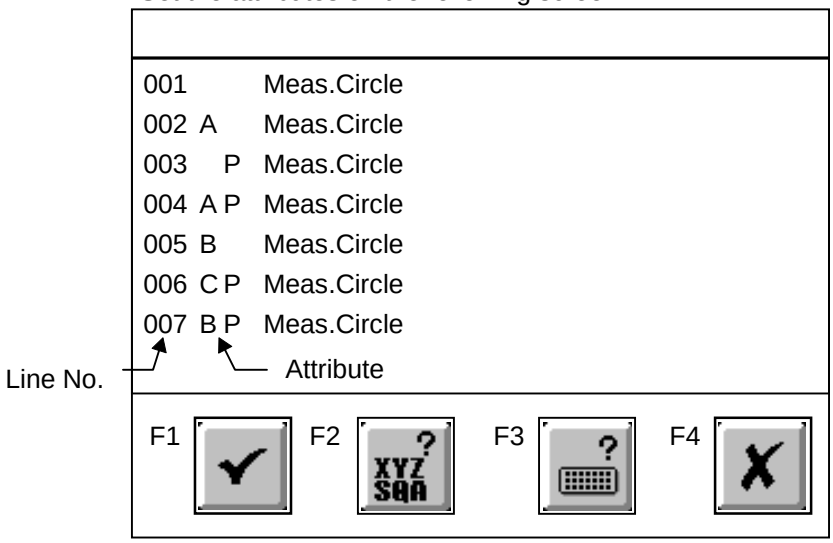


Fig.13-1

F1 (Cancel processing)

Cancels specification of a macro registration.

F2 (Change the presence or absence of the output item selection screen)

Switches the presence or absence of the output item selection screen.

The screen is sequentially switched to the non-attribute, attribute A, attribute B, or attribute C display each time the key is pressed.

F3 (Change the presence or absence of parameter entry)

Switches the presence or absence of parameter entry.

The screen is switched to the non-attribute or attribute P display each time the key is pressed.

F4 (Quit)

Quits specification of attributes.

Cursor up/down keys

Move the cursor up or down.

13.2 Listing Macros

[Function]

Displays the list of macros that have been registered.

[Operation]

1)Select [List] from the parameters of the macro management.

2)Specify the start ID number and end ID number of macro functions.

➢The screen displays the comment and other item contents of macros registered within the range of the specified ID numbers.

ID	Comment	Regist.date	Size
001	Meas.Circle	01-01-12	45
002	Meas.Line	01-01-12	125
040	Meas.Cylinder	01-01-12	84
035	Meas.Sphere	01-01-12	136

Fig.13-2

13.3 Deleting a Macro

[Function]

Deletes a macro that has been registered.

[Operation]

1)Select [Deletion] from the parameters of the macro management.

2)Specify the ID number of a macro to be deleted.

13.4 Saving Macros

[Function]

Saves the information of all the macros that have been registered as a file on a floppy disk.

The file name extension is .MCR.

[Operation]

1)Select [Storage] from the parameters of the macro management.

2)Enter the name of a file to be saved.

➢The file is saved on a floppy disk.

NOTE

・To store macros on a floppy disk, a floppy disk drive unit must be prepared separately.

13.5 Loading a Macro

[Function]

Loads a file that has been saved on a floppy disk with the macro saving function.

[Operation]

1)Select [Load] from the parameters of the macro management.

2)Enter the name of a file to be loaded.

➢Loading of the file will start.

NOTE

・If the ID number of a file to be loaded already exists, the registered file is overwritten.

・A macro with an ID number that has not been loaded from a floppy disk will remain.

13.6 Executing a Macro

[Function]

Registered macros cannot be called directly. Therefore register the macros in the user menu with the user menu function. For detailed information,
refer to "Chapter 15 USER MENU FUNCTION".

[Operation]

Display the user menu with the single-key function and then click on a macro registered in the user menu.
The registered commands are called sequentially.
Then, perform the following operations as required.

- Measurement
- **Input** the parameters for a command with the presence attribute of the parameter specification.
- Specify the **output** item for a command with the presence attribute of the output item specification. Also, enter the tolerancing data.

NOTE

- In the Learn mode, each command that executed in a macro is recorded in a part program.
- A macro itself cannot be recorded in a part program.

13.7 Listing the Registered Macros

[Function]

The following macro functions are provided as standard. Make the most of them.

[Key Operation]

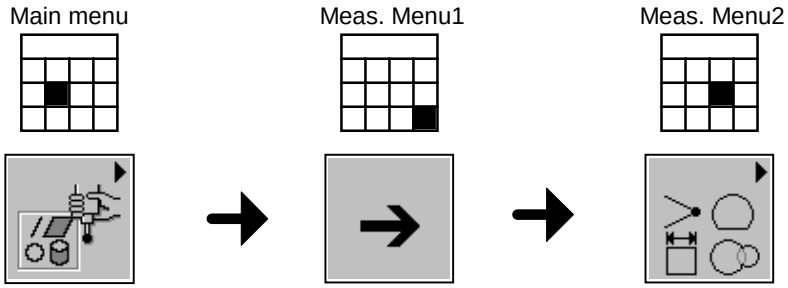
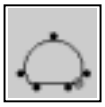
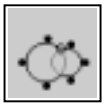
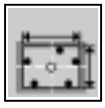


Table13-1

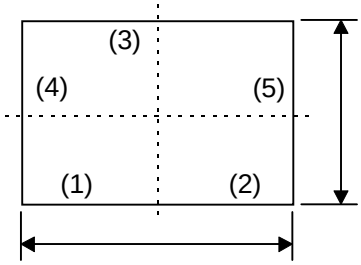
Icon	Macro name (content)	List	Attribute	Output result
 (F1)	**Intersection/angle measurement** Determines the point and angle of intersection of two lines.	Measuring projected straight line	B	—
		Measuring projected straight line	B	CA
		Calculating projected Intersection point	—	Optional
 (F2)	**Circle Line intersection measurement** Determines the intersections (2 points) of a circle and a line.	Measuring circle	C	D1
		Measuring projected straight line	B	—
		Calculating projected intersection point	—	Optional
 (F3)	**2-circle intersection measurement** Determines the intersections (2 points) of two circles.	Measuring circle	C	D1
		Measuring circle	B	D1
		Calculating projected intersection point	—	Optional
 (F4)	**3-plane intersection measurement** Determines the intersection of three planes.	Measuring plane	A	—
		Measuring plane	A	—
		Measuring plane	A	—
		Calculating intersecting line	A	—
		Calculating spatial intersection point	—	Optional

Icon	Macro name (content)	List	Attribute	Output result
 (F5)	**2-plane angle measurement** Determines the angle of intersection of two planes.	Measuring plane	A	—
		Measuring plane	A	WA
 (F6)	**Plane Cylinder angle measurement** Determines the angle of intersection of a plane and a cylinder.	Measuring plane	A	—
		Measuring Stepped cylinder	A	D1,D2,WA
		Measuring side (Projected normal direction)	B	LC
 (F7)	**Projected distance measurement** Determines the distance between a line and a point that are projected on the reference plane.	Measuring line	B	—
		Measuring side (Projected normal direction)	B	LC
 (F8)	**Spatial distance measurement** Determines the distance between a plane and a point that are in space.	Measuring plane	B	—
		Measuring side (Spatial normal direction)	B	SC
 (F9)	**Square hole measurement** Determines the lateral and longitudinal dimensions of a square hole and its center. (See the following tip for the measuring order.)	Measuring line	B	—
		Measuring side (Projected normal direction)	B	LC
		Calculating bisection line	B	—
		Measuring point with approach direction	B	—
		Projecting one feature on another feature	B	—
		Projecting one feature on another feature	B	—
		Measuring projected straight line	B	—
		Measuring side (Projected normal direction)	B	LC
		Calculating bisection line	B	—
		Calculating spatial intersection point	—	Optional

TIP

・The desired output results can be optionally selected for columns where "Optional" is indicated

・Perform a square hole measurement in the order of points (1) to (5), as shown below.



14 1-Key FUNCTION

This chapter explains the registration, storage, and loading of the 1-Key function.

The 1-Key function is a function to allow the user to easily call a desired menu screen by assigning each menu screen to one alphabetic key. If a frequently-used menu screen is registered on a 1-Key, it is not required to perform most of the operations to display the menu screen by pressing multiple keys.

The following commands are provided for the 1-Key function.

1) 1-Key function registration
2) 1-Key function saving
3) 1-Key function loading

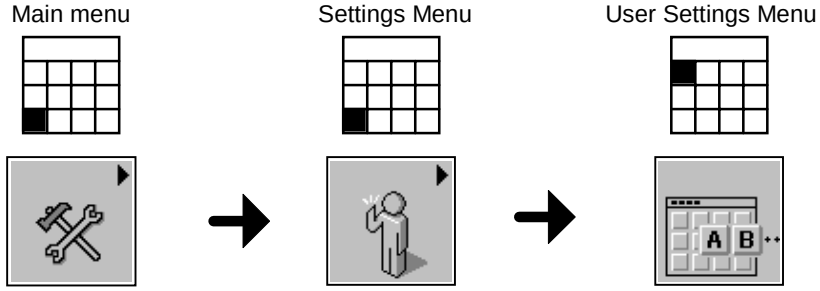
The following menus are default setting.

(The menus may differ if the software is upgraded from a previous version.)

Key	Menu
Q	User menu 1
W	User menu 2
E	User menu 3
R	User menu 4
H	1-Key list display

Table 14-1

[Key Operations to access 1-Key function]



NOTE

・The 1-Key function can be used during display of the AI function screen or a measurement entry wait screen. This function cannot be used while using the probe function for interrupting measurement or the QMScan (optional software).

14.1 Registering 1-Key Functions

[Function]

Registers 1-Key functions.

A maximum of 26 1-Key functions can be assigned to the alphabetic keys, A to Z, respectively.

Standard menus, user menus, and 1-Key list menus can be registered.

For information about the procedure for registering each menu, refer to the following sections.

NOTE

- 1-Key functions can be registered in the Single mode.
- No gage-like measurement menu can be registered for a 1-Key.

14.1.1 Registering a standard menu

[Function]

Registers a standard menu for a 1-Key.

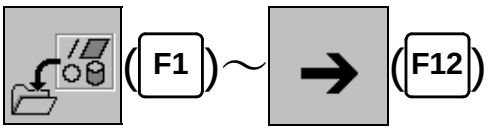
[Operation]

1)Select [Registration] from the parameters of the 1-Key function.

2)Key-in the key to be registered.

3)Select [Standard] from the menu types.

4)Display the menu to be registered for a 1-Key from among the icons shown below.



5)With the menu to be registered being displayed, press the ENTER key.

➢The menu screen is registered for the 1-Key.

14.1.2 Registering a user menu

[Function]

Registers a standard menu for a 1-Key.

[Operation]

1)Select [Registration] from the parameters of the 1-Key function.

2)Key-in the key to be registered.

3)Select [User menu] from the menu types.

4)Enter a user menu number, then press the ENTER key.

➢The user menu is registered for the 1-Key.

NOTE ・User menus must be registered in memory beforehand with the user menu function.

14.1.3 Registering the 1-Key list.

[Function]

Registers the list of the 1-Key functions for the 1-Key.

[Operation]

1)Select [Registration] from the parameters of the 1-Key function.

2)Key-in the key to be registered.

3)Select [Key list] from the menu types.

4)With the list of 1-Key functions being displayed, press the ENTER key.

➢The 1-Key list is registered for the 1-Key.

[About the 1-Key list]

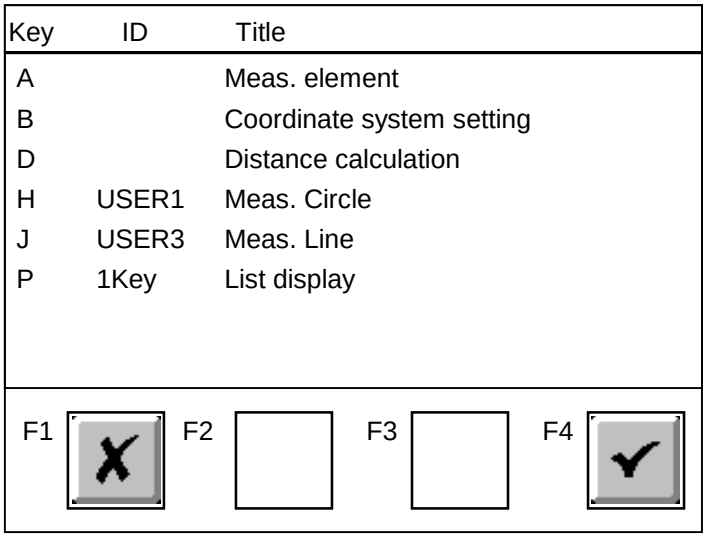


Fig.14-1

F1 (CANCEL) , F4 (EXIT)

Closes the display of the 1-Key list and returns to the AI screen.

Cursor up/down key

Proceeds or returns to a screen if the registered 1-Keys cannot be displayed in one screen.

14.2 Saving 1-Key Functions

[Function]

Saves the information of all the 1-Key functions that have been registered as a file on a floppy disk

The file name extension is .1KY.

[Operation]

1)Select [Save] from the parameters of the 1-Key function.

2)Enter the name of a file to be saved.

➢The file is saved on a floppy disk.

NOTE ・To store 1-Key functions information on a floppy disk, a floppy disk drive unit must be prepared separately.

14.3 Loading a 1-Key Function

[Function]

Loads a file that has been saved on a floppy disk with the 1-Key saving function.

[Operation]

1)Select [Load] from the parameters of the 1-Key function.

2)Enter the name of a file to be loaded.

➢Loading the file will start.

NOTE ・If the name of a file to be loaded already exists, the registered file is overwritten.

14.4 Executing a 1-Key Function

[Operation]

With the AI function screen or a measurement entry wait screen (for the first point) being displayed, press one of the keys (A to Z) to which a 1-Key function has been assigned.

➢The registered menu is displayed.

NOTE

・When a key which has not been registered as a 1-Key is pressed, nothing is called.
・If any 1-Key is pressed in the wait state of a measurement input, the current command execution will be aborted.

MEMO

15 USER MENU FUNCTION

This chapter explains management functions including the registration and deletion of user menus.

The user menu function is a function to allow the user to use this software more easily by assigning various icons to the desired menus, respectively.

In addition to the standard pictograms, the following can be used as icons.

• Pictograms created by a personal computer (Windows compatible)

• Character labels

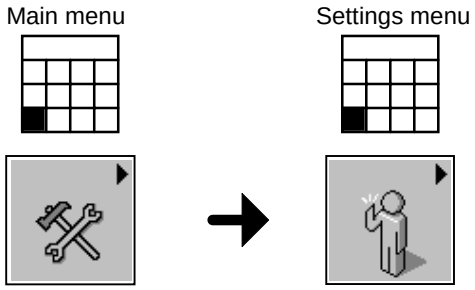
Register the user menus for 1-Keys beforehand with the 1-Key function.

Then, any registered user menu can be called from the AI function screen by pressing the relevant 1-Key.

The following commands are provided for the user menu function.

1) Register a pictogram as an icon
2) Delete a pictogram for icon
3) Register a function on a user menu

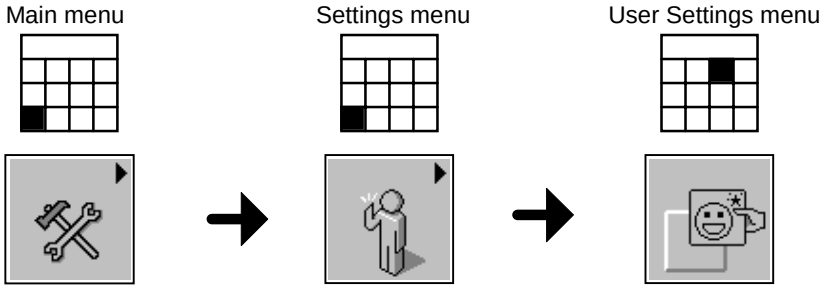
[Key Operations to access user menu function]



NOTE ・The gauge-like measurement icons cannot be registered on a user menu.

15.1 Registering a Pictogram as an Icon

[Key Operation]



[Function]

Reads a Bmp file to register it as a pictogram for icon.

[Operation]

1)Insert the floppy disk in which the Bmp file is saved into the floppy disk drive unit.

2)Select this command from the menu.

3)Select [Registration] from the parameters of icon setup.

4)Enter the number of an icon to be registered.

5)Enter the name of the Bmp file to be loaded.

6)Observe the description of the confirmation message that appears.

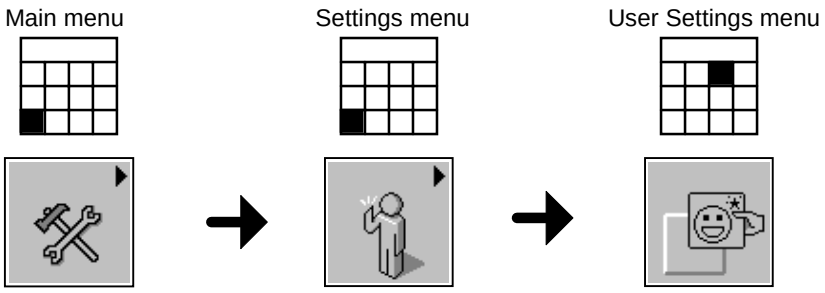
➢The specified Bmp file is registered as an icon.

NOTE

- A pictogram is registered in the RAM in the same way as a part program is registered.
- If a large icon number is specified for a pictogram, a large area of the RAM capacity will be consumed. Use a number as small as possible from 1 up to 48.
  Example: If 20 is specified as the maximum icon number, the area of [RAM size for one Bmp file] x 20 is reserved.
- To register user icons, a floppy disk drive unit must be prepared separately.
- Use 16-color graphic data with a resolution of 64 x 64 dots for a Bmp file to be registered as a pictogram for icon.
- Draw the pictograms using a Windows-compatible PC.

15.2 Deleting a Pictogram for Icon

[Key Operation]



[Function]

Deletes a pictogram which has been registered as an icon with the icon registration function.

[Operation]

1)Select this command from the menu.

2)Select [Deletion] from the parameters of icon setup.

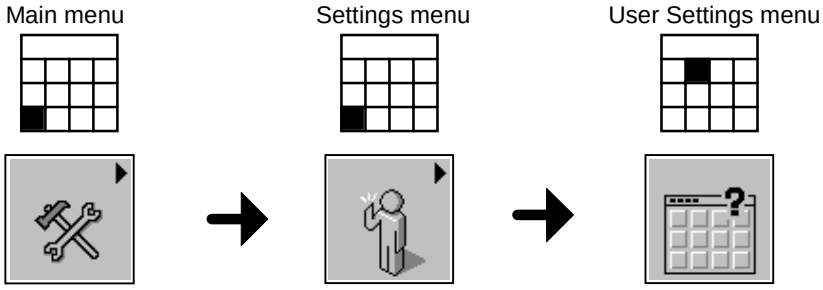
3)Enter the number of an icon to be deleted.

4)Observe the description of the confirmation message that appears.

➢The specified icon is deleted.

15.3 Registering a Function on a User Menu

[Key Operation]



[Function]

Registers a function on the user menu. The functions that can be registered are standard functions, user macro functions, and the part program start command.

Four screens can be registered for user menus 1 to 4.

[Operation]

1)Select this command from the menu.

2)Key-in menu#.

3)The user menu registration screen is displayed.

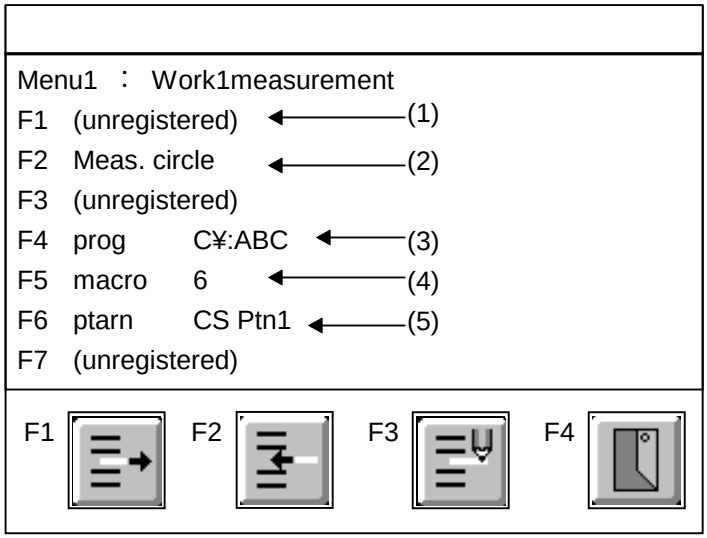


Fig.15-1

The items listed on the user menu registration screen differ depending on the registered contents as described below.

(1)Unregistered

Data has not been registered.

(2)Command

The name of a command that has been registered is displayed.

(3)Part program execution (prog)

The name of a part program that has been registered is displayed.

(4)Macro command (macro)

The ID number of a macro that has been registered is displayed.

(5)Coordinate system setup pattern (ptern)

The name of a coordinate system setup pattern is displayed.

4)The registration, change, and deletion of each user menu can be performed from this screen.

15.3.1 Registering a standard function

[Function]

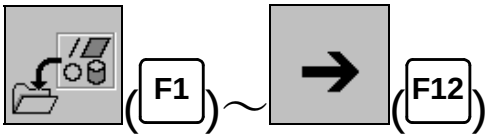
Registers a standard function on a user menu.

[Operation]

1)Select one of the user menus on which a standard function is to be registered, then press the  (F2) key in the user menu registration screen.

2)Select [Standard function] from the parameters of user menu registration.

3)The main menu is displayed. Select an icon to be registered from among the following icons.



4)Observe the description of the confirmation message that appears.

➢The icon is registered on the specified user menu.

15.3.2 Registering a user macro function

[Function]

Registers a user macro function on a user menu.

[Operation]

1)Press the  (F2) key in the user menu registration screen.

2)Select [User macro] from the parameters of user menu registration.

3)Enter the ID number of a user macro to be registered.

4)Press the  (F4 key or ENTER key.

➢The icon selection screen is displayed.

（Refer to [About the icon selection screen].）

5)Select a pictogram to be registered as an icon.

6)Enter a name of the key label (top, middle, and bottom) displayed on the icon.

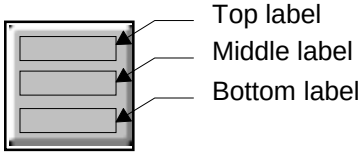
7) Observe the description of the confirmation message that appears.

➢The icon is registered on the specified user menu.

NOTE

・To register a user macro, it needs to be created beforehand.

・A maximum of 8 characters can be entered on each of 3 key labels (top, middle, and bottom).



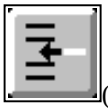
・If characters are entered on either label, the pictogram in that area will be erased with the character's entered.

15.3.3 Registering a part program

[Function]

Registers the command to execute a part program on a user menu.

[Operation]

1)Press the  (F2) key in the user menu registration screen.

2)Select [Part program] from the parameters of user menu registration.

3)Select a part program file to be registered.

4)Press the  (F4) key or ENTER key.

➢The icon selection screen is displayed.

（Refer to [About the icon selection screen].）

5)Select a pictogram to be registered as an icon.

6)Enter a name of the key label (top, middle, and bottom) displayed on the icon.

7)Observe the description of the confirmation message that appears.

➢The icon is registered on the specified user menu.

NOTE ・To register a part program, it needs to be created beforehand.

[About the icon selection screen]

The icons that have been registered through registration of the pictograms for icons are displayed on the icon selection screen. Select an icon desired to be registered on a user menu from the following screen.

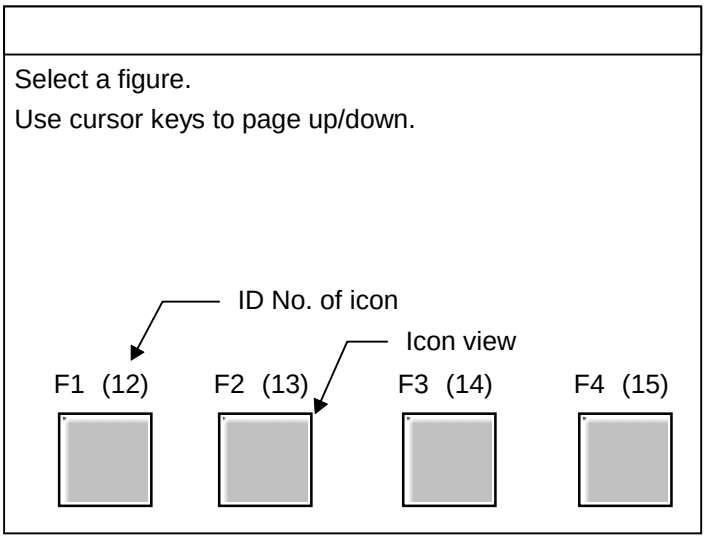


Fig.15-1

TIP ・Four icons among the registered icons are displayed in one screen in ascending order of icon numbers. Pressing the cursor up or down key will switch the current screen to the previous or next screen that displays other 4 icons.

15.3.4 Deleting a user menu

[Function]

Deletes an icon that has been assigned to a user menu.

[Operation]

1)Move the cursor onto an icon to be deleted in the user menu registration screen.

2)With the icon being highlighted, press the  (F1) key.

➢The user menu and its assigned icon will be deleted.

15.3.5 Modifying a user menu

[Function]

Modifies a part of contents that have been registered on a user menu.

[Operation]

1)Move the cursor onto an icon to be modified in the user menu registration screen.

2)With the icon being highlighted, press the  (F3) key.

3)Select the item to be modified from [Command, figure, label].

4)Hereafter observe each operating procedure of user menu registration.

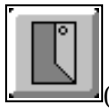
➢The icon is registered on the specified user menu, the contents of which was modified.

15.3.6 Saving a user menu

[Function]

Saves the contents of a modified user menu.

[Operation]

1)Press the  (F4) key on the user menu registration screen.

2)Select [Save] from the parameters of file management.

3)Observe the description of the confirmation message that appears.

➢The specified user menu is saved.

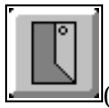
15.3.7 Storing a user menu file

[Function]

Stores the contents of the user menu file being currently loaded on a floppy disk.

The extension of a file name is .MNU.

[Operation]

1)Press the  (F4) key on the user menu registration screen.

2)Select [File storage] from the parameters of file management.

3)Enter the name of a file to be stored.

➢The specified user menu file is stored on a floppy disk.

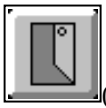
TIP ・To store a user menu file on a floppy disk, a floppy disk drive unit must be prepared separately.

15.3.8 Loading a user menu file

[Function]

Loads a user menu file that has been stored on a floppy disk with the file storage function.

[Operation]

1)Press the  (F4) key on the user menu registration screen.

2)Select [File load] from the parameters of file management.

3)Enter the name of a file to be loaded.

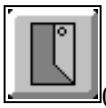
➢The specified user menu file is loaded from the floppy disk to the user menu.

15.3.9 Quitting the user menu registration screen

[Function]

Quits the screen of user menu registration list.

[Operation]

1)Press the  (F4) key in the user menu registration list.

2)Select [Quit] from the parameters of file management.

3)Select whether to register the modified user menu or to discard it.

MEMO

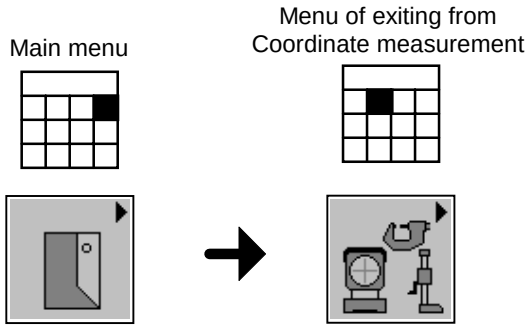
16 EXITING COORDINATE MEASUREMENT AND LAUNCHING OTHER PROGRAMS

By selecting particular icons from the command menu, you can launch the programs shown below or exit from the general 3-dimensional coordinate measurement program.

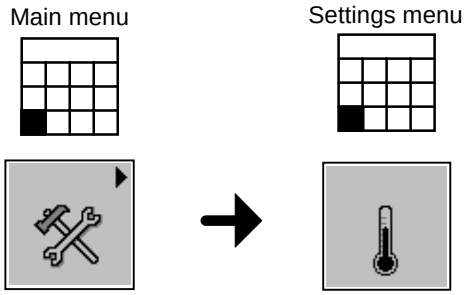
1) Gage-like measurement program
   When executing this program, the operator need not be conscious of the coordinate system and measurement results can be obtained as if the operator was using a gage. Refer to the “QM-Data: Operation Guide (MANUAL No. 99MCA084)”.
2) Temperature compensation program (option)
   This optional program compensates for coordinate measuring machine scale temperatures and workpiece temperature. Refer to the “QM-Data: Temperature Compensation Manual (Software Part) (MANUAL No. 99MCA089)”.
3) QMFit (option)
   The “QMFit” is an optional software having the best fit function. Refer to the “QM-Data: QMFit Operation Guide (MANUAL No. 99MCA090)”.
4) QMGraph (option)
   The “QMGraph” is an optional software having the drawing function of various geometrical deviations. Refer to the “QM-Data: QMGraph Operation Guide (MANUAL No. 99MCA091)”.
5) QMScan (option)
   The “QMScan” is an optional software having the drawing function of various geometrical deviations. Refer to the “QM-Data: QMScan Operation Guide (MANUAL No. 99MCA211)”.
6) QMStat (option)
   The “QMStat” is an optional software having the drawing function of various geometrical deviations. Refer to the “QM-Data: QMStat Operation Guide (MANUAL No. 99MCA094)”.
7) Exit from the general 3-dimensional coordinate measurement program (go to “System menu”).

16.1 Key Operations

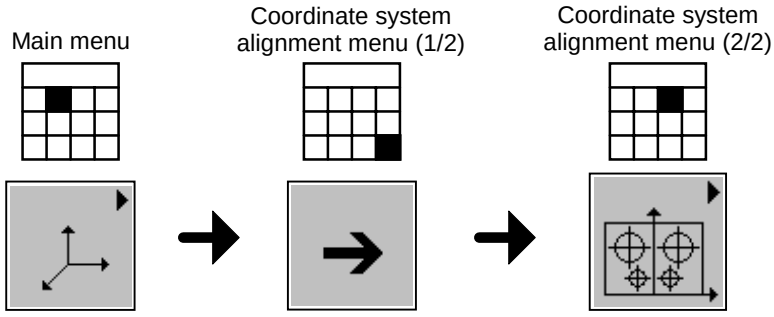
[Key operations to launch Gage-like measurement program]



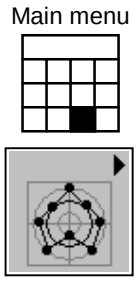
[Key operations to launch Temperature compensation program]



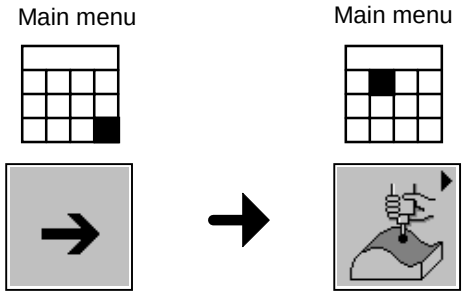
[Key operations to launch QMFit]



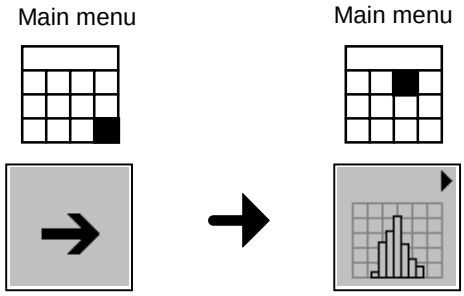
[Key operations to launch QMGraph]



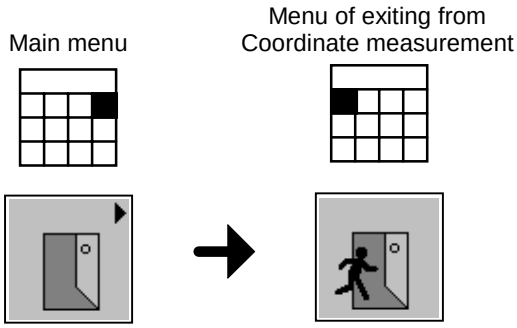
[Key operations to launch QMScan]



[Key operations to launch QMStat]



[Key operations to exit (go to System menu)]



MEMO

17 SYSTEM CONFIGURATION

Use the procedure described below to set the system configuration for QM-Data.

Selecting "Configuration" in the System menu enables you to specify the settings shown below.

[Operation Flow]

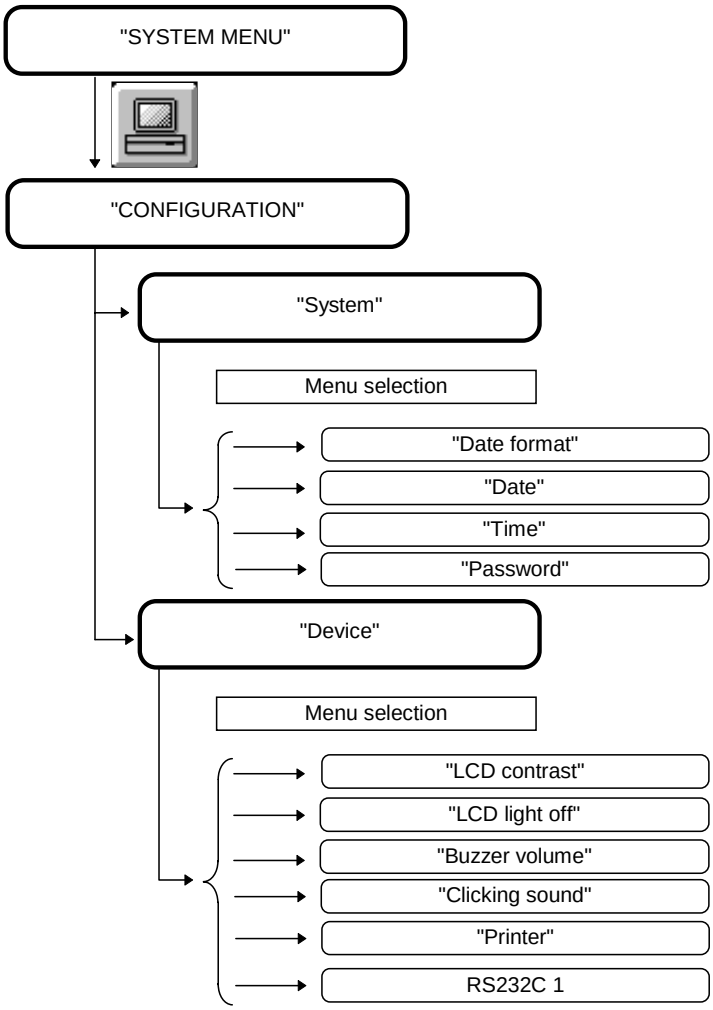


Figure 17-1

17.1 System Settings

17.1.1 Date Format

When you select this menu option, a pop-up menu appears showing the [dd-mm-yyyy], [mm-dd-yyyy] and [yyyy-mm-dd] parameters.

In the pop-up menu, select the parameter directly by entering a number, or use the up and down arrow keys to highlight the desired parameter and then press the [Enter] key to confirm your selection. (The procedure for using the pop-up menu is the same for the other options listed below.)

17.1.2 Date

Select this menu option to enter the date.

Enter numbers in the order set in the date format and then press the [Enter] key to confirm your selection. (The number input method is the same for the other options listed below.)

17.1.3 Time

Select this menu option to enter the time, starting with hours, then minutes and then seconds.

17.1.4 Password

Select this menu option to enter (or change) your password. Use alphanumeric characters.

TIP

- If you set a password, some of the file management and measurement processes will not be accessible until you enter the registered password.
- To change your password, you must first enter the old password.
- You can forcibly delete the password by holding down the [Delete] key when you switch the QM-data on and continuing to hold down the [Delete] key until you hear a beep.

17.2 Device Settings

17.2.1 LCD Contrast

Select this menu option and use the numeric keys to enter a value between 10 and 0.

17.2.2 LCD Light Off

Select this menu option and use the numeric keys to enter a value between 999 and 0 (minutes) which represents the time elapsed before the backlight of the LCD goes off automatically. Entering a value of 0 disables the automatic LCD light off function.

17.2.3 Buzzer Volume

Select this menu option and use the numeric keys to enter a value between 10 and 0. If you enter a value of 0, the buzzer does not sound.

17.2.4 Clicking Sound

Select this menu option and then select ON or OFF.

17.2.5 Printer

Select this menu option and then select "ESC/P", "ESC/P (Color)", "Receipt printer", or "None".

17.2.6 RS-232C 1

Select this menu option and then select the desired parameter from the respective pop-up menus.

Menu	Parameters
Baud rate	1200 / 2400 / 4800 / 9600
Communication condition (parity check, word length and stop bit)	NONE, 8, 1 / NONE, 8, 2 EVEN, 7, 1 / EVEN, 7, 2 ODD, 7, 1 / ODD, 7, 2
Flow control method	Xon/Xoff, RTS/CTS, NONE

MEMO

18 FILE MANAGEMENT

This chapter describes how QM-Data performs file management.

By selecting “File management” in the System menu, you can manage files. The following files can be managed:

1) Part programs
2) Probe files
3) ASCII files
4) Tolerance files
5) Data files

[Operation Flow]

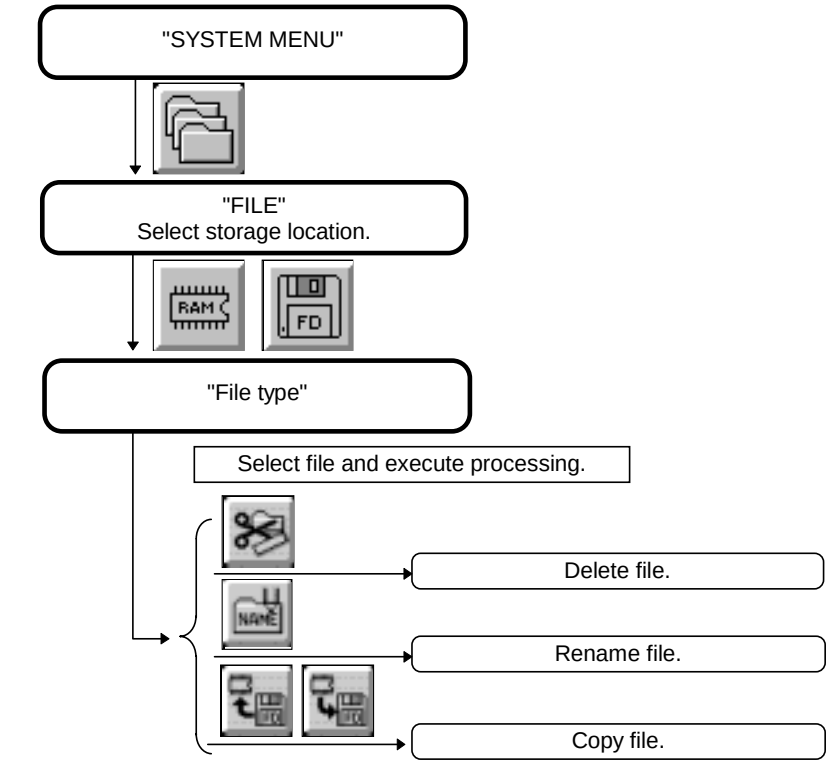


Figure 18-1

[File Management Screen]

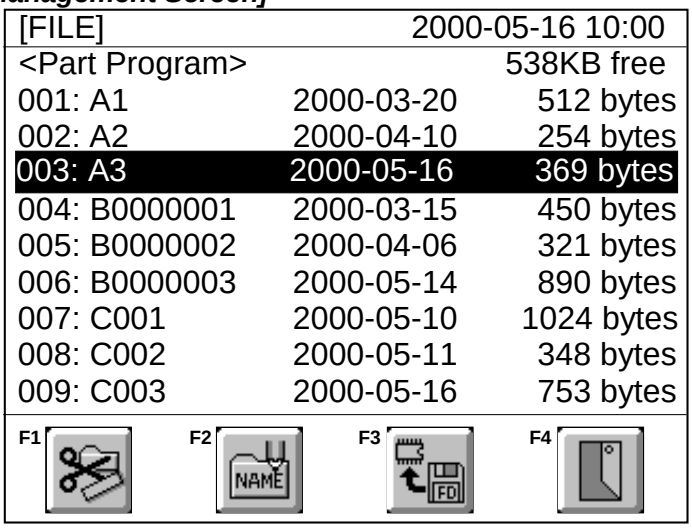


Figure 18-2

[Procedure]

1) Select “File management” in the System menu.
2) Select the storage location.
3) Select the file type.
4) Use the up and down cursor keys to select the desired file from the file list.
5) Use the function keys to select the processing.

19 APPENDIX

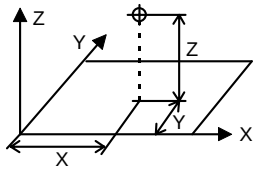
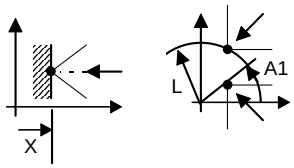
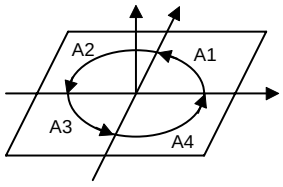
19.1 Output Symbols

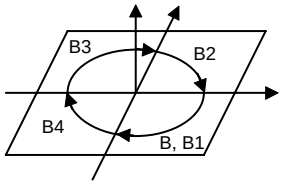
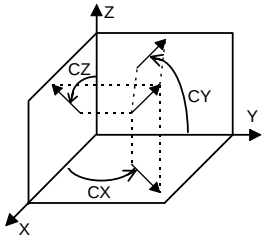
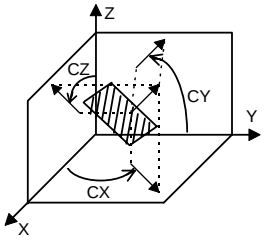
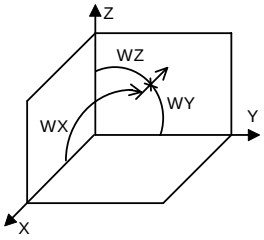
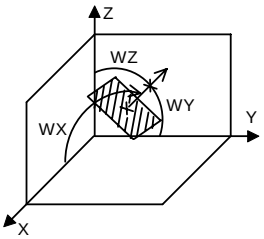
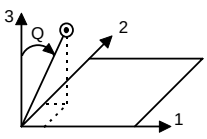
19.1.1 Types of Output Symbol

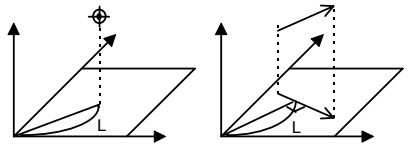
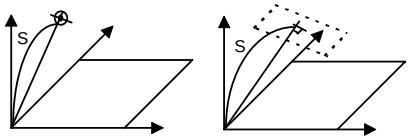
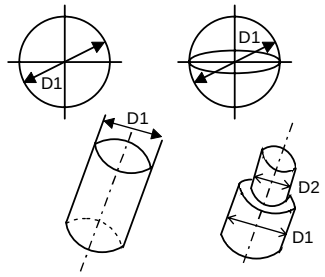
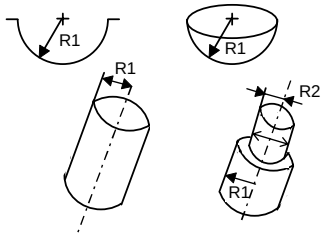
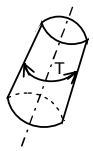
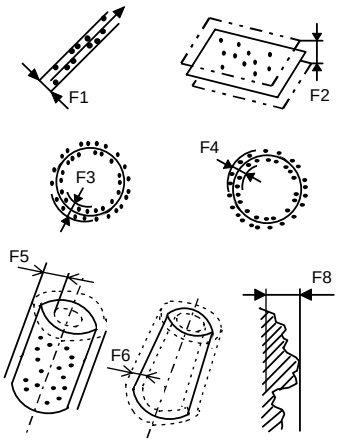
Tables 19-1 to 19-3 show the output symbols related to the feature data obtained by the QM-Data.

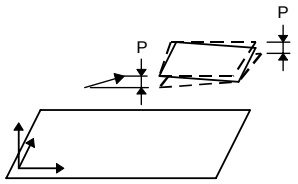
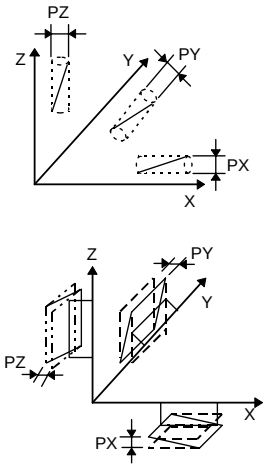
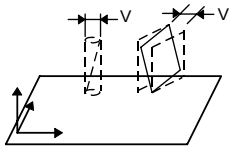
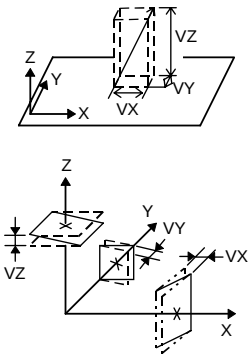
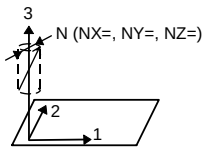
(1) Output symbols related to one feature

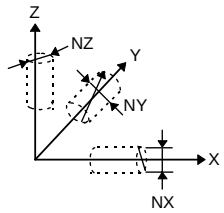
Table 19-1

Output symbol	Meaning	Display	Schematic diagram
X	Coordinate value along the X axis	Coord: X=	
Y	Coordinate value along the Y axis	Coord: Y=	
Z	Coordinate value along the Z axis	Coord: Z=	
U	Coordinate value along the axis of the probe tip radius compensation direction	Coord: X= Coord: Y= Coord: Z= Coord: L= Coord: A= Coord: S=	
An n: 1 ~ 4	Angle measured from the n^{th} axis in the counterclockwise direction on the reference plane	Angle: An=	

Output symbol	Meaning	Display	Schematic diagram
Bn n: 1 ~ 4	Angle measured from the n^{th} axis in the clockwise direction on the reference plane	Angle: Bn=	
C	Angle formed by the first axis and the projected line of a straight line or a plane's normal line	Angle: CX= Angle: CY= Angle: CZ=	
CX CY CZ	Angle formed by the specified axis and the projected line of a straight line or a plane's normal line	Angle: CX= Angle: CY= Angle: CZ=	
W	Angle formed by the third axis and a spatial line or a spatial plane's normal line	Angle: WX= Angle: WY= Angle: WZ=	
WX WY WZ	Angle formed by the specified axis and a spatial line or a spatial plane's normal line	Angle: WX= Angle: WY= Angle: WZ=	
Q	Polar angle in the spherical coordinate system	Angle: Q=	

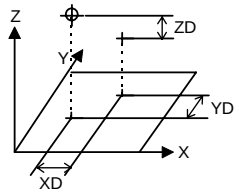
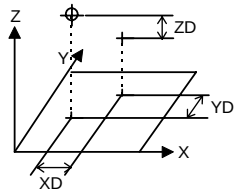
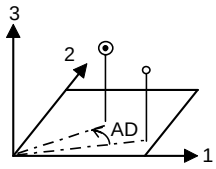
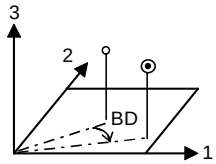
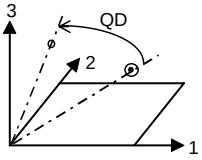
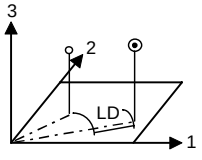
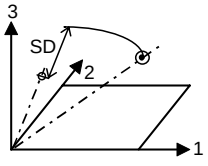
Output symbol	Meaning	Display	Schematic diagram
L	Radial distance from the origin on the reference plane (Radial distance in the cylindrical coordinate system)	RadDist:L=	
S	Radial distance in the spherical coordinate system	RadDist:S=	
D1	Diameter (or the first diameter)	Dia: D1=	
D2	The second diameter	Dia: D2=	
R1	Radius (or the first radius)	Radius: R1=	
R2	The second radius	Radius: R2=	
T	Angle of a cone	Angle: T=	
F	Geometrical deviation		
F1	Straightness	Straigh:F1=	
F2	Flatness	Flat: F2=	
F3	Circularity or roundness	Circlr: F3=	
F4	Sphericity	Spher: F4=	
F5	Cylindricity	Cylind: F5=	
F6	Conicity	Conic: F6=	
F8	Other geometrical deviation	GeoDev: F8=	

Output symbol	Meaning	Display	Schematic diagram
P	Parallelism with the reference plane	Parall: P=	
PX PY PZ	Parallelism with the specified axis	Parall: PX= Parall: PY= Parall: PZ=	
V	Perpendicularity with the reference plane	Perpend:V=	
VX VY VZ	Perpendicularity with the specified axis	Perpend:VX= Perpend:VY= Perpend:VZ=	
N	Coaxiality with the third axis	Coaxial:NX= Coaxial:NY= Coaxial:NZ=	

Output symbol	Meaning	Display	Schematic diagram
NX NY NZ	Coaxiality with the specified axis	Coaxial:NX= Coaxial:NY= Coaxial:NZ=	

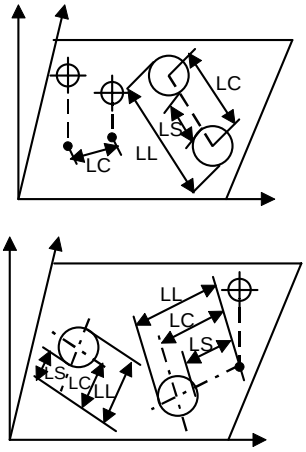
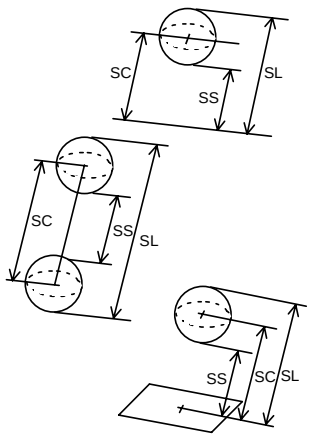
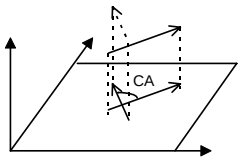
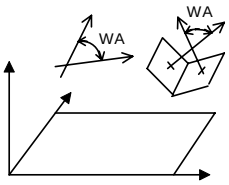
(2) Output symbols related to difference between features

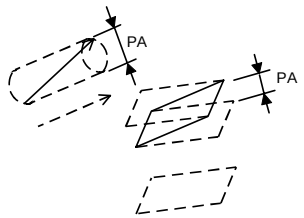
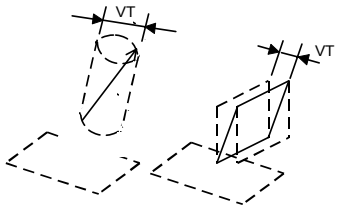
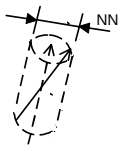
Table 19-2

Output symbol	Meaning	Display	Schematic diagram
XD	X-axis coordinate difference from the immediately previous feature	Differ: XD=	
YD	Y-axis coordinate difference from the immediately previous feature	Differ: YD=	
ZD	Z-axis coordinate difference from the immediately previous feature	Differ: ZD=	
UD	Coordinate difference from the immediately previous feature along the axis of the probe tip radius compensation direction	Differ: XD= Differ: YD= Differ: ZD= Differ: LD= Differ: AD= Differ: SD=	
AD	Angle difference in the counterclockwise direction from the immediately previous feature on the reference plane	Differ: AD=	
BD	Angle difference in the clockwise direction from the immediately previous feature on the reference plane	Differ: BD=	
QD	Polar angle difference from the immediately previous feature in the spherical coordinate system	Differ: QD=	
LD	Difference in radial distance in the cylindrical coordinate system (or on the reference plane) from the immediately previous feature	Differ: LD=	
SD	Difference in radial distance in the spherical coordinate system from the immediately previous feature	Differ: SD=	

(3) Output symbols related to distance and intersection angle of features

Table 19-3

Output symbol	Meaning	Display	Schematic diagram
LC	Distance between feature centers on the reference plane	Dist: LC=	
LS	Minimum distance between features on the reference plane	MinDist:LS=	
LL	Maximum distance between features on the reference plane	MaxDist:LL=	
SC	Spatial distance between feature centers	Dist: SC=	
SS	Minimum spatial distance between features	MinDist:SS=	
SL	Maximum spatial distance between features	MaxDist:SL=	
CA	Projected intersection angle of features on the reference plane	Angle: CA=	
WA	Spatial intersection angle of features	Angle: WA=	

Output symbol	Meaning	Display	Schematic diagram
PA	Parallelism between the current feature and the immediately previous feature	Parall: PA=	
VT	Perpendicularity between the current feature and the immediately previous feature	Perpend:VT=	
NN	Coaxiality between the current feature and the immediately previous feature	Coaxial:NN=	

19.1.2 List of Output Symbols

Table 19-4 lists the output symbols for each QM-Data command.

Table 19-4

Command	Output symbols for one feature	Output symbols for feature difference	Output symbols for distance & intersection angle of features
Feature measurement function			
Measure point with approach direction (see Section 4.1)	X, Y, Z, A1, A2, A3, A4, B1, B2, B3, B4, Q, L, S, NX, NY, NZ	XD, YD, ZD, AD, BD, QD, LD, SD	LC, LS, LL, SC, SS, SL, NN
Measure side point (Cartesian coordinate axis) (see Section 4.2)	X, Y, Z, A1, A2, A3, A4, B1, B2, B3, B4, Q, L, S, F8 **NOTE:** When U is specified, only the coordinate of the axis selected as the probe tip radius compensation direction (X, Y or Z) is output.	XD, YD, ZD, AD, BD, QD, LD, SD **NOTE:** When UD is specified, only the distance along the axis selected as the probe tip radius compensation direction (XD, YD or ZD) is output.	LC, LS, LL, SC, SS, SL
Measure side point (polar coordinate axis) (see Section 4.3)	X, Y, Z, A1, A2, A3, A4, B1, B2, B3, B4, Q, L, S, F8 **NOTE:** When U is specified, only the coordinate of the axis selected as the probe tip radius compensation direction (L or A (A1-A4)) is output.	XD, YD, ZD, AD, BD, QD, LD, SD **NOTE:** When UD is specified, only the distance along the axis selected as the probe tip radius compensation direction (LD or AD) is output.	LC, LS, LL, SC, SS, SL
Measure side point (spherical coordinate axis) (see Section 4.4)	X, Y, Z, A1, A2, A3, A4, B1, B2, B3, B4, Q, L, S, F8 **NOTE:** When U is specified in this command, S is output.	XD, YD, ZD, AD, BD, QD, LD, SD **NOTE:** When U is specified in this command, SD is output.	LC, LS, LL, SC, SS, SL
Measure side point (projected normal direction) (see Section 4.5)	X, Y, Z, A1, A2, A3, A4, B1, B2, B3, B4, Q, L, S, F8	XD, YD, ZD, AD, BD, QD, LD, SD	LC, LS, LL, SC, SS, SL

Command	Output symbols for one feature	Output symbols for feature difference	Output symbols for distance & intersection angle of features
Measure side point (spatial normal direction) (see Section 4.6)	X, Y, Z, A1, A2, A3, A4, B1, B2, B3, B4, Q, L, S, F8	XD, YD, ZD, AD, BD, QD, LD, SD	LC, LS, LL, SC, SS, SL
Measure point (see Section 4.7)	X, Y, Z, A1, A2, A3, A4, B1, B2, B3, B4, CX, CY, CZ, WX, WY, WZ, Q, L, S, NX, NY, NZ	XD, YD, ZD, AD, BD, QD, LD, SD	LC, LS, LL, SC, SS, SL, NN
Measure projected straight line (see Section 4.8)	CX, CY, CZ, WX, WY, WZ, L, S, F1, P, PX, PY, PZ, V, VX, VY, VZ		LC, LS, LL, SC, SS, SL, CA, WA, PA, VT
Measure plane (see Section 4.9)	CX, CY, CZ, WX, WY, WZ, S, F2, P, PX, PY, PZ, V, VX, VY, VZ		SC, SS, SL, CA, WA, PA, VT
Measure circle (see Section 4.10)	X, Y, Z, A1, A2, A3, A4, B1, B2, B3, B4, Q, L, S, D1, R1, F3, NX, NY, NZ	XD, YD, ZD, AD, BD, QD, LD, SD	LC, LS, LL, SC, NN
Measure circle with known radius (see Section 4.11)	X, Y, Z, A1, A2, A3, A4, B1, B2, B3, B4, Q, L, S, D1, R1, F3, NX, NY, NZ	XD, YD, ZD, AD, BD, QD, LD, SD	LC, LS, LL, SC, NN
Measure corner circle (see Section 4.12)	X, Y, Z, A1, A2, A3, A4, B1, B2, B3, B4, Q, L, S, D1, R1, F3, NX, NY, NZ	XD, YD, ZD, AD, BD, QD, LD, SD	LC, LS, LL, SC, NN
Measure ellipse (see Section 4.13)	X, Y, Z, A1, A2, A3, A4, B1, B2, B3, B4, L D1, D2, R1, R2, F8 **NOTE:** When C is specified, CX, CY or CZ is output.	XD, YD, ZD, AD, BD, LD	LC, LS, LL, SC
Measure sphere (see Section 4.14)	X, Y, Z, A1, A2, A3, A4, B1, B2, B3, B4, Q, L, S, D1, R1, F4, NX, NY, NZ	XD, YD, ZD, AD, BD, QD, LD, SD	LC, SC, SS, SL, NN
Measure cylinder (see Section 4.15)	CX, CY, CZ, WX, WY, WZ, L, S, D1, R1, F5, P, PX, PY, PZ, V, VX, VY, VZ, NX, NY, NZ		LC, LS, LL, SC, SS, SL, CA, WA, PA, TV, NN

Command	Output symbols for one feature	Output symbols for feature difference	Output symbols for distance & intersection angle of features
Measure stepped cylinder (see Section 4.16)	CX, CY, CZ, WX, WY, WZ, L, S, D1, D2, R1, R2, P, PX, PY, PZ, V, VX, VY, VZ, NX, NY, NZ		LC, LS, LL, SC, SS, SL, CA, WA, PA, VT, NN
Measure cone (see Section 4.17)	CX, CY, CZ, WX, WY, WZ, L, S, T, F6, P, PX, PY, PZ, V, VX, VY, VZ, NX, NY, NZ		LC, LS, LL, SC, SS, SL, CA, WA, PA, VT, NN
Feature construction function			
Construct projected line (see Chapter 5)	CX, CY, CZ, WX, WY, WZ, L, S, F1, P, PX, PY, PZ, V, VX, VY, VZ **NOTE:** In datum feature construction, NX, NY and NZ are also output.		LC, LS, LL, SC, SS, SL, CA, WA, PA, VT **NOTE:** In datum feature construction, NN is also output.
Construct spatial line (see Chapter 5)	CX, CY, CZ, WX, WY, WZ, L, S, F1, P, PX, PY, PZ, V, VX, VY, VZ, NX, NY, NZ		LC, LS, LL, SC, SS, SL, CA, WA, PA, VT, NN
Construct plane (see Chapter 5)	CX, CY, CZ, WX, WY, WZ, S, F2, P, PX, PY, PZ, V, VX, VY, VZ		SC, SS, SL, CA, WA, PA, VT
Construct circle (see Chapter 5)	X, Y, Z, A1, A2, A3, A4, B1, B2, B3, B4, Q, L, S, D1, R1, F3, NX, NY, NZ	XD, YD, ZD, AD, BD, QD, LD, SD	LC, LS, LL, SC, NN
Construct circle with known radius (see Chapter 5)	X, Y, Z, A1, A2, A3, A4, B1, B2, B3, B4, Q, L, S, D1, R1, F3, NX, NY, NZ	XD, YD, ZD, AD, BD, QD, LD, SD	LC, LS, LL, SC, NN
Construct ellipse (see Chapter 5)	X, Y, Z, A1, A2, A3, A4, B1, B2, B3, B4, L D1, D2, R1, R2, F8 **NOTE:** When C is specified, CX, CY or CZ is output.	XD, YD, ZD, AD, BD, LD	LC, LS, LL, SC

Command	Output symbols for one feature	Output symbols for feature difference	Output symbols for distance & intersection angle of features
Construct sphere (see Chapter 5)	X, Y, Z, A1, A2, A3, A4, B1, B2, B3, B4, Q, L, S, D1, R1, F4, NX, NY, NZ	XD, YD, ZD, AD, BD, QD, LD, SD	LC, SC, SS, SL, NN
Construct cylinder (see Chapter 5)	CX, CY, CZ, WX, WY, WZ, L, S, D1, R1, F5, P, PX, PY, PZ, V, VX, VY, VZ, NX, NY, NZ		LC, LS, LL, SC, SS, SL, CA, WA, PA, TV, NN
Construct stepped cylinder (see Chapter 5)	CX, CY, CZ, WX, WY, WZ, L, S, D1, D2, R1, R2, P, PX, PY, PZ, V, VX, VY, VZ, NX, NY, NZ		LC, LS, LL, SC, SS, SL, CA, WA, PA, VT, NN
Construct cone (see Chapter 5)	CX, CY, CZ, WX, WY, WZ, L, S, T, F6, P, PX, PY, PZ, V, VX, VY, VZ, NX, NY, NZ		LC, LS, LL, SC, SS, SL, CA, WA, PA, VT, NN
Feature combination calculation			
Calculate projected intersection point (see Section 6.2.1)	X, Y, Z, A1, A2, A3, A4, B1, B2, B3, B4, CX, CY, CZ, Q, L, S	XD, YD, ZD, AD, BD, QD, LD, SD	LC, LS, LL, SC, SS, SL
Calculate spatial intersection point (see Section 6.2.2)	X, Y, Z, A1, A2, A3, A4, B1, B2, B3, B4, Q, L, S	XD, YD, ZD, AD, BD, QD, LD, SD	LC, LS, LL, SC, SS, SL
Calculate bisection point (see Section 6.2.3)	X, Y, Z, A1, A2, A3, A4, B1, B2, B3, B4, Q, L, S	XD, YD, ZD, AD, BD, QD, LD, SD	LC, LS, LL, SC, SS, SL
Calculate point of tangency (see Section 6.2.4)	X, Y, Z, A1, A2, A3, A4, B1, B2, B3, B4, Q, L, S	XD, YD, ZD, AD, BD, QD, LD, SD	LC, LS, LL, SC, SS, SL
Calculate intersecting line (see Section 6.3.1)	CX, CY, CZ, WX, WY, WZ, S		LC, LS, LL, SC, SS, SL, CA, WA
Calculate bisection line (see Section 6.3.2)	CX, CY, CZ, WX, WY, WZ, L, S		LC, LS, LL, SC, SS, SL, CA, WA
Calculate tangent line (see Section 6.3.3)	CX, CY, CZ, WX, WY, WZ, L, S, P, PX, PY, PZ, V, VX, VY, VZ		LC, LS, LL, SC, SS, SL, CA, WA, PA, VT
Calculate bisection plane (see Section 6.4.1)	CX, CY, CZ, WX, WY, WZ, S		SC, SS, SL, CA, WA
Calculate intersecting circle (see Section 6.5.1)	X, Y, Z, A1, A2, A3, A4, B1, B2, B3, B4, Q, L, S, D1, R1,	XD, YD, ZD, AD, BD, QD, LD, SD	LC, LS, LL, SC

Command	Output symbols for one feature	Output symbols for feature difference	Output symbols for distance & intersection angle of features
Calculate cross-sectional circle of cone (see Section 6.5.2)	X, Y, Z, A1, A2, A3, A4, B1, B2, B3, B4, Q, L, S, D1, R1,	XD, YD, ZD, AD, BD, QD, LD, SD	LC, LS, LL, SC
Calculate projected distance (see Section 6.6.1)			LC, LS, LL
Calculate spatial distance (see Section 6.6.2)			LC, LS, LL
Calculate projected intersection angle (see Section 6.7.1)			CA
Calculate spatial intersection angle (see Section 6.7.2)			WA
Calculate parallelism (see Section 6.8.1)			PA
Calculate perpendicularity (see Section 6.8.2)			VT
Calculate angularity (see Section 6.8.3)			AG
Recall feature (see Section 6.9.1)	In accordance with the result output specification for each recalled feature. (However, P, V and N are not possible.)		
Project one feature on another feature (see Section 6.9.2)	Conforms to “Measure point with approach direction” or “Measure projected straight line” command. (However, P, V, N. PA, VT and NN are not possible.)		
Change feature type (see Section 6.9.3)	In accordance with the result output specification for each changed feature. (However, P, V, N. PA, VT and NN are not possible.)		
Conform feature direction (see Section 6.9.4)	In accordance with the result output specification for each feature. (However, P, V, N. PA, VT and NN are not possible.)		

19.2 Language Selection

You can change the language displayed on the LCD of the QM-Data from the System menu. See Chapter 16 for information on transferring to the System menu.

Use the following procedure in the System menu.

1) Press the function key corresponding to the  icon.
2) Use the numeric keys to select the displayed language.

19.3 Setting Up Optional Software

The optional software (QMFit and QMGraph) can be enabled (or disabled) from the System menu. See Chapter 16 for information on transferring to the System menu.

Use the following procedure in the System menu.

1) Press the function key corresponding to the  icon.
2) Use the numeric keys to select the optional software.
3) Enter the software ID.

19.4 Installing Software

This section describes how to upgrade the QM-Data program and how to reinstall the program when a software problem arises.

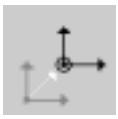
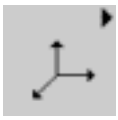
NOTE
- You must connect the floppy disk drive “FD-1” to the QM-Data before you install the program. Refer to the “Hardware Guide of QM-Data (MANUAL No. 99MCA081)” for details.
- To install the program, use the procedure below. If you install the program without following this procedure, Mitutoyo accepts no liability for any system problems that arise.

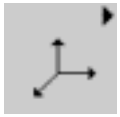
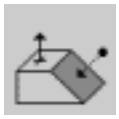
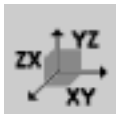
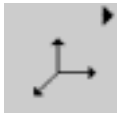
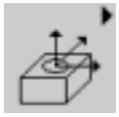
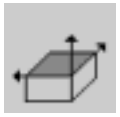
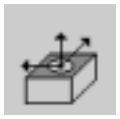
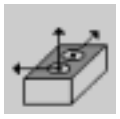
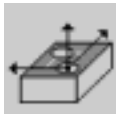
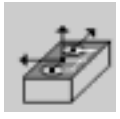
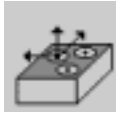
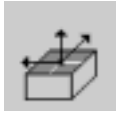
[Procedure]

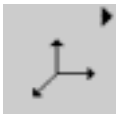
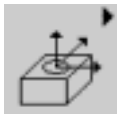
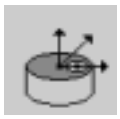
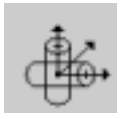
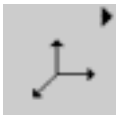
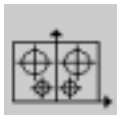
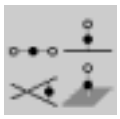
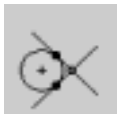
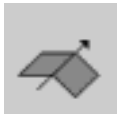
1) Switch the QM-Data on with the install disk loaded in the floppy disk drive “FD-1”.
2) After a few moments, the language selection menu for the installation appears. Use the numeric keys to select the language to be used. This language selection has no effect on the language setting specified in the language selection process described in Section 19.2.
3) Follow the on-screen instructions for the remainder of the installation procedure.

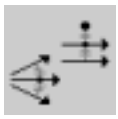
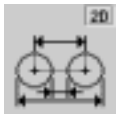
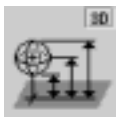
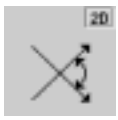
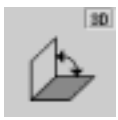
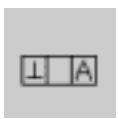
19.5 List of Icons

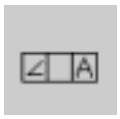
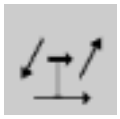
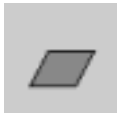
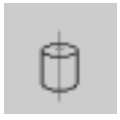
Table 19-5

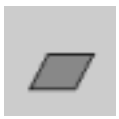
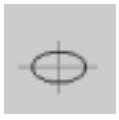
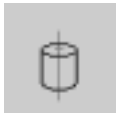
Icon			Function
First level	Second level	Third level	
Storing feature in specified memory			
	-	-	Store feature in specified memory (see Section 6.1)
Coordinate system setting function			
		-	Align reference plane (see Section 8.1)
		-	Align origin (see Section 8.2)
		-	Align reference axis (see Section 8.3)
		-	Align reference axis with offset values (see Section 8.4)
		-	Rotate coordinate system (see Section 8.5)
		-	Align reference plane with offset values (see Section 8.6)
		-	Reset coordinate system (see Section 8.7)
		-	Store coordinate system (see Section 8.8)
		-	Recall coordinate system (see Section 8.9)

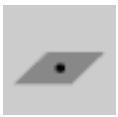
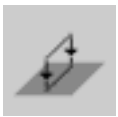
Icon			Function
First level	Second level	Third level	
Coordinate system setting function			
		-	Designate projection plane for rotational projection (see Section 8.10)
		-	Create auxiliary inclined plane (see Section 8.11)
		-	Designate reference plane (see Section 8.12)
Macro function for aligning coordinate system			
			Coordinate system alignment macro No. 1 (4-point plane, 2-point line, 1-point side plane) (see Section 9.1)
			Coordinate system alignment macro No. 2 (4-point plane, 2-point line, 4-point circle) (see Section 9.2)
			Coordinate system alignment macro No. 3 (4-point plane, 4-point circle, 4-point circle) (see Section 9.3)
			Coordinate system alignment macro No. 4 (4-point plane, 4-point circle, 4-point circle) (see Section 9.4)
			Coordinate system alignment macro No. 5 (4-point plane, 2-point line, 2-point line) (see Section 9.5)
			Coordinate system alignment macro No. 6 (4-point plane, 4-point circle, 4-point circle) (see Section 9.6)
			Coordinate system alignment macro No. 7 (4-point plane, 4-point circle, 4-point circle, 4-point circle) (see Section 9.7)
			Coordinate system alignment macro No. 8 (4-point plane, 2-point line, 1-point side plane, 1-point side plane, 1-point side plane) (see Section 9.8)

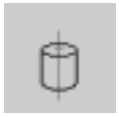
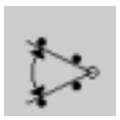
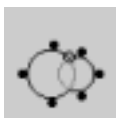
Icon			Function
First level	Second level	Third level	
Macro function for aligning coordinate system			
			Coordinate system alignment macro No. 9 (8-point cylinder, 1-point side plane, 4-point circle) (see Section 9.9)
			Coordinate system alignment macro No. 10 (8-point cylinder, 1-point side plane, 2-point bisection) (see Section 9.10)
			Coordinate system alignment macro No. 11 (8-point cylinder, 1-point side plane, 2-point line) (see Section 9.11)
			Coordinate system alignment macro No. 12 (8-point cylinder, 8-point cylinder) (see Section 9.12)
QMFit program (option)			
		-	Launch QMFit program (see Chapter 13 and the “QMFit Operation Guide of QM-Data (MANUAL No. 99MCA090)”)
Feature combination calculation and keying-in functions			
			Calculate projected intersection point (see Section 6.2.1)
			Calculate spatial intersection point (see Section 6.2.2)
			Calculate bisection point (see Section 6.2.3)
			Calculate point of tangency (see Section 6.2.4)
			Calculate intersecting line (see Section 6.3.1)

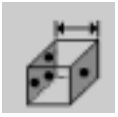
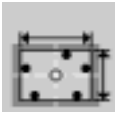
Icon			Function
First level	Second level	Third level	
Feature combination calculation and keying-in functions			
			Calculate bisection line (see Section 6.3.2)
			Calculate tangent line (see Section 6.3.3)
			Calculate bisection plane (see Section 6.4.1)
			Calculate intersecting circle (see Section 6.5.1)
			Calculate cross-sectional circle of cone (see Section 6.5.2)
			Calculate projected distance (see Section 6.6.1)
			Calculate spatial distance (see Section 6.6.2)
			Calculate projected intersection angle (see Section 6.7.1)
			Calculate spatial intersection angle (see Section 6.7.2)
			Calculate parallelism (see Section 6.8.1)
			Calculate perpendicularity (see Section 6.8.2)

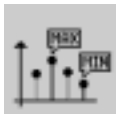
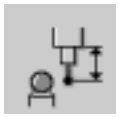
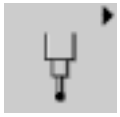
Icon			Function
First level	Second level	Third level	
Feature combination calculation and keying-in functions			
			Calculate angularity (see Section 6.8.3)
			Recall feature (see Section 6.9.1)
			Project one feature on another feature (see Section 6.9.2)
			Change feature type (see Section 6.9.3)
			Conform feature direction (see Section 6.9.4)
			Key in point feature (see Section 6.10.1)
			Key in straight line feature (see Section 6.10.2)
			Key in plane feature (see Section 6.10.3)
			Key in circle feature (see Section 6.10.4)
			Key in ellipse feature (see Section 6.10.5)
			Key in sphere feature (see Section 6.10.6)
			Key in cylinder feature (see Section 6.10.7)

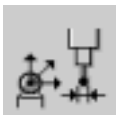
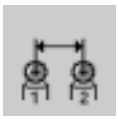
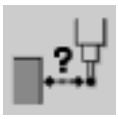
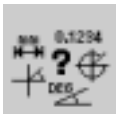
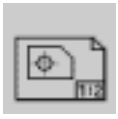
Icon			Function
First level	Second level	Third level	
Feature combination calculation and keying-in functions			
			Key in cone feature (see Section 6.10.8)
Exiting from coordinate measurement program			
		-	Exit from coordinate measurement program (go to System menu) (see Chapter 13)
		-	Launch Gage-like measurement program (see Chapter 13 and the “Operation Guide of QM-Data (MANUAL No. 99MCA084)”)
Feature construction function			
		-	Construct projected line (see Chapter 5)
		-	Construct spatial line (see Chapter 5)
		-	Construct plane (see Chapter 5)
		-	Construct circle (see Chapter 5)
		-	Construct circle with known radius (see Chapter 5)
		-	Construct ellipse (see Chapter 5)
		-	Construct sphere (see Chapter 5)
		-	Construct cylinder (see Chapter 5)

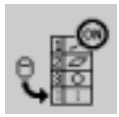
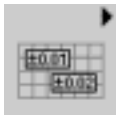
Icon			Function
First level	Second level	Third level	
Feature construction function			
		-	Construct stepped cylinder (see Chapter 5)
		-	Construct cone (see Chapter 5)
Feature measurement function			
		-	Measure point with approach direction (see Section 4.1)
		-	Measure side point (Cartesian coordinate axis) (see Section 4.2)
		-	Measure side point (polar coordinate axis) (see Section 4.3)
		-	Measure side point (spherical coordinate axis) (see Section 4.4)
		-	Measure side point (projected normal direction) (see Section 4.5)
		-	Measure side point (spatial normal direction) (see Section 4.6)
		-	Measure point (see Section 4.7)
		-	Measure projected straight line (see Section 4.8)
		-	Measure plane (see Section 4.9)

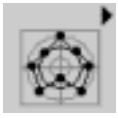
Icon			Function
First level	Second level	Third level	
Feature measurement function			
		-	Measure circle (see Section 4.10)
		-	Measure circle with known radius (see Section 4.11)
		-	Measure corner circle (see Section 4.12)
		-	Measure ellipse (see Section 4.13)
		-	Measure sphere (see Section 4.14)
		-	Measure cylinder (see Section 4.15)
		-	Measure stepped cylinder (see Section 4.16)
		-	Measure cone (see Section 4.17)
			Intersection/angle measurement (see Section 13.7)
			Circle Line intersection measurement (see Section 13.7)
			2-circle intersection measurement (see Section 13.7)

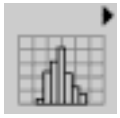
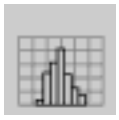
Icon			Function
First level	Second level	Third level	
Feature measurement function			
			3-plane intersection measurement (see Section 13.7)
			2-plane angle measurement (see Section 13.7)
			Plane Cylinder angle measurement (see Section 13.7)
			Projected distance measurement (see Section 13.7)
			Spatial distance measurement (see Section 13.7)
			Square hole measurement (see Section 13.7)
Supplementary output function			
		-	Outputting comment (see Section 10.1)
		-	Displaying date & time (see Section 10.2)
		-	Tolerance heading output (see Section 10.3)

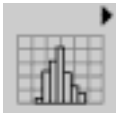
Icon			Function
First level	Second level	Third level	
Supplementary output function			
		-	Line feed or page feed (see Section 10.4)
		-	Displaying stored feature (see Section 10.5)
		-	Displaying raw data (see Section 10.6)
		-	Calculating mean, maximum and minimum (see Section 10.7)
Probe setting function			
		-	Designate probe tip number (see Section 7.1)
		-	Calibrate probe tip position (see Section 7.2)
		-	Key in probe tip diameter (see Section 7.3)
		-	Key in probe tip position relative to the first tip (see Section 7.4)
		-	Probe information (see Section 7.5)
		-	Clear probe information (see Section 7.6)

Icon			Function
First level	Second level	Third level	
Probe setting function			
		-	Store probe data (see Section 7.7)
		-	Recall probe data (see Section 7.8)
		-	Register reference origin (see Section 7.9)
		-	Key in master ball diameter (see Section 7.10)
		-	Register sub-reference origin position (see Section 7.11)
		-	Key in auto-dummy distance (see Section 7.12)
Supplementary setting function			
		-	Parameter reset (see Section 11.1.1)
		-	Change measurement number (see Section 11.1.2)
		-	Unit setting (see Section 11.1.3)
		-	Key in scale factor (see Section 11.1.4)
		-	Switch printing function ON/OFF (see Section 11.1.5)

Icon			Function
First level	Second level	Third level	
Supplementary setting function			
			Continuous storage ON (see Section 11.2.1)
			Continuous storage OFF (see Section 11.2.2)
			Tolerance table registration (see Section 11.3.1)
			Displaying tolerance table data (see Section 11.3.2)
			Part program management (see Section 11.4.1)
			Probe file management (see Section 11.4.2)
			Tolerance file management (see Section 11.4.3)
			External output file management (see Section 11.4.6)
			Contour point group file management (see Section 11.4.4)
			Statistical data file management (see Section 11.4.5)

Icon			Function
First level	Second level	Third level	
Supplementary setting function			
			1-Key (see Chapter 13)
			User menu (see Chapter 14)
			Icon Setup (see Chapter 14)
			MACRO Management (see Chapter 13)
Temperature compensation program (option)			
		-	Launch Temperature compensation program (see Chapter 16 and the “Temperature Compensation Manual (Software Part) of QM-Data (MANUAL No. 99MCA089)”)
Part program function			
		-	Edit mode (see Section 12.3)
		-	Exit from part program (see Section 12.4)
QMGraph program (option)			
		-	Draw feature deviation (see Chapter 16 and the “QMGraph Operation Guide of QM-Data (MANUAL No. 99MCA091)”)
		-	Draw positional deviation (see Chapter 16 and the “QMGraph Operation Guide of QM-Data (MANUAL No. 99MCA091)”)

Icon			Function
First level	Second level	Third level	
QMScan (option)			
		—	Contour measurement(see Chapter 16 and the “QMScan Operation Guide of QM-Data (MANUAL No. 99MCA211)”)
		—	Contour point group figure display(see Chapter 16 and the “QMScan Operation Guide of QM-Data (MANUAL No. 99MCA211)”)
		—	Contour point group file output(see Chapter 16 and the “QMScan Operation Guide of QM-Data (MANUAL No. 99MCA211)”)
		—	Contour point group RS232C output(see Chapter 16 and the “QMScan Operation Guide of QM-Data (MANUAL No. 99MCA211)”)
		—	Contour point group file management(see Chapter 16 and the “QMScan Operation Guide of QM-Data (MANUAL No. 99MCA211)”)
QMStat program (option)			
		—	Statistical data collection start(see Chapter 16 and the “QMStat Operation Guide of QM-Data (MANUAL No. 99MCA094)”)
		—	Statistical data collection end(see Chapter 16 and the “QMStat Operation Guide of QM-Data (MANUAL No. 99MCA094)”)
		—	Initialization(see Chapter 16 and the “QMStat Operation Guide of QM-Data (MANUAL No. 99MCA094)”)
		—	Statistical processing(see Chapter 16 and the “QMStat Operation Guide of QM-Data (MANUAL No. 99MCA094)”)
		—	Measurement data file output(see Chapter 16 and the “QMStat Operation Guide of QM-Data (MANUAL No. 99MCA094)”)
		—	Measurement data RS232C output(see Chapter 16 and the “QMStat Operation Guide of QM-Data (MANUAL No. 99MCA094)”)

Icon			Function
First level	Second level	Third level	
QMStat (option)			
		—	External output of comments(see Chapter 16 and the “QMStat Operation Guide of QM-Data (MANUAL No. 99MCA094)”)
		—	External output end(see Chapter 16 and the “QMStat Operation Guide of QM-Data (MANUAL No. 99MCA094)”)
		—	MeasurLink data collection start(see Chapter 16 and the “QMStat Operation Guide of QM-Data (MANUAL No. 99MCA094)”)
		—	MeasurLink communication/collection end(see Chapter 16 and the “QMStat Operation Guide of QM-Data (MANUAL No. 99MCA094)”
Scrolling menu			
	-	-	Move to the next page of the menu
	-	-	Move to the previous page of the menu

Mitutoyo Corporation

20-1, Sakado 1-chome, Takatsu-ku, Kawasaki, Kanagawa 213-0012, Japan
Cable: MITUTOYO Kawasaki
Phone: (044)813-8230 Fax: (044)813-8231