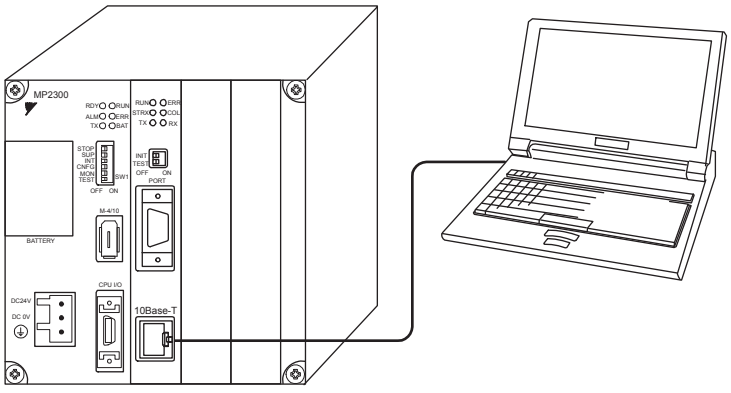
YASKAWA

Machine Controller MP900/MP2000 Series

ELECTRONIC CAM DATA PREPARATION TOOL

OPERATION MANUAL



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INTRODUCTION

This manual describes how to operate the MPE720 Electronic Cam Data Preparation Tool.
The Electronic Cam Data Preparation Tool runs on Windows 95/98/2000/NT/XP. Refer to the Windows manuals for details.
Refer to the materials indicated below regarding matters for the Electronic Cam Data Preparation Tool.

＜Relevant document＞

Document No.	Name of document
SIEPC88070005	Machine Controller MP900/MP2000 Series MPE720 Software for Programming Device User's Manual

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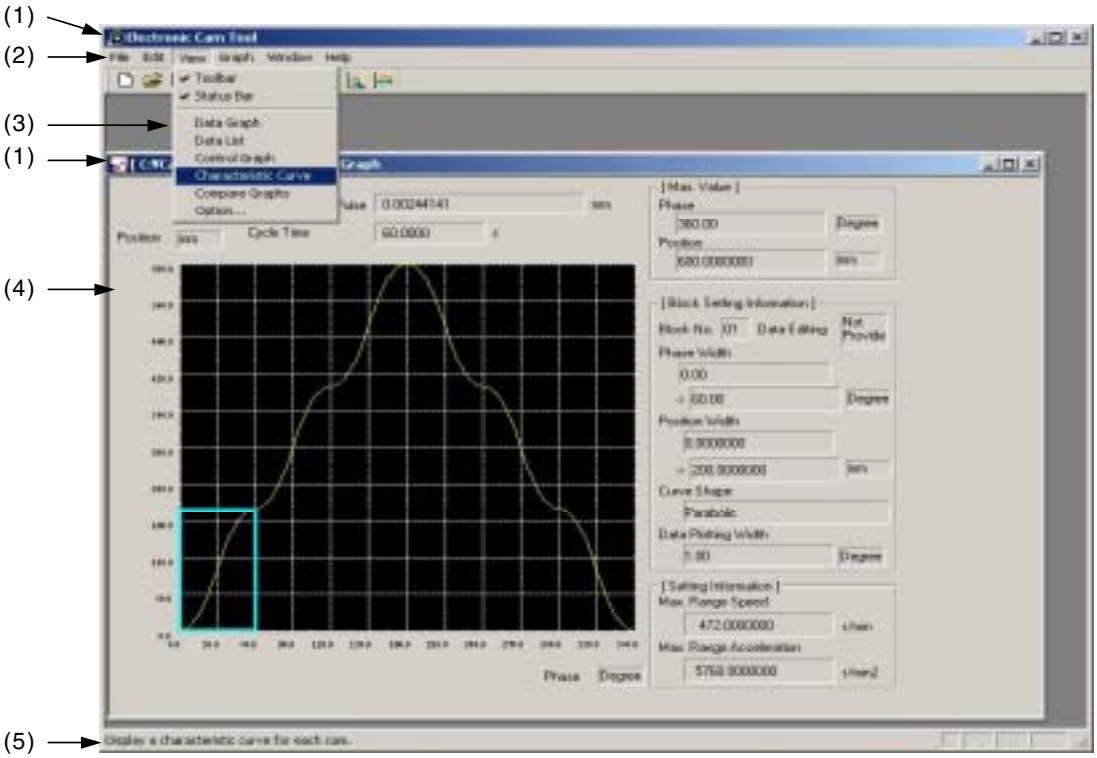
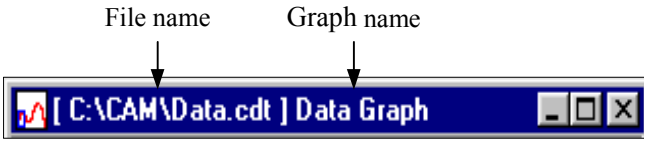
1 BASIC OPERATION OF ELECTRONIC CAM DATA PREPARATION TOOL

1.1 Components of Electronic Cam Data Preparation Tool Screens



(1) Title bar

The title of each window and box is displayed in the title bar.



(2) Bar menu

This menu appears at the top of a window. Select an item in the menu bar and a pulldown menu appears. Select a function in the pulldown menu.

(3) Pulldown menu

This menu appears below a selected item in the menu bar.

＊ The items in the bar and pulldown menus depend on an active window.

(4) Function windows

Various programming function windows are displayed. Multiple windows can be displayed simultaneously.

Refer to 1.3 “Windows” for details.

(5) Status bar

A system message is displayed.

1.2 Mouse

The mouse is used to move the cursor, to select a command, to set the input position, and to select an operation, etc. The terms related to mouse operations are defined in Table 1.1.

Table 1.1 Definitions of terms related to the mouse

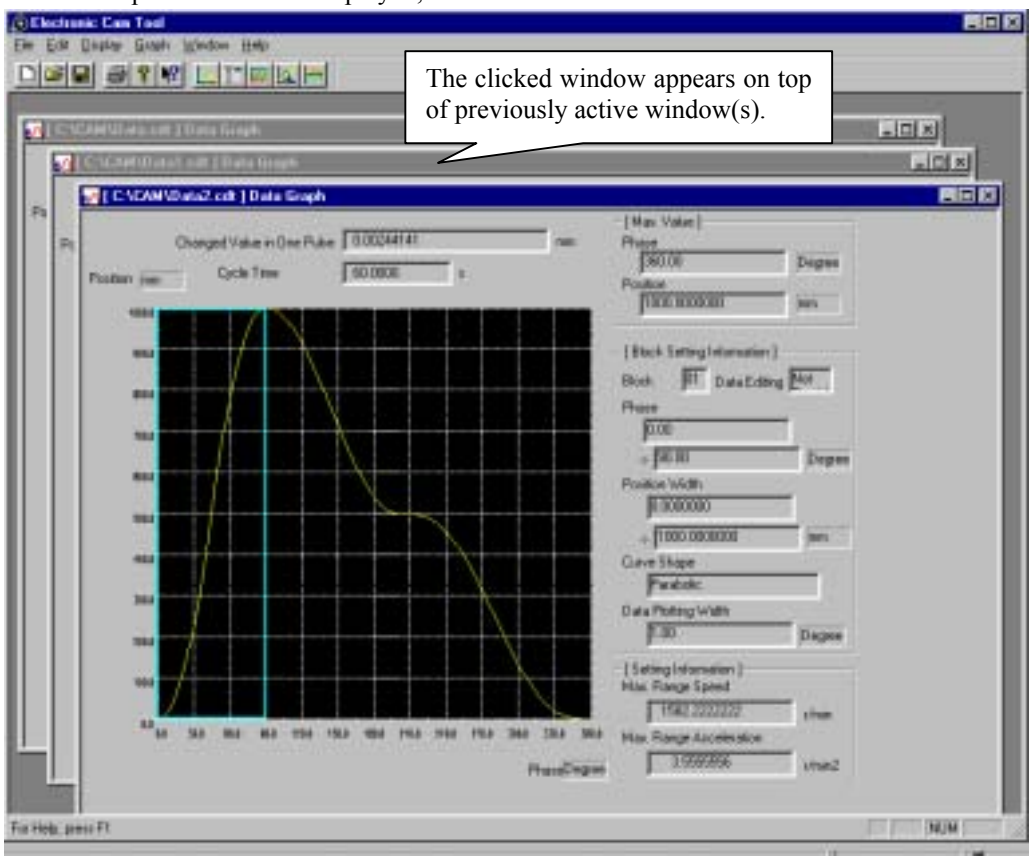
Term	Meaning
Click	To press the mouse button
A click	To press the A button (left button) of the mouse
B click	To press the B button (right button) of the mouse
Double click	To press the A button of the mouse twice repeatedly
Point	To move the mouse cursor to a certain location and then press the A button of the mouse.
Drag	To move the mouse while continually pressing the button.

1.3 Windows

A window is displayed according to its function. Programs and data are prepared by switching windows. The title bar of the active window is displayed in a deeper color.

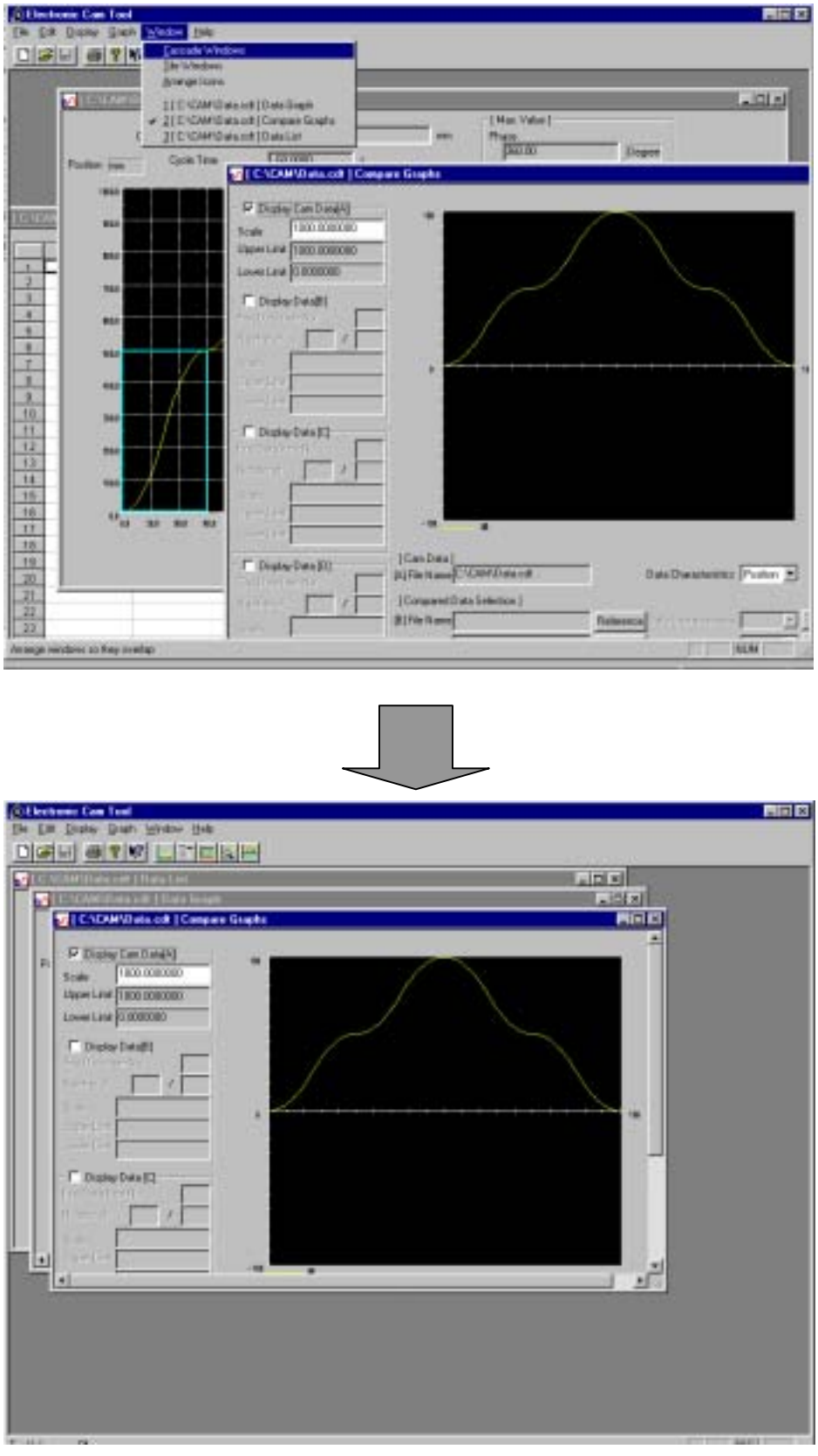
1.3.1 Switching windows

When multiple windows are displayed, click the window desired to activate it.



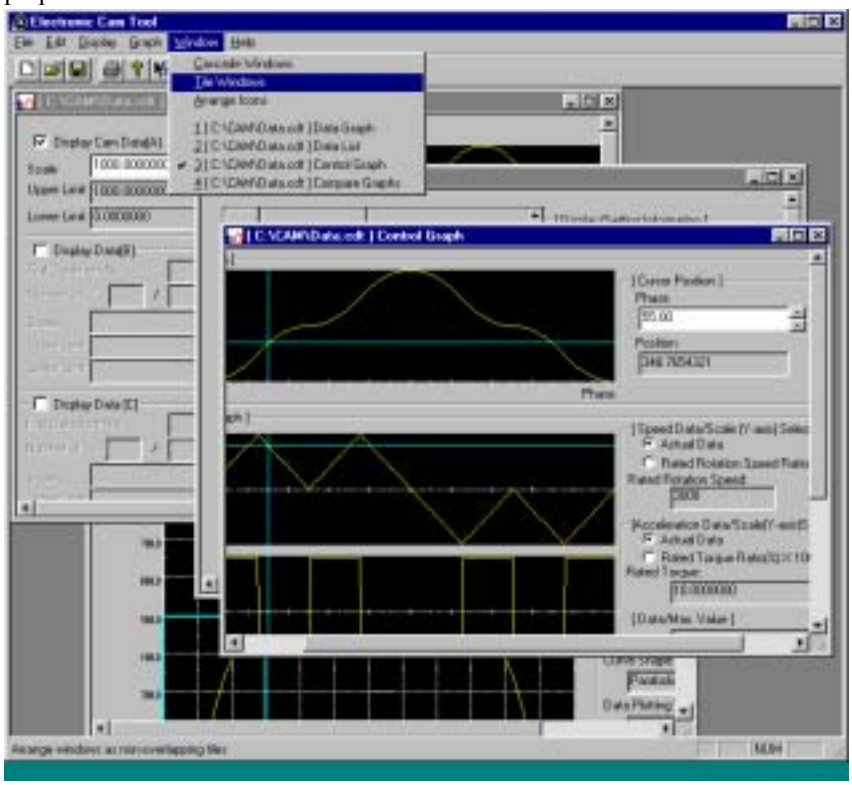
1.3.2 Cascade display

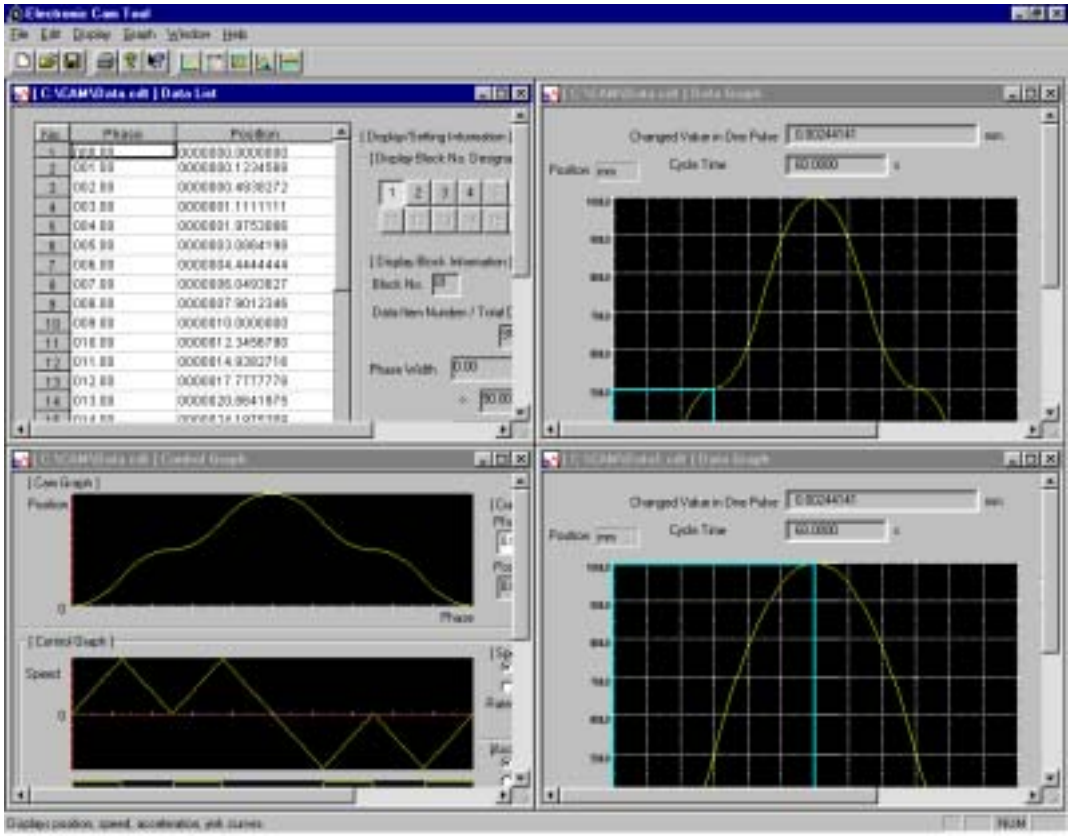
Point to "Window", and select "Cascade Windows" to arrange the currently opened electronic cam data preparation tool windows in a cascade display.



1.3.3 Tiled display

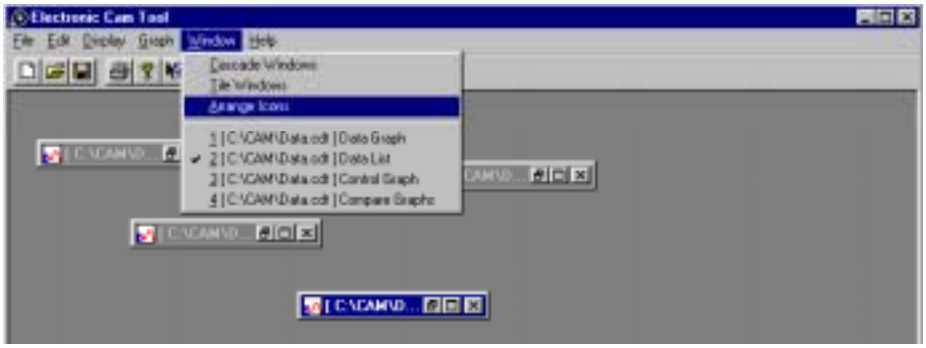
Point to "Window", and select "Tile Windows" to arrange the currently opened electronic cam data preparation tool windows in a tiled format.



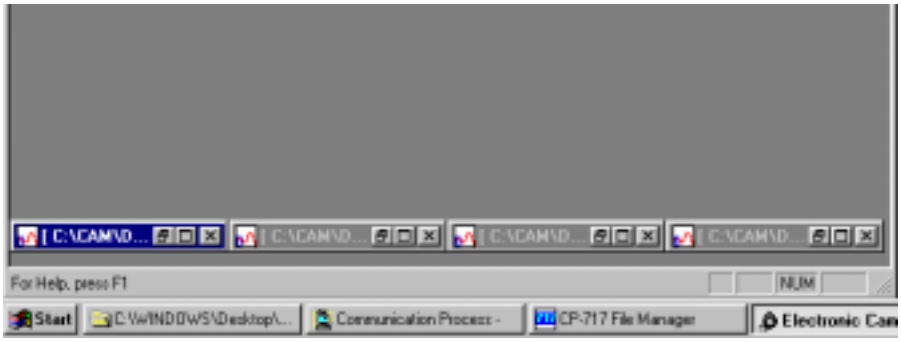


1.3.4 Arranging icons

Point to "Window", and select "Arrange Icons" to arrange the icons in a line.



The icons are arranged.



1.4 Help

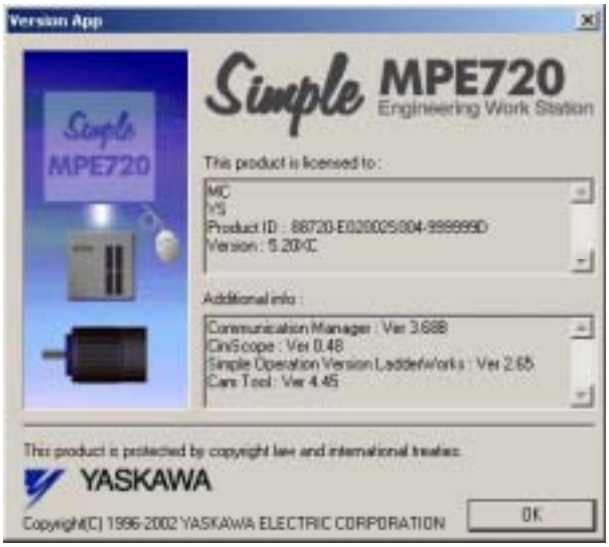
1.4.1 Help search by topic

Point to "Help", and select "Help Search by Topic" to display the help information for the electronic cam data preparation tool.

Select Cancel to close the help window.

1.4.2 Display of version information

Point to "Help", and select "About App." to display information on the version of the electronic cam data preparation tool. Select OK to close the version information box.

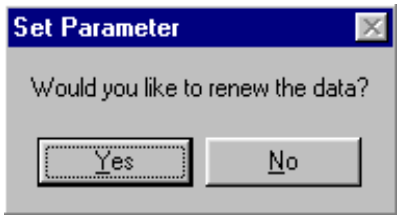


1.4.3 Sub windows

There are two types of sub windows: the message box and the dialog box.

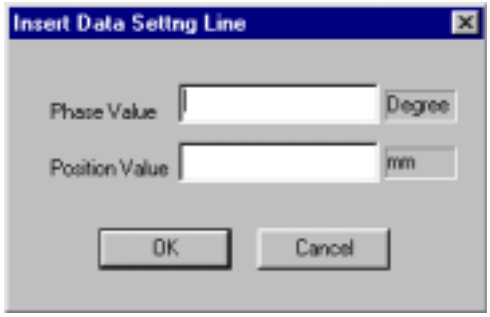
(1) Message box

A message box with Yes and No is displayed to confirm operation or to confirm an error message.



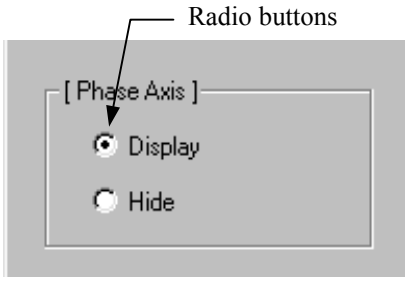
(2) Dialog box

Although this is similar to a message box, but whereas a message box is for making a simple selection such as a Yes / No selection, or for confirmation, the dialog box enables the user to set the necessary information.



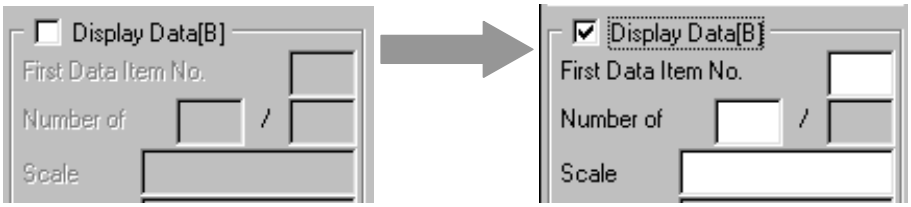
■ Radio buttons

These are displayed when only one is to be selected.
Point to and click an item in the radio button to be selected.
A black dot appears in a selected radio button.



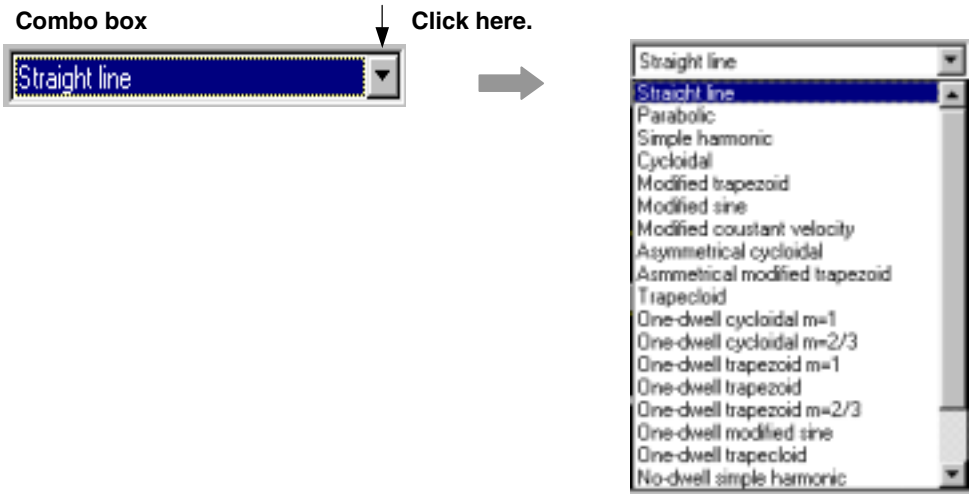
■ Check box

Check boxes are displayed when multiple items are to be selected.
Point to and click items in the check box to be selected.
A check appears in a selected check box.



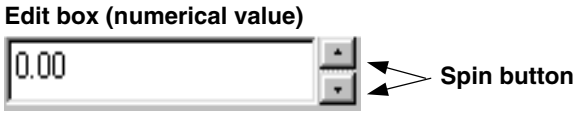
■ Combo box

A combo box is displayed to select one item among many.
To select an item in a combo box, display a list box, scroll with the scroll bar, and click the item desired. When the number of choices is small, the scroll bar is not displayed. The selected item is displayed in the input field.



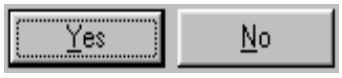
■ Edit box (numerical value)

An edit box is displayed to set a numerical value.
To set a numerical value, point the spin button at the right of the edit box. Or, move the cursor to the edit box and input with the keyboard.



■ Push buttons

These are displayed to select simple instructions.
Point the push button to be selected for setting.



1.5 Starting and Ending the Electronic Cam Data Preparation Tool

1.5.1 Starting the electronic cam data preparation tool

Start the electronic cam data preparation tool from the MPE720 file manager window. Refer to Machine Controller MP900/MP2000 Series MPE720 Software for Programming Device User's Manual (SIEPC88070005) for details.

① Confirm that the MPE720 file manager is displayed.
② Point to "Tool" in the menu bar and select "Cam Tool".
③ The electronic cam data preparation tool starts.

1.5.2 Ending the electronic cam data preparation tool

Terminate the electronic cam data preparation tool (electronic cam tool) and return to the MPE720 file manager window. Refer to Machine Controller MP900/MP2000 Series MPE720 Software for Programming Device User's Manual (SIEPC88070005) for details.

① Point to "File" in the menu bar and select "Exit".
② The electronic cam data preparation tool window closes.

1.6 Menu for Common Functions

The menu for common functions is displayed in every window of the tool cam data preparation tool.

Common menu displayed for the electronic cam data preparation tool

Table 1.2 shows the common menu displayed for the electronic cam data preparation tool. Refer to the section number shown in Table 1.2 for details on each function.

Table 1.2 Common menu of the electronic cam data preparation tool

Menu		Function	Reference section No.
File			
	New	Displays a new window.	2.2.1
	Open	Opens the save data file.	2.2.2
	Close	Closes each function window.	2.2.3
	Save	Refer to the descriptions on the function of each window.	
	Delete		
	Data Transfer		
	Print	Prints electronic cam data preparation tool documents.	2.2.4
	Exit	Exits the preparation of the electronic cam data preparation tool application.	2.2.5
Refer to the descriptions on the function of each window.			
Window			
	Cascade Windows	Arranges windows in a cascade display.	2.4.1
	Tile Windows	Arranges windows in a tiled format.	2.4.2
	Arrange Icons	Arranges icons in lines.	2.4.3
Help			
	Help Search by Topic	Searches topics in Help.	2.5.1
	About App.(Cambld)	Displays information on the version.	2.5.2

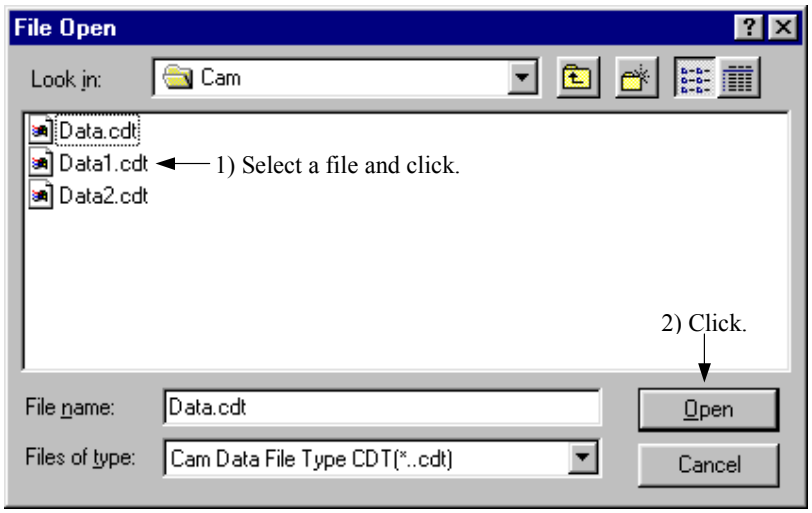
1.7 Electronic Cam Data Preparation Tool File

1.7.1 Opening files

Click "File" and select "Open" in the pulldown menu.

Or, click the "Open"  button in the tool bar to open the file window.

＊ The Cam Data File(＊..cdt) -- Control Pack CP-92CAM (the electronic cam data preparation tool for NEC PC-98 Series) -- which is displayed at the "Files of type" column can also be opened. Note that this function is effective for model No. 87716-20000-S102 and higher.



1.7.2 Closing function windows

Point to "File", and select "Close".

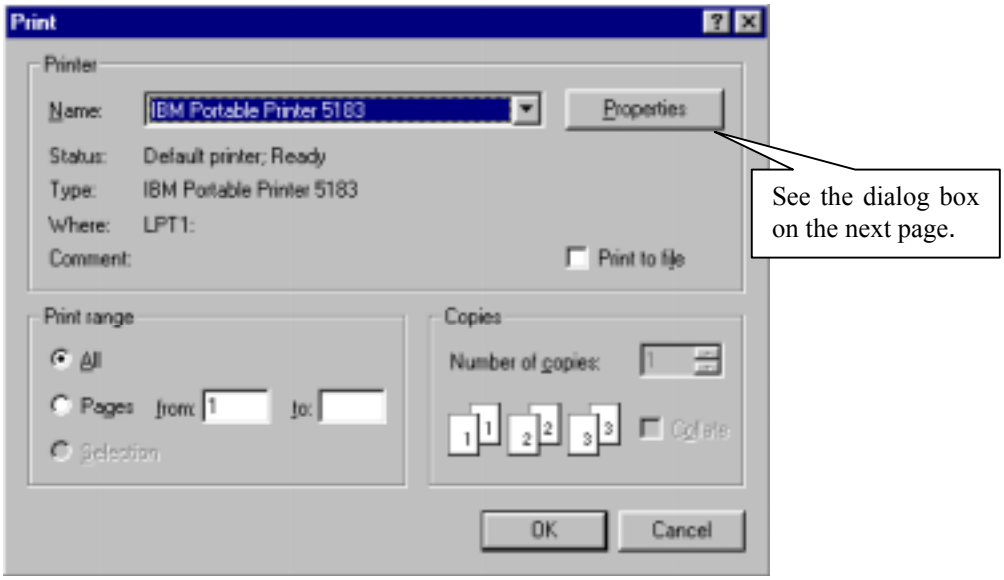
1.7.3 Saving data files

Point to "File", and select "Save" to save the prepared and/or modified data. Refer to 3.7.

1.7.4 Printing electronic cam data preparation tool documents

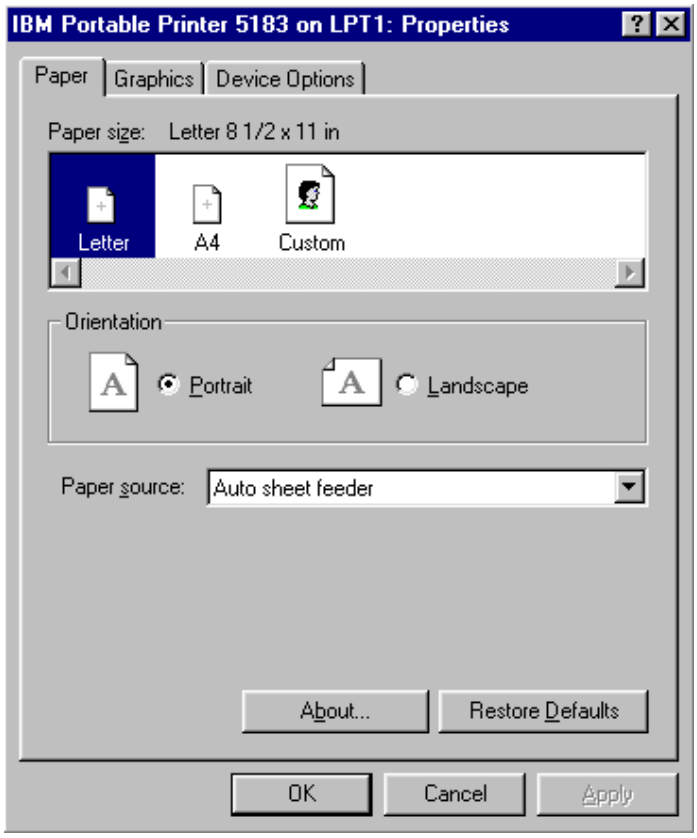
Programs and definition data which are prepared with the electronic cam data preparation tool are printed.

① Point to "File", and select "Print". The following dialog box appears.



Set the print range and number of copies and click the OK button.

② Select the Properties button in the “Print” dialog box to display the printer property. Change the setting to reformat the page including the paper orientation and other properties.



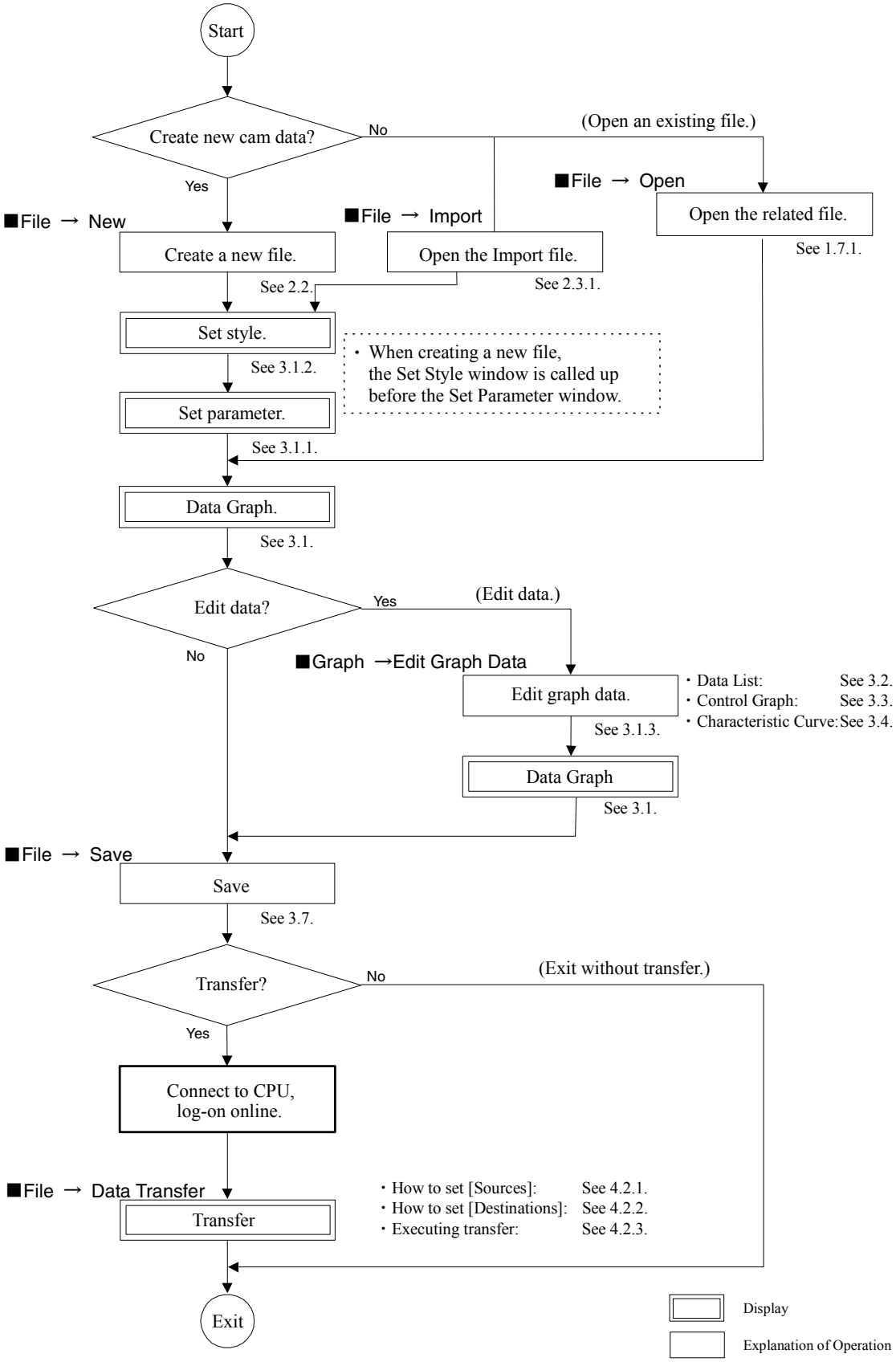
1.7.5 Exiting applications

Point to “File”, and select “Exit” to close the electronic cam data preparation tool file window.

2 NEW DOCUMENT

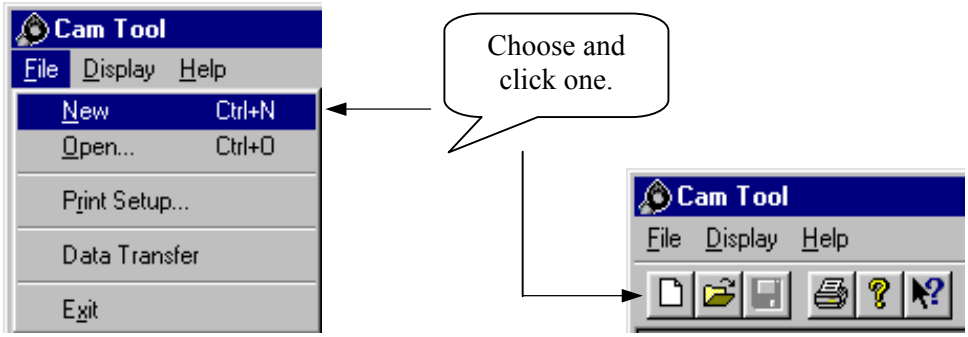
2.1 Outline of Operation

The following flowchart outlines an actual operation with the electric cam data.

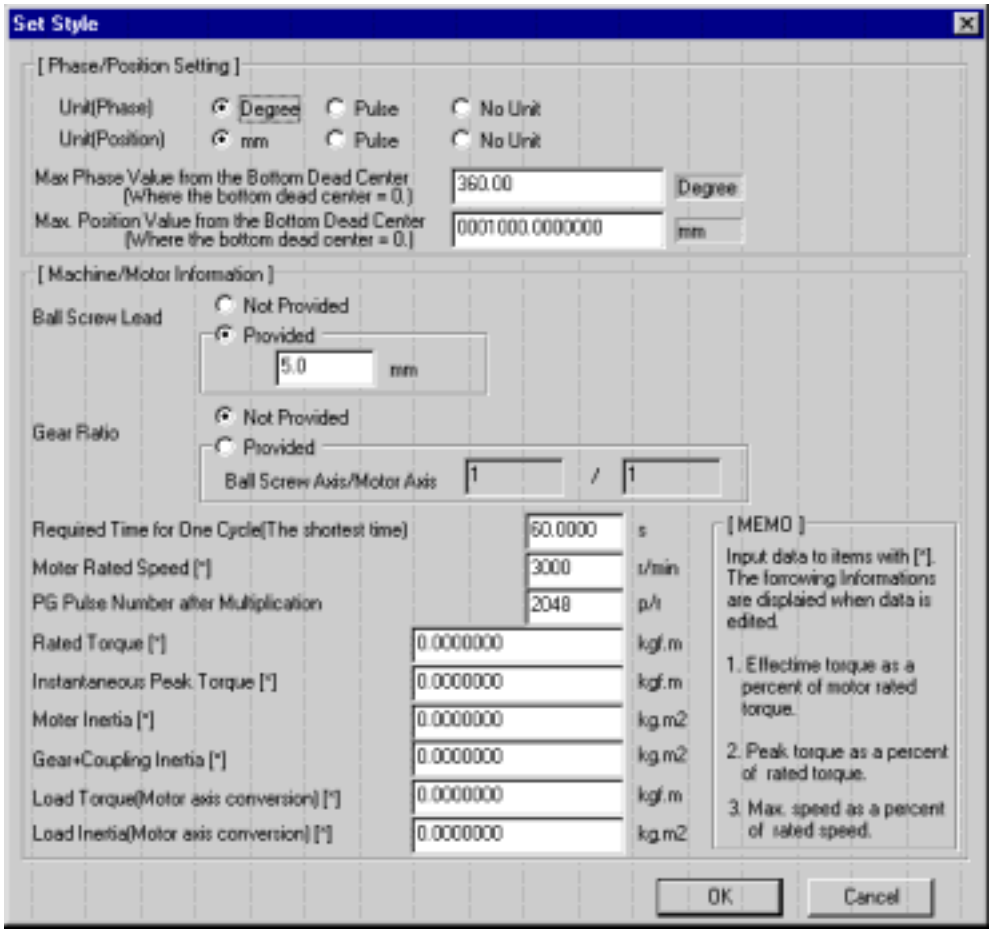


2.2 Inputting New Data

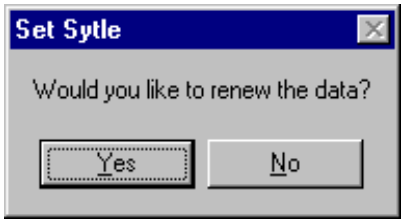
① Point to "File" and select "New".



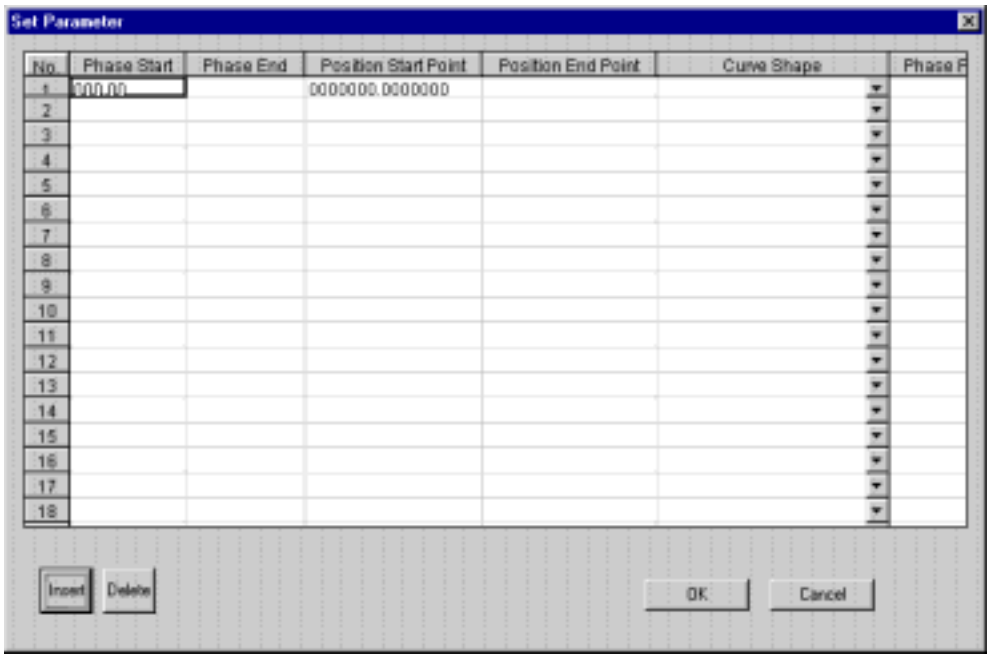
② The Set Style window appears. Refer to 3.1.2 for inputting the data.



③ Click OK and the message box to confirm data updating appears.



④ Select [Yes] to display the Set Parameter window. Refer to 3.1.1 for inputting the data.



⑤ Click [OK] and the message box to confirm data updating appears.

⑥ Select [Yes] to display the data graph window. Refer to Chapter 3 for inputting the data.

Note:
When writing a new document, the Set Style window and the Set Parameter window are called up in this order.

2.3 Import

2.3.1 Import

Using import function, the electric cam data can be created by reading the CSV type position data prepared with CAD etc. with the electric cam data tool.

■Import File

The import file is limited to the following specified position data.

File extension : CSV
Line, Column : N lines two columns
Column definition : 1st column : Phase
: 2nd column : Position

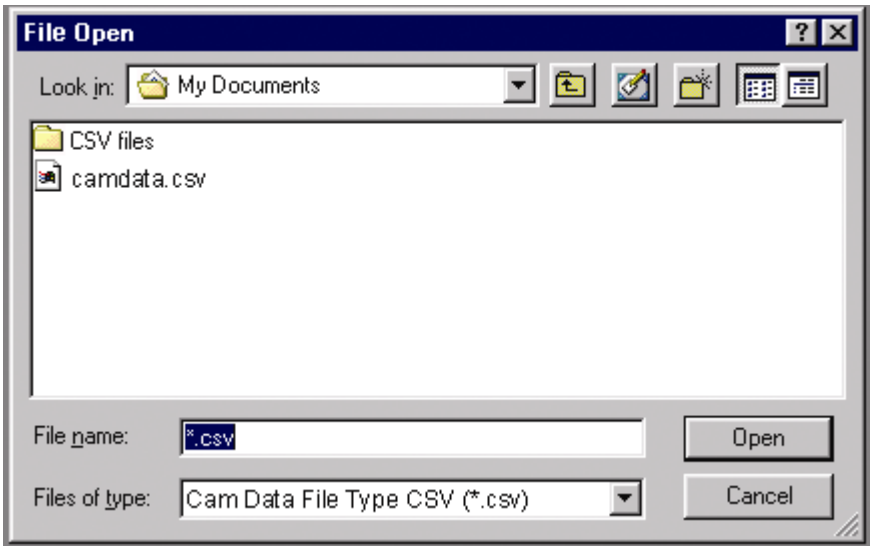
[Example]

0.0000000	0.0000000
1.0000000	0.0123457
2.0000000	0.0493827
3.0000000	0.1111111
4.0000000	0.1975309
5.0000000	0.3086420
6.0000000	0.4444444
7.0000000	0.6049383
8.0000000	0.7901235
9.0000000	1.0000000

→ Position
→ Phase

■Import Operation

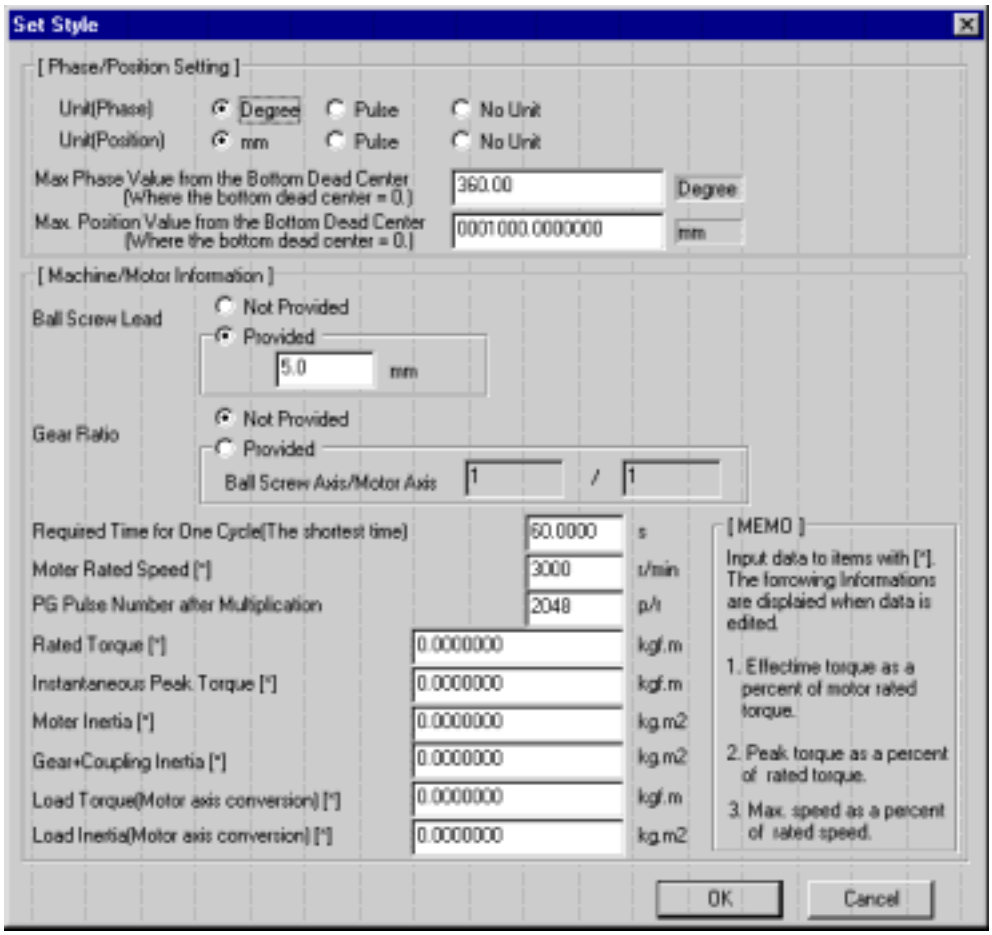
① Select “File (F) → Import (I)” from the Menu Bar.



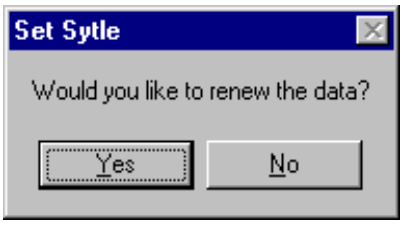
Note:
Execute “the position data storage” when creating the import data by using the CSV type file storage of electric cam data tool.

② The following dialog is displayed for the illegible types. Reestablish the data referring to the previous example.

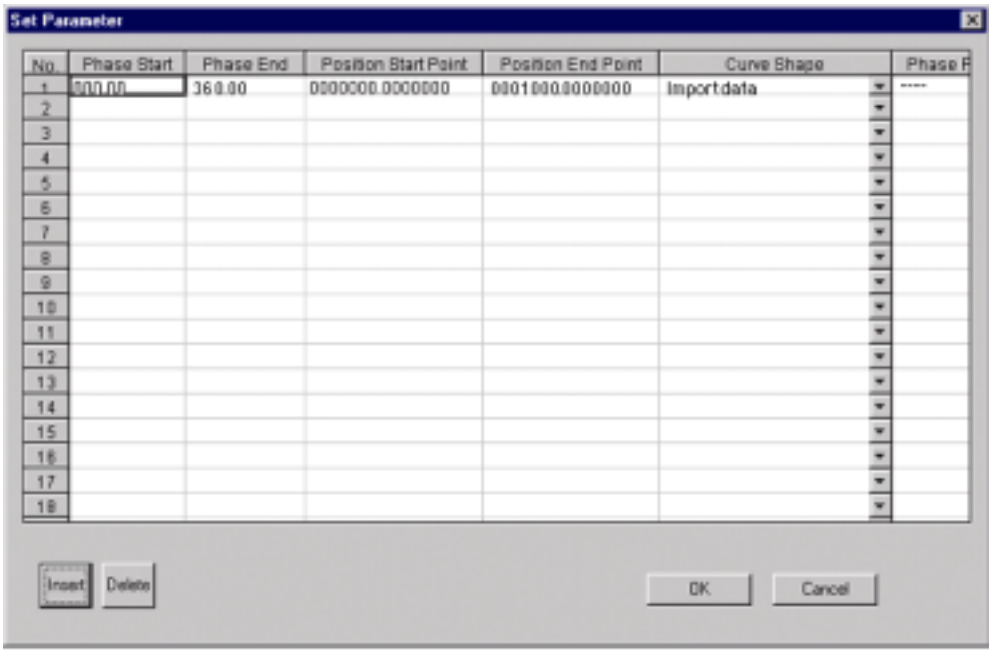
③ Next, the set style window appears. Refer to 3.1.2 for inputting the data.



④ Click OK and the message box to confirm data updating appears.



⑤ Select Yes to display the Set Parameter window. Refer to 3.1.1 for inputting the data.



⑥ Click OK and the data graph window appears.

Note:
The import data will always be 1 block data in a curved shape. (Can not be changed.)
This is the same as when using CSV type storage data with the electric cam data tool.

2.3.2 Import data edit

Import data can be edited in the same way as the normal cam curved data. Refer to 3. Edit Data.

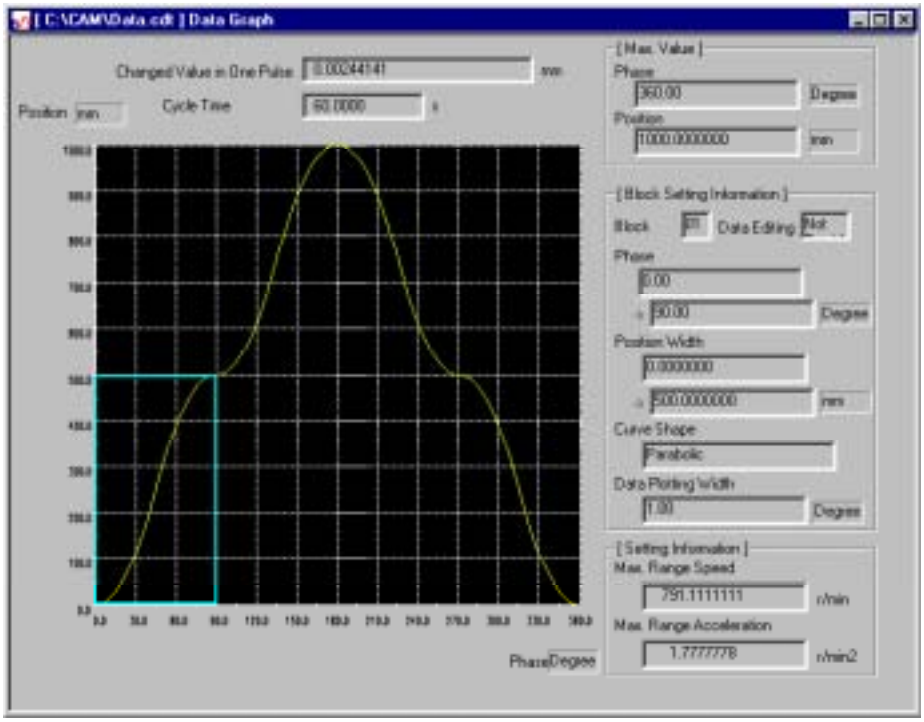
2.3.3 Import data transfer

CSV type data can not be selected as cam curved transfer file due to the luck of data. When transferring to the controller, restore the import data as the cam data file. Refer to 3.7 Storage.

3 EDIT DATA

3.1 Data Graph

A data graph shows the cam data in a curved line.



When preparing a new data graph, the Set Style window and the Set Parameter window are called up in this order. A data graph appears by setting the parameter.

To change the data of existing files, open the Data Graph window and select “Graph(G)” in the menu bar.

Data Graph Menu

Table 3.1 lists the menu other than the common menu displayed in Data Graph.

Table 3.1 Data Graph Menu

Menu		Function	Reference Section No.
Display			
	Data Graph	Displays the cam data in a curved line.	3.1
	Data List	Displays the numeric data of the cam curve.	3.2
	Control Graphs	Displays the speed, acceleration, and jerk of the prepared cam graph as graphics.	3.3
	Characteristic Curve	Displays the position, speed, acceleration, and jerk of the designated curve shape as graphics.	3.4
	Compare Graphs	Displays the currently edited cam data, other cam data, and data from another source on the same graph for comparison.	3.5
	Option	Sets whether or not to display the grid line.	3.6
Graph			
	Set Parameter	Defines the cam curve data for each block.	3.1.1
	Set Style	Sets the data environment.	3.1.2
	Edit Graph Data	Edits the data while checking the cam curve on the graph.	3.1.2
	Shift Phase Direction	Changes the phase value by setting the shift point of the cam curve data.	3.1.4

3.1.1 Parameter setting

Parameter setting defines the cam curve data for each block in the Set Parameter window (Fig. 3.1).

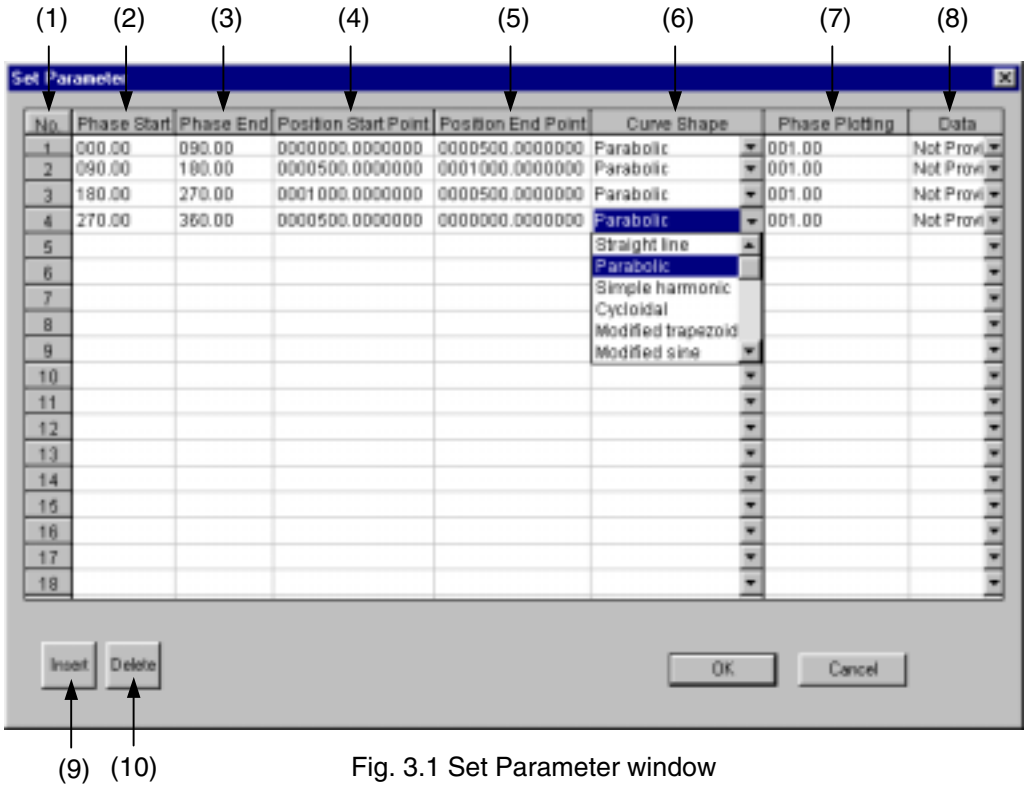


Fig. 3.1 Set Parameter window

(1) No.

Block numbers are displayed. Up to 20 blocks are defined.

(2) Phase Start

The phase start value of each block is indicated.
The phase start value of the No. 1 block is 0.
The starting point is automatically set to the phase end point of the previous block.

(3) Phase End

Set the phase end value of each block.

(4) Position Start Point

The position start value of each block is indicated.
The position start value of the No. 1 block is 0.
The starting point is automatically set to the position end point of the previous block.

(5) Position End Point

Set the position end value of each block.

(6) Curve Shape

Select the cam curve shape.
The following 21 shapes are available:

1. Straight line	2. Parabolic	3. Simple harmonic
4. Cycloidal	5. Modified trapezoid	6. Modified sine
7. Modified constant velocity	8. Asymmetrical cycloidal	9. Asymmetrical modified trapezoid
10. Trapecloid	11. One-dwell cycloidal m=1	12. One-dwell cycloidal m=2/3
13. One-dwell trapezoid m=1	14. One-dwell trapezoid	15. One-dwell trapezoid m=2/3
16. One-dwell modified sine	17. One-dwell trapecloid	18. No-dwell simple harmonic
19. No-dwell modified trapezoid	20. No-dwell modified constant velocity	21. NC2 curve

Display the combo box and click the desired shape.

(7) Phase Plotting

Set the phase division width of the specified block.

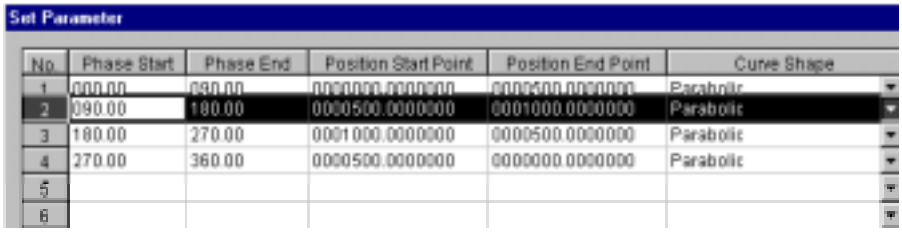
(8) Data (Provided/Not Provided)

For a new parameter, "----" is displayed.
"Provided" or "Not Provided" is displayed depending on the necessity of the graph data editing. Refer to Chapter 3 EDIT DATA for details.
Click the OK button to display the graph based on the set data.

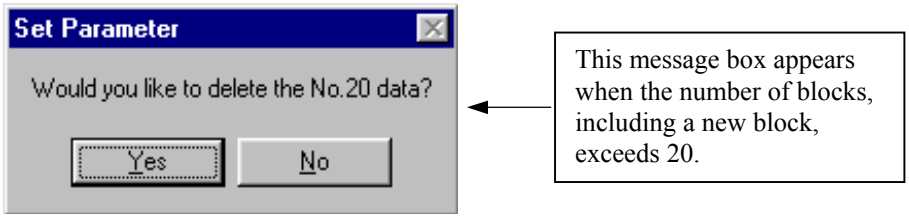
(9) Insert ... Inserting a data block

A new data block can be inserted to the existing data blocks.

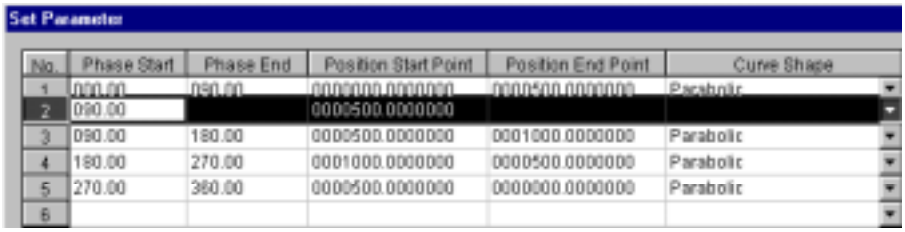
① Move the cursor to a line before which a new line is inserted.



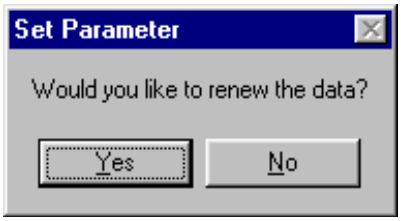
② Click the Insert button.
The following message box may appear.



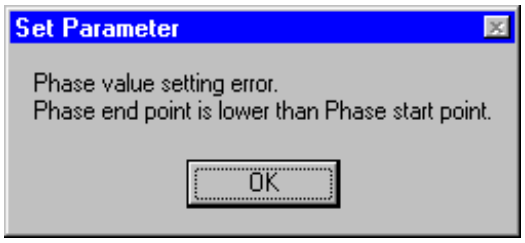
③ A new data block is inserted above the block selected in step ①.



④ Input the phase end, position end point, curve shape and phase plotting. The setting for the "Data" column changes to the initial setting, "----" in (8). Click the OK button and the following message box appears.



⑤ Click the Yes button and a new data graph appears. If the data is not input or input incorrectly, the following message box appears.

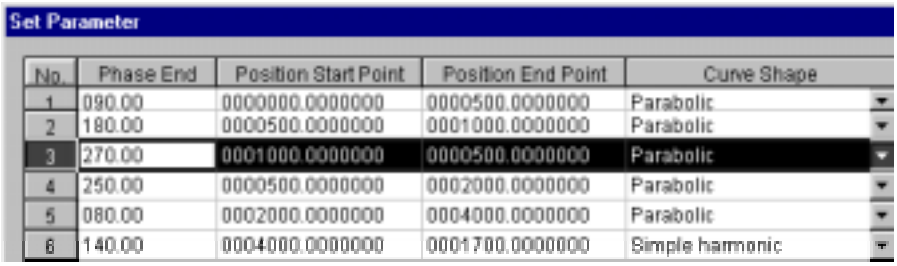


⑥ Click the OK button and input the data correctly.
The phase and position are automatically checked and matched.

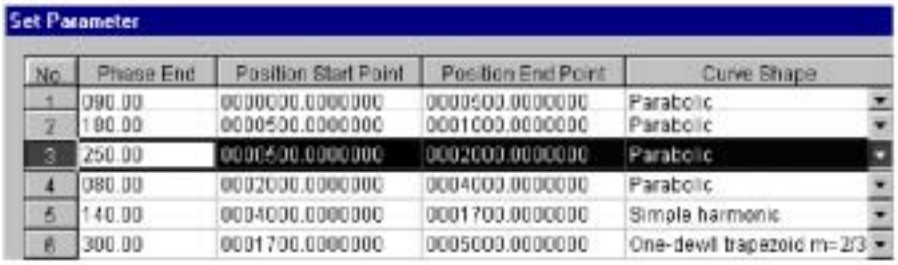
(10) Delete ... Deleting the data block

The designated data block can be deleted from the existing data blocks.

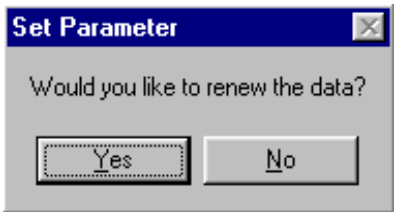
① Move the cursor to the line to be deleted.



② Click the Delete button.



③ The data block selected in step ① is deleted.
Click the OK button. The following message box appears.



④ Click Yes and a new data graph appears.
The phase and position are automatically checked and matched.

3.1.2 Style setting

The existing data can be changed based on the values which were input when preparing a new data block.
In the Set Style window (Fig. 3.2), set the data environment necessary for preparing the cam curve data.

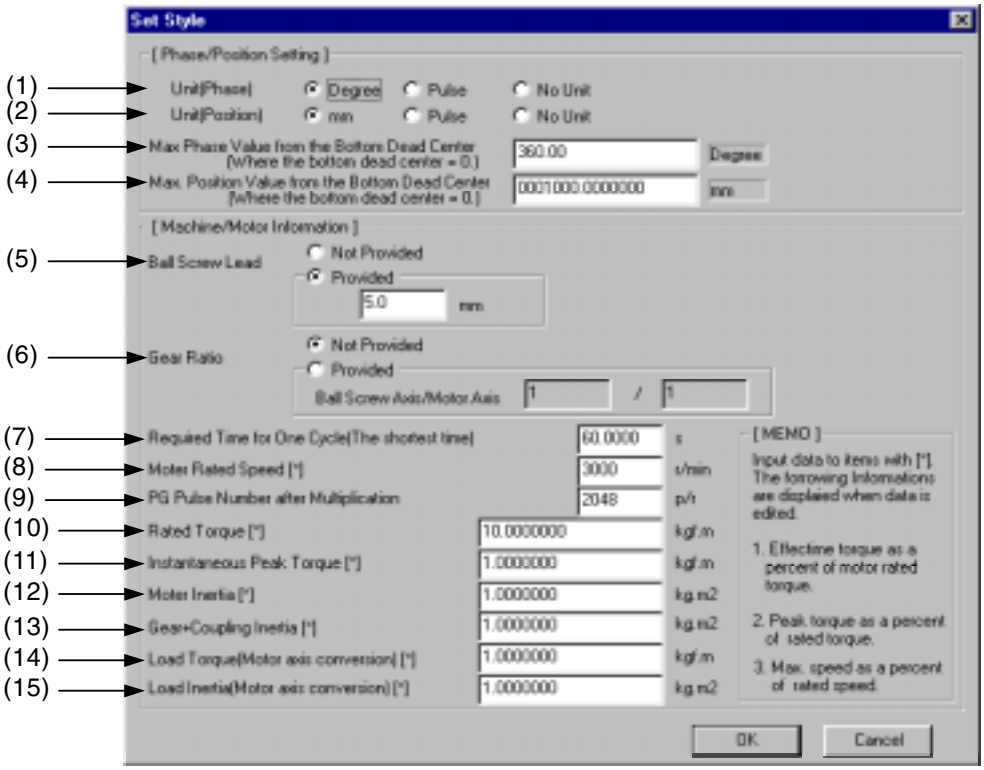


Fig. 3.2 Set Style window

(1) [Phase/Position Setting]

(1) Unit (Phase)

Select <Degree>, <Pulse>, or <No Unit>.
Initial setting: <Degree>

(2) Unit (Position)

Select <mm>, <Pulse>, or <No Unit>.
Initial setting: <mm>

(3) Max. Phase Value from the Bottom Dead Center (Available input values depend on the unit.)

Unit	Set value
<Degree>	1.00 to 360.00
<Pulse>	1 to 10000000
<No unit>	1.0000 to 1000000.0000

Input the maximum phase value of the cam curve data.
Initial setting: <Degree>, 360.0

(4) Max. Position Value from the Bottom Dead Center (Available input values depend on the unit.)

Unit	Set value
<mm>	1.0000000 to 1000000.0000000
<Pulse>	1 to 10000000
<No unit>	1.0000000 to 1000000.0000000

Input the maximum position value of the cam curve data.
Initial setting: <mm>, 1000.0000000

(2) [Machine/Motor Information]

(5) Ball Screw Lead

Select Provided or Not Provided.
When Provided is selected:
Set range: 0.0 to 99999.9
When Not Provided is selected:
The lead is automatically set to 0 (inputting is not necessary).
Initial setting: Provided, 5.0

(6) Gear Ratio

Select Provided or Not Provided.
The gear ratio is expressed as ball screw axis/motor axis.
Without the gear ratio, input 1/1.
Ball Screw Axis: 1 to 9999
Motor Axis: 1 to 9999
Initial setting: Not Provided, 1/1

(7) Required Time for One Cycle (Shortest time)

Set a time required for one rotation of the cam.
Set range: 0.0001 to 9999.9999
Initial setting: 60.0000

(8) Motor Rated Speed

Set range: 1 to 99999
Initial setting: 3000

(9) PG Pulse Number after Multiplication

Set range: 1 to 99999
Initial setting: 2048

(10) Rated Torque (T_R)

Output torque of the motor which operates at the rated output and rated speed.
Set range: 0.0000000 to 99999.9999999
Initial setting: 0.0000000

(11) Instantaneous Peak Torque (T_{MP})

Maximum torque which is generated when the instantaneous peak torque is flown through the motor.
Set range: 0.0000000 to 99999.9999999
Initial setting: 0.0000000

(12) Motor Inertia

Set range: 0.0000000 to 99999.9999999
Initial setting: 0.0000000

(13) Gear + Coupling Inertia

Set range: 0.0000000 to 99999.9999999
Initial setting: 0.0000000

(14) Load Torque (Motor axis conversion)

Set range: 0.0000000 to 99999.9999999
Initial setting: 0.0000000

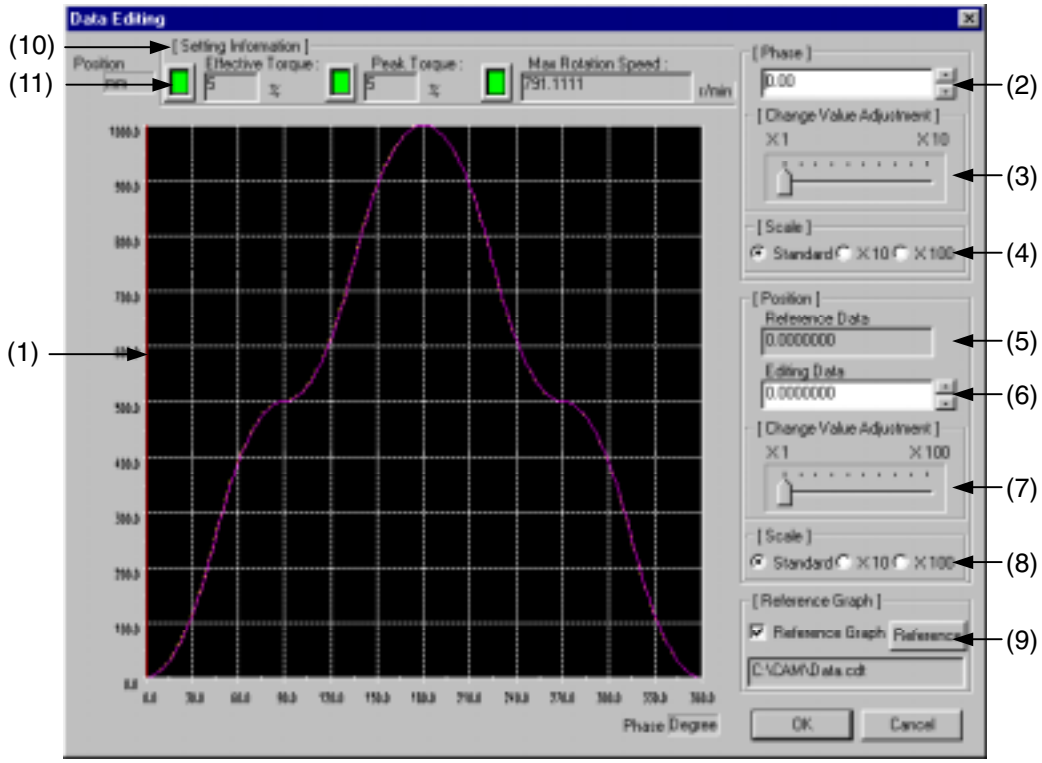
(15) Load Inertia (Motor axis conversion)

Set range: 0.0000000 to 99999.9999999
Initial setting: 0.0000000

Input the machine and motor information and click the OK button. The Set Parameter window appears.

3.1.3 Graph data editing

The data can be edited while checking the cam data curve on the graph.



Change the position value of the cam data curve to the value desired. The cam data curve is drown in the shape designated in the set parameter window.

(1) Edit graph

The graph can be edited with the mouse.
For the editing method, refer to 1. Editing the graph with the mouse.

(2) Phase

Set the phase value. Edit the position value corresponding to the phase value set here.

(3) Phase: Change Value Adjustment

Set the increase/decrease value when the phase value is set with the spin button.

(4) Phase: Scale

Select the scale for the Phase.
To edit the graph accurately, expand the graph with the current cursor position as the staring point.

(5) Position: Reference Data

The position value corresponding to the phase value set in (2) is displayed.

(6) Position: Editing Data

Set the position value corresponding to the phase value set in (2).

(7) Position: Change Value Adjustment

Set the increase/decrease value when the position value is set with the spin button.

(8) Position: Scale

Select the scale for the Position.
To edit the graph accurately, expand the graph with the current cursor position as the starting point.

(9) Reference Graph

Select the reference graph to be displayed together with the edit graph.
For the setting method, refer to 4. Setting the reference graph.

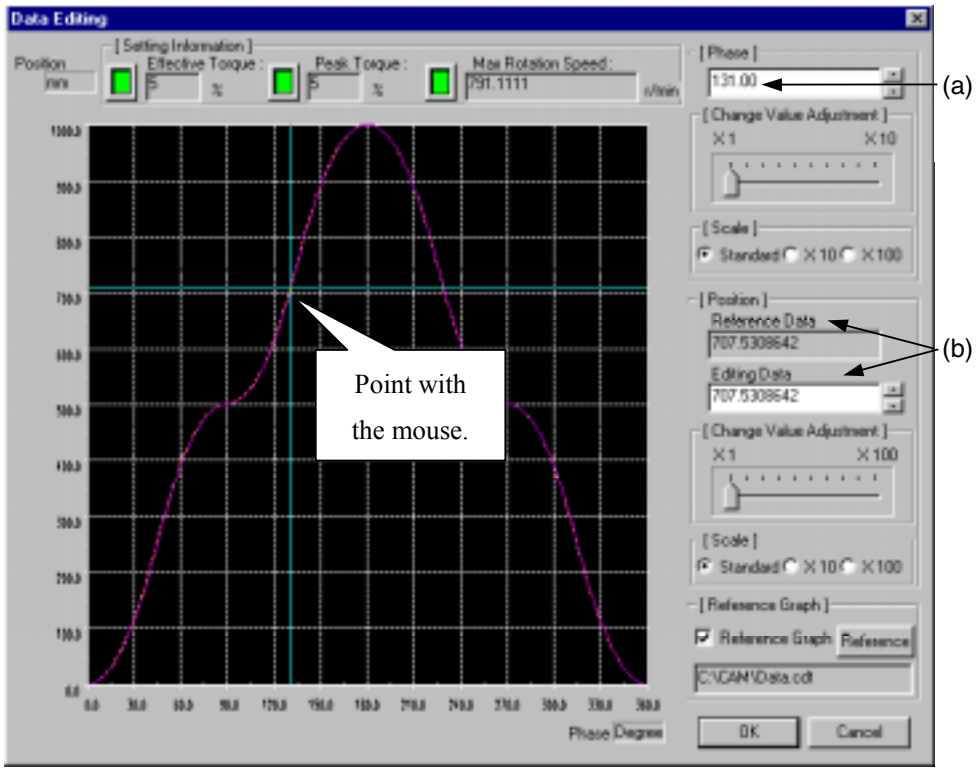
(10) Setting Information

Based on the edit data, the effective torque, peak torque, and max. rotation speed are displayed.
These values are automatically calculated and displayed if the items with an [*] for [Machine/Motor Information] are set on the Set Style window.
The effective torque and peak torque are displayed as a ratio (%) of the rated torque.

(11) Warning display

The boxes are displayed in green when the set values for the effective torque (no more than 100%), peak torque (no more than 300%), and max. rotation speed (under the rated rotation speed) are within the tolerances, and displayed in red when they are out of the tolerances.

1 Editing the graph with the mouse



The phase value at which the cursor is pointing is displayed at (a).

The position value at which the cursor is pointing is displayed at (b).

Change the position values displayed at (b) by moving the cursor up and down.

2 Editing the graph with the keys

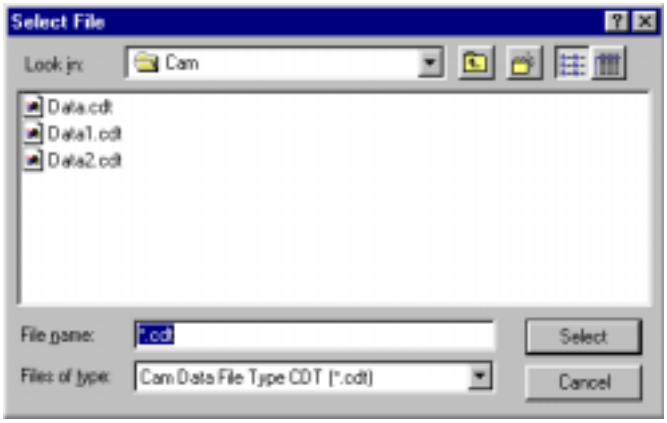
Input new values for the edit boxes (b).

3 Expanding the edit graph

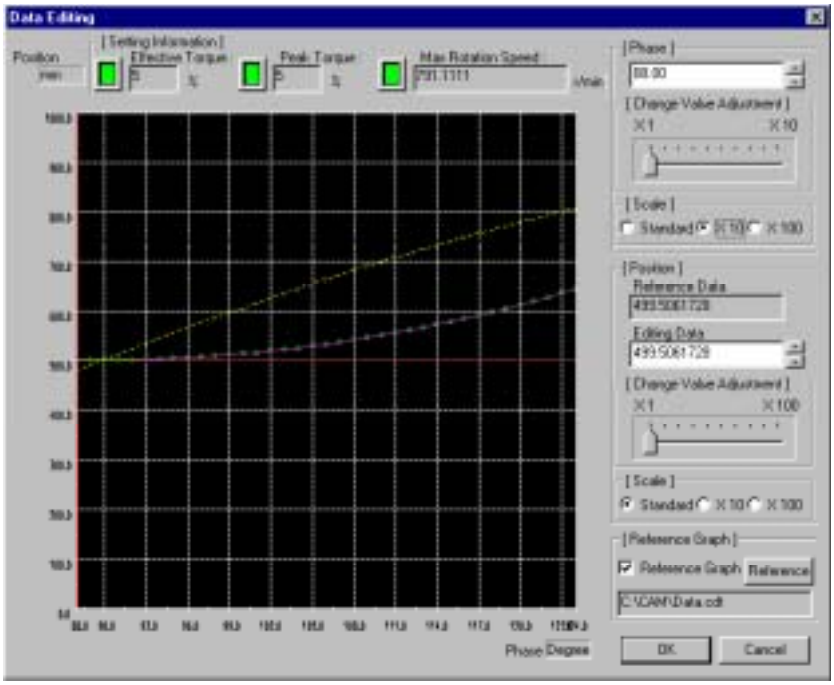
Select ×10 or ×100 in the scale settings. The section of the graph after the current cursor position (phase value) enlarges according to the designated scale.

4 Setting the reference graph

① Click Reference and the following Select File window appears.

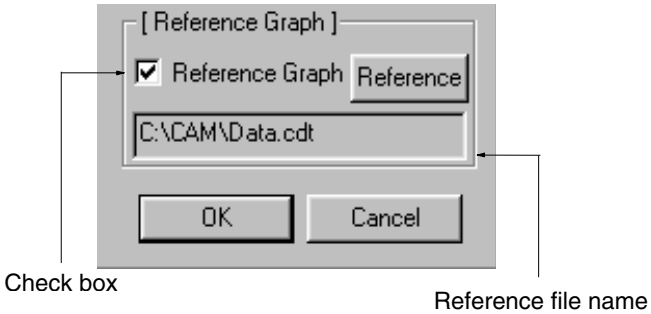


② Click the file to be compared with and click the Select button.



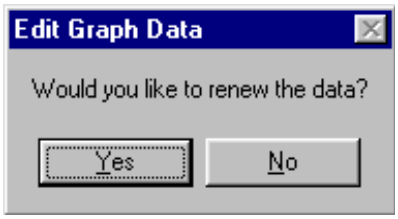
Example. Graph displayed in units of 10

The dotted line shows the reference graph.



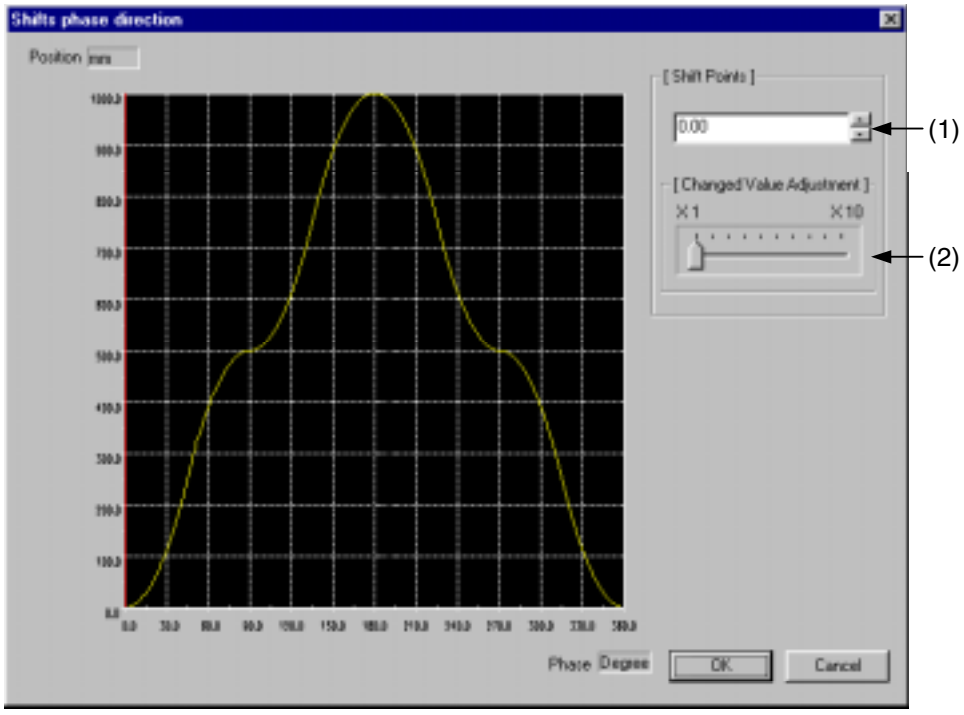
By removing the check from the Reference Graph box, the reference graph disappears.

③ When editing is completed, click the OK button.
The following message box appears.



④ Click Yes and the graph based on the edited data reappears.
As a condition for this display, Provided must be selected for Data Editing in the Set Parameter window.
Returning to the initial data is also possible in the Set Parameter window.
To return to the initial data, click the data edit button, select [Not Provided] or [----], and click the OK button.

3.1.4 Phase direction shift

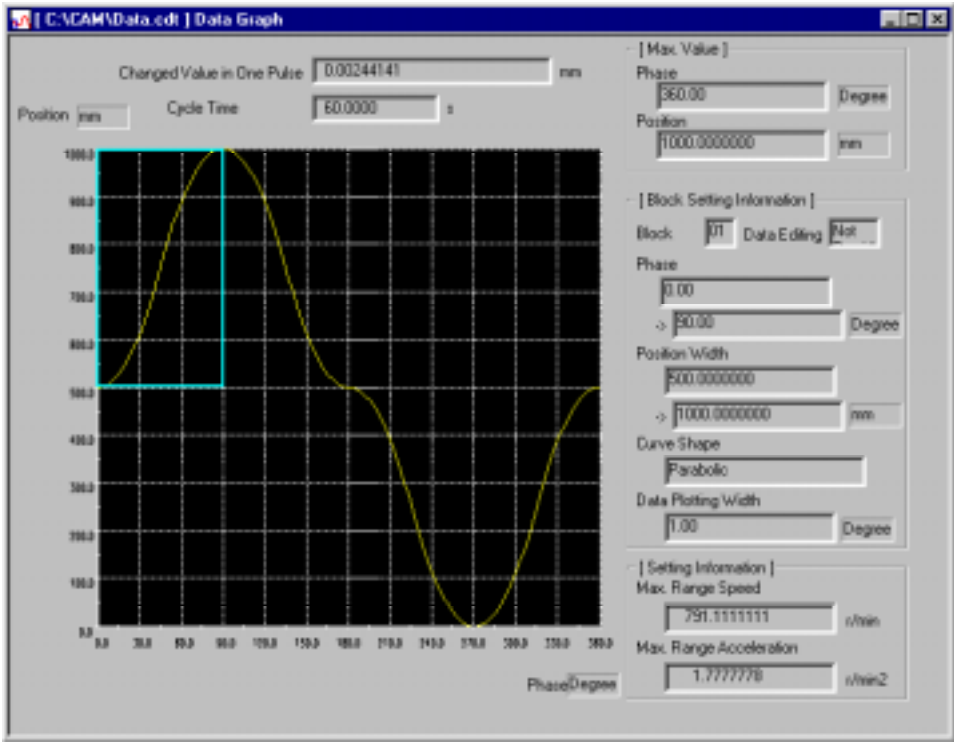


(1) Changing the phase starting point

The data is rearranged with the phase value for which the shift point is set as a starting point.
The shift point is set at stages of the data plotting width.
By inputting a value for Shift Points, or by clicking a point on the graph with the mouse, the shift point value is displayed.

(2) Adjusting the changed value

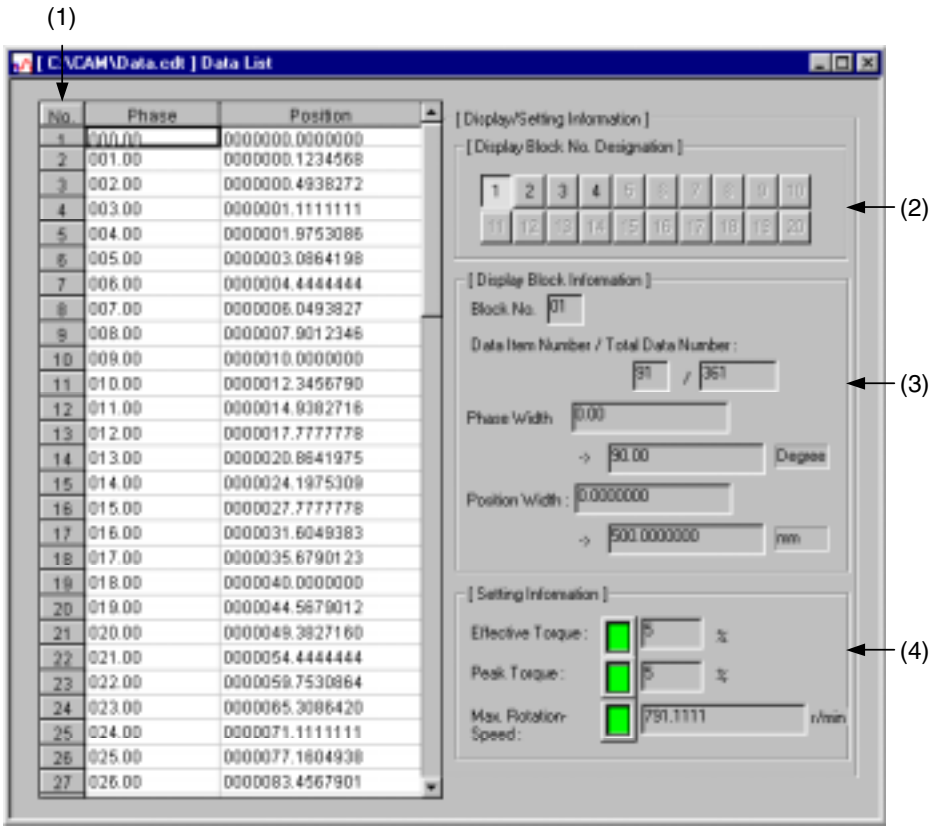
Click the OK button.



3.2 Data List

3.2.1 Data list details

The numeric data of the cam curve is displayed.



(1) List data

The numeric data of the cam curve of the specified block is displayed in each phase plotting width.

(2) Display Block No. Designation

Select the block No. whose numeric data is to be displayed.
For example, click [1] button and the numeric data of block 1 appears.

(3) Display Block Information

The data quantity and ranges of the phase and position values of the designated block are displayed.
When editing an insertion and/or deletion is performed, the data quantity changes.

(4) Setting Information

The effective torque, peak torque, and max. rotation speed are automatically calculated if the items with an [*] for [Machine/Motor Information] are set on the Set Style window.
These values are calculated based on the edited data and then displayed.
The effective torque and peak torque are displayed with the rated torque as 100%.

Menu exclusive to data

Table 3.2 lists the menu other than the common menu in the data list.

Menu		Function	Reference Section No.
Edit			
	Undo	Cancels the previous operation.	3.2.2 (3)
	Insert	Inserts a row of data.	3.2.2 (1)
	Delete	Deletes a data line.	3.2.2 (2)

3.2.2 Editing the data list

(1) Inserting row data

① Move the cursor to a block above which a new line is to be inserted.

② Point to "Edit" and select "Insert".
The following dialog box appears.

③ Enter both values for Phase Value and Position Value. Click the OK button, and the entered data is inserted above the cell where the cursor is located.

④ The data becomes effective when data entry is confirmed and then is reflected in the cam curve.

(2) Deleting the data line.

① Move the cursor to the block to be deleted.

② Point to "Edit" in the menu bar and select "Delete". The block where the cursor is located is then deleted.

(3) "Undo" function

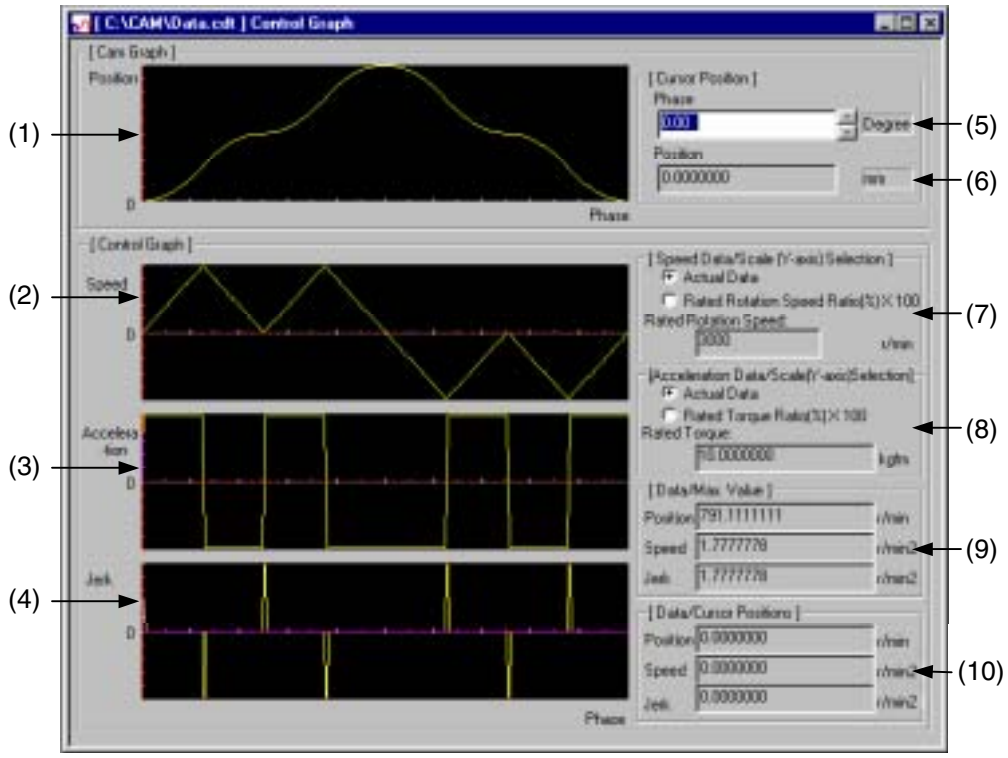
Point to "Edit" in the menu bar and select "Undo". This function in the Data List window cancels the previous operation or input.

(4) Resetting to the initial value

To reset all the edited data to the initial setting, click the data edit combo box button, select [Not Provided] or [----], and click the OK button. Then the data changes to the initial data.

3.3 Control Graph

The speed, acceleration, and jerk of the prepared cam graph are displayed as graphics.



(1) Cam Graph: Position

The cam curve is displayed.

(2) Control Graph: Speed

The speed data calculated based on the cam curve data is displayed.

(3) Control Graph: Acceleration

The acceleration data calculated based on the cam curve data is displayed.

(4) Control Graph: Jerk

The jerk data calculated based on the cam curve data is displayed.

(5) Cursor Position: Phase

Input the phase value or set with the spin buttons.
By clicking a point on the cam graph, the phase and position values at which the mouse is pointing are displayed.
The X axis of the cam graph (1) shows the phase value and the Y axis shows the position value.

(6) Cursor Position: Position

The position value corresponding to the phase value set in the above step (5) is displayed.

(7) Speed Data/Scale (Y-axis) Selection

Select the graph display type of the speed data graph (2).
By selecting Actual Data or Rated Rotation Speed Ratio (%)×100, the speed control graph changes.

(8) Acceleration Data/Scale (Y-axis) Selection

Select the graph display type of the acceleration data graph (3).
By selecting Actual Data or Rated Torque Ratio (%)×100, the acceleration control graph changes.
For this selection, the items with an [＊] on the Set Style window, such as Rated Torque [＊] must be preset.

(9) Data/Max. Value

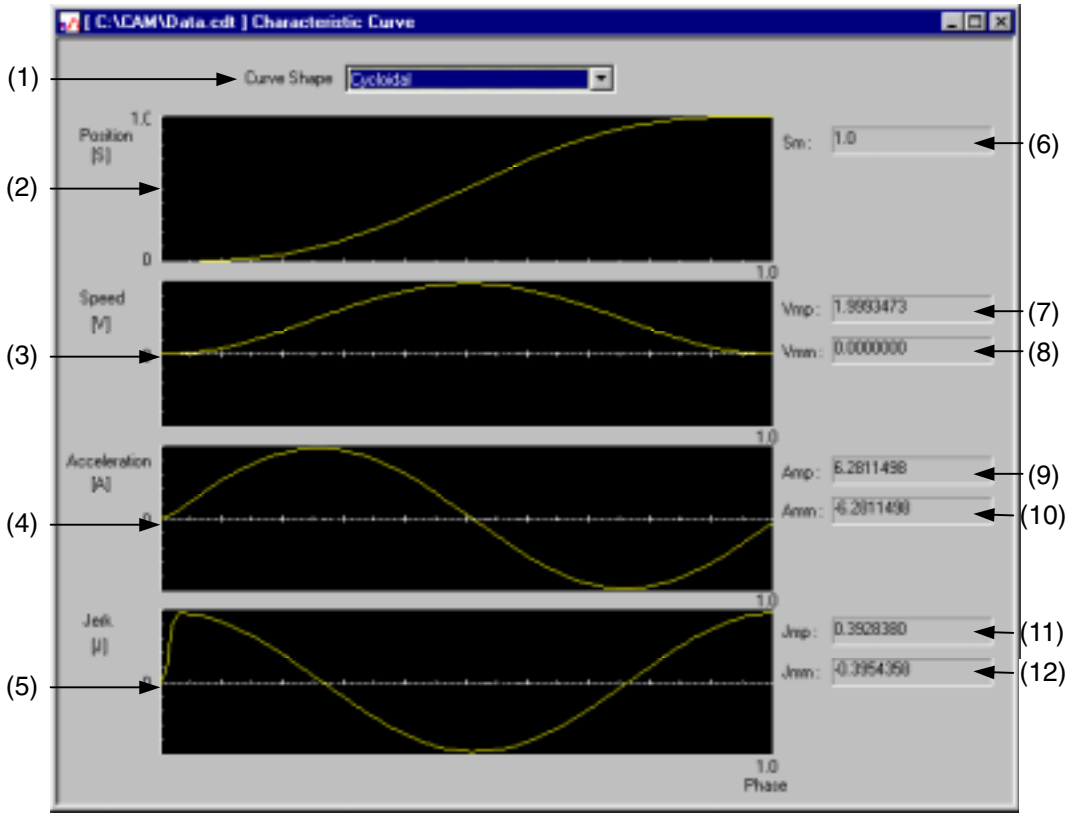
The maximum values of speed, acceleration and jerk are displayed.

(10) Data/Cursor Positions

The speed, acceleration and jerk of the phase and position values at which the mouse is pointing on the cam graph are displayed.

3.4 Characteristic Curve

The position, speed, acceleration, and jerk of the designated curve shape are displayed as graphics.



(1) Curve Shape

Display the curve shape combo box, scroll with the scroll bar, and click the curve shape desired. The graph is then displayed in the curve shape desired.

Available curve shapes

1. Straight line	2. Parabolic	3. Simple harmonic
4. Cycloidal	5. Modified trapezoid	6. Modified sine
7. Modified constant velocity	8. Asymmetrical cycloidal	9. Asymmetrical modified trapezoid
10. Trapecloid	11. One-dwell cycloidal m=1	12. One-dwell cycloidal m=2/3
13. One-dwell trapezoid m=1	14. One-dwell trapezoid	15. One-dwell trapezoid m=2/3
16. One-dwell modified sine	17. One-dwell trapecloid	18. No-dwell simple harmonic
19. No-dwell modified trapezoid	20. No-dwell modified constant velocity	21. NC2 curve

(2) Position

The position data of the cam curve is displayed in the selected curve shape.

(3) Speed

The speed data of the cam curve is displayed in the selected curve shape.

(4) Acceleration

The acceleration data of the cam curve is displayed in the selected curve shape.

(5) Jerk

The jerk data of the cam curve is displayed in the selected curve shape.

(6) Sm:

The maximum position value is displayed.

(7) Vmp:
The maximum positive speed is displayed.

(8) Vmm:
The maximum negative speed is displayed.

(9) Amp:
The maximum positive acceleration is displayed.

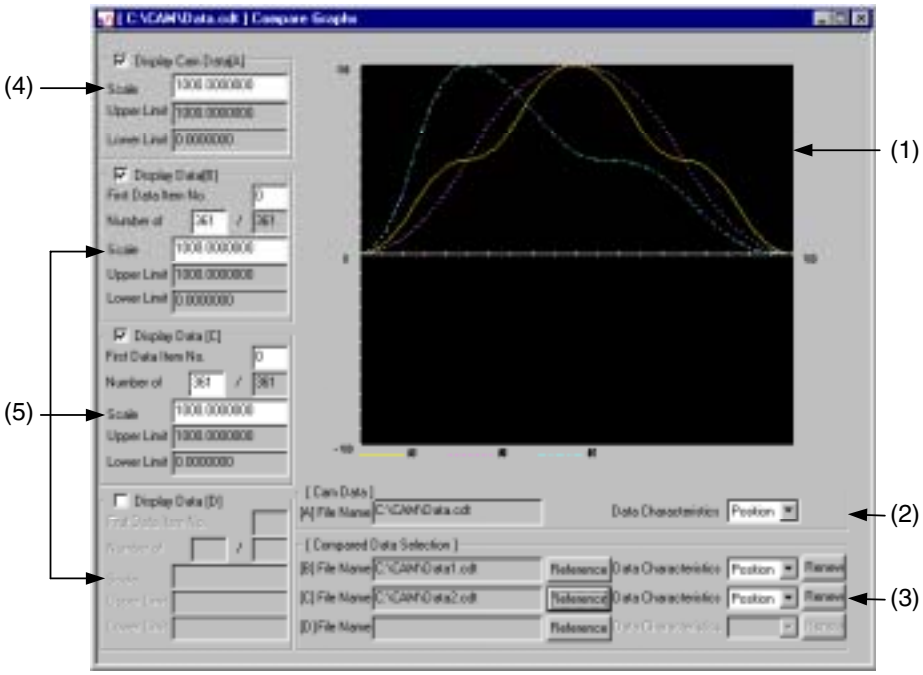
(10) Amm:
The maximum negative acceleration is displayed .

(11) Jmp:
The maximum positive jerk value is displayed .

(12) Jmm:
The maximum negative jerk value is displayed.

3.5 Graph Comparison

The currently edited cam data, other cam data saved in the file, and data which was prepared by means other than the cam tool and saved in the CSV format, are displayed on the same graph for comparison.



(1) Graph display

The currently edited cam data and data to be compared are displayed as graphics.
The currently edited cam data is displayed on a yellow line.

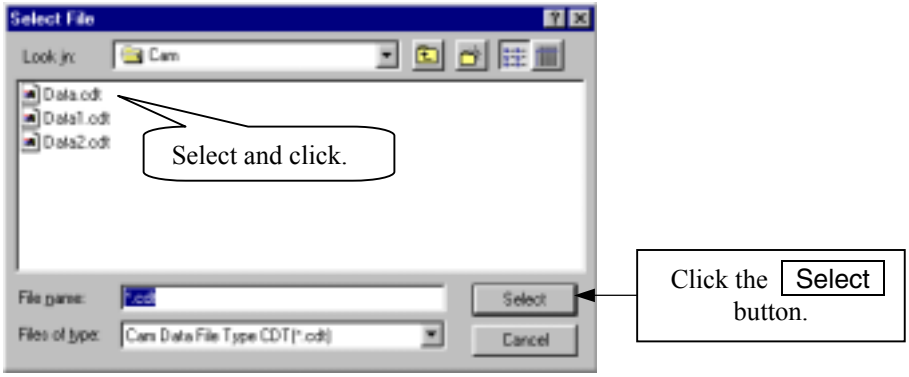
(2) Cam Data

The file name of the currently edited cam data is displayed. Select the data to be displayed.
Data Characteristics: Position, Speed, Acceleration

(3) Compared Data Selection

Select the data to be compared with the currently edited data.
Up to three files can be selected.
File Name..... Displays the file name of the data to be compared.
Reference ..... Select the data file to be compared.
Data Characteristics ... Position, Speed, Acceleration, External
When the data to be compared is the cam data, select from Position, Speed, and Acceleration.
When the data to be compared is prepared by means other than the cam tool, select External.

∗ Click the Reference button and the following dialog box appears. Select a file for composition.



(4) Display Cam Data

Select the display type of the currently edited cam data graph.

Scale .....Set the scale of the graph (1) vertical axis to a value 100 or less.
The default values are the absolute upper and lower limit values of the cam data.

Upper Limit ..Displays the upper limit (maximum) value of the cam data.

Lower Limit..Displays the lower limit (minimum) value of the cam data.

(5) Display Data

Select the display type of the comparison data graph.

If the check is removed from the check box, the compared graph disappears.

Since the data to be compared has been stored, if the check is put in the check box, the graph is displayed again.

For First Data Item No., set the first No. of the data to be displayed as graphics.

Number of ....Set the quantity of data from the first data No.
At the right side of / (the slash), the total data quantity is displayed.

Scale .....Set the scale of the graph (1) vertical axis to a value 100 or less.
The default values are the absolute upper and lower limit values of the data to be compared.

Upper Limit ..Displays the upper limit (maximum) value of the data to be compared.

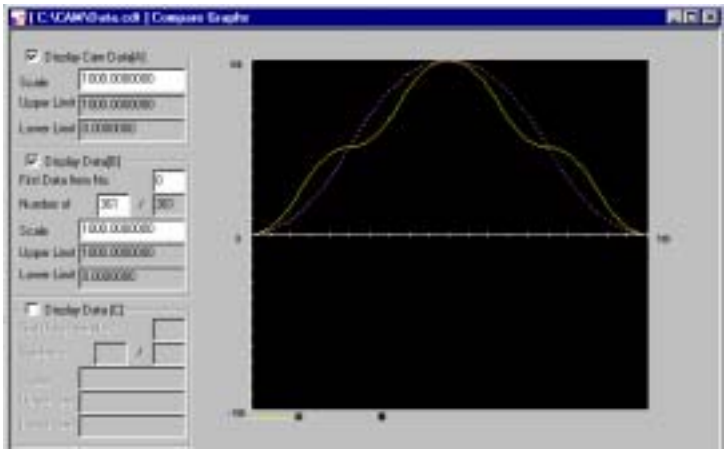
Lower Limit..Displays the lower limit (minimum) value of the data to be compared.

1. Conversion of the scale

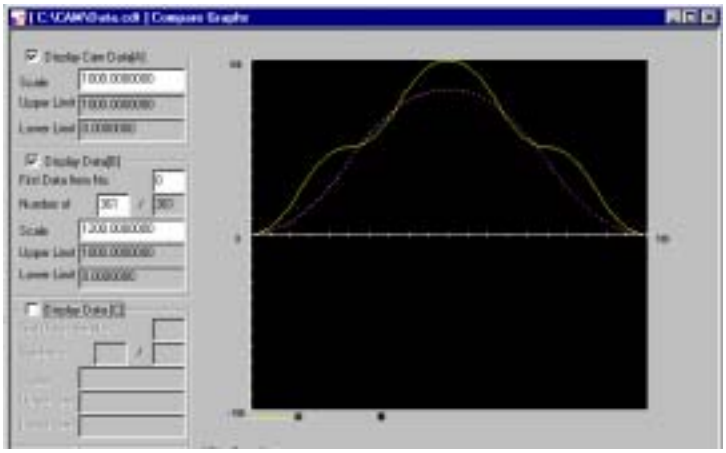
The graph scale is set with the maximum absolute value of the displayed data as 100. When comparing data whose upper and lower limit values are different, or when comparing data at a designated section, change the scale setting.

(a) Comparison of data with different upper and lower limit values

(Ex.)	Display Cam Data [A]	Data Characteristics: Position	Scale: 1000
		Upper Limit: 1000	Lower Limit: 0
	Display Data [B]	Data Characteristics: Position	Scale: 800.0000416
		Upper Limit: 800.0000416	Lower Limit: 0



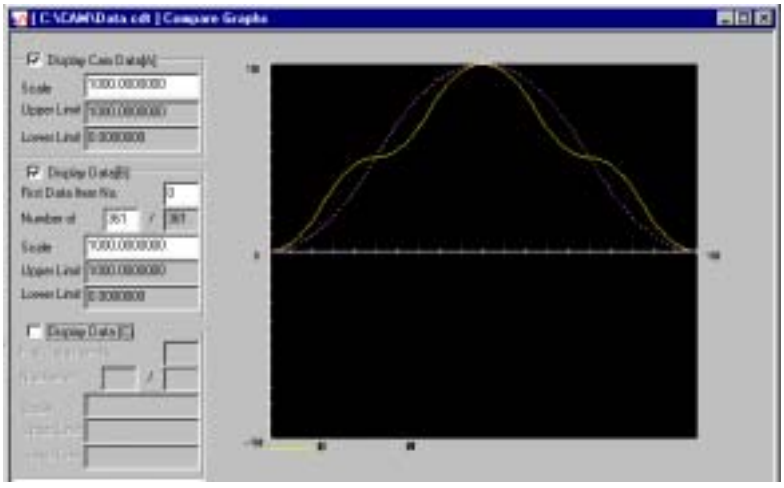
The scales for [A] and [B] are set to 1000.



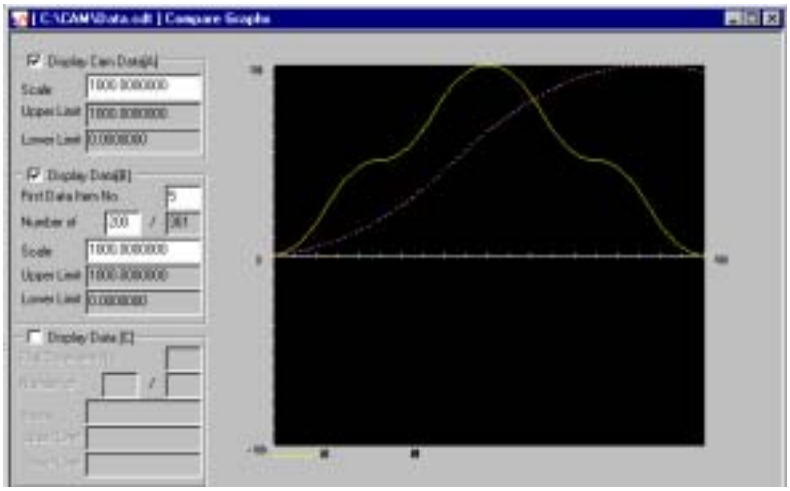
(b) Comparison of data at a designated section

(Ex.) Comparison of [A] and [B]

Display Cam Data [A]	Data Characteristics: Position	Scale: 1000
	Upper Limit: 1000	Lower Limit: 0
	First Data Item No.: 0	Number of: 361
Display Data [B]	Data Characteristics: Position	Scale: 1000
	Upper Limit: 1000	Lower Limit: 0
	First Data Item No.: 5	Number of: 200



5 is set for First Data Item No. of [B] and 200 is set for Number of.

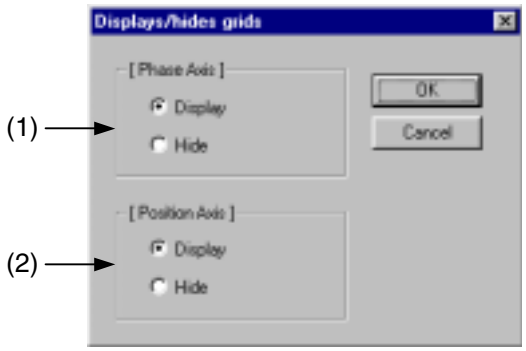


3.6 Setting Display/Hide of the Grid Line

Set whether or not to display the grid line of the graph at the data graph window.

< How to set >

When the data graph is displayed, point to “Display” in the menu bar and select “Option”. The following dialog box appears.



(1) Phase Axis

Set whether to display or to hide the phase axis grid line by clicking the radio button.

(2) Position Axis

Set whether to display or to hide the position axis grid line by clicking the radio button.

The initial setting is Display.

3.7 Saving

(1) Saving files

① Point to "File" in the menu bar and select "Save".
The Save File dialog box appears.

② For File name, input a new file name.

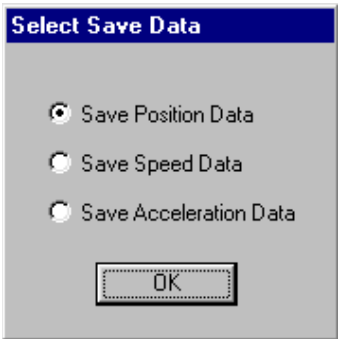
③ For Save as type, set the save file format.
Cam Data File Type CDT(＊.cdt) ..... In general, set this type.
Cam Data File Type CAM(＊.cam) .... Set this type when the cam data prepared with the Control Pack CP-92CAM (for NEC PC98 Series) is used. The model must be No. 87716-20000-S102 and higher.
CSV(＊.CSV)..... Set this type when saving the cam data in the CSV format.

④ Click the Save button.

(2) Saving CSV files

To use the data which was prepared with the electronic cam tool on Excel, save the data in the CSV format.
The CSV file format is a text file where the field is divided with a comma and the record is divided with a new line entering code.

① Save each data which was prepared with the electronic cam tool.
The Select Save Data dialog box appears.



② Select the data to be saved.
Save Position Data Saves the position data prepared with the cam tool in the file.
Save Speed Data Saves the speed data prepared with the cam tool in the file.
Save Acceleration Data Saves the acceleration data prepared with the cam tool in the file.

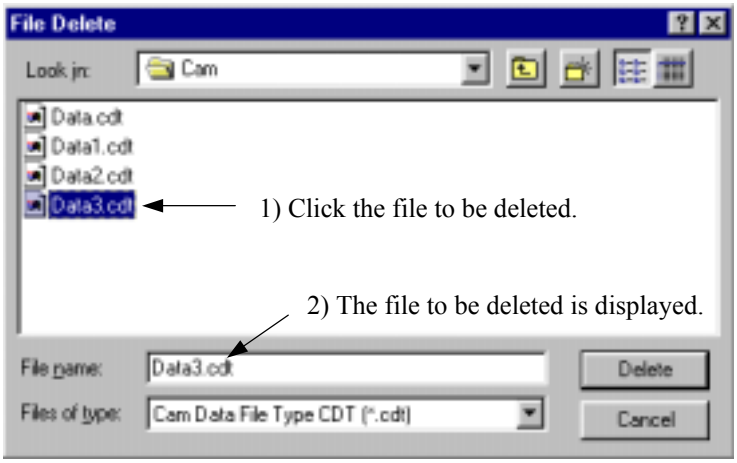
③ Click the OK button.

3.8 Deleting Files

The data file is deleted.

The cam data file (＊.cam) is deleted together with the files which have the same name as the cam data file and have extensions ＊.REG, ＊.SPD, and ＊.ACC.

① Point to from "File" in the menu bar and select "Delete". The following dialog box appears.



Check the file name to be deleted and click the Delete button. The following message box appears.

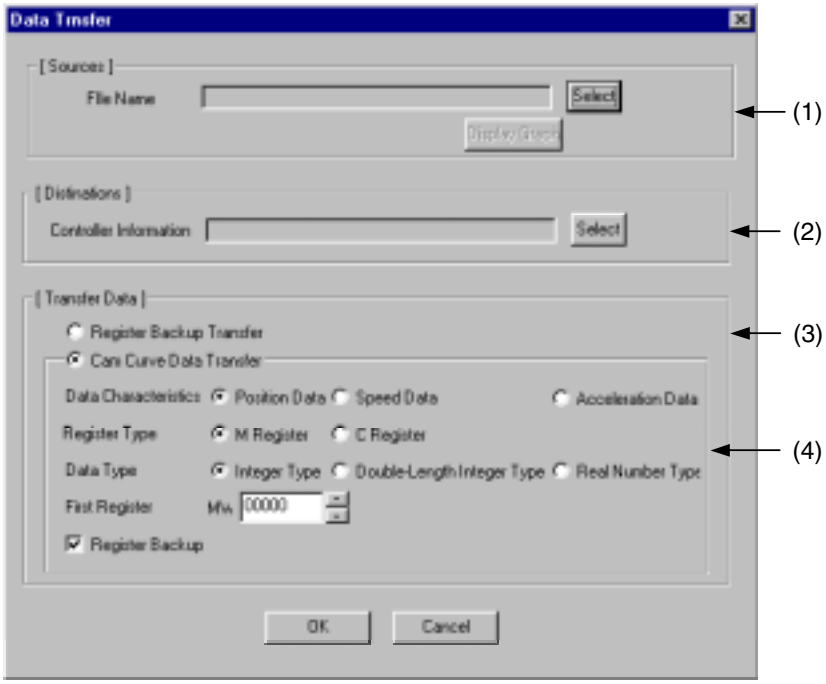
Yes button ....The file is deleted.

No button .....The message box disappears and the previous dialog box appears.

4. DATA TRANSFER

4.1 Data Transfer Window

The data in the cam data file is transferred to the M register or C register.
The transfer data is prepared according to each setting and then transferred.
Refer to 4.3 “Data Conversion for Transfer” for details.



(1) Sources

Select the cam data file from which the data is to be transferred.
For the selection method, refer to 4.2.1 “How to set [Sources]”.

(2) Destinations

Select the controller of the destination.
For the selection method, refer to 4.2.2 “How to set [Destinations]”.

(3) Transfer Data

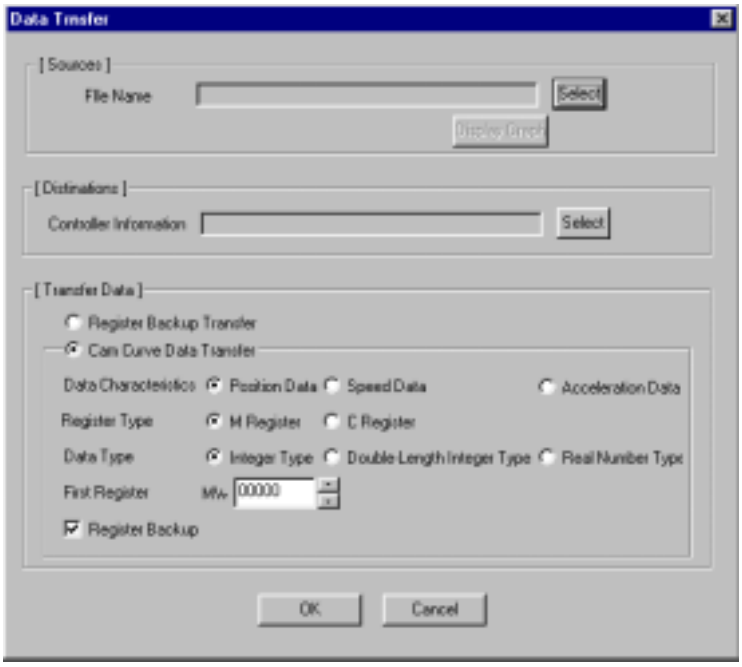
Select the data to be transferred.
Register Backup Transfer..... Transfers the register backup file data before data transfer.
Cam Curve Data Transfer ..... Transfers the data in the cam data file.

(4) Cam Curve Data Transfer

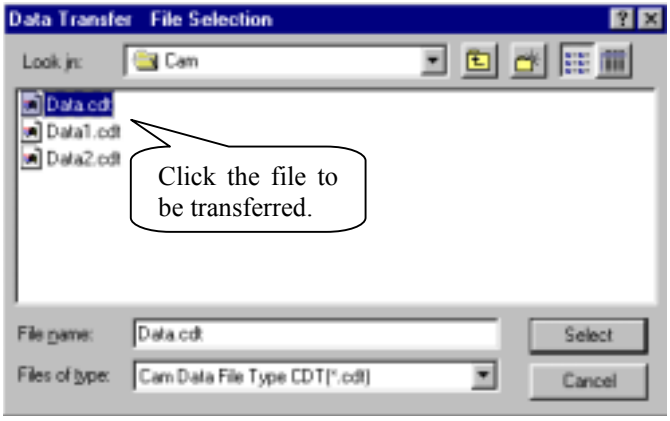
Set the data necessary for the cam curve data transfer.
Each setting becomes effective (refer to 4.4 “Register Contents after Data Transfer”).
Data Characteristics..... Select the type of the data to be transferred.
Register Type ..... Select the type of the transfer destination register.
Data Type ..... Select the data type of the transfer destination register.
First Register ..... Set the first address of the transfer destination register.
Register Backup ..... Set whether (or not) to prepare the backup file of the transfer destination register during transfer.

4.2 How to Set Data Transfer

4.2.1 How to set [Sources]



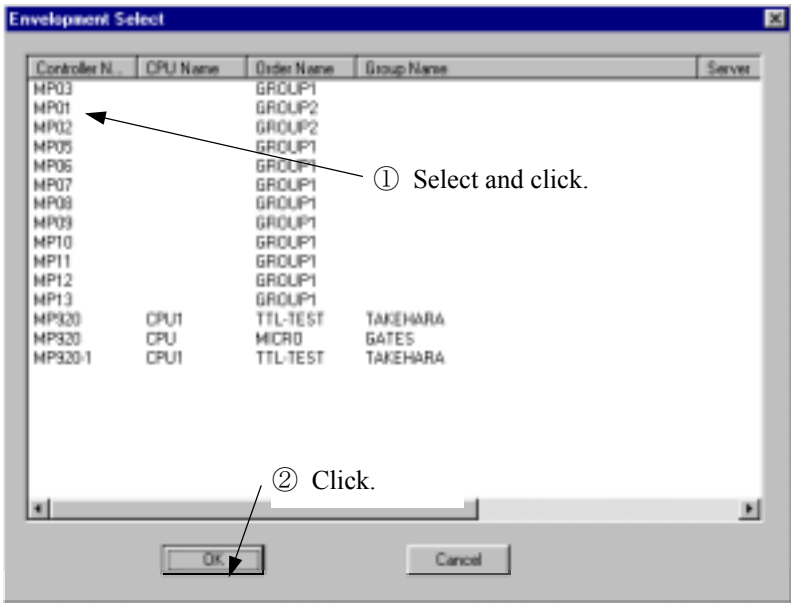
① Setting the source
Click the Select button, and the Data Transfer File Selection dialog box appears.



② Select the file to be transferred.
The selected file name is displayed in the [Sources] File Name box.
Next, the Display Graph button is displayed.
Click the Display Graph button and the graph of the data to be transferred appears. Check that the displayed graph is the one to be transferred.

4.2.2 How to set [Destinations]

Click the Select button and the following window appears.

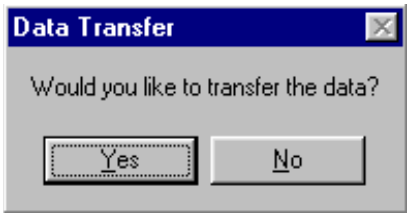


① The selected file name is displayed in the [Destinations] Controller Information box.
② Set the data to be transferred and click the OK button.

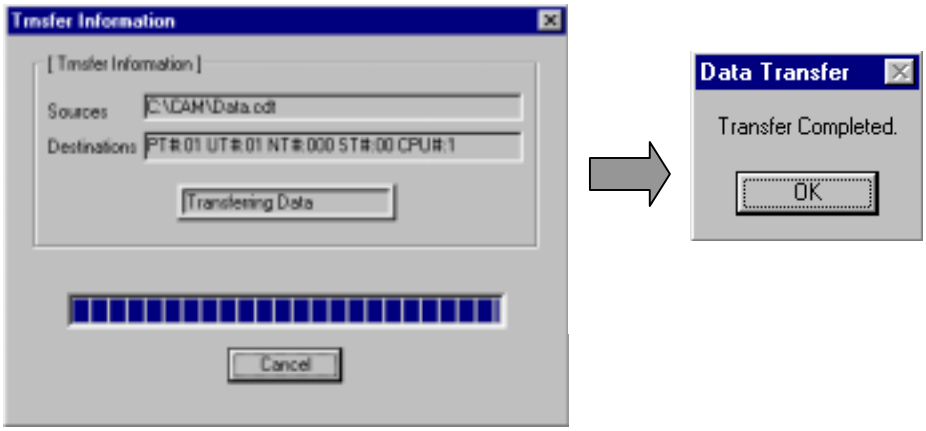
4.2.3 Executing transfer

Start the data transfer.

① Set the transfer destination in the Environment Select window shown in 4.2.2, and click the OK button. The following message box appears.



② Select Yes in the message box.
The data transfer starts. During the transfer, the following dialog box appears. Select Cancel to stop the transfer.

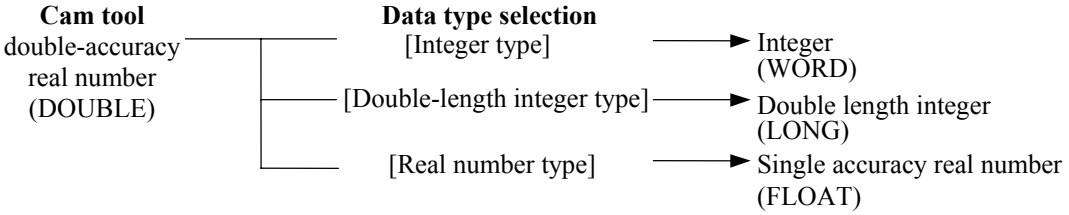


4.3 Data Conversion during Data Transfer

The data to be transferred is prepared as described below and then transferred.

① The transfer data is converted to the pulse.

② With the cam tool, the data is handled as double-accuracy real numbers; while the data to be transferred is converted to the designated data type. Therefore, the data to be transferred is not always the same as the data displayed with the cam tool.



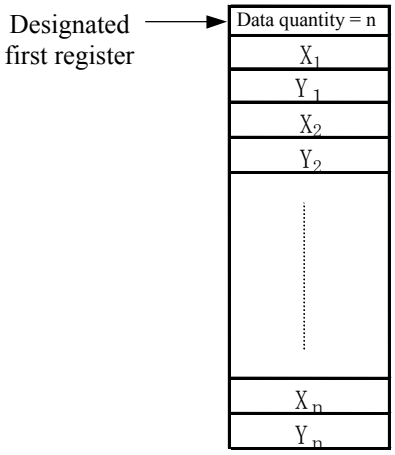
③ The speed data is converted to a value 100 times the ratio to the motor rated rotation speed.

④ The acceleration data is transferred to a value 100 times the ratio to the motor rated torque.

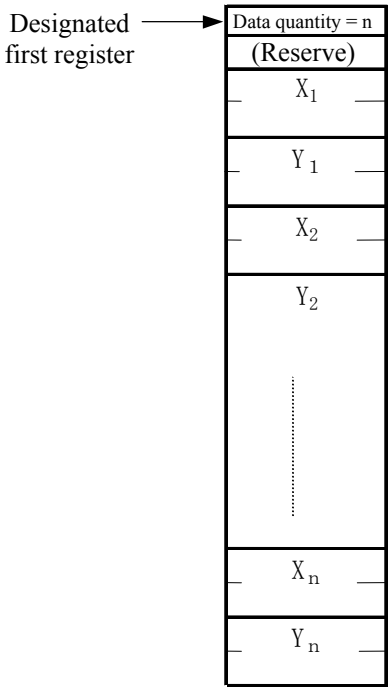
4.4 Register Contents after Data Transfer

The electronic cam data is transferred to the register according to the parameter table type which is used for the FGN instruction. The following show the contents of the register after the data transfer. Refer to manuals such as Machine Controller MP900 Series New Ladder Editor Programming Manual (SIEZ-C887-13.1) for details of the FGN instruction.

Integer type

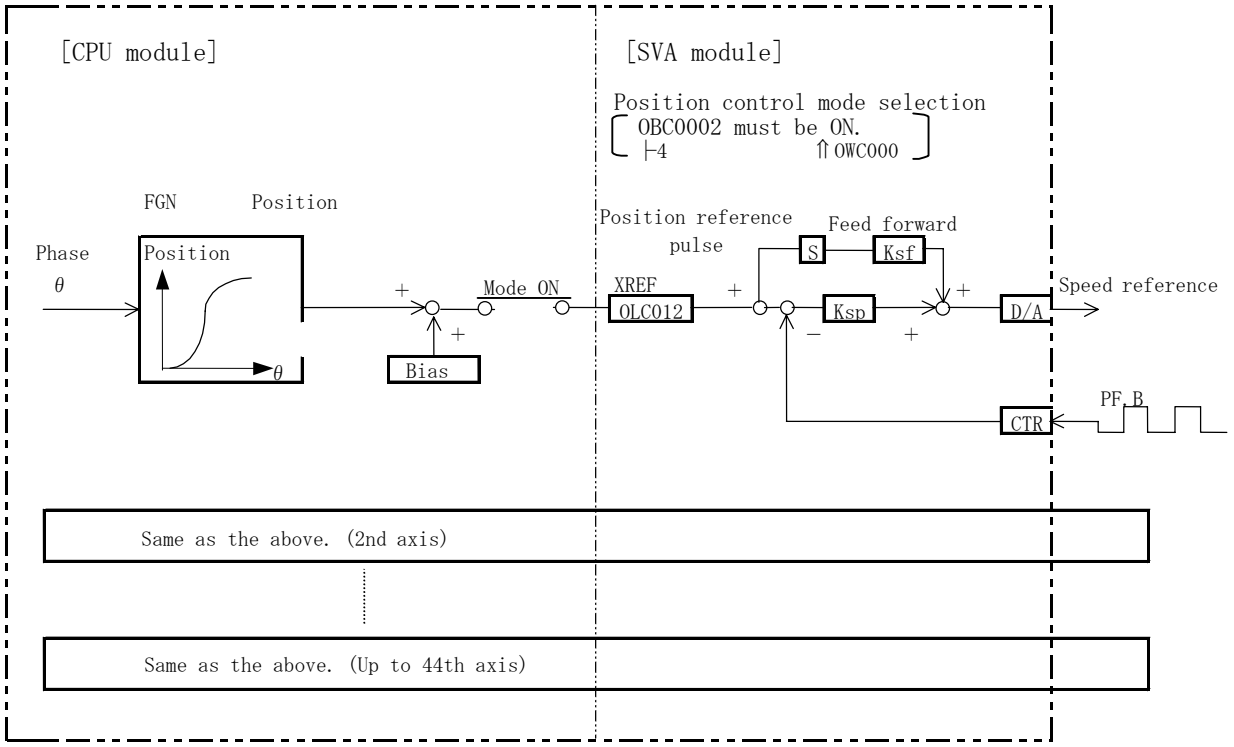


Double-length integer/real number type

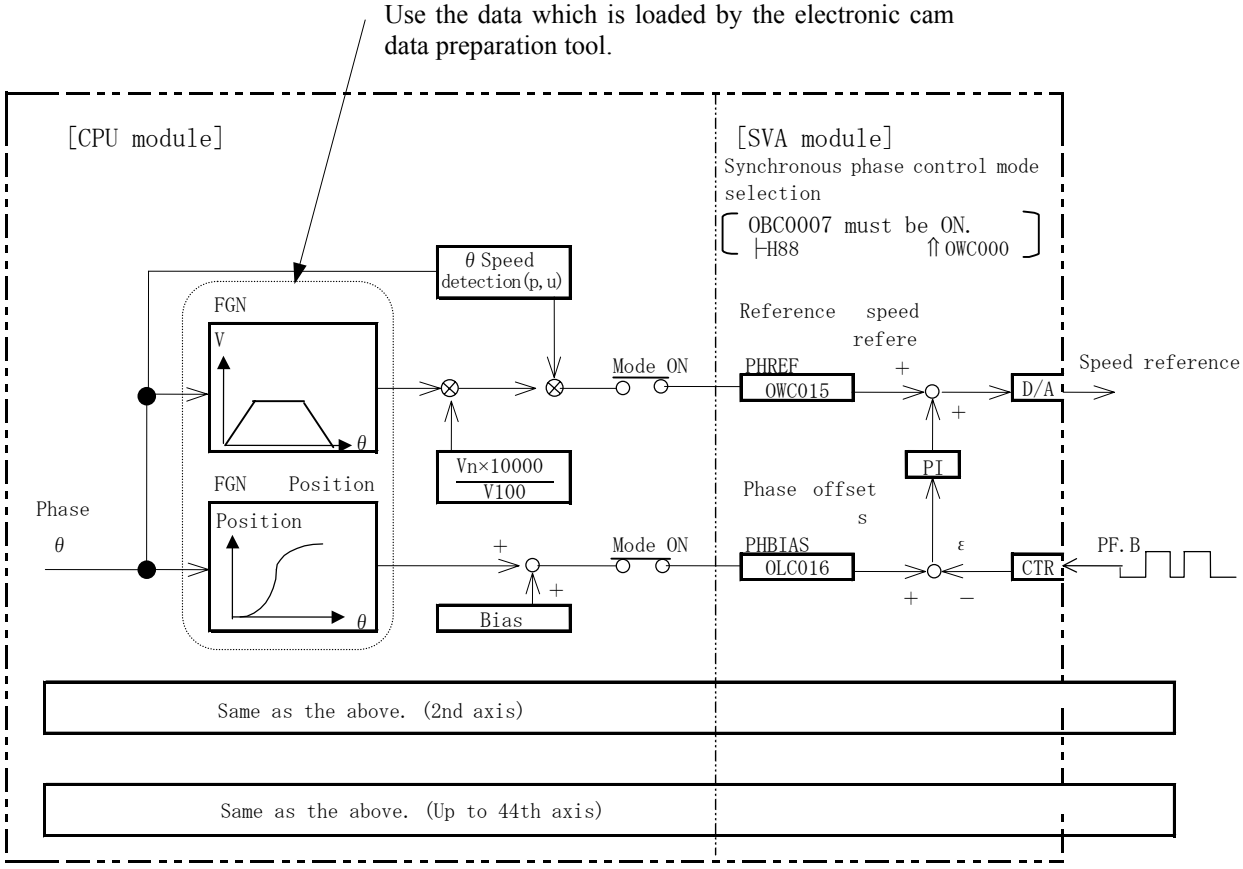


Appendix Control Circuit Configuration

(1) How to use the position control mode



(2) How to Use the Synchronous Phase Control



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