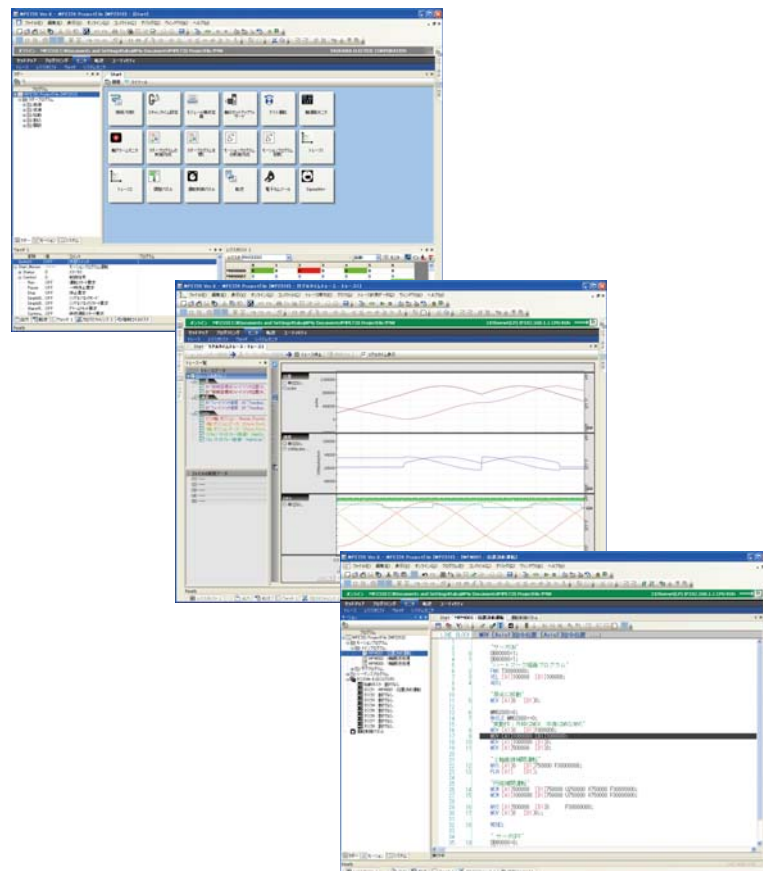


Engineering Tool for MP2000 Series Machine Controller

MPE720 Version 6

USER'S MANUAL

Model CPMC-MPE770



Overview and Basic Operations of
MPE720 Version 6

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Graphic Symbols Used in this Manual

The graphic symbols used in this manual indicate the following type of information.



- This symbol is used to indicate important information that should be memorized or minor precautions, such as precautions that will result in alarms if not heeded.

Caution on Managing Passwords

The following passwords can be set for this software.

- User passwords (Refer to *1.9.4 (1) Registering New Users.*)
- Project passwords (Refer to *1.9.5 Security: Project Password.*)
- Program passwords (Refer to *1.12.3 Setting Passwords for Ladder Programs.*)
- Online passwords (Refer to *1.12.4 Online Security.*)

If a password is set and then forgotten or lost, a project file can be opened and there is no way, however, to recover a project file or program.

Set passwords carefully and then take full responsibility for managing the passwords.

Caution on Managing Project Files

Project files are always overwritten when closed. A project file cannot be saved under a new name. Whenever a backup file is required, be sure to make a copy of the project file before opening it or before overwriting changes while editing the project.

Table Programming Functions Not Supported by MPE720 Version 6

MPE720 version 6 does not support these three table programming functions: Interlock Tables, Part Composition Tables, and I/O Conversion Tables.

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Revision History

1



Overview and Basic Operations of MPE720 Version 6

This chapter provides an overview of MPE720 version 6 and describes basic MPE720 operations.

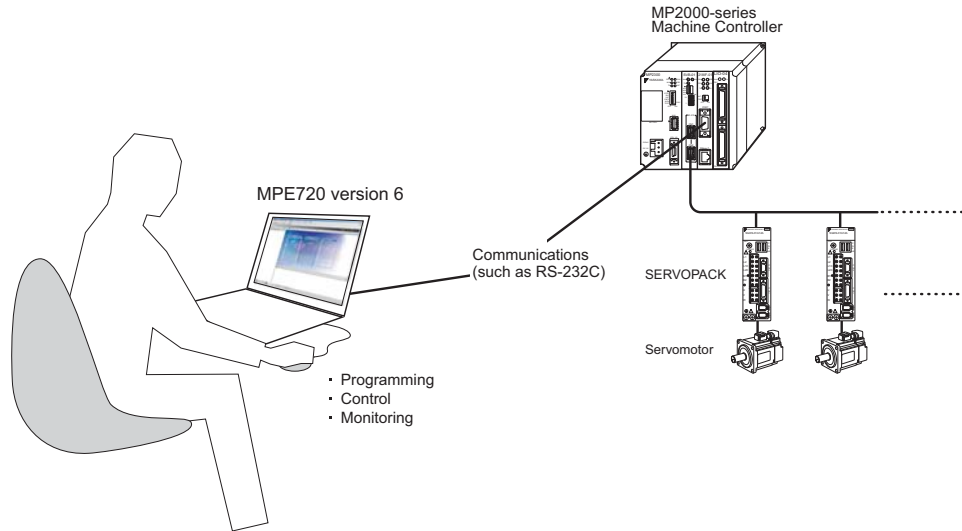
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1.1 What Is MPE720 Version 6?

MPE720 version 6 (CPMC-MPE770) is an engineering tool for MP2000-series Machine Controllers. Installing MPE720 version 6 on a computer and connecting to a Machine Controller via a Communications Module enables programming, control, and monitoring operations from the computer.

* Note: A Communications Module is not required for the MP2100 or the MP2100M.



1.2 Basic Engineering Procedure Using MPE720 Version 6

Use the following procedure to operate a Machine Controller and motion system using MPE720 version 6.

1. Connect the computer to the MP2000-series Machine Controller.
↓
2. Install MPE720 version 6 on the computer. (Refer to 1.3.4 *Installing MPE720 Version 6*.)
↓
3. Set the Communication Process. (Refer to 1.3.7 *Communication Process Settings*.)
↓
4. Start MPE720 version 6. (Refer to 1.4.1 *Starting MPE720 Version 6*.)
↓
5. Create a project file. (Refer to 1.8.2 *Creating New Project Files*.)
↓
6. Make the required settings. (Refer to 1.10.1 *Connecting to Machine Controllers* and 2.1 *Module Configuration*.)
↓
7. Create the programs. (Refer to *Chapter 3 Ladder Programming* and *Chapter 4 Motion Programming*.)
↓
8. Transfer the programs to the Machine Controller. (Refer to 1.12 *Security*.)
↓
9. Perform a test run.

1.3 Installing and Uninstalling MPE720 Version 6

1.3.1 MPE720 Version 6 System Requirements

The following table shows the computer system requirements for the computer in which MPE720 version 6 is to be installed and used.

Item	Specifications
CPU	Pentium 800 MHz min. or equivalent. (1 GHz min. is recommended.)
Memory Capacity	128 MB min. (256 MB min. is recommended.)
Display	Resolution: 1,024 x 768 min., 16-bit High Color
Available HDD Space	200 MB min.
CD Drive	One CD drive (Required only for installation.)
Communications Ports	Serial, Ethernet, MP2100 bus, or USB
Operating System	Windows 2000 (service pack 1 or later) Windows XP, Windows Vista, Windows 7 (32 bit version)
Other	Adobe Reader version 6.00 or later (Required for help displays.) Internet Explorer version 5.5 or later (Required for displaying online help for ladder instructions.)

1.3.2 Version Applicability

The Machine Controllers and OS types applicable to each MPE720 version are shown below.

MPE720 Version	Applicable Machine Controllers			Applicable OS		
	MP900 Series	MP2000 Series	MP3200 Series	Windows XP	Windows Vista	Windows 7
Ver.6.01 or later	Not Applicable	Applicable	Not Applicable	Applicable	Not Applicable	Not Applicable
Ver.6.06 or later	Not Applicable	Applicable	Not Applicable	Applicable	Applicable	Not Applicable
Ver.6.30 or later	Not Applicable	Applicable	Not Applicable	Applicable	Applicable	Applicable

1.3.3 Compatibility with MPE720 Version 5

If MPE720 version 5 is already installed, removal is not required before installing MPE720 version 6. Moreover, MPE720 version 5 will not be overwritten when MPE720 version 6 is installed.

After MPE720 version 6 has been installed, version 5 and version 6 can both be used.

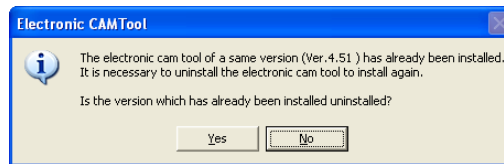
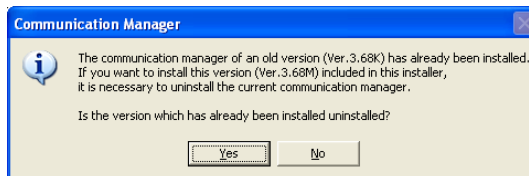
1.3.4 Installing MPE720 Version 6

- To install MPE720 version 6, you need to logon with the administrator privilege.
- If MPE720 version 5 is already installed, uninstall it before installing MPE720 version 6 is not required. Moreover, MPE720 version 5 will not be overwritten when MPE720 version 6 is installed.
- After MPE720 version 6 has been installed, version 5 and version 6 can both be used.
- If MPE720 version 6 has been previously installed, the new installation of MPE720 version 6 will overwrite it.

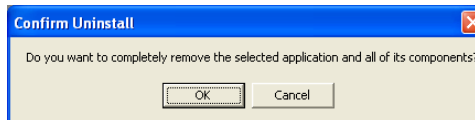
Prepare the MPE720 version 6 installation CD-ROM and use the following procedure to install the software.

1. Start the computer, and insert the installation CD-ROM in the CD-ROM drive.

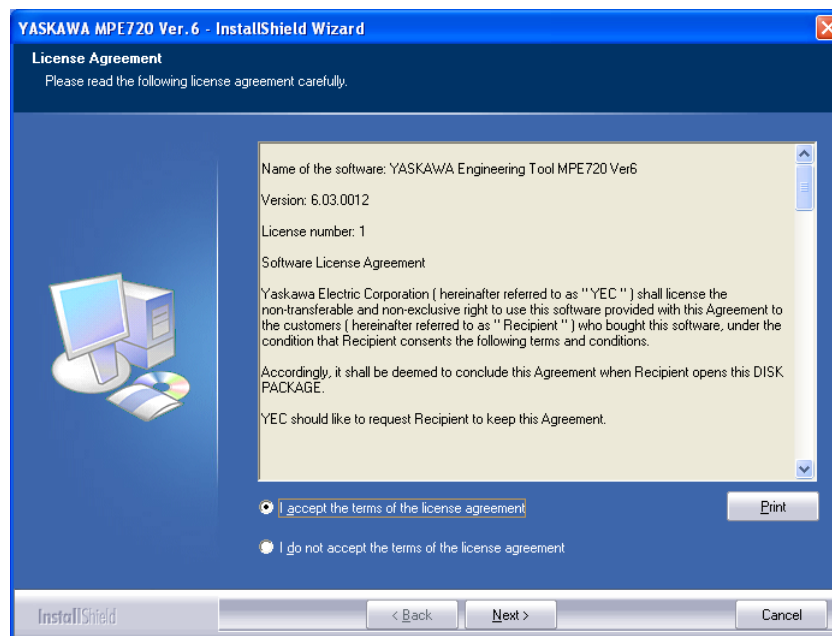
- If any other software applications are running, close them before proceeding.
- If either MPE720 version 5 or MPE720 version 6 is already installed, the following dialog boxes may be displayed for confirmation when the InstallShield Wizard is started. In either case, click the **Yes** Button.



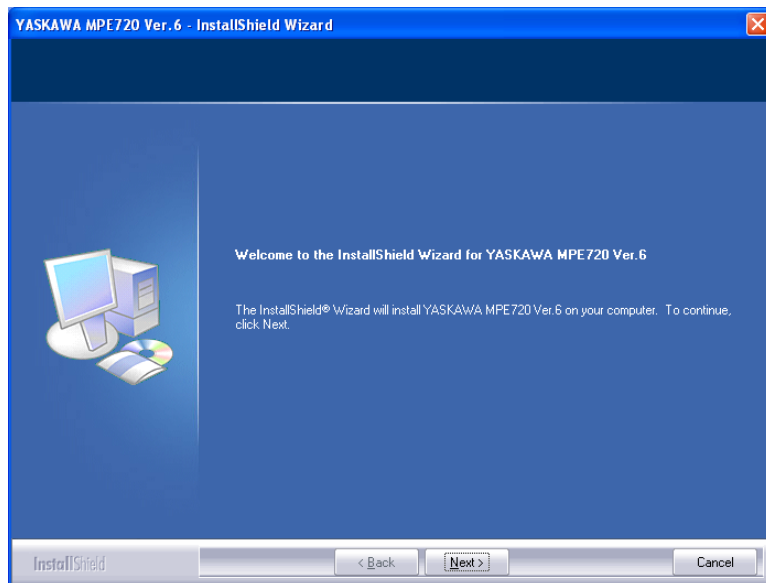
The following dialog box will then be displayed for confirmation. Click the **OK** Button. The earlier version or the same version of the Communications Process or the Electronic CAM Tool will be overwritten.



The MPE720 version 6 Installer will automatically start, the Title Window will be displayed, and then the **License Agreement** Window will be displayed.

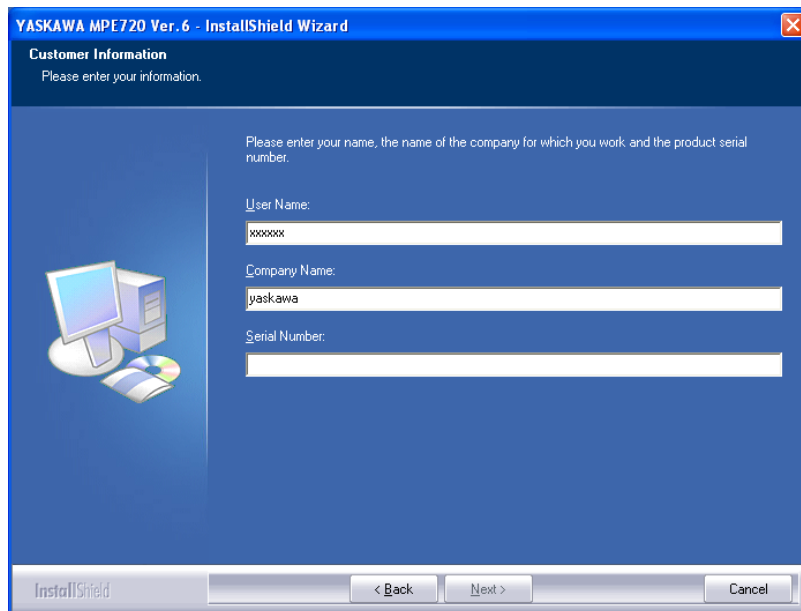


2. Click the **Next** Button to continue.



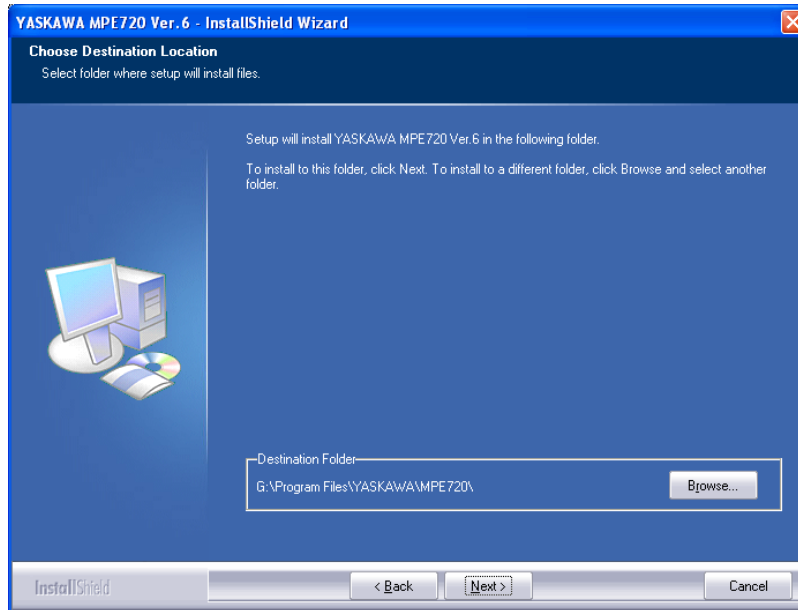
The Customer Information Window will be displayed for registration.

3. Enter the user name, company name, and product serial number, and then click the **Next** Button to continue.



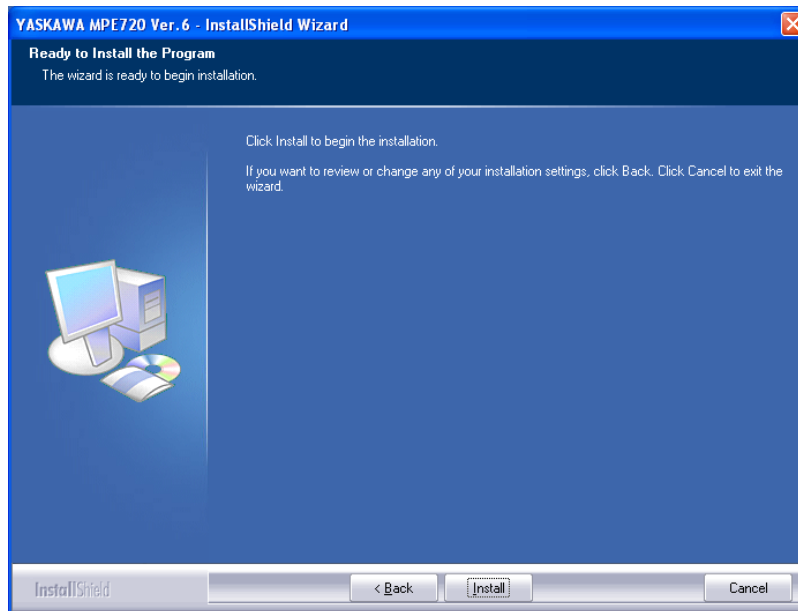
A window to set the destination folder for the installation will be displayed.

- To install the program in the destination folder that is displayed, click the **Next** Button. To install it in a different folder, click the **Browse** Button, specify the destination folder, and then click the **Next** Button.



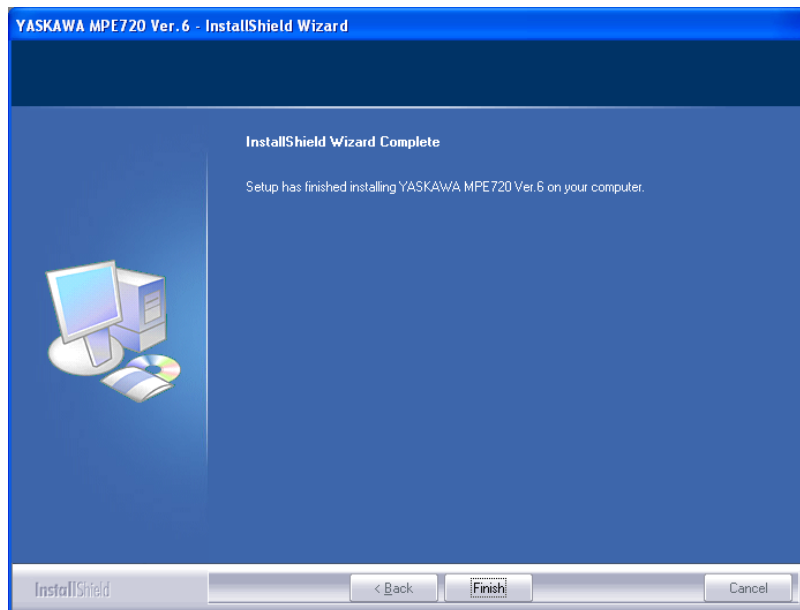
A window to begin the installation will be displayed.

- Click the **Install** Button.



The installation will begin, and messages to indicate the progress will be displayed. When the installation has been completed, a window to complete the installation will be displayed.

6. Click the **Finish** Button.

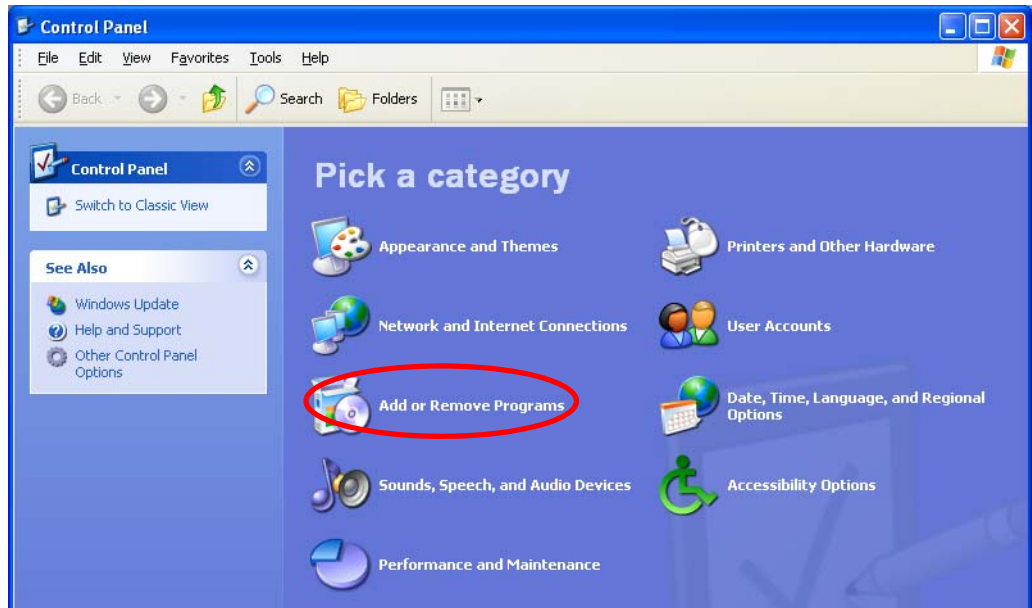


The InstallShield Wizard will close and the installation of MPE720 version 6 will be completed.

1.3.5 Uninstalling MPE720 Version 6

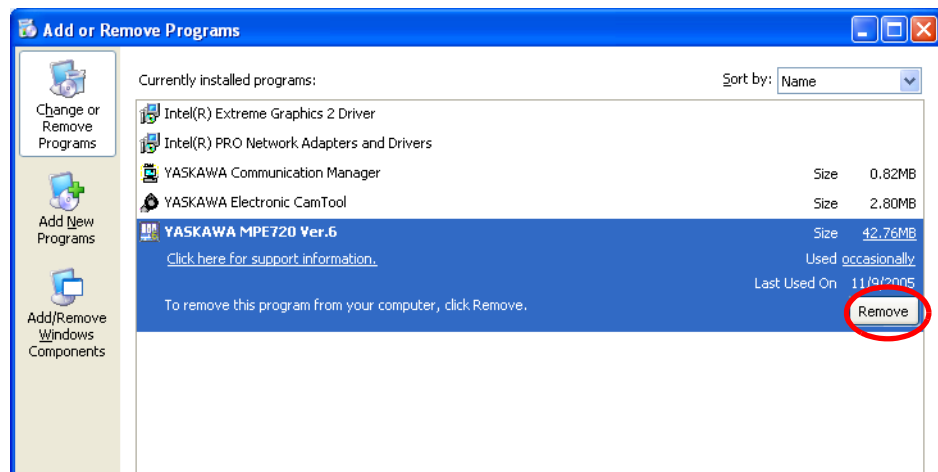
Use the following procedure to uninstall MPE720 version 6.

1. Exit MPE720 version 6 and open the Windows Control Panel.
2. Double-click **Add or Remove Programs** (or *Add or Remove Applications* in Windows 2000).



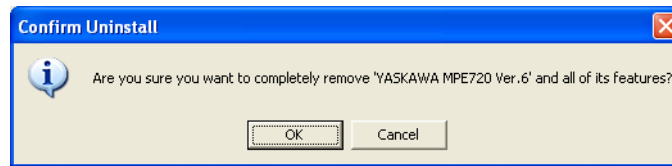
The **Add or Remove Programs** Window will be displayed.

3. Select **YASKAWA MPE720 Ver.6** from the list of programs, and click the **Remove** Button.



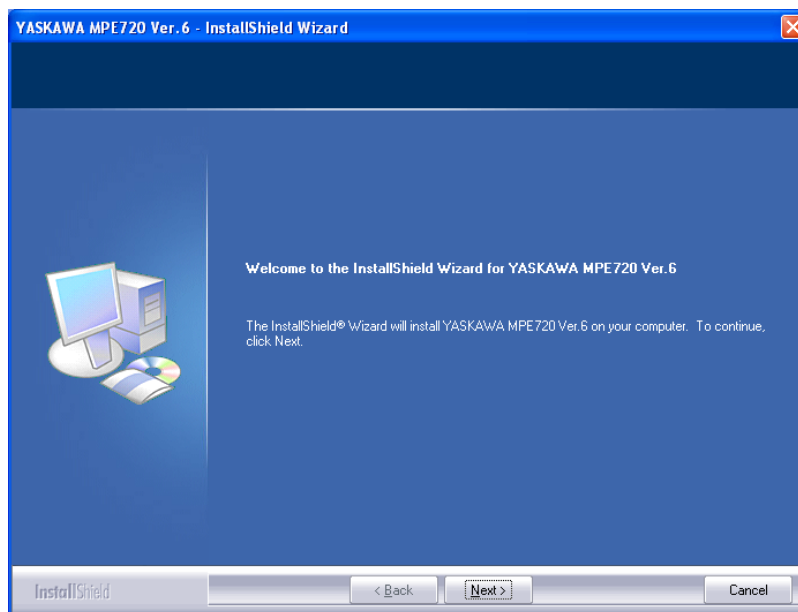
A dialog box will be displayed for confirmation that the program is to be removed.

4. Click the **OK** Button.



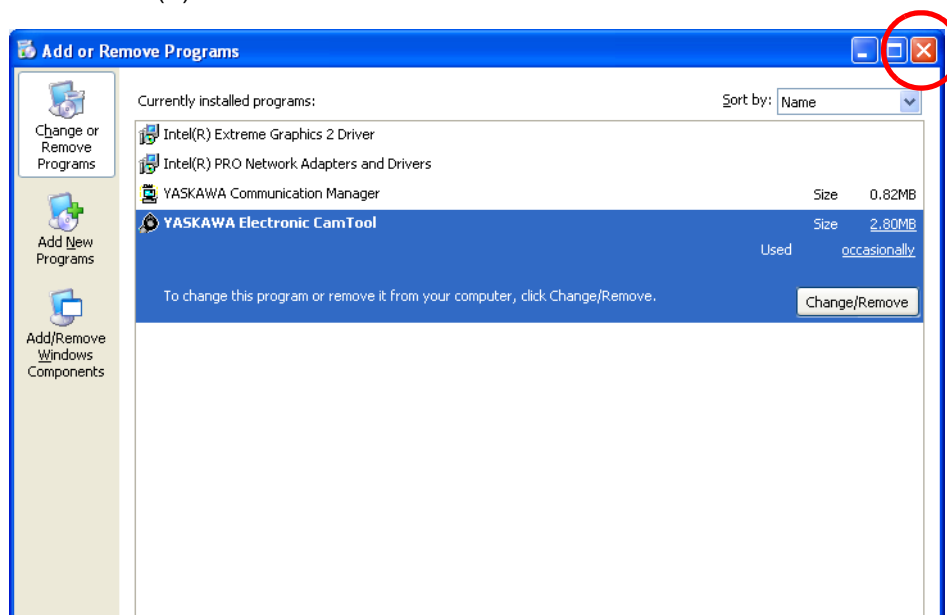
The operation to uninstall MPE720 version 6 will begin. When uninstall is finished, the **Maintenance Complete** Window will be displayed.

5. Click the **Finish** Button.



The **Add or Remove Programs** Window will again be displayed.

6. Click the **Close** Button (X) to close the Control Panel.



1.3.6 Communication Settings

(1) Overview of Communication Settings

[a] What are Communication Settings?

Communication settings are the settings of the communications port and the logical port required to connect MPE720 version 6 to the Machine Controller.

All the operations from communications port setting to connection to the Machine Controller can be performed easily without worrying about communication processes.

[b] Conditions of Use

The communications ports that can be used for the connection with the Machine Controller are as follows.

- Ethernet (10 MB Ethernet)
- Ethernet (LP) (100 MB Ethernet)
- Serial
- USB
- MP2100 bus

Table 1.1 List of Communications Ports Connectable to Machine Controller

Communications Ports	Item	Setting Value
Ethernet	Port type	CP218
	Timeout time	10000 ms
	IP address	Automatically reading the IP address set at the computer
	Engineering port	10000
	Message reception designation	None
Ethernet (LP)	Port type	100 Base-TX
	Timeout time	10000 ms
	IP address	Automatically reading the IP address set at the computer
	Engineering port	9999
	Message reception designation	None
Serial	Port type	Serial
	Timeout time	10000 ms
	Physical port	Automatically reading the port number set at the computer
	Unit number	1
	Baud rate	19.2 K
	Data length	8
	Parity	Even
Stop bit	1	
USB	Port type	USB
	Timeout time	10000 ms
MP2100 bus	Port type	MP2100/2500
	Timeout time	10000 ms
	Communication destination	Device
	CP	Automatically reading the CP number set at the computer

(2) When Using Ethernet for Connection

This setting is needed for engineering using an Ethernet connection via a CP-218 communications port (Ethernet). There are three types of port available for Ethernet connections: the communications port (10 MB Ethernet) of the 218IF-01 Module, and the communications ports (100 MB Ethernet) of 218IFA Module and 218IF-02 Module.

The 218IFA Module is the built-in 218 Module of the Machine Controller.

For an Ethernet connection, the IP address of the computer and MPE720 version 6 need to be set properly.

IP address setting of the computer: Refer to 1.3.6 (1) [a] *How to Set the IP Address*.

Settings for MPE720 version 6: Refer to 1.3.6 (2) [b] *How to Set the Ethernet Port*.

[a] How to Set the IP Address

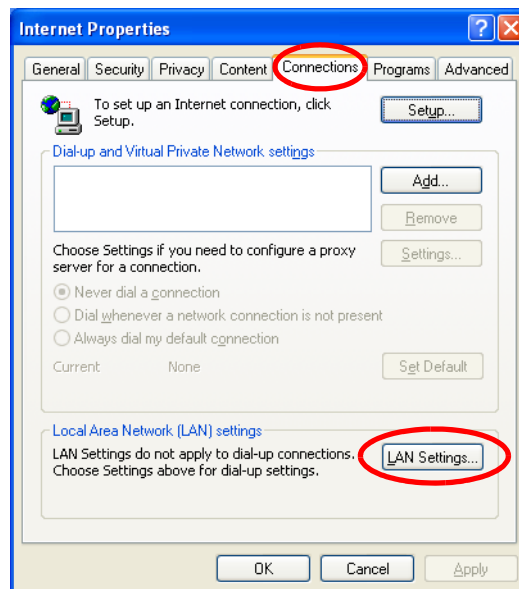
The IP address of the computer must be set before setting the Ethernet connection. Set the IP address in the following manner.

- Make the following setting with a LAN cable connected to the computer.

1. Click the **Start** Button and then select **Settings - Control Panel - Internet Options**.

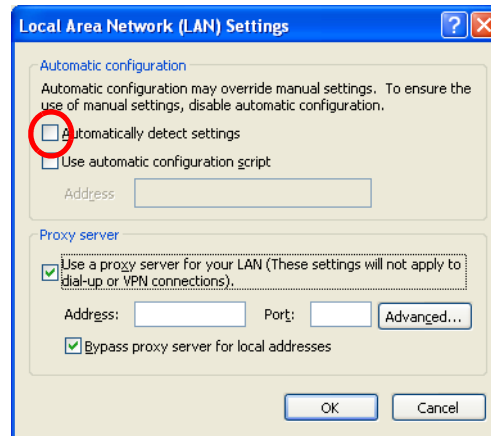
The **Internet Properties** Dialog Box will be displayed.

2. Select the **Connections** Tab, and then click the **LAN Settings** Button.



The **Local Area Network (LAN) Settings** Dialog Box will be displayed.

3. Confirm that the **Automatically detect settings** check box is not selected, and then click the **OK** Button to close the dialog box.



4. In Windows XP, click the **Start** Button, and then select **Settings - Control Panel - Network Connections**.

In Windows 2000, click the **Start** Button, and then select **Settings - Control Panel - Network and Dial-up Connections**.

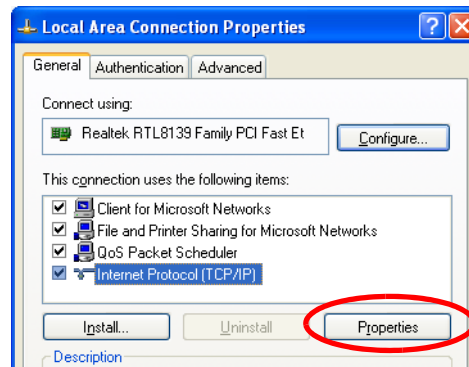
The **Network Connections** Window (in Windows XP) or the **Network and Dial-up Connections** Window (in Windows 2000) will be displayed.

5. In Windows XP, click the **Local Area Connection** Button, and then click **Change settings of this connection** in the **Network Tasks** field.

In Windows 2000, double-click **Local Area Connection**.

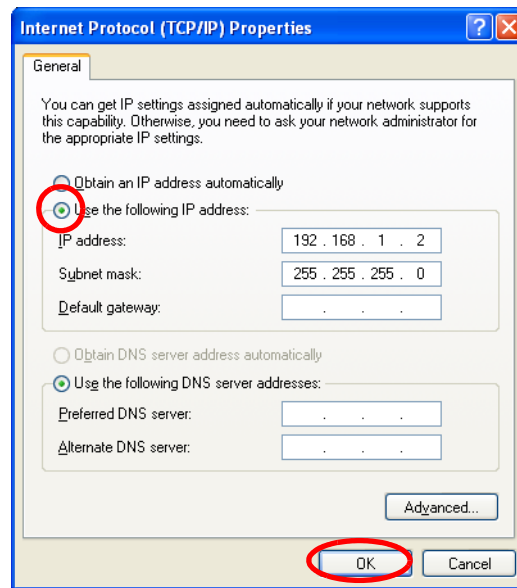
The **Local Area Connection Properties** Dialog Box will be displayed.

6. Select the **Internet Protocol (TCP/IP)** check box and then click the **Properties** Button.



The **Internet Protocol (TCP/IP) Properties** Dialog Box will be displayed.

7. Select **Use the following IP address**, and then enter the IP address, “192.168.1.2” for example, in the **IP address** field and “255.255.255.0” in the **Subnet mask** field.

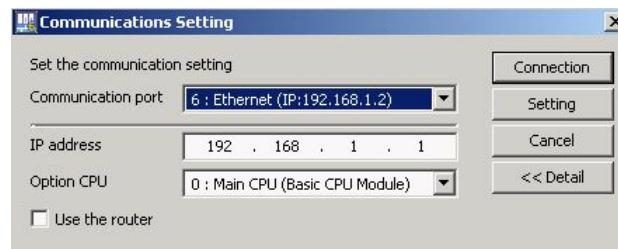


8. Click the **OK** Button to close the dialog box.

[b] How to Set the Ethernet Port

Connect the computer in which MPE720 version 6 is installed to the Machine Controller through Ethernet in the following manner.

1. Select **Online - Communications Setting** from the Main Menu. Alternatively, click **Communications Setting** under **Controller** (or **Project**) in the Start Window.
The **Communications Setting** Dialog Box will be displayed.
2. Select the communications port to be used for connecting to the Machine Controller and click the **Connection** Button.



The **Communications Setting** Dialog Box closes and the MPE720 version 6 is connected to the Machine Controller.

- The **Connection** Button and the **Setting** Button are invalid while connected to the Machine Controller, and communications cannot be set.

[c] How to Set the Ethernet (LP) Port

On selecting Ethernet (LP), Machine Controller search list is displayed. Click the **Search** Button to search for the Machine Controllers connected to the Ethernet (LP) network. The search result is displayed in the list.

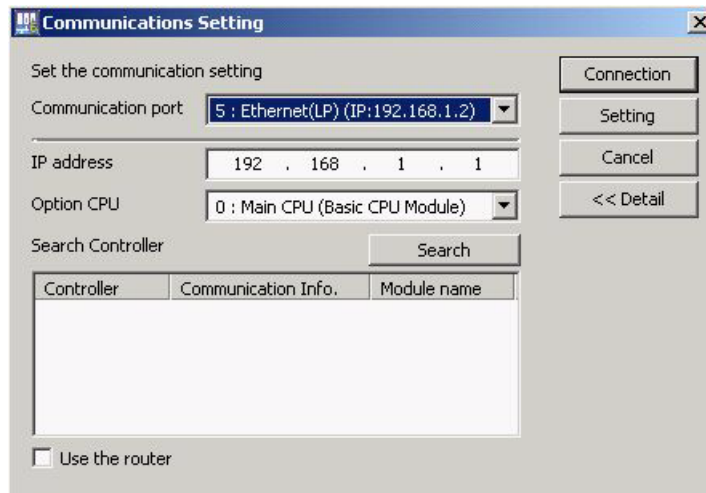
On selecting a Machine Controller from the search list, the IP address of the selected Machine Controller is automatically set in the **IP address** field.

Connect the computer in which MPE720 version 6 is installed to the Machine Controller through Ethernet (LP) in the following manner.

1. Select **Online - Communications Setting** from the Main Menu. Alternatively, click **Communications Setting** under **Controller** (or **Project**) in the Start Window.

The **Communications Setting** Dialog Box will be displayed.

2. Select the communications port to be used for connecting to the Machine Controller and click the **Connection** Button.



The **Communications Setting** Dialog Box closes and the MPE720 version 6 is connected to the Machine Controller.

- The **Connection** Button and the **Setting** Button are invalid while connected to the Machine Controller, and communications cannot be set.

■ If the connection to the Machine Controller cannot be established, perform the following operations.

Setting the communications port

1. Open the **Communications Setting** Dialog Box and click the **Search** Button.
2. The name and IP address of the Machine Controllers that can be connected are listed in the Machine Controller search list.
3. Check that the IP address of the target Machine Controller displayed in step 2 is identical to the one set for the IP address field, and then click the **Connection** Button.

Setting the Ethernet port

Check that the port settings of the computer made in [b] *How to Set the Ethernet Port* are correct.

(3) When Using a Serial Port for Connection

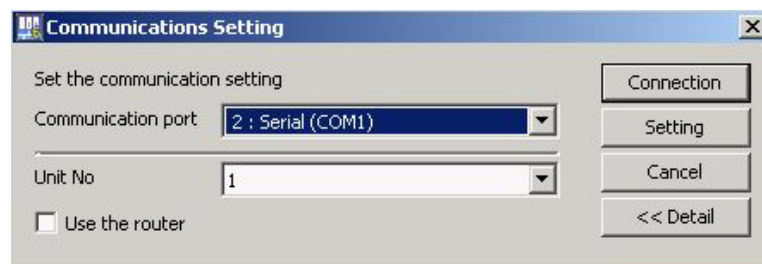
[a] How to Set the Serial Port

Connect the computer in which MPE720 version 6 is installed to the Machine Controller through a serial port in the following manner.

1. Select **Online - Communications Setting** from the Main Menu. Alternatively, click **Communications Setting** under **Controller** (or **Project**) in the Start Window.

The **Communications Setting** Dialog Box will be displayed.

2. Select the communications port to be used for connecting to the Machine Controller and click the **Connection** Button.



The **Communications Setting** Dialog Box closes and the MPE720 version 6 is connected to the Machine Controller.

- The **Connection** Button and the **Setting** Button are invalid while connected to the Machine Controller, and communications cannot be set.

1.3.7 Communication Process Settings

The Communication Manager (Communication Process), which is installed along with MPE720 version 6, is used to set the communication port at the computer that is used to connect to the Machine Controller.

(1) Serial Port Settings

[a] How to Set a Serial Port

- If the Communication Process settings have already been made for MPE720 version 5, settings will not have to be reconfigured after installing version 6.

1. Start the Communication Manager (Communication Process) either by double-clicking the **Communication Manager** Icon in the **YE_Applications** Folder on the desktop or by clicking the **Start** Button and selecting **Programs - YE_Applications - Communication Manager**.

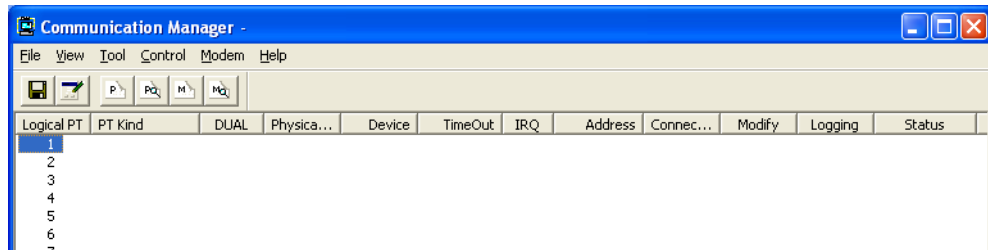
The **Communication Process** Icon will be displayed in the task bar at the bottom right of the screen.

2. Double-click the **Communication Process** Icon in the task bar to display the Communication Manager Window.



- If the window is not displayed when the **Communication Process** Icon is double-clicked, then right-click the icon and select **Application Display** from the pop-up menu.

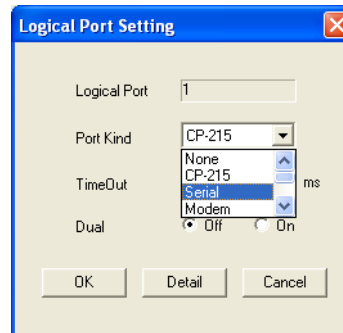
3. Double-click the logical port number (*logical PT*) for which the settings are to be made.



The **Logical Port Setting** Dialog Box will be displayed.

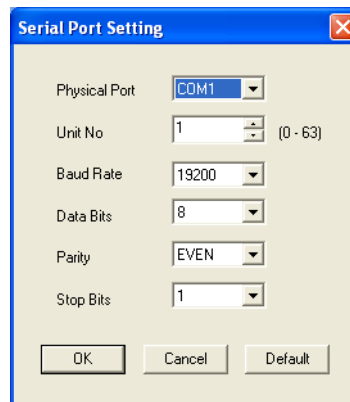
4. Select an option for **Port Kind** and set the **TimeOut** and other fields. Click the **Detail** Button.

- CP-215: Connected through a CP-215 cable
 Serial: Connected through a serial cable
 Modem: Connected through a modem
 CP-218: Connected through a 10 MB Ethernet cable
 Ethernet (LP): Connected through a 100 MB Ethernet cable
 MP2100/2500: Selected when using Machine Controller MP2100
 USB: Connected through a USB cable
- The explanation given here takes "Serial" as an example.



The **Serial Port Setting** Dialog Box will be displayed.

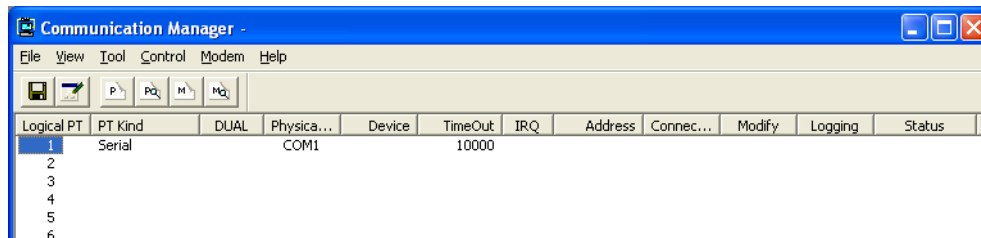
5. Set each item, and then click the **OK** Button.



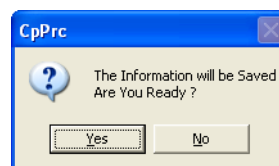
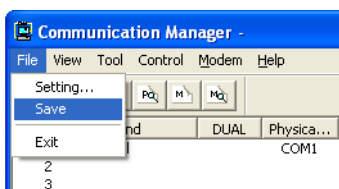
The **Logical Port Setting** Dialog Box will again be displayed.

6. Click the **OK** Button in the **Logical Port Setting** Dialog Box. The **Communication Manager** Window will again be displayed.

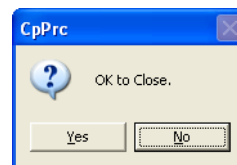
Serial will be displayed for the logical port selected in step 3.



7. Select **File - Save** and then click the **Yes** Button in the dialog box displayed for confirmation. The settings will be saved.



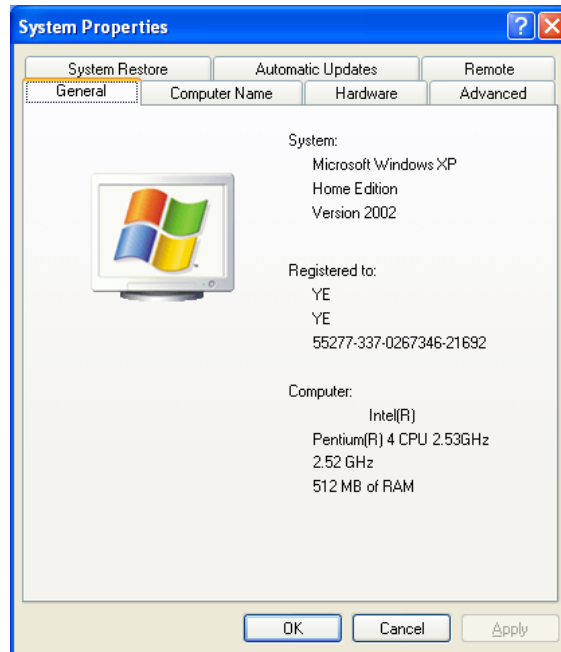
8. Select **File - Exit** and then click the **Yes** Button in the dialog box displayed for confirmation. The Communication Manager (Communication Process) will be closed.



[b] How to Set a Serial Port with a USB Serial Conversion Adapter

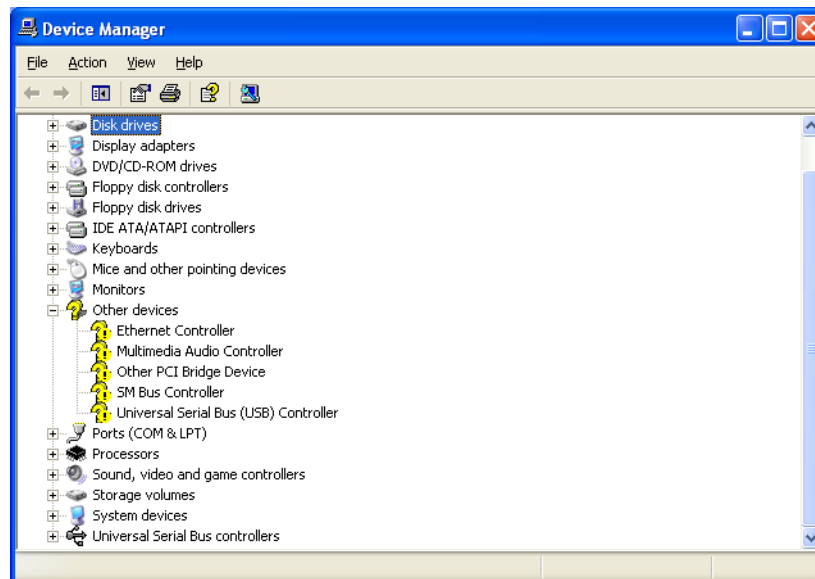
If the computer is connected to the Machine Controller using a USB serial port conversion adapter, confirm the logical port in the following manner.

1. Right-click the **My Computer** Icon on the desktop, and then select **Properties** from the pop-up menu.



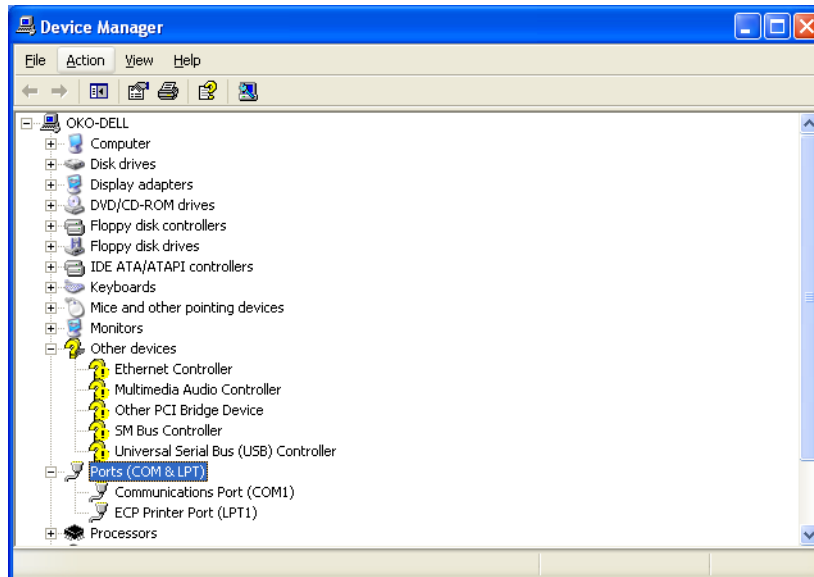
The **System Properties** Dialog Box will open.

2. Select the **Hardware** Tab, and then click **Device Manager**.



The **Device Manager** Window will open.

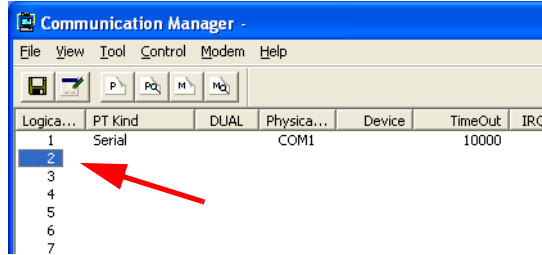
3. Click on **Ports (COM & LPT)** to display the tree.



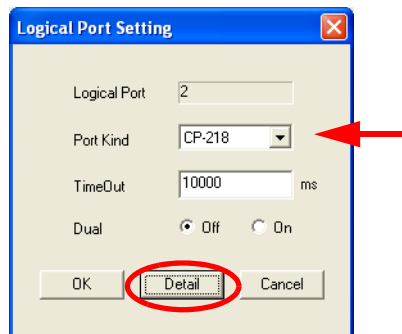
4. Set the physical port of the newly added port name in the **Serial Port Setting** Dialog Box opened from the **Communication Manager** Window.

(2) CP-218 Communications Port Settings

1. Double-click No. **2** under **Logical PT** in the **Communication Manager** Window to open the **Logical Port Setting** Dialog Box.

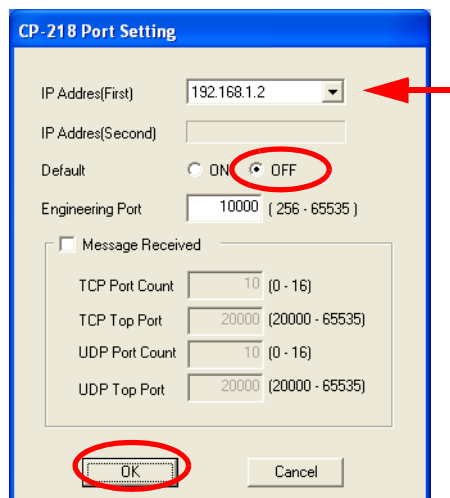


2. In the **Logical Port Setting** Dialog Box, select **CP-218** for **Port Kind**, and then click **Detail**.



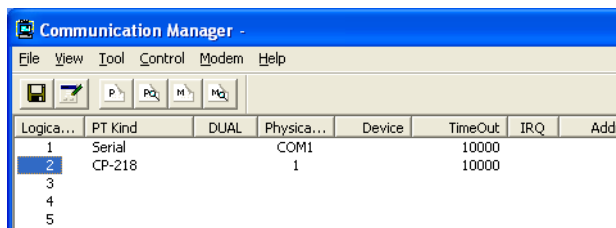
The **CP-218 Port Setting** Dialog Box will open.

3. Enter the IP address of the computer for **IP Address (First)** and select the **OFF** option for **Default**. Leave the other items at their default settings, and then click **OK** to close the dialog box.

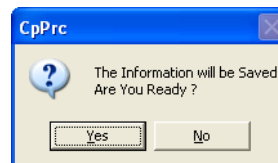
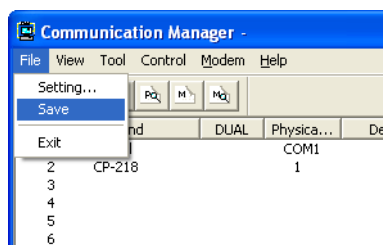


4. When **OK** is clicked in the **Logical Port Setting** Dialog Box, you will be returned to the **Communication Manager** Window.

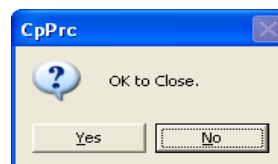
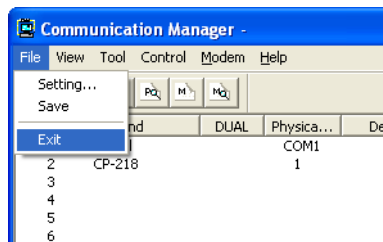
CP-218 will be displayed for the logical port selected in step 1.



5. Select **File-Save**, and then click **Yes** in the dialog box displayed for confirmation. The setting will be saved.



6. Select **File-Exit**, and then click **Yes** in the dialog box displayed for confirmation. The setting will be saved.

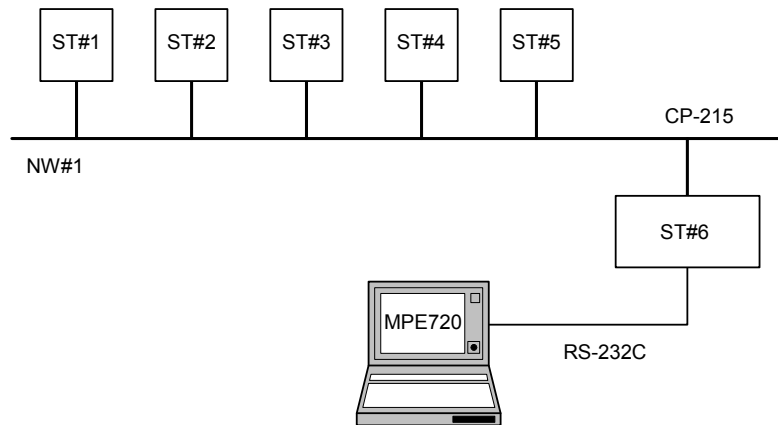


(3) 215AIF-01 Module Network Relay Function

An entire system can be managed and controlled from the MPE720 version 6 by using more than one 215AIF-01 Module mounted relay station^{*1} (Machine Controller). By allocating a unique network number (NW#nn) to each network segment and a unique station number (ST#nn) to the 215AIF-01 Module in each network segment, all devices connected to all networks can be identified by their network addresses, specified with the combination of these two numbers.

In this way, the relay function enables message communications^{*2} among networks.

The following diagram illustrates an example of a network configuration that uses the relay function.



- * 1. "Relay Station" indicates an MP2□00 Machine Controller equipped with more than one 215AIF-01 Module whose MPLINK or MR connectors are connected with another network's MPLINK/CP-215 cables to transmit data between networks.
- * 2. Only engineering message transmission is possible with the relay function.
 - To use the relay function, "Message relay function" must be enabled, and "Relayed network number" must be specified by setting the 215AIF-01 Module parameters.

1.4 Starting and Exiting MPE720 Version 6

1.4.1 Starting MPE720 Version 6

Use any of the following methods to start MPE720 version 6.

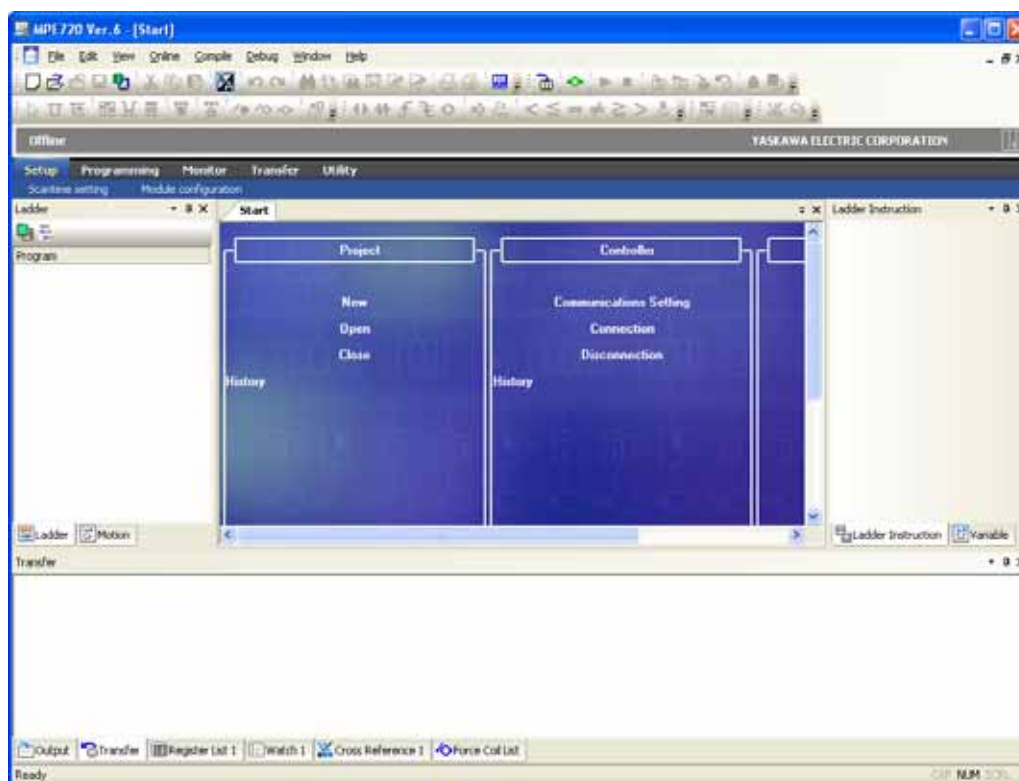
(1) Starting from a Desktop Icon



Double-click the icon (shown in the illustration) that was created on the desktop when MPE720 version 6 was installed. MPE720 version 6 will start and the **MPE720 Ver.6** Window will be displayed as shown below.

(2) Starting from the Windows Start Menu

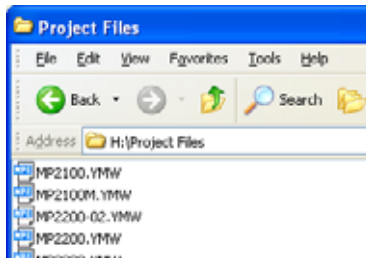
Click the **Start** Button and select *All Programs - YE_Applications - MPE720 Ver.6*.



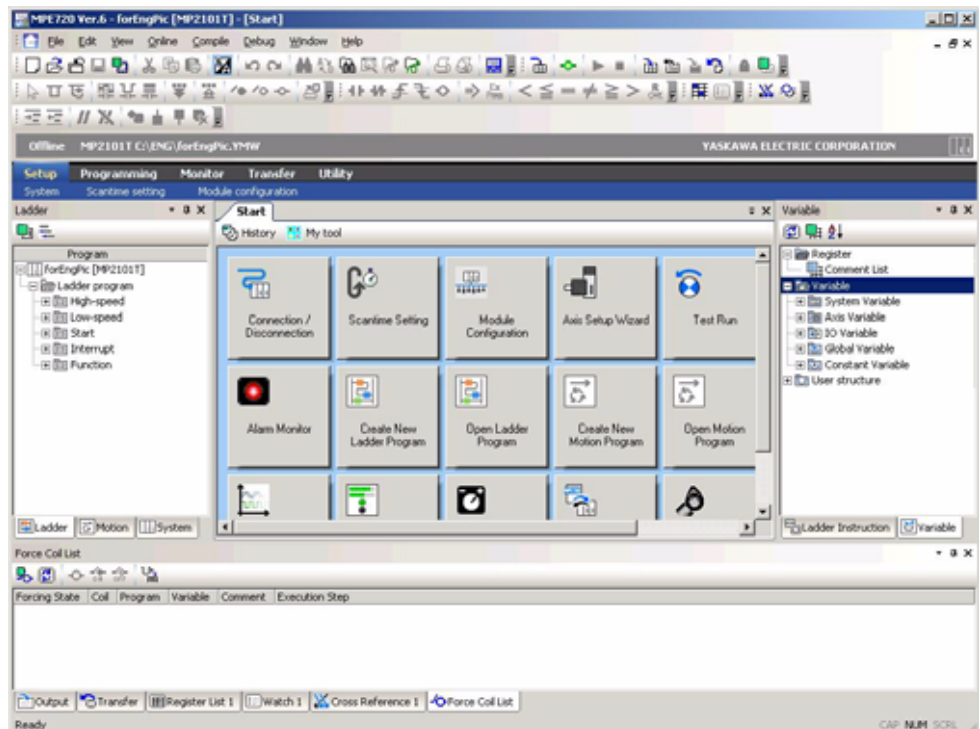
MPE720 version 6 will start and the **MPE720 Ver.6** Window will appear as shown above.

- For details on the **Start** Window, refer to *1.5.1 Names and Descriptions of Window Components*.
- For details on opening project files, refer to *1.8.2 Creating New Project Files* and *1.8.3 Opening Project Files*.

(3) Starting from a Project File



If a project file has already been created, either double-click or right-click the icon and then select **Open**. (Refer to 1.8 Project Files.) MPE720 version 6 will start and the **MPE720 Ver.6** Window will appear as shown below.



When MPE720 version 6 is started from a project file, then only *Project* and *Help* will be displayed in the **Start** Window as shown above, and their contents will be displayed in ladder and variable subwindows.

If the contents of communications settings are stored in the selected project file, the following dialog box will open. (Refer to 1.10.1 Connecting to Machine Controllers.)



When the **Connect** Button Is Clicked

The port set in the communications settings will be used to connect to the Machine Controller set in the project file, and the application data saved in the Machine Controller RAM will be displayed. If the displayed application data is edited, the changes will be overwritten in both the Machine Controller RAM and the selected project file (on the computer).

When the **Not Connect** Button Is Clicked

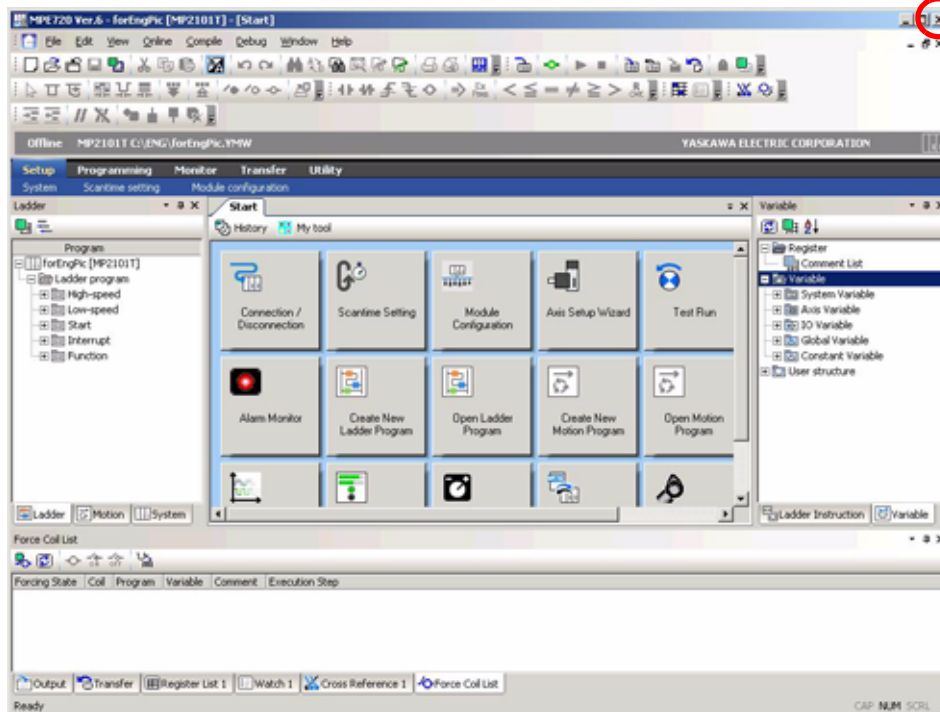
The project file (on the computer) that was first selected will be displayed.

- ♦ For details on the Start Window, refer to *1.5.1 Names and Descriptions of Window Components*.
- ♦ For details on starting the Ladder Editor Window, refer to *3.2.1 Creating New Ladder Programs* and *3.2.3 Opening Ladder Programs*.

1.4.2 Exiting MPE720 Version 6

Either select **File - Exit** from the Main Menu or click the **Close** Button (X) in the **MPE720 Ver.6** Window.

Close Button in the MPE
720 version 6 Window

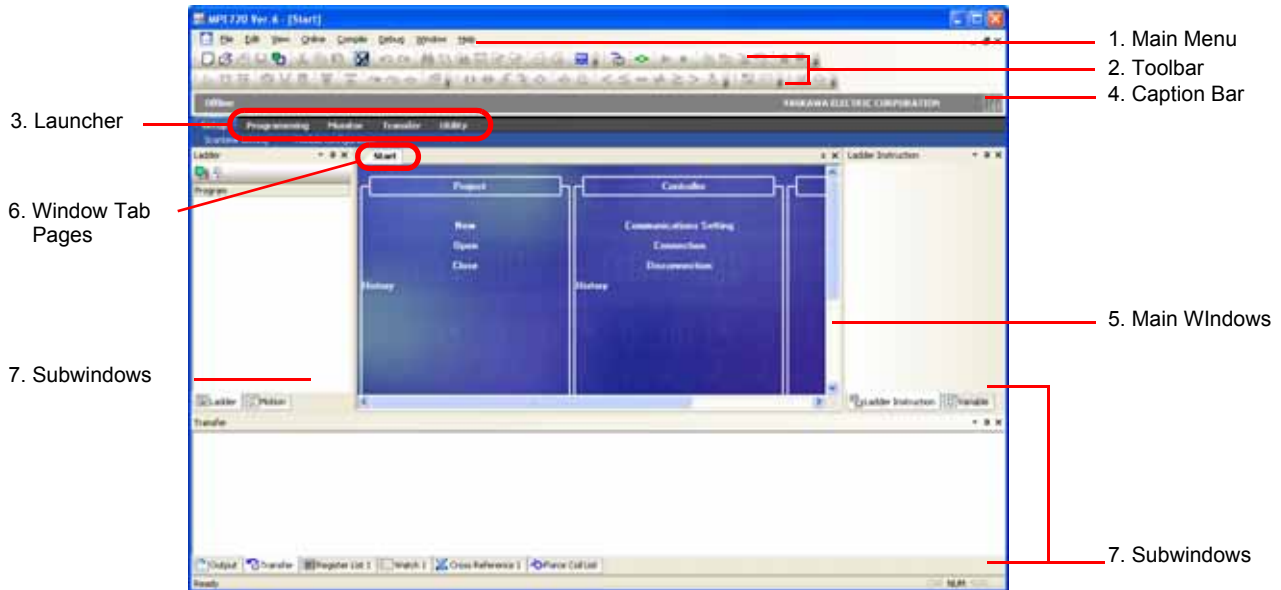


The window will close, and MPE720 version 6 will close.

1.5 MPE720 Version 6 Window Operations

1.5.1 Names and Descriptions of Window Components

A description of each of the **MPE720 Ver.6** Window components is provided below.



1. Main Menu

Used to select operations required for using MPE720 version 6.

2. Toolbar

Used to facilitate using functions related to project file management and programming.

3. Launcher

A submenu bar for quick and easy access to often-used functions.

- ♦ The launcher can be set to be displayed or hidden in the **View** Menu.

4. Caption Bar

Displays the Machine Controller connection status (online or offline), Machine Controller name, CPU status (when online), and project file name (when offline).

5. Main Windows

Aside from the **Start** Window, the following windows are displayed depending on the operation selected.

Ladder Program Edit Window (Refer to 3.3.1 *Ladder Program Edit Window*.)

Motion Program Edit Window (Refer to Chapter 4 *Motion Programming*.)

Data Trace Edit Window (Refer to Chapter 13 *Tracing*.)

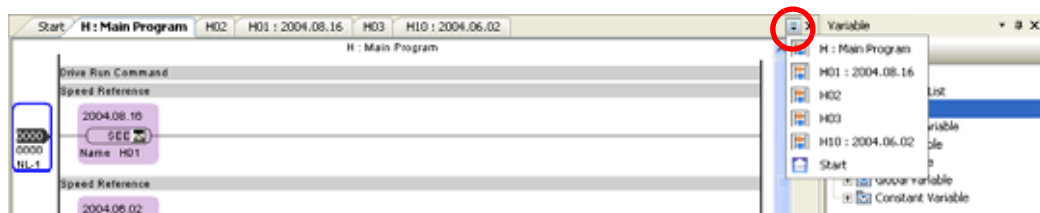
Register Comment Edit Window (Refer to 5.7.1 *Referencing Comment Lists*.)

Adjustment Panel Edit Window (Refer to Chapter 14 *Tuning Panel*.)

- ♦ For details on the Start Window, refer to 1.5.1 *Names and Descriptions of Window Components*.

6. Window Tab Pages

Used to select the window displayed in the foreground when multiple windows are displayed. If there are many windows and not all of the tabs can be displayed, click the [▼] symbol to display a list of tabs from which to select.



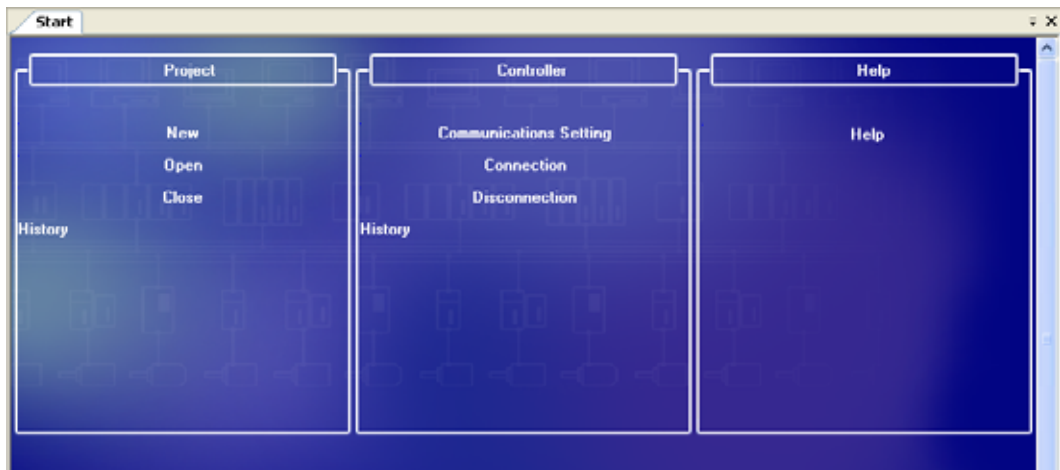
7. Subwindows

Subwindows are windows for supplementing the operations in the main windows. Multiple subwindows can be displayed by selecting from the **View** Menu. (Refer to 1.7 *Subwindow Operations*.)

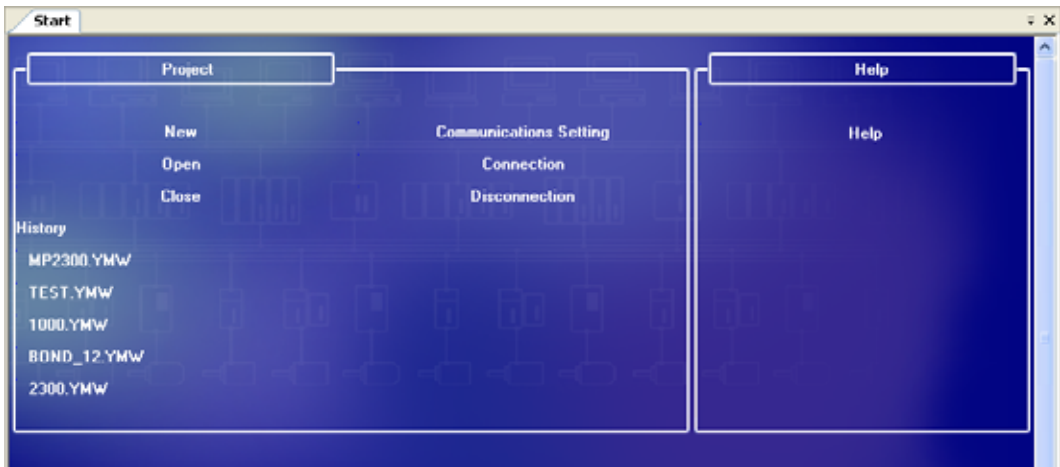
1.6 Main Window Operations

1.6.1 Start Window

The appearance of the **Start** Window depends on whether or not a project file is open.



When a Project File Is Not Opened



When a Project File Is Opened

The following items are displayed in the **Start** Window.

Project

New: Display the **Create New Project** Dialog Box. A new project file can then be created. (Refer to *1.8.2 Creating New Project Files.*)

Open: Display the **Open Project** Dialog Box. A Project File can then be selected and opened. (Refer to *1.8.3 Opening Project Files.*)

Close: Automatically save and close the project file. (Refer to *1.8.6 Closing Project Files.*)

History (File Name): The names of the five project files most recently created or edited using MPE720 version 6 can be displayed in order beginning with the most recent. If a file name is clicked, the project file is opened. By moving the cursor over a file name, a balloon appears. And the location of the file, the date that the file was created, and the date that it was changed can be confirmed. (Refer to *1.8.3 Opening Project Files.*)

- If any of the above operations (i.e., opening a project file from *New*, *Open*, *Close*, or *History*) are executed while connected to the Machine Controller, the connection will be closed.

Note that the **Close** Button is displayed only when online by project link connection. For details on the project link connection, refer to *1.10.1 Connecting to Machine Controllers.*

Controller

Communications Setting: Display the **Communications Setting** Dialog Box. The communications port can then be set, and a connection can be made to the Machine Controller. (Refer to *1.10.1 Connecting to Machine Controllers*.)

Connection: Enable a connection to the Machine Controller using the communications port that is currently set. (Refer to *1.10.1 Connecting to Machine Controllers*.)

Disconnection: Close the connection with the Machine Controller. (Refer to *1.10.2 Disconnecting from Machine Controllers*.)

History (Connection Name): Up to five connection names (logical port number + port type) that have been used for connections can be displayed. When a connection name is clicked, changes the Machine Controller to which the connection is to be made can be selected. (Refer to *1.10.1 Connecting to Machine Controllers*.)

Help

Help: Starts Acrobat Reader and displays the **Help Selection** Dialog Box. On selecting a PDF file and clicking the **OK** Button, the help for MPE720 version 6 is displayed.

- When the **Close** Button (**X**) in the Start Window is clicked, the start window moves to the last main window without closing. To exit MPE720 version 6, either click the **Close** Button in the **MPE720 Ver.6** Window or select **File - Exit** from the main menu.

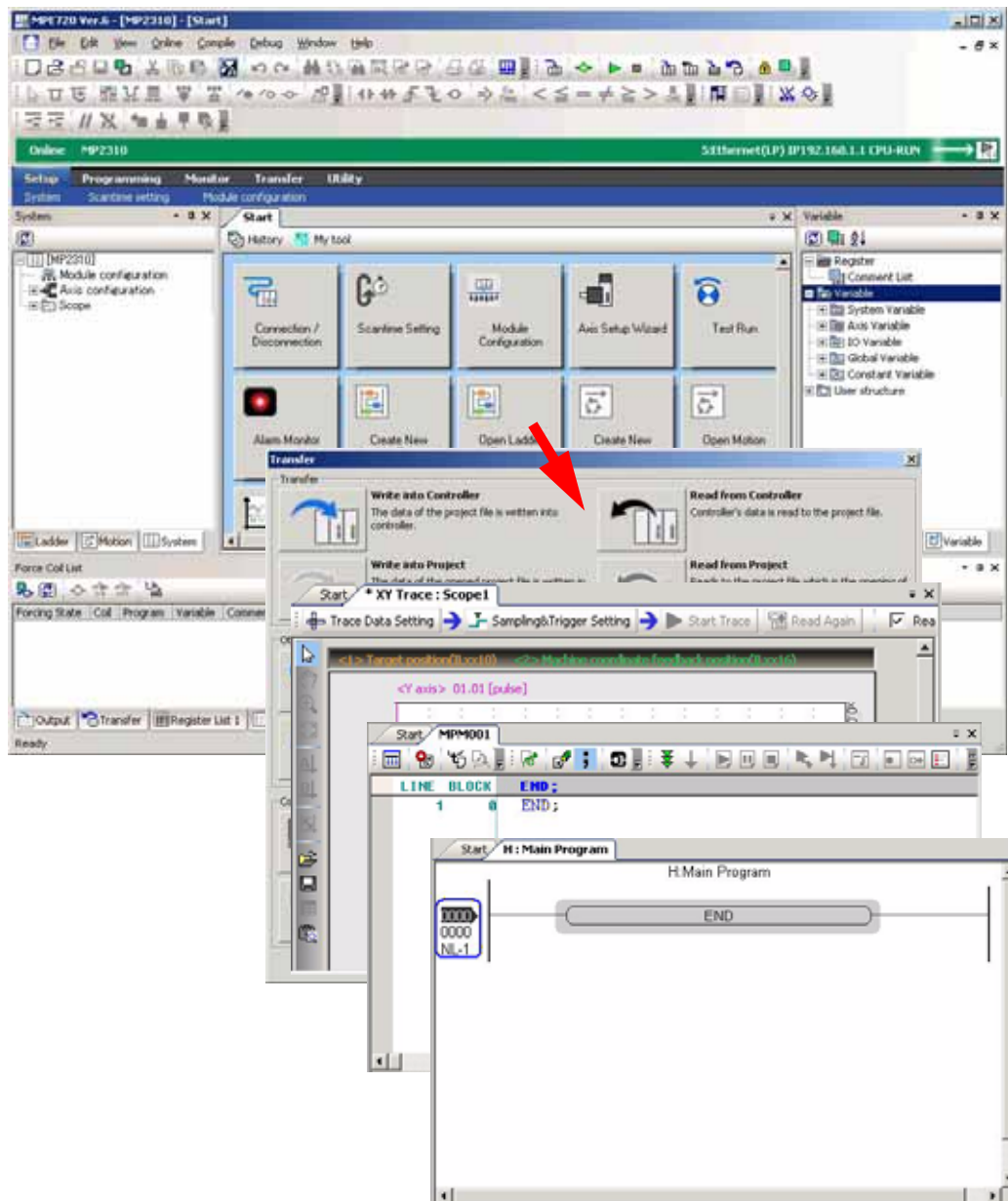
■ Saving Data when Connected to a Machine Controller after Opening a Project File

When MPE720 version 6 is started from a project file and a connection is made to a Machine Controller from the **Communications Setting** Dialog Box or when a connection is made to a Machine Controller from Connection (Connection Name) in the Start Window, the display will be changed to the contents of the application data stored in the Machine Controller RAM. If the displayed application data is edited and then a save or exit (disconnection) operation is executed, the changes will be overwritten in both the Machine Controller RAM and the selected project file (on the computer).

1.6.2 My Tool Window

(1) What is My Tool?

My Tool is the function to facilitate the calling of various functions just by clicking a button displayed in the main window. The buttons registered to **My Tool** can be customized, and registering frequently used functions enables engineering to be started quickly.



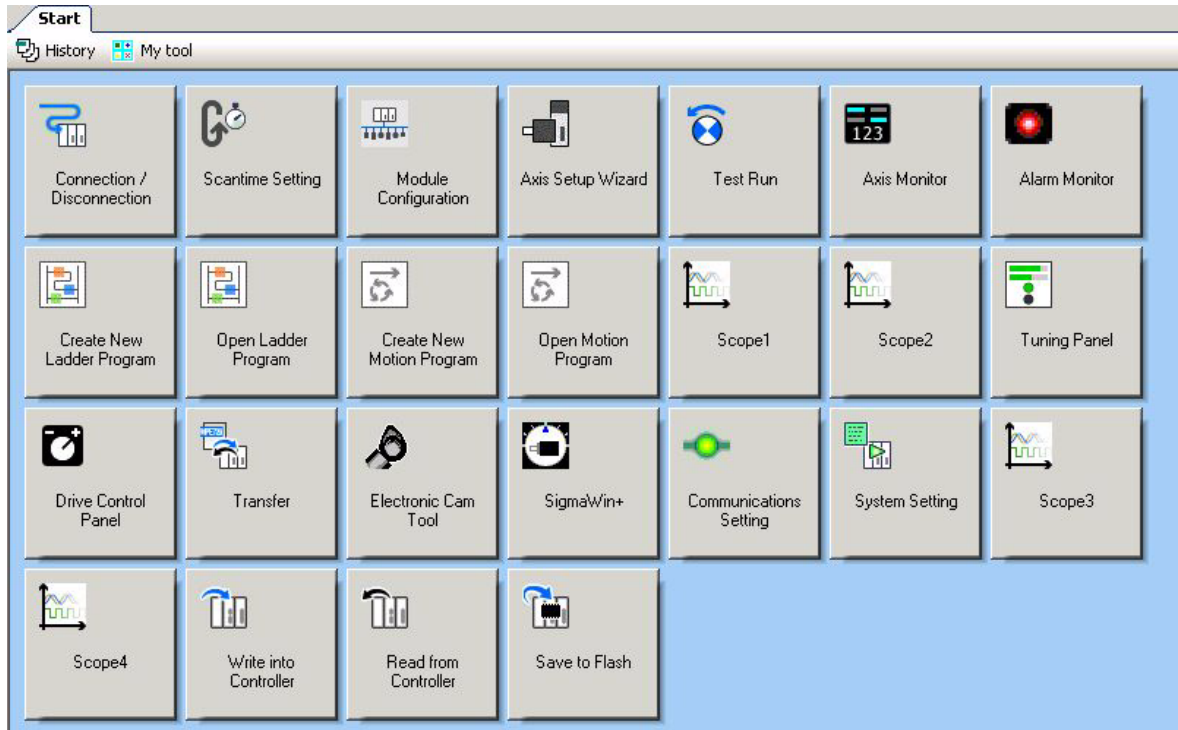
(2) Starting My Tool

My Tool is automatically displayed when a project file is opened, or a connection to the Machine Controller is established.

(3) Names and Descriptions of Components of My Tool

[a] My Tool Buttons

The following buttons can be registered to the **My Tool** Window to enable calling of the functions by clicking the button.



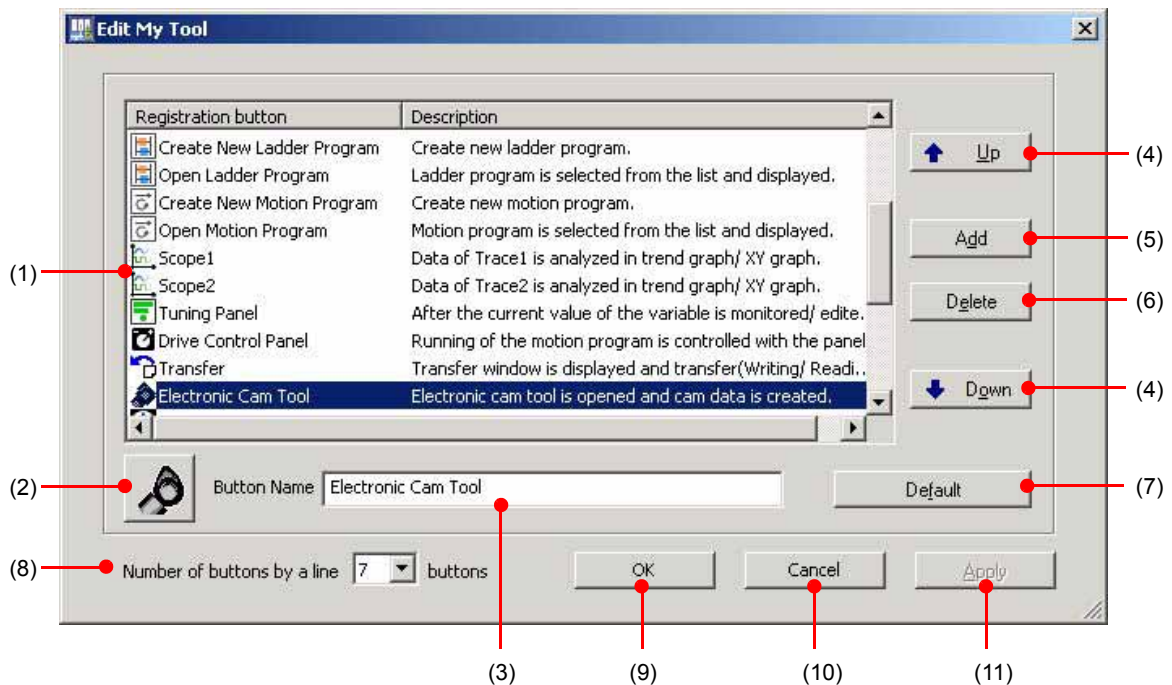
No.	Button	Function
1.	Connection/Disconnection*	Connects/disconnects the Controller.
2.	Scantime Setting*	Sets the high-speed and low-speed scan time.
3.	Module Configuration*	Displays the Module Configuration Window.
4.	Axis Setup Wizard*	Sets up the axes.
5.	Test Run*	Executes test operations of the axes in the jog/step operation mode.
6.	Axis Monitor*	Monitors the operation status of the axes.
7.	Alarm Monitor*	Monitors the alarm status of the axes.
8.	Create New Ladder Program*	Creates a new ladder program. The H diagram, L diagram, A diagram, I diagram, and functions will be created.
9.	Open Ladder Program*	Displays a ladder program selected in the list.
10.	Create New Motion Program*	Creates the main program and subprograms of a motion program and the main program and subprograms of a sequence program. Program numbers can be specified. ♦ The Controller needs to be compatible with sequence programs.
11.	Open Motion Program*	Displays a motion program selected in the list.
12.	Tuning Panel*	Monitors/Edits the current value of variables at the panel and makes adjustments.
13.	Scope 1*	Analyzes the data obtained by scope 1 in the form of a trend graph/XY graph.
14.	Scope 2*	Analyzes the data obtained by scope 2 in the form of a trend graph/XY graph.
15.	Drive Control Panel*	Controls the operation of motion programs from the panel.
16.	SigmaWin+*	Starts SigmaWin+ and makes adjustments for SERVOPACKs.
17.	Transfer*	Displays the Transfer Selection Window to execute transfer functions such as writing/reading/comparison.

18.	Electronic Cam Tool*	Starts the Electronic Cam Tool to create cam data.
19.	Communications Setting*	Sets the communications to connect to the Controller.
20.	System Setting*	Displays the system settings.
21.	Scope 3	Analyzes the data obtained by scope 3 in the form of a trend graph/XY graph.
22.	Scope 4	Analyzes the data obtained by scope 4 in the form of a trend graph/XY graph.
23.	Write into Controller	Writes data of the project file to the Controller.
24.	Read from Controller	Reads the data of the Controller to the project file.
25.	Save to Flash	Writes the data in the Controller RAM to the flash memory.

* Displayed by default.

[b] Edit Window

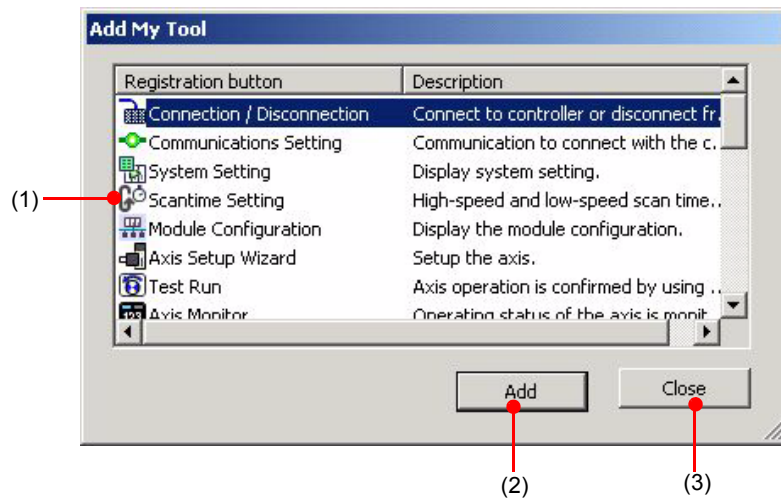
Buttons can be edited, i.e. registered, removed, or sorted, in this window.



No.	Component	Description
(1)	Registration button/Description	Displays the registered buttons and their description.
(2)	Icon	Displays the button selected in (1).
(3)	Button Name	Displays the name of the button selected in (1).
(4)	Up/Down	Moves the button selected in (1) up or down.
(5)	Add	Displays the Add My Tool Window to add a new button. For the details on the adding operation, refer to 1.6.2 My Tool Window.
(6)	Delete	Deletes the button selected in (1).
(7)	Default	Restores the default name and icon of the edited registered button.
(8)	Number of buttons by a line	Sets the number of buttons to be displayed in each row in the My Tool Window. (3 to 10)
(9)	OK	Confirms the edited settings of the button and returns you to the My Tool Window.
(10)	Cancel	Cancels the edited settings of the button and returns you to the My Tool Window.
(11)	Apply	Confirms the edited settings of the button.

[c] Add Window

Pressing (5) the **Add** Button in the [b] *Edit Window* displays the **Add My Tool** Window, enabling addition of a button.



No.	Component	Description
(1)	Registration button/Description	Selects a button to be added.
(2)	Add	Adds the button selected in (1).
(3)	Close	Closes the Add My Tool Window and returns you to the Edit My Tool Window.

(4) Editing My Tool

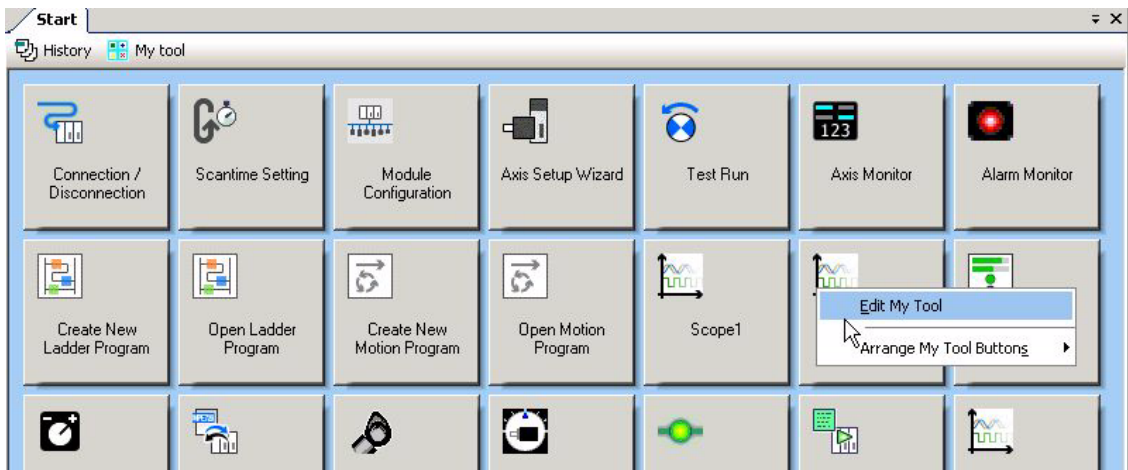
In My Tool, frequently used functions can be registered as buttons, and the names and the arrangement of the buttons can be customized for better comprehension.

- One customized setting is possible for one installation environment of MPE720 version 6.

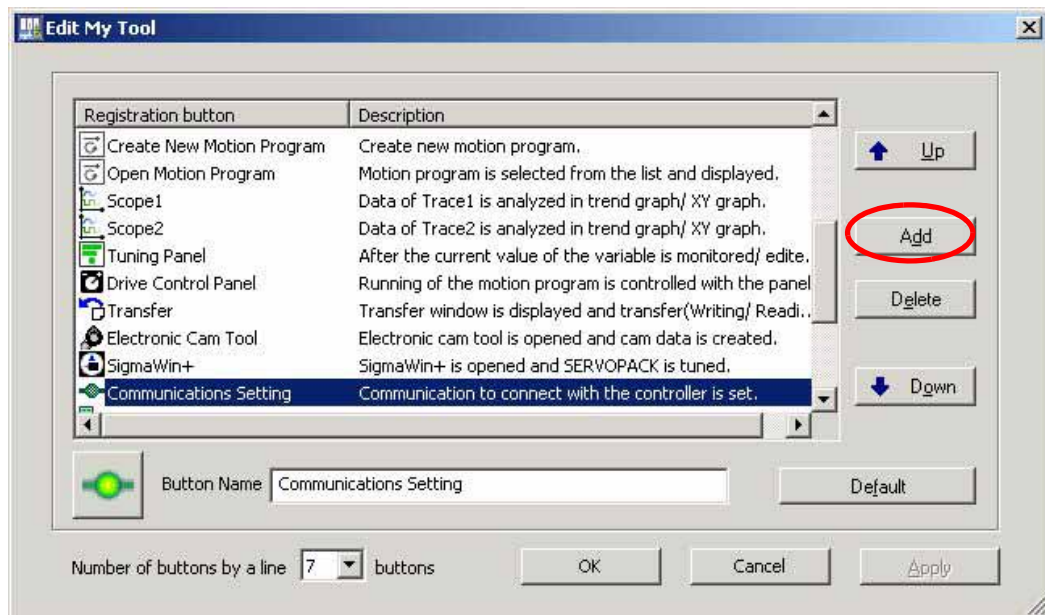
[a] Registering/Removing a Button

■ Registering a Button to be Used in My Tool

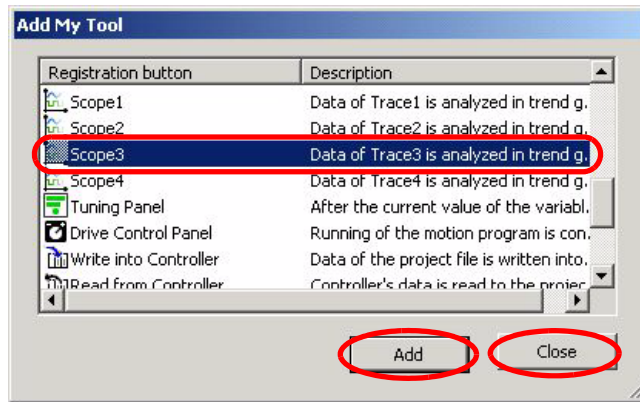
1. Right-click in the **My Tool** Window and select **Edit My Tool** from the pop-up menu.



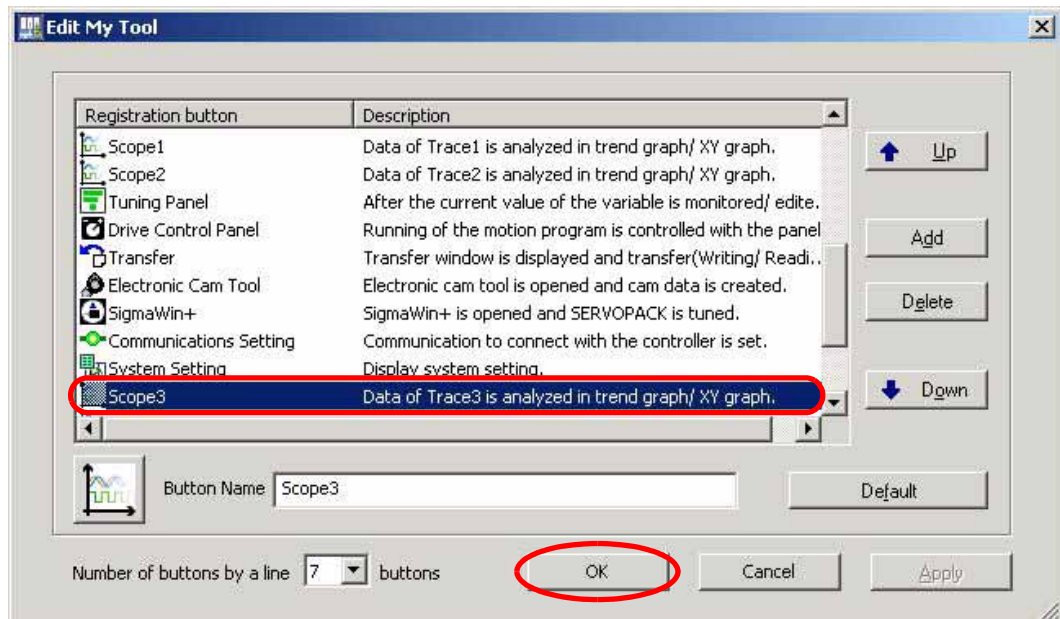
2. The **Edit My Tool** Window will be displayed. Click the **Add** Button.



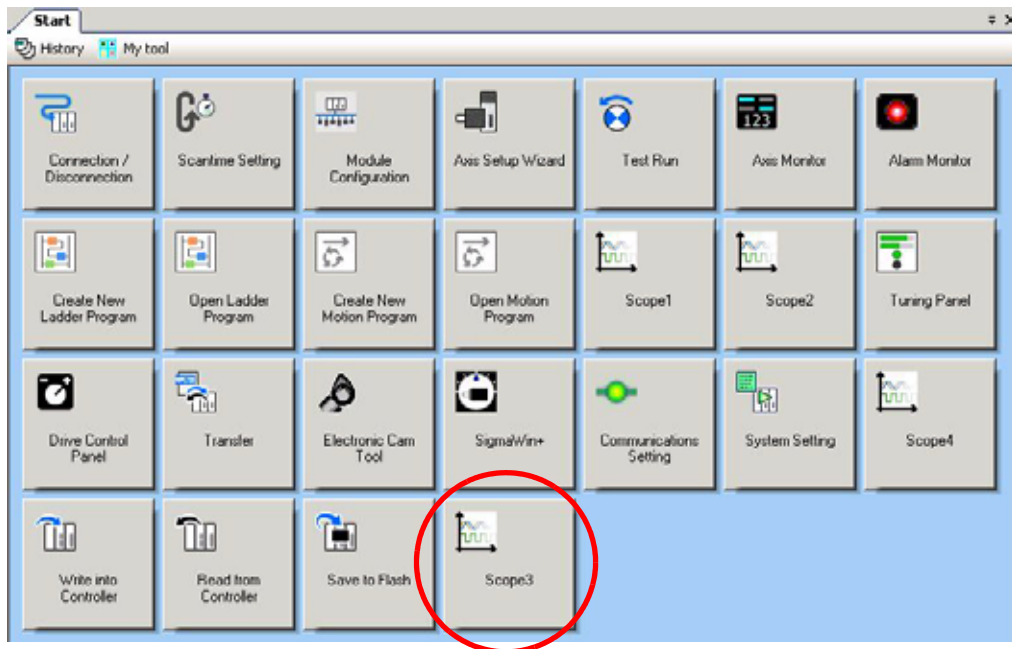
3. The **Add My Tool** Window will be displayed. Select the function to be registered in the **Registration button** column and click the **Add** Button. After registering all desired buttons, click the **Close** Button.



4. The buttons corresponding to the selected functions will be registered in the **Edit My Tool** Window. Click the **OK** Button.

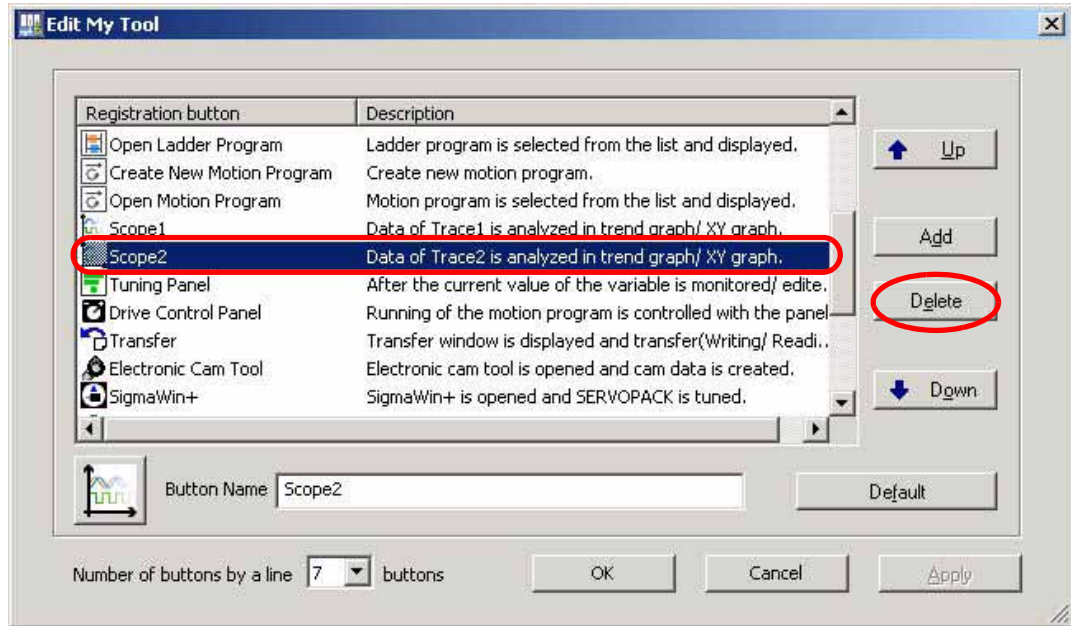


5. The registered buttons will be displayed in the **My Tool** Window.

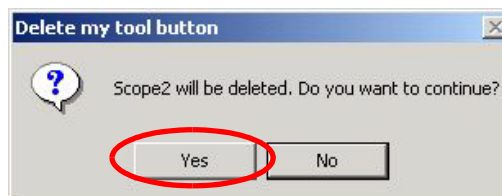


■ Removing Unused Buttons from My Tool

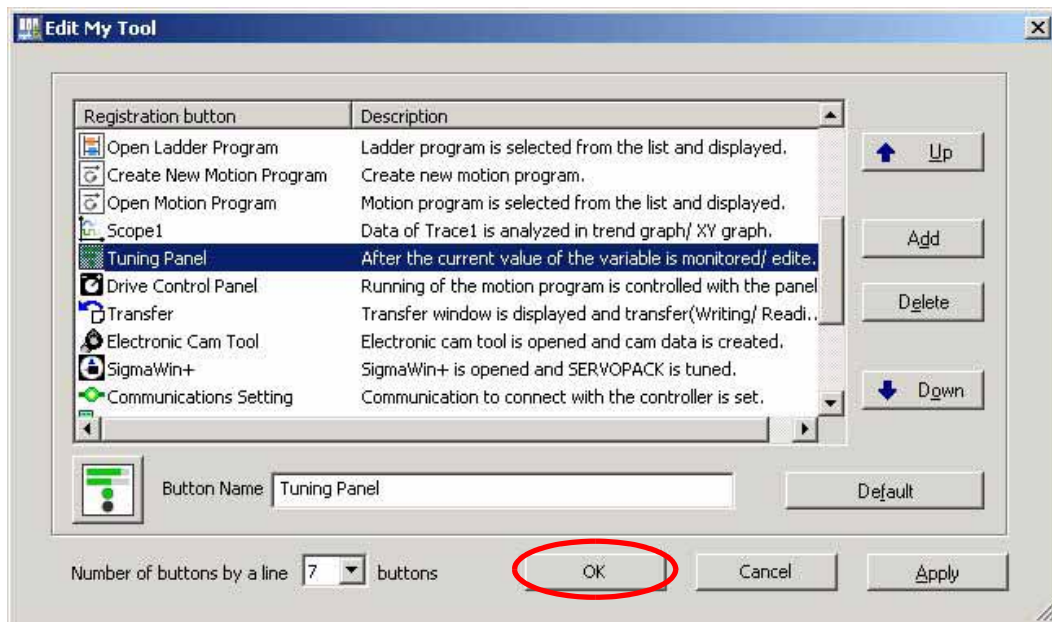
1. Display the **Edit My Tool** Window. Select the function to be removed in the **Registration button** column and click the **Delete** Button.



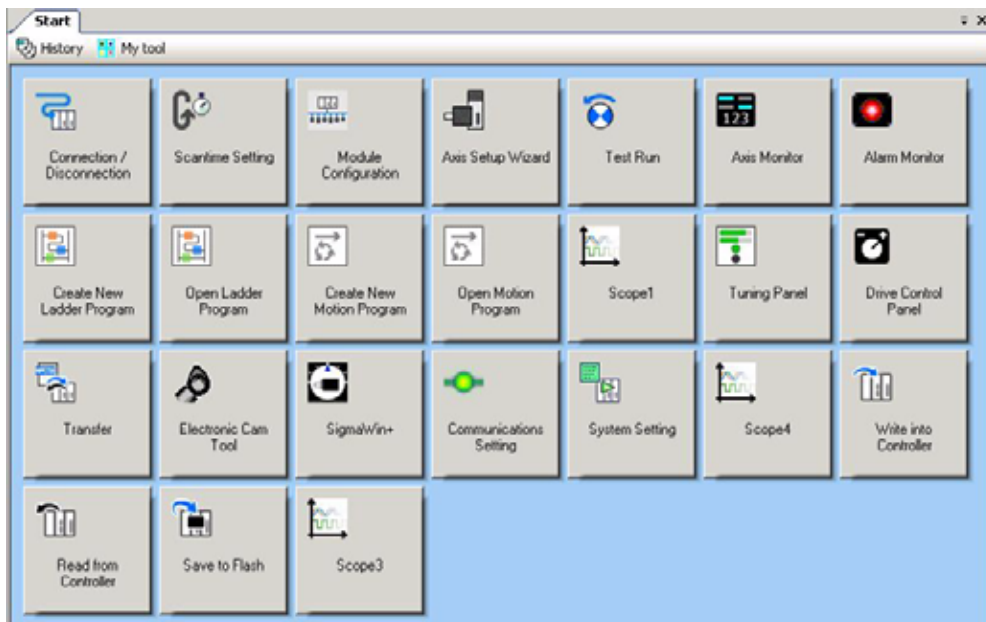
2. A message will be displayed. Click the **Yes** Button.



- The button corresponding to the selected function will be removed from the **Edit My Tool** Window. Click the **OK** Button.



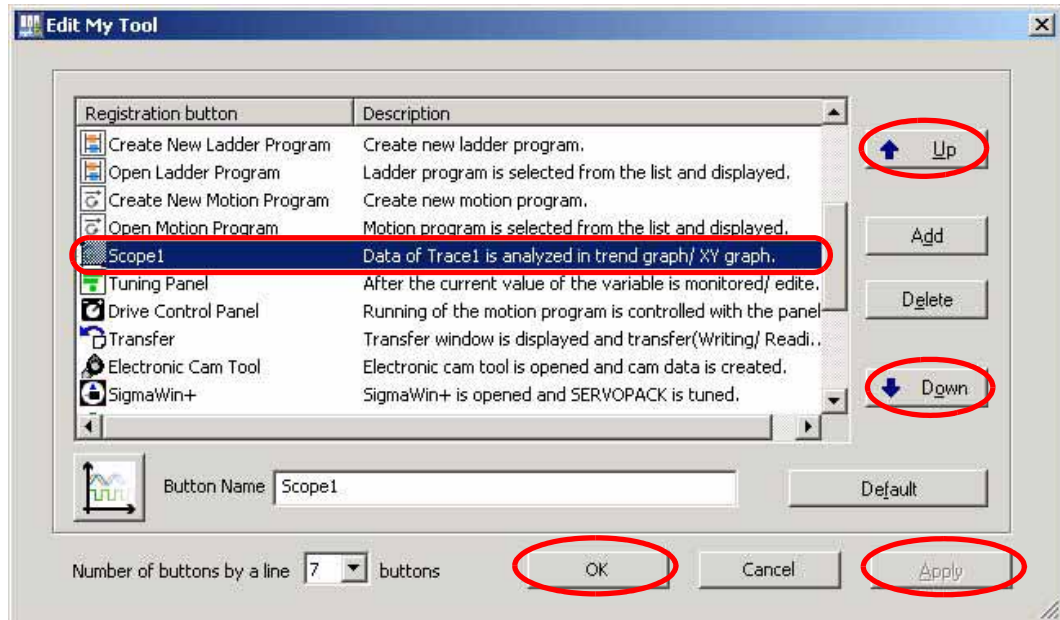
- The button corresponding to the selected function will be removed from the **My Tool** Window.



[b] Setting Buttons for Easier Operation

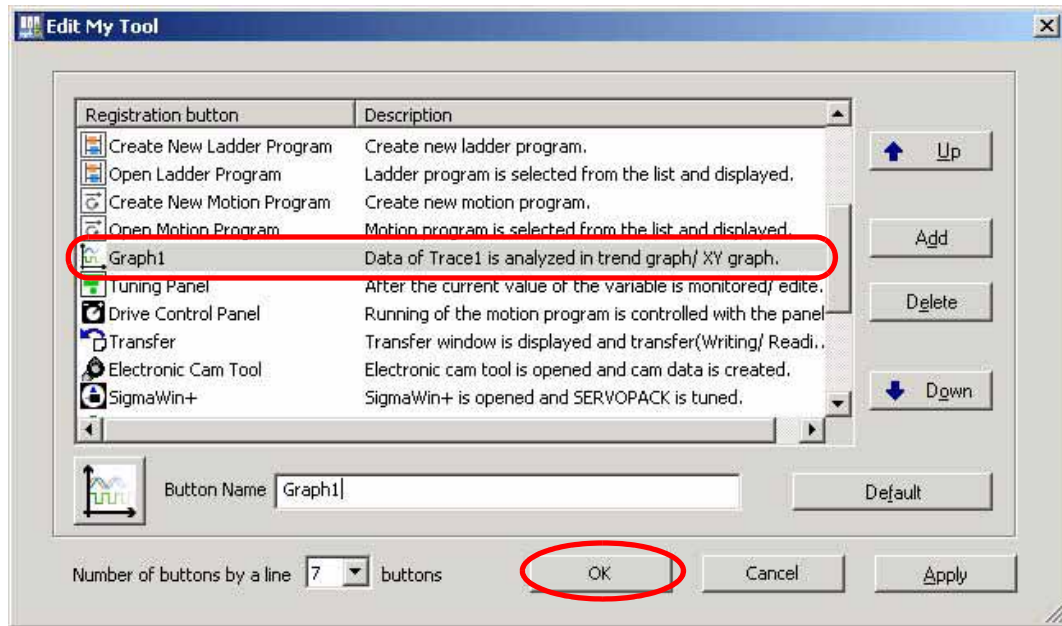
■ Changing the Display Position of a Button

1. Display the **Edit My Tool** Window. Select the function to be moved in the **Registration button** column and click the **Up** or **Down** Button. Then click the **OK** or **Apply** Button.



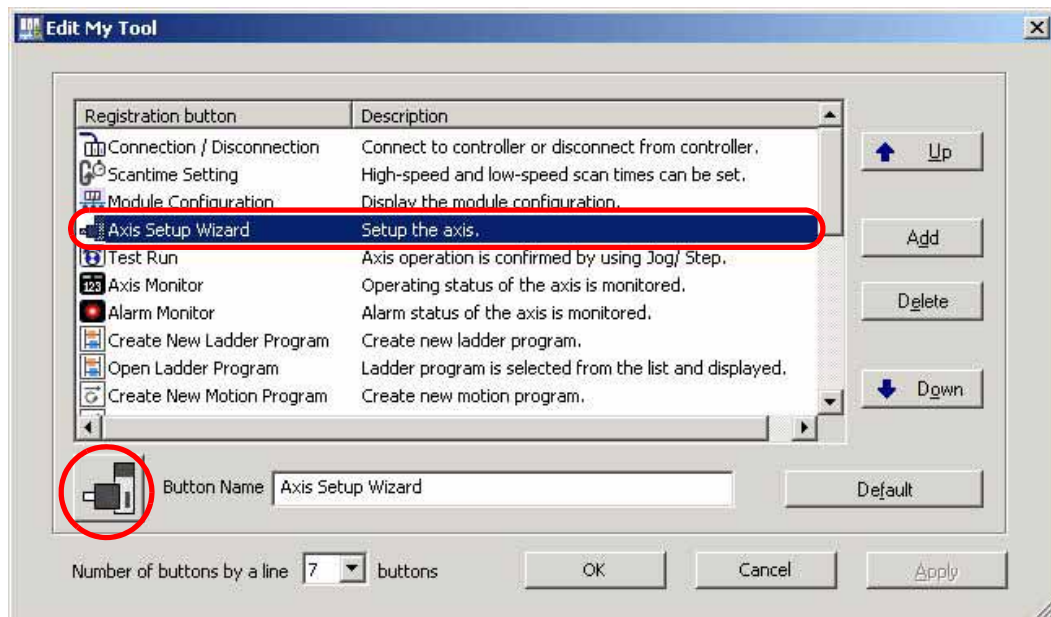
■ Renaming a Button

1. Display the **Edit My Tool** Window. Select the function to be renamed in the **Registration button** column and enter the new name to the **Button Name** field. Then click the **OK** or **Apply** Button.

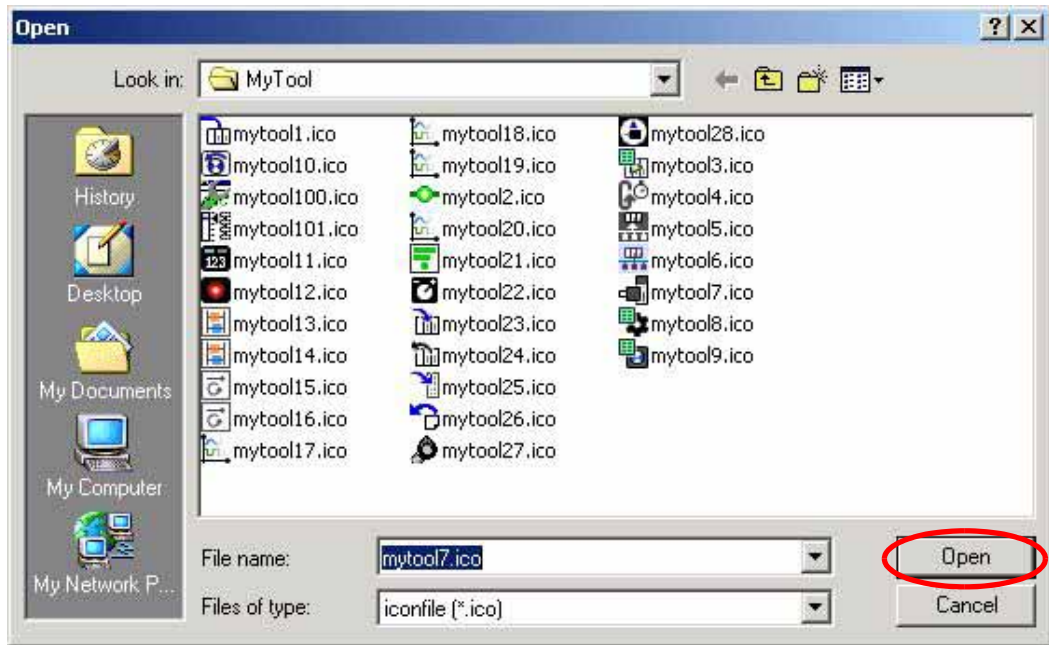


■ Changing the Icon of a Button

1. Display the **Edit My Tool** Window. Select the function to be assigned a new icon in the **Registration button** column and click the icon.

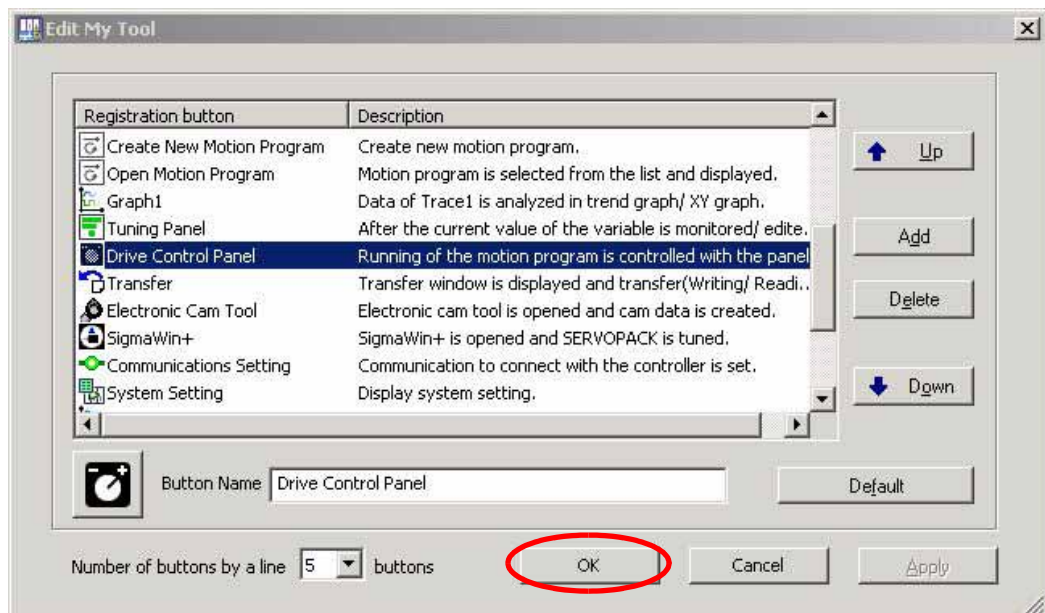


2. Select the image to be assigned and click the **Open** Button.

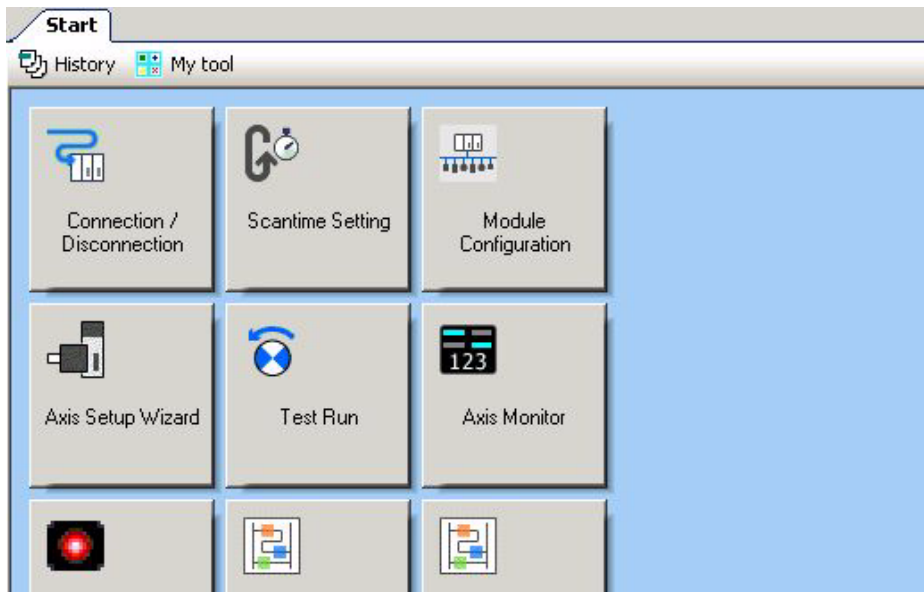


■ Changing the Number of Buttons to be Displayed in Each Row

1. Display the **Edit My Tool** Window. Select a value from the **Number of buttons by a line** list and click the **OK** Button.

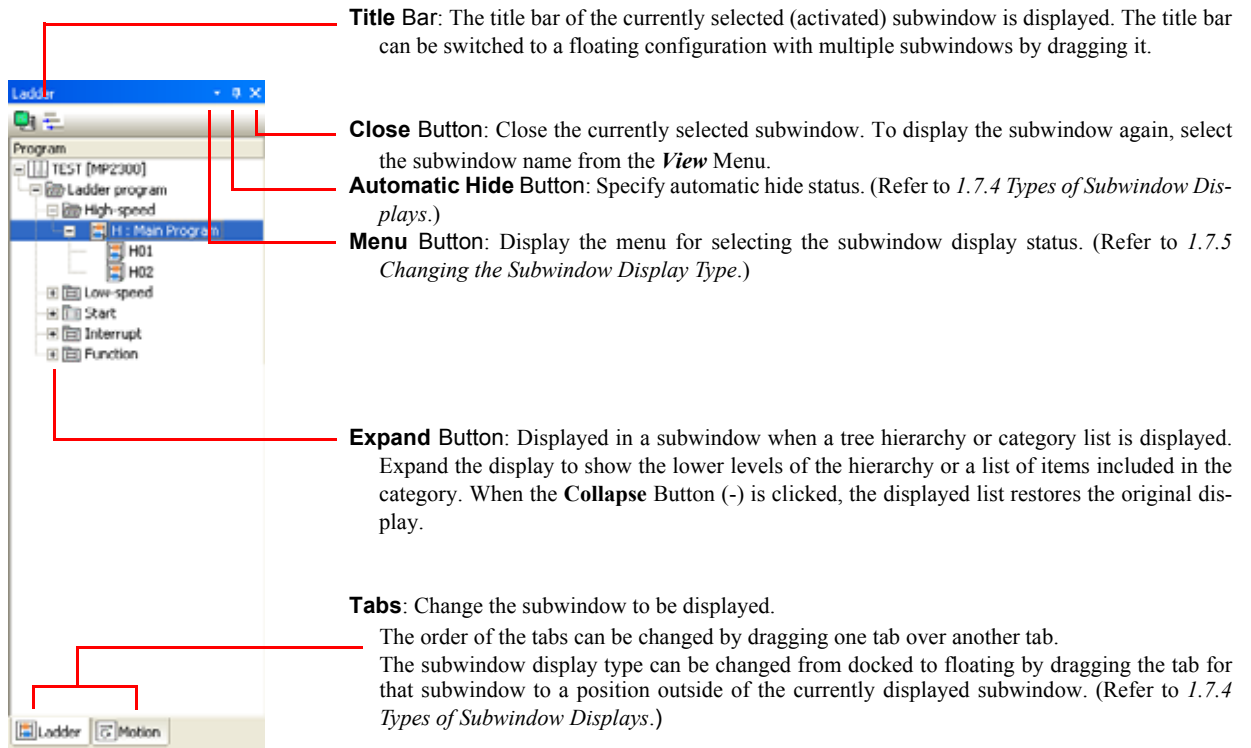


2. The number of buttons to be displayed in each row is changed and the **My Tool** Window will be displayed with the new setting.



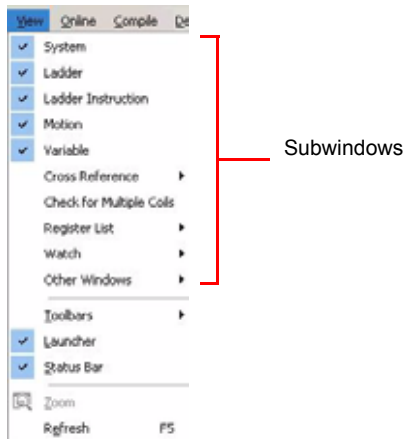
1.7 Subwindow Operations

1.7.1 Descriptions of Subwindow Components



1.7.2 Displaying and Hiding Subwindows

Subwindows can be selected for display from the *View* Menu. When a subwindow that is currently displayed is clicked, the check box is cleared and the subwindow is hidden.



System Subwindow

- Refer to *11.5 Axis Management in the System Subwindow*

Ladder Subwindow

- Refer to *3.4.3 Managing Ladder Program Files.*

Ladder Instruction Subwindow

- Refer to *3.3.10 Inserting Instruction Objects.*

Motion Subwindow

- Refer to *Chapter 4 Motion Programming.*

Variable Subwindow

- Refer to *5.1 Overview.*

Cross Reference Subwindows (1 to 3)

- Refer to *3.5.4 Cross Reference Searching.*

Check for Multiple Coils Subwindow

- Refer to *3.5.5 Searching for Duplicate Coils.*

Register List Subwindows (1 to 3)

- Refer *12.2 Register Lists.*

Watch Subwindows (1 to 3)

- Refer to *12.3 Watch Function.*

Other Windows: Output Subwindow

- Refer to *3.3.17 Ladder Program Compiling and Compile Options.*

Other Windows: Find Subwindows (1 and 2)

- Refer to *3.5.2 Searching and Replacing in a Program.*

Other Windows: Transfer Subwindow

- Refer to *1.12 Security.*

Other Windows: Forced Coil List Subwindow

- Refer to *3.5.6 (2) Changing ON/OFF Status of Forced Coil.*

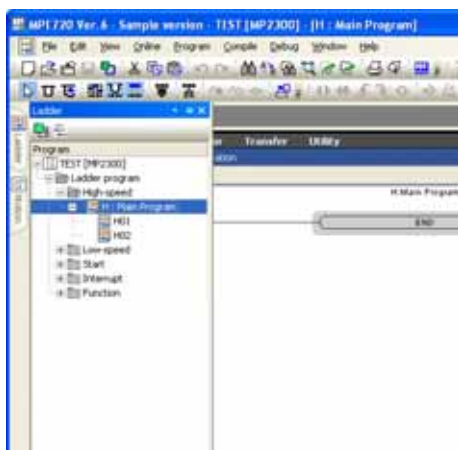
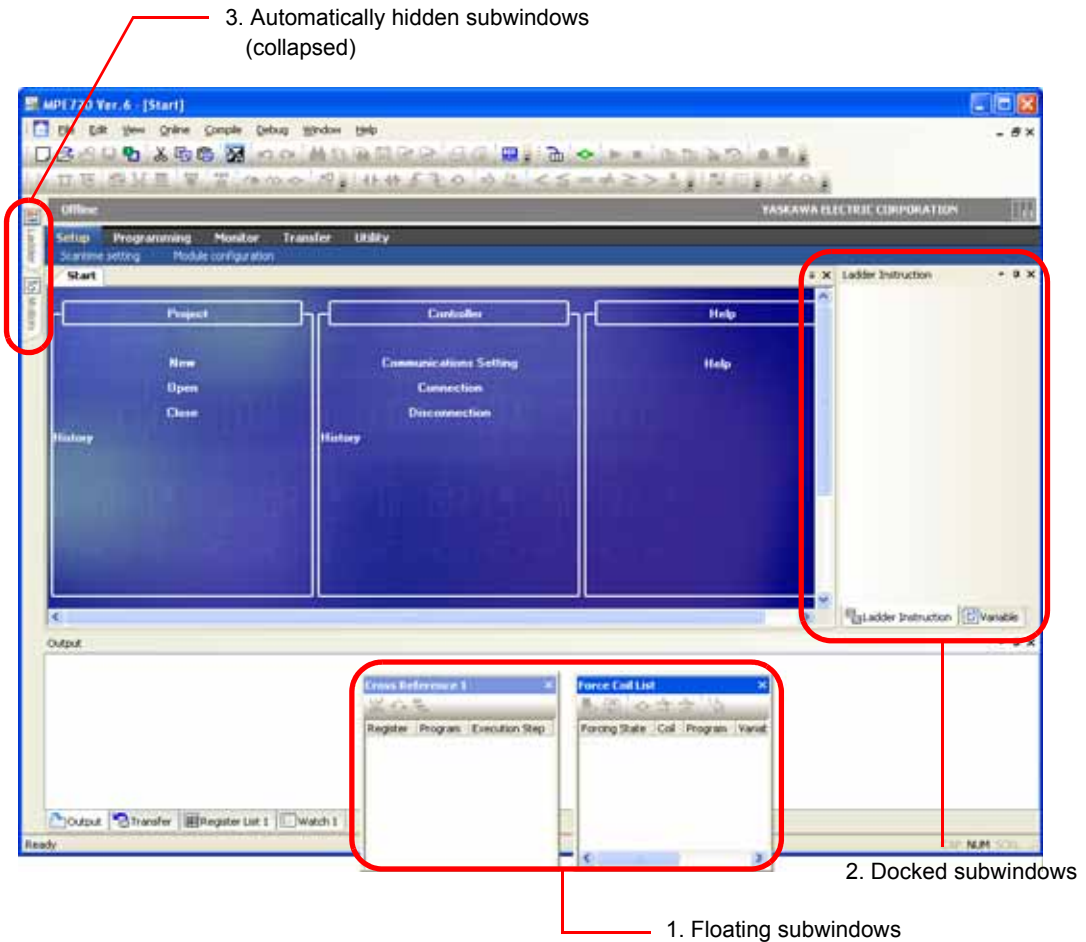
1.7.3 Updating Subwindow Data

The data displayed in a Ladder, Motion, or Variable Subwindow can be updated either by selecting **View - Update** from the Main Menu or by pressing the **F5** Key.

- The above operations update comment lists as well. (Refer to 5.7 Comment Lists.)

1.7.4 Types of Subwindow Displays

The following illustration shows the three types of subwindow displays.



When an Automatically Hidden Subwindow Is Displayed

Subwindows can be displayed in the following three ways:

1. Floating

Displayed apart from the **MPE720 Ver.6** Window. Can be freely moved by dragging the task bar.

2. Docked

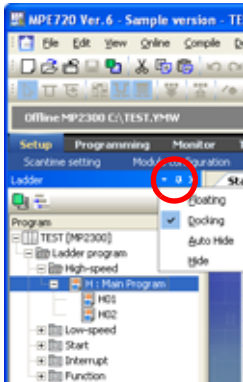
This is the subwindow display type when MPE720 version 6 is first started after being installed. Multiple subwindows are displayed on top of each other just like the main windows. The top subwindow can be changed by clicking the tabs.

3. Automatically Hidden

The subwindow slides out from the side when the relevant tab is clicked, and closes when any location outside of the subwindow is clicked. As shown in the illustration to the left, it is displayed above the main window and below floating subwindows.

1.7.5 Changing the Subwindow Display Type

(1) Selecting from a Menu

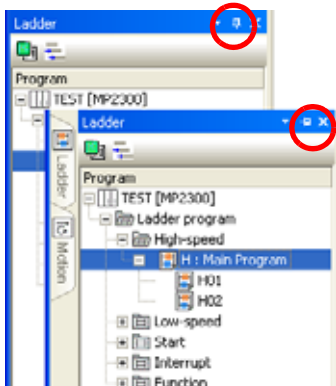




In a subwindow with the **Menu Button** (▼) displayed in the title bar, click the **Menu Button** to display the menu as shown in the illustration on the left. Then select the new type of display on this menu.


To hide the subwindow, select **Hide** on the menu.

- To again display a subwindow that has been hidden, select the subwindow to be displayed from the **View Menu**. (Refer to 1.7.2 *Displaying and Hiding Subwindows*.)

(2) Changing from a Docked to an Auto Hide Subwindow



In a subwindow with the **Automatic Hide Button** ( or ) displayed in the title bar, click this button to toggle between the docked and automatically hidden subwindows.

 : Docked → Auto Hide

 : Auto Hide → Docked

- The form of the **Automatic Hide Button** switches each time it is clicked.
- If multiple subwindows are displayed on top of each other, all of the subwindows become displayed as auto hide subwindows.
- The **Automatic Hide Button** is not displayed in floating subwindows.

(3) Changing the Display Type by Dragging and Dropping

A docked subwindow can be changed to a floating subwindow or vice versa by dragging and dropping a subwindow tab or title bar.

- An auto hide subwindow cannot be changed to another display type by dragging and dropping.

[a] Changing from Docked to Floating

- The title bar of a docked subwindow is double-clicked the display type is changed to floating.
- When a docked subwindow tab or title bar is dragged and dropped in any location, a floating subwindow is displayed in that location.
- When the title bar of a docked subwindow is dragged and dropped when multiple subwindows are stacked, the display type is changed to floating with the multiple subwindows stacked in the same way.

[b] Changing from Floating to Docked

- When the title bar of a floating subwindow is double-clicked, the subwindow will be docked in the original docked position.
- A floating subwindow can be moved to a desired position by dragging the tab or title bar to the left, right, top, or bottom of the main window and releasing the mouse button where the direction icons (◀, ▲, ▶, or ▼) are displayed.
 - A docked subwindow is not allowed on the same side as an auto hide subwindow.
- When a floating subwindow tab or title bar is dragged and dropped when multiple subwindows are stacked, the display type is changed to docked with the subwindows stacked in the same way.

1.8 Project Files

1.8.1 What Is a Project File?

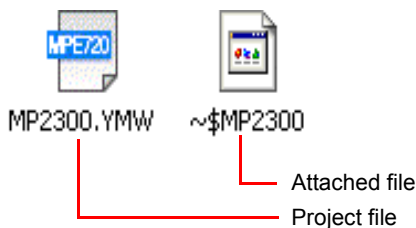
A project file is an application file used for MPE720 version 6 and is configured of the following files.

- **System Configuration Files**
 - System Definitions
 - Scan Time Definitions
 - Module Configuration Definitions
 - Data Trace
- **Program Files**
 - Ladder programs: High-speed, Low-speed, Start, Interrupt, and Function
 - Motion programs: Main, Sub, and Group definitions
 - Table data
 - Variables: Axis, I/O, Global, Constant, and User structure
 - Comments: I/O, Global, and Constant
- **Register Files**
 - M (Data registers), D (Internal registers), C (Constant registers), S (System registers), I (Input registers), and O (Output registers)

Project files keep these files together so that they can be managed as a single file in Windows. The file extension is YMW.

The above files can be edited when the project file is opened.

An attached file is displayed for an open project file, as shown below. This file indicates that the project file is open. When the project file is closed, the attached file is deleted.

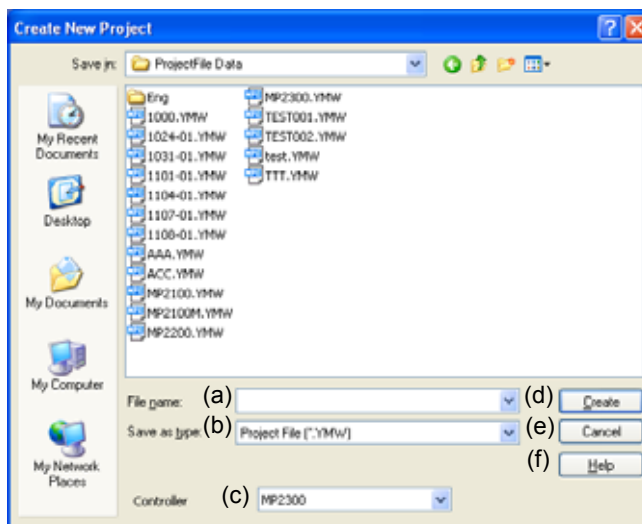


Only one project file can be opened at a time for a single **MPE720 Ver.6** Window. In addition, the same project file cannot be opened in multiple **MPE720 Ver.6** Windows. If an attempt is made to open a project file that is already open, the **MPE720 Ver.6** Window for which the project file is open will be displayed in front.

1.8.2 Creating New Project Files

Use the following procedure to create a new project file.

1. Start the operation in either of the following two ways.
 - Click *New* under *Project* in the **Start Window**.
 - Select **File - Create New Project** from the main menu.
 - If there is an edited file, a message will be displayed asking whether the file is to be compiled and saved. The results of clicking each of the buttons are described below.
 - Yes: Compile, overwrite, and exit.
 - No: Exit without compiling or saving.
 - Cancel: Cancel the new project creation and continue editing.
 - For details on closing a project file, refer to *1.8.6 Closing Project Files*.
2. Open the save destination folder, input the file name, and select the file type and the Machine Controller to be used.

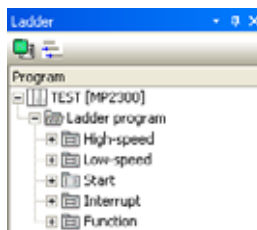


The setting items and methods are as follows.

- (a) File name
 - Enter a name for the project file to be saved.
- (b) Save as type
 - Displays extensions of the project file that can be selected.
 - (Example) Project File (*.YMW)
- (c) Controller
 - Select the type of Machine Controller to be used.
- (d) Create
 - Click this button to create a file with the name entered in (a).
- (e) Cancel
 - Click this button to cancel the Create New Project operation and close the Dialog Box.
- (f) Help
 - Click this button to open the **Help Selection Dialog Box**.
 - The following characters cannot be used in the file name: /, \, :, *, ?, ", <, >, or |.
 - Either *Project Files (*.YMW)* or *All Files (*.*)* can be selected as the *Save as type*, but the project file (.YMW) will be created in either case.

3. Click the **Create** Button.

A message will be displayed notifying that “The project file will be created and opened.” The project file will be created in the specified folder and the new project file will be displayed in the Ladder Subwindow.



After the project file has been created, project file operations can be performed in the Ladder and Motion Subwindows.

- Refer to *1.9 Environment Settings* and *1.10.1 (1) Communications Settings* to make the required settings for the new project file.

After a project file has been created, configure the following settings.

- Communications settings (Refer to *1.10.1 Connecting to Machine Controllers.*)
- Module configuration settings (Refer to *2.1 Module Configuration.*)
- System settings (Refer to *1.9.7 Setup: System Setting.*)
- Scan settings (Refer to *1.9.8 Setup: Scan Time Setting.*)

In addition, configure the following settings as needed.

- User registration settings (Refer to *1.9.4 Security: User Registration.*)
- Default user settings (Refer to *1.9.6 Security: Default User Setting.*)

1.8.3 Opening Project Files

A project file can be opened using either of the following two methods.

- Open the project file in an **MPE720 Ver.6** Window that is already started.
- Start a new **MPE720 Ver.6** Window to open the project file.

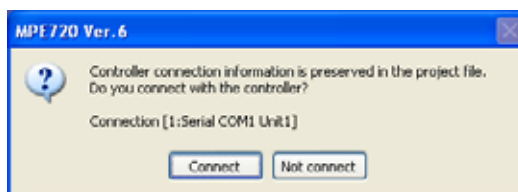
These two methods are described in detail on the following pages.

(1) Opening the Project File in an MPE720 Version 6 Window That Is Already Started

Execute any of the following operations to open a project file in the **MPE720 Ver.6** Window.

- Click a project file name displayed in *History* under *Project* in the **Start** Menu.
- Click **File** in the main menu, and select a project file from the file history displayed in the menu.
- Drag and drop a project file icon into an MPE720 window that is already started.
- Select **File - Open Project** from the main menu, and then select a project file in the **Project File** Dialog Box.
- Click *Open* under *Project* in the **Start** Window, and then select a project file in the **Project File** Dialog Box.

-
- If one of the above operations is executed when another project file is already open in the same window, the project file that was already open will be automatically overwritten and closed. For details on closing project files, refer to *1.8.6 Closing Project Files*.
 - If the contents of *Communications Setting* are saved in the selected project file, the following dialog box will be displayed. (Refer to *1.10.1 Connecting to Machine Controllers*.)



When the **connect** Button Is Clicked

The port set in the *Communications Setting* will be used to connect to the Machine Controller set in the project file, and the application data saved in the Machine Controller RAM will be displayed. If the displayed application data is edited and a save or exit operation is executed, the changes will be overwritten in both the Machine Controller RAM and the selected project file (on the computer).

When the **Not connect** Button Is Clicked

The selected project file will be opened in the **MPE720 Ver.6** Window.

- If a password has been set for the selected project file, the following **Security** Dialog Box will be displayed.



Enter the password that has been set, and then click the **OK** Button.

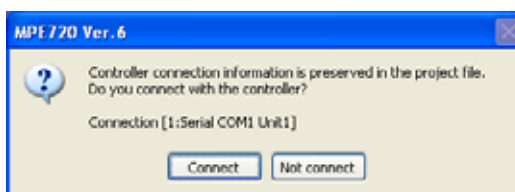
- For details on project file passwords, refer to *1.9.5 Security: Project Password*.
-

(2) Starting a New MPE720 version 6 Window to Open a Project File

The following methods can be used to start a new **MPE720 Ver.6** Window and open a project file.

- Double-click the project file icon.
- Select the project file icon, right-click, and select **Open** from the pop-up menu that will be displayed.
- Drag and drop the **project file** Icon into the **MPE720 Ver.6** Icon.

-
- If the contents of *Communications Setting* are saved in the selected project file, the following dialog box will be displayed. (Refer to *1.10.1 Connecting to Machine Controllers*.)



When the **Connect** Button Is Clicked

The port set in the *Communications Setting* will be used to connect to the Machine Controller set in the project file, and the application data saved in the Machine Controller RAM will be displayed. If the displayed application data is edited and saved, the changes will be overwritten in both the Machine Controller RAM and the selected project file (on the computer).

When the **Not connect** Button Is Clicked

The project file (on the computer) that was first selected will be displayed.

- If a password has been set for the selected project file, the following **Security** Dialog Box will be displayed.



Enter the password that has been set, and then click the **OK** Button.

- For details on project file passwords, refer to *1.9.5 Security: Project Password*.
-

1.8.4 Opening an MPE720 Version 5 MAL File

A MAL file (PLC folder compression file) that was created in MPE720 version 5 can be converted to a YMW file and opened using the following procedure.

- A PLC folder is compressed by selecting **File - Transfer - Block Transfer - File Transfer [MPE720 to Media]** in the MPE720 version 5 File Manager, and then selecting the *Compress* option in the **Execution Confirmation Dialog Box**.
- When MAL files are converted to project files, new ladder programs that were not compiled and saved will not be converted. Confirm that Verify All Programs has been executed in MPE720 version 5 before creating a MAL file.

1. Start MPE720 version 6.

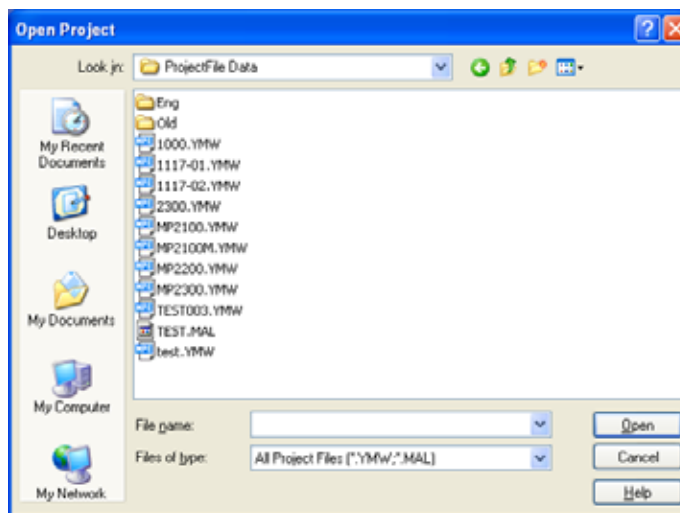
- For details, refer to *1.4.1 Starting MPE720 Version 6*.

2. Select **File - Open Project** from the Main Menu. Alternatively, select *Open* under *Project* in the **Start Window**.

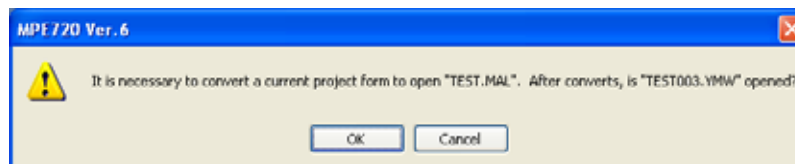
The **Open Project** Dialog Box will be displayed.

- A MAL file can be opened by dragging and dropping into an **MPE720 Ver.6** Window that is already open. If doing that, skip to step 4.

3. Select a file with an MAL extension, and click the **Open** Button.

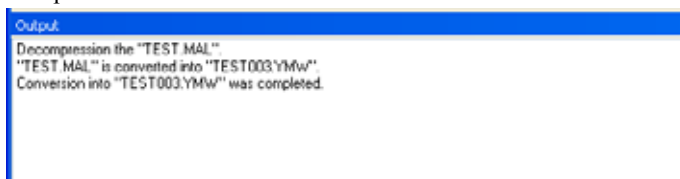


A message asking for confirmation will be displayed.



4. Click the **OK** Button.

Conversion to a project file will begin, and a conversion log will be displayed in the Output Subwindow. When the conversion has been successfully completed, the message notifying that “Conversion has been completed.” will be displayed in the Output Subwindow.



1.8.5 Saving Project Files

A project file can be overwritten or save as a new file.

(1) Overwriting Project Files

1. Select **File - Save Project** from the Main Menu.

The edited project file will be overwritten after the message notifying that “The project file is being saved. Please wait for a minute.”

(2) Saving as Project File



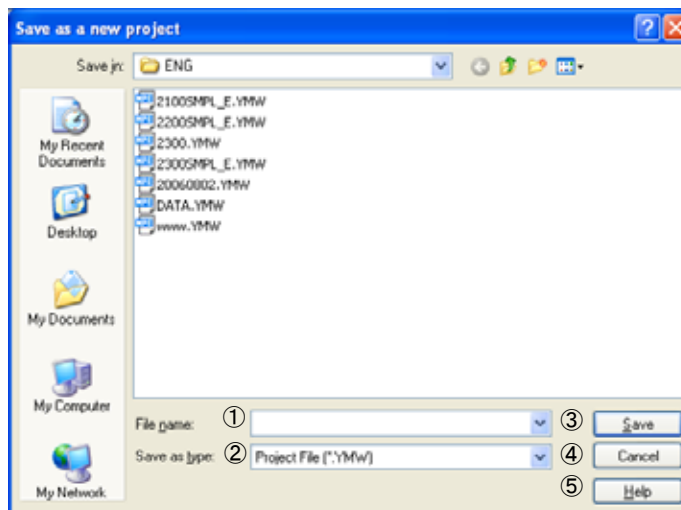
- If a saving error occurs while overwriting a project file.
When overwriting a project file by executing the Save Project command, a saving error may occur. If an error occurs, the project file can be restored by renaming the following files with the extension “.YMW”.
***.YMW~Backup: Backup of the project file before overwriting.
***.YMW~MW: Backup of the project file after overwriting.

1. Select **File - Save as a new Project** from the main menu.

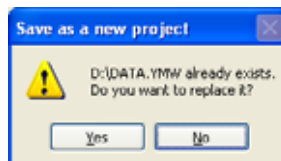
The **Save as a new Project** Dialog Box will be displayed.

2. Enter a project file name, and then click the **Save** Button.

- An existing project file can be opened if it is not opened by another computer running MPE720 version 6.



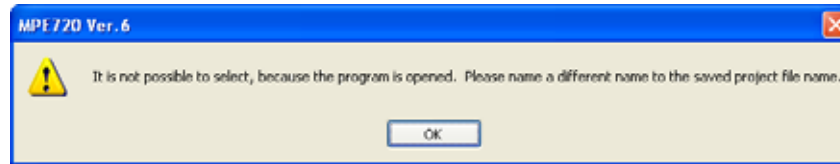
If a project file with the same name already exists in the specified folder, a message asking for confirmation to overwrite the existing file will appear.



Yes: The existing file is overwritten with the new project file and the selected name.

No: The project file is not saved, and the **Save as a new Project** Dialog Box will be displayed.

If the project file to be overwritten is opened by another MPE720 version 6, the following error message will appear and the file cannot be saved.



Click **OK** to return to the **Save as a new Project** Dialog Box.

Change the name of the project file or close the project file on the other computer and then save the project file.

1.8.6 Closing Project Files

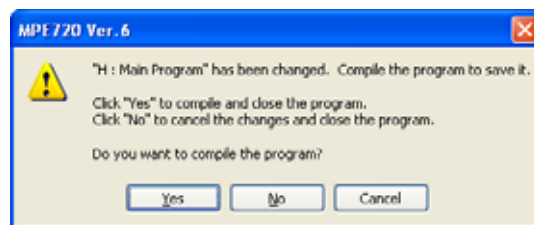
To close an edited project file, either select **File - Close Project** from the main menu or click *Close* under *Project* in the **Start** Window.

The project file will be saved, and then the display will be disappeared from the subwindow. In addition, the attached file displayed while the project file is open will be deleted.

If MPE720 version 6 is closed without first closing a project file, the opened project file will be saved and closed.

If MPE720 version 6 is closed without first compiling an edited program, the following confirmation message will be displayed.

- If there are multiple programs that are not compiled, the message will be displayed once for each program.



Yes: After the applicable program has been compiled, it will be saved and closed. If a compile error occurs during the compiling, closing the project file will be cancelled as if the **Cancel** Button had been clicked and editing can be continued.

No: The applicable program will be closed without saving the changes.

Cancel: Closing the project file will be cancelled and editing can be continued. All programs closed up to that point, however, will remain closed.

When all uncompiled programs are closed, the project file will close.

If there is a connection to a Machine Controller when the project file is closed, the connection will be closed at the same time.

1.8.7 Moving Project Files: Deleting, Copying, and Renaming Project Files

Just as with other Windows application files, operations such as moving project files to other folders or deleting, copying, or renaming project files can be executed using a file manager tool such as Explorer.

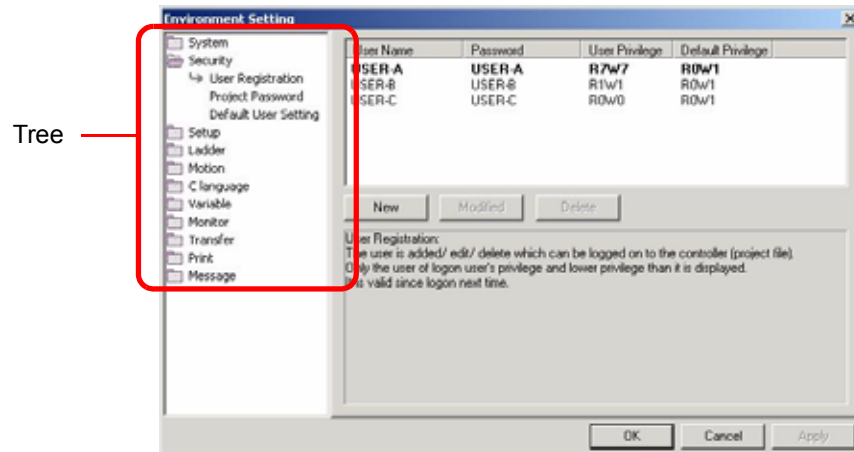
Shortcut keys, such as Ctrl+C (copy), Ctrl+X (cut), and Ctrl+V (paste) can also be used.

1.9 Environment Settings

The environment settings required for project files can be made in the **Environment Setting** Dialog Box.

1.9.1 Environment Setting Dialog Box

The **Environment Setting** Dialog Box will be displayed as shown below by selecting **File - Environment Setting** from the Main Menu.



The following settings can be made by selecting items from the tree. (*Controller Type* is for reference only.)

- An asterisk (*) is displayed next to any item for which the setting has been changed after the **Environment Setting** Dialog Box is opened.

System

Communications Settings (Refer to 1.9.2 *System: Communication Setting*.)

Controller Type (For reference only. Refer to 1.9.3 *System: Controller Type*.)

Security

User Registration (Refer to 1.9.4 *Security: User Registration*.)

Protect Password (Refer to 1.9.5 *Security: Project Password*.)

Default User Settings (Refer to 1.9.6 *Security: Default User Setting*.)

Setup

System Settings (Refer to 1.9.7 *Setup: System Setting*.)

Scan Time Settings (Refer to 1.9.8 *Setup: Scan Time Setting*.)

Ladder

General (Refer to 1.9.9 *Ladder: General*.)

Motion

Tab (Refer to 1.9.10 *Motion/Tab*.)

Font and Color (Refer to 1.9.11 *Motion/Font*.)

C language

General (Refer to 1.9.12 *C Language: General*.)

Linker

Variables

Variables (Refer to 1.9.14 *Variable: Variable*.)

Monitor

System Monitor (Refer to 1.9.15 *Monitor: System Monitor*.)

Transfer

Transfer (Refer to 1.9.16 *Transfer: Transfer*.)

MP Loader (Refer to 1.9.17 *Transfer: MP Loader*.)

Print

Ladder (Refer to 1.9.18 *Print: Ladder*.)

The following operations are executed by clicking the buttons.

When the **OK** Button is clicked:

The current settings are saved, the **Environment Setting** Dialog Box is closed, and any changes are reflected.

When the **Cancel** Button is clicked:

Changes to the settings are cancelled, and the **Environment Setting** Dialog Box is closed.

When the **Apply** Button is clicked:

Changes to the settings are overwritten and are immediately reflected. The **Environment Setting** Dialog Box remains open, allowing more settings to be made.

- Be careful when clicking the **Apply** Button or the **OK** Button. Clicking the **Apply** Button or the **OK** Button overwrites the setting the items of tree in the **Environment Setting** Dialog Box.

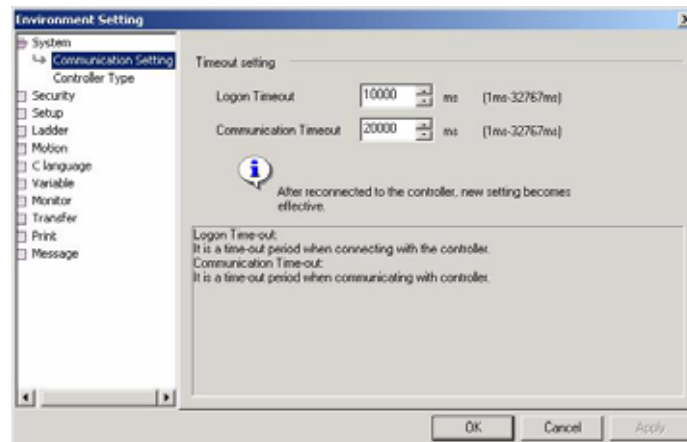
The methods for setting these items are described in detail below.

1.9.2 System: Communication Setting

The timeout can be set for connecting and communicating with the Machine Controller.

Select *System - Communications Setting* from the tree in the **Environment Setting** Dialog Box to bring up that window, and then change the settings. (Refer to *1.9.1 Environment Setting Dialog Box*.)

- Any changes made to the settings in this window will not be reflected until the next connection to the Machine Controller, even if the **Apply** Button is clicked.



Logon Timeout (1 ms to 32,767 ms)

Set the timeout time for when connecting to the Machine Controller. An error will occur if a connection is not completed within the set time after the connection operation has been started.

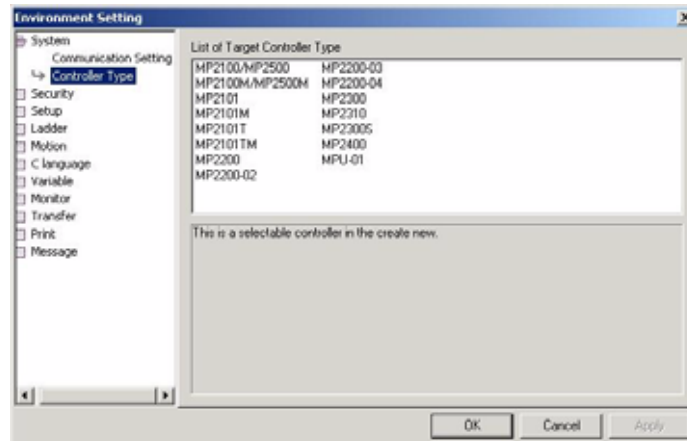
Communication Timeout (1 ms to 32,767 ms)

Set the timeout time for communications with the Machine Controller. An error will occur if communications are not restarted within the set time.

1.9.3 System: Controller Type

When a new project file is created, a list of Machine Controllers can be referenced that will be displayed in the Combo box.

Select *System - Controller Type* from the tree in the **Environment Setting** Dialog Box to bring up the following window for reference. (Refer to *1.9.1 Environment Setting Dialog Box*.) These settings cannot be changed.

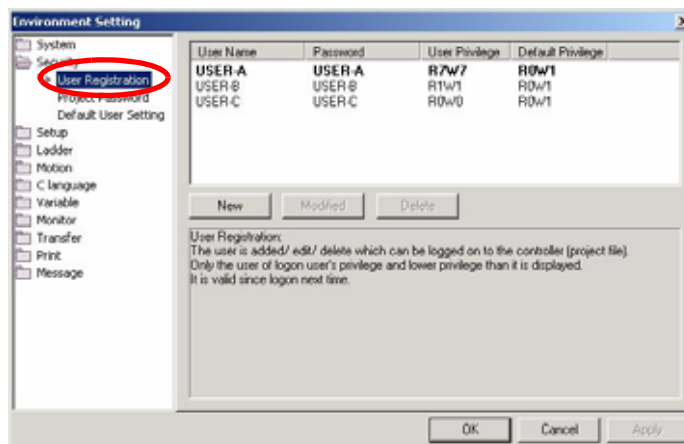


1.9.4 Security: User Registration

The users are allowed to open a project file can be registered and changed.

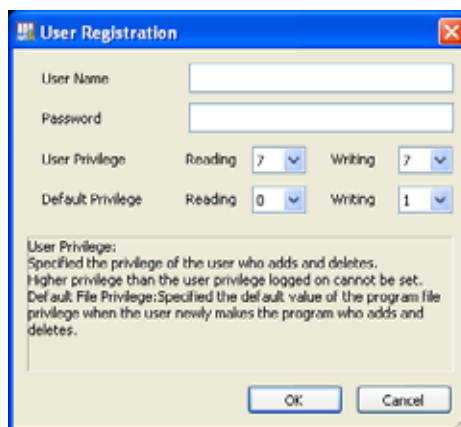
These settings can be made while the project file is open or while connected to the Machine Controller. If the settings are made while connected to the Machine Controller, they become the settings for access and writing rights to the Machine Controller.

Select *Security - User Registration* from the tree in the **Environment Setting** Dialog Box to bring up that window, and then make the settings. (Refer to *1.9.1 Environment Setting Dialog Box*.)



(1) Registering New Users

Click the **New** Button in the User Registration Window. The **User Registration** Dialog Box will be displayed as shown below. Set each item, and then click the **OK** Button.



User Name: Enter a name using from 1 to 16 alphanumeric characters.

Password: Enter a password using from 1 to 16 alphanumeric characters.

User Privilege:

Select privilege levels of 0 to 7 for the user's reading and writing privileges. The higher the number, the greater the user's privileges will be.

- For details on reading and writing privileges, see *Reading and Writing Privileges* on the following pages.

Default Privileges

Set the privilege level to be set by default when the user creates a new program.



- Once a password has been set, be very careful not to forget it. If a password that has been set is forgotten, there is no way to undo it, and that user will no longer be able to open the project file.

■ Reading and Writing Privileges

Reading and writing privilege levels are established to maintain program security. To open a particular program, the user must have a privilege level at least as high as the program's reading privilege level. Similarly, to edit and save a program, the user must have a privilege level at least as high as the program's writing privilege level.

(2) Changing Registration Information

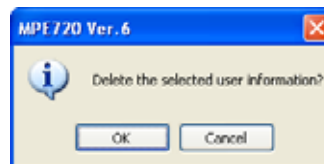
In the User Registration Window of the **Environment Setting** Dialog Box, select the user whose information is to be changed, and click the **Modified** Button. Set the required items in the **User Registration** Dialog Box that will be displayed, and click the **OK** Button. The user information will be changed.



- For details on the registration contents, refer to (1) *Registering New Users* on the previous page.
- If the default user has been selected, only the default privileges can be changed.
- For details on specifying the default user, refer to *1.9.6 Security: Default User Setting*.)

(3) Deleting User Registrations

In the **User Registration** Window of the **Environment Setting** Dialog Box, select the user whose information is to be deleted, and click the **Delete** Button. Then click the **OK** Button in the dialog box displayed for confirmation. The selected user information will be deleted.



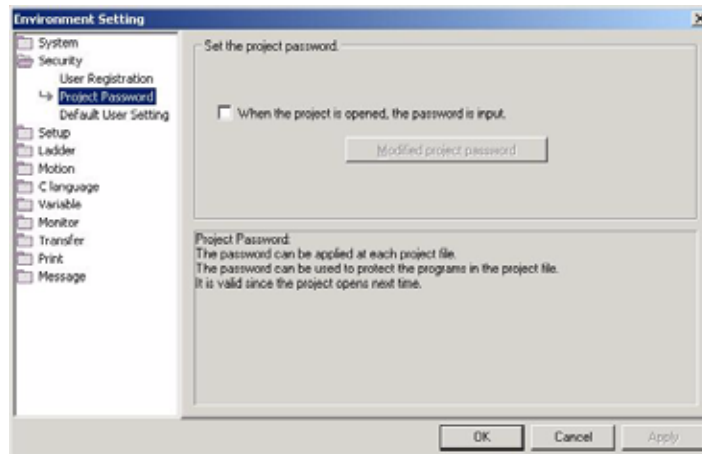
1.9.5 Security: Project Password

A password can be set for a project file that is currently open.



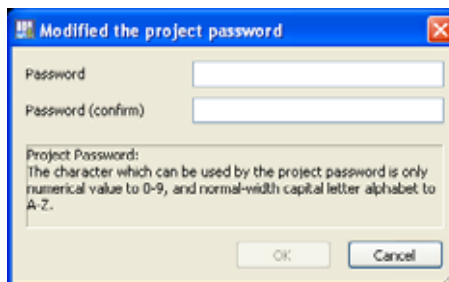
- Once a password has been set for a project file, be very careful not to forget it. If a password that has been set is forgotten, there is no way to undo it that project file can no longer be opened.

Select **Security - Project Password** from the tree in the **Environment Setting** Dialog Box to bring up that window, and then make the settings. (Refer to *1.9.1 Environment Setting Dialog Box*.)



(1) Registering and Changing Passwords

Select the ***When the project is opened, the password is input*** option in the Project Password Area, and then click the **Modified project password** Button. The **Modified the project password** Dialog Box will be displayed as shown below. Set each item, and then click the **OK** Button.



Password

Enter a new password using from 1 to 16 alphanumeric characters. No distinction is made between upper and lower case.

Password (confirm)

Enter the same password again for confirmation, and then press the **OK** Button.

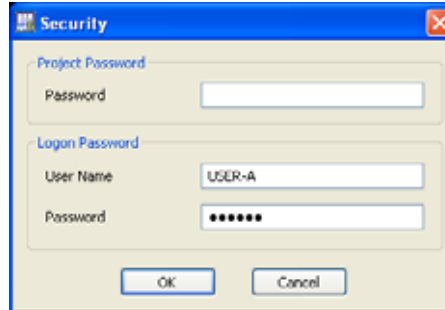
- The **OK** Button is valid when one or more characters of text are entered in the *Password (Confirm)* Field.

(2) Deleting Passwords

To clear the password that has been set, clear the ***When the project is opened, the password is input*** option in the Project Password Area.

(3) Opening a Project File for Which a Password Has Been Set

When an attempt is made to open a project file for which a password has been set, the **Security** Dialog Box will be displayed as shown below.



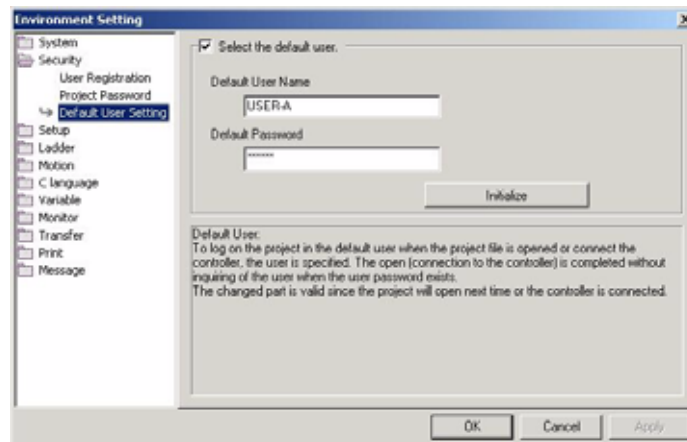
Enter the project password has been set, and then click the **OK** Button. The project file can then be opened.

1.9.6 Security: Default User Setting

A default user can be specified, and the default user name and password can be set.

When *Select the default user* is selected option, the default user information (user name and password) will be found when an attempt is made to open the project file. If the user registration settings are the same as the default user settings for the project file, then the project file can be opened without logging in. If the user settings are not the same, a dialog box will be displayed for logging in.

Select **Security - Default User Setting** from the tree in the **Environment Setting** Dialog Box to bring up that window, and then make the settings. (Refer to 1.9.1 Environment Setting Dialog Box.)



Select the Default User.

When this option is selected, the project file (or Machine Controller) can be accessed by the default user account.

Default User Name

Enter the default user name using from 1 to 16 alphanumeric characters.

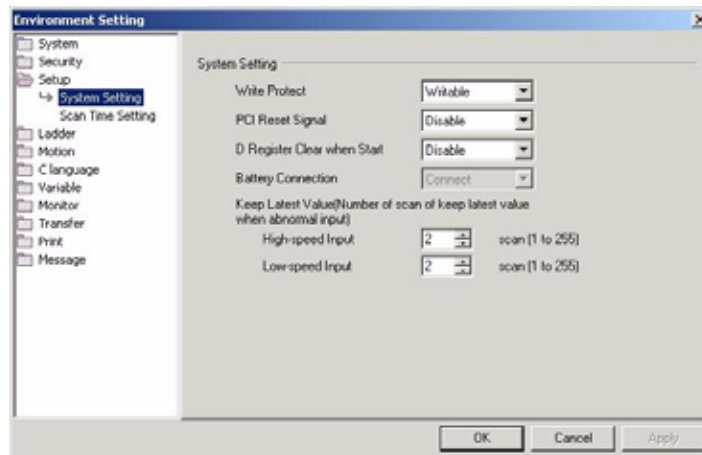
Default Password

Enter the default password using from 1 to 16 alphanumeric characters.

1.9.7 Setup: System Setting

System settings, such as those for program security and clearing of the D register at startup, can be made for program files that are currently being used.

Select **Setup - System Setting** from the tree in the **Environment Setting** Dialog Box to bring up that window, and then make the settings. (Refer to *1.9.1 Environment Setting Dialog Box*.)



● System Settings

Write Protect

Select **Writable** or **Not Writable** to allow or prohibit the writing of program data to the Machine Controller. If **Not writable** is selected, data cannot be transferred to the Machine Controller and the program cannot be edited or compiled while connected, online, to the Machine Controller.

PCI Reset Signal (MP2100/2500 Only)

Select from **Enable** or **Disable** whether PCI reset signals of the MP2100/MP2500 are to be valid or invalid.

D Register Clear when Start

Select from **Enable** or **Disable** whether or not the D registers are to be cleared when the Machine Controller is started. If **Disable** is selected, the contents of the D registers in flash memory will be read to RAM.

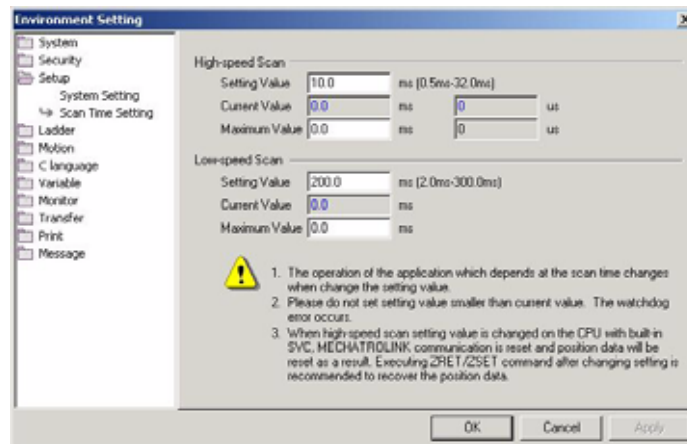
Keep Latest Value

Set a number from 1 to 255 to specify the number of previous input values to be stored for both the high-speed and low-speed scan when an I/O error occurs.

1.9.8 Setup: Scan Time Setting

The high-speed and low-speed scan times can be set.

Select **System - Scan Time Setting** from the tree in the **Environment Setting** Dialog Box or select **Setup - Scan Time Setting** from the Launcher to bring up that window, and then make the settings. (Refer to *1.9.1 Environment Setting Dialog Box*.)



● High-speed Scan (1.0 ms to 32.0 ms)

Setting Value

Set the scan time for high-speed processing programs (H, Hxx, and Hxx.xx) in units of ms.

Current Value

If offline, 0.0 ms is displayed. If online, the value read from the scan data of the S register in the same way as the system monitor is displayed.

Maximum Value

The setting value can be changed within a specified range. While changing the maximum value for high-speed or low-speed scans, Click **Apply** to start monitoring.

The maximum current value displayed during monitoring is the higher one of that the maximum value read from the scan data of S register or the maximum value set by the user.

● Low-speed Scan (2.0 ms to 300.0 ms)

Setting Value

Set the scan time for low-speed processing programs (L, Lxx, and Lxx.xx) in units of ms.

Current Value

If offline, 0.0 ms is displayed. When online, the value read from the scan data of the S register in the same way as the system monitor is displayed.

Maximum Value

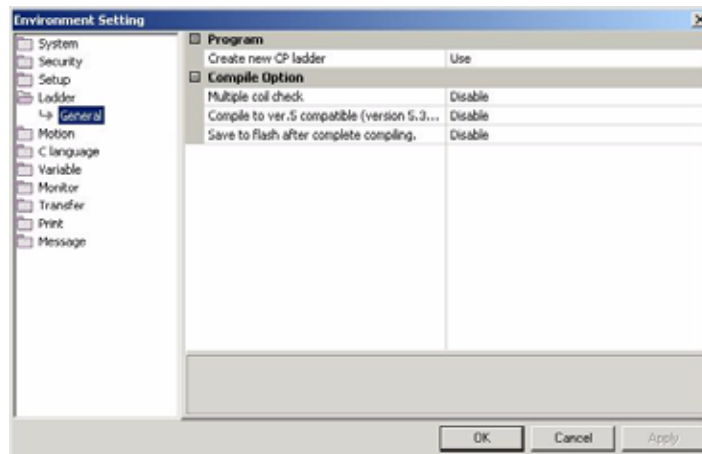
The setting value can be changed within a specified range. While changing the maximum value for high-speed or low-speed scans, Click **Apply** to start monitoring.

The maximum current value displayed during monitoring is the higher one of that the maximum value read from the scan data of S register or the maximum value set by the user.

1.9.9 Ladder: General

This option can be specified whether *Create new CP ladder* option is to be displayed in Ladder Subwindow pop-up menus.

Select **Ladder - General** from the tree in the **Environment Setting** Dialog Box to bring up that window, and then make the settings. (Refer to 1.9.1 *Environment Setting Dialog Box*.)



- Program

- Create new CP ladder

- Set whether the *Create new CP ladder* option is to be displayed in Ladder Subwindow pop-up menus.

- On selecting *Use*, the *Create new CP ladder* option will be displayed in Ladder Subwindow pop-up menus.

- Even if *Create new CP ladder* option is selected to *Not Use*, the Engineering Manager can still be used to create programs in the *CP* form. For details, refer to 3.2.2 (2) *Creating New Programs from the Engineering Manager*.

- Compile Option

- Multiple coil check

- On selecting *Use*, the programs to be compiled will be checked and duplicate coils will be detected at compilation.

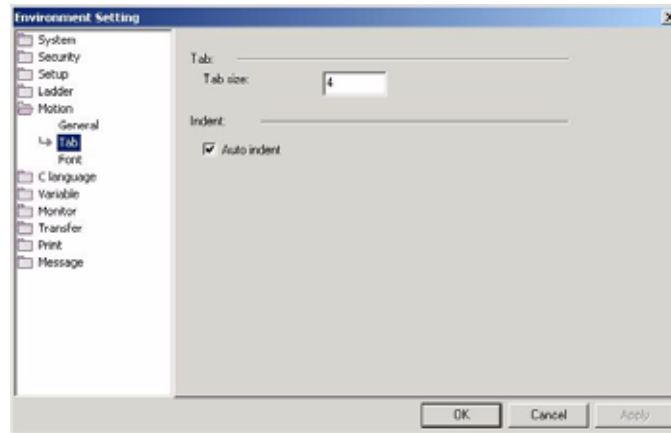
- Compile to ver. 5 compatible

- On selecting *Use*, the ladder programs will be compiled so that they can be displayed or edited on MPE720 version 5. MPE720 version 5.34 and later can be used for displaying or editing.

1.9.10 Motion/Tab

These options can be used to set the tab stop position and the size of automatic indentation.

Select **Motion - Tab** from the tree in the **Environment Setting** Dialog Box to bring up that window, and then make the settings. (Refer to *1.9.1 Environment Setting Dialog Box*.)



Tab

Set the tab stop position. The tab stop position and the size of automatic indentations share the same setting.

Indent

Automatic indentation is a function to indent the start position of the next line to the tab stop position of the current line when the Enter key is pressed.

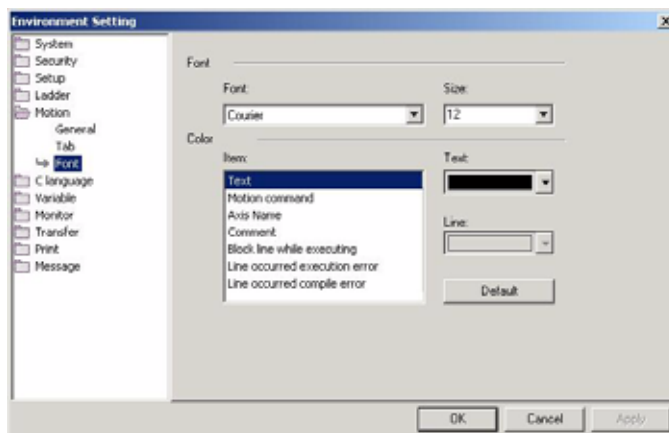
When the **Auto indent** check box is selected, automatic indentation is activated.

The tab stop position and the size of automatic indentations share the same setting.

1.9.11 Motion/Font

Different colors can be used for motion commands, logical axis names, comments to distinguish them from other text strings in programs. This makes it possible to comprehend the program code at a glance.

Select **Motion - Font** from the tree in the **Environment Setting** Dialog Box to bring up that window, and then change the settings. (Refer to 1.9.1 *Environment Setting Dialog Box*.)



Font

Set the font family and the font size.

Color

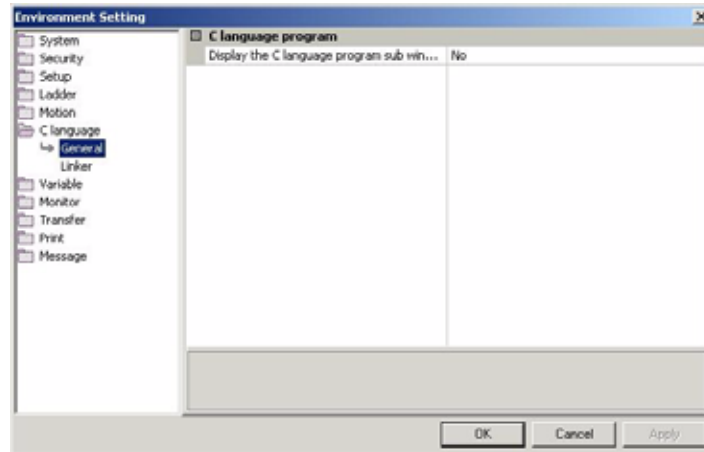
Set the text colors and background colors used in the edit windows.

	Default Text Color	Default Background Color
Text	Black	-
Motion command	Blue	-
Axis Name	Dark red	-
Comment	Green	-
Block line while executing	White	Black
Line occurred execution error	White	Red
Line occurred compile error	White	Red

1.9.12 C Language: General

This option can specify whether *Display C language program sub window* option is to be displayed in Language Sub-window pop-up menus.

Select *C language - General* from the tree in the **Environment Setting** Dialog Box to bring up that window, and then make the settings. (Refer to *1.9.1 Environment Setting Dialog Box*.)



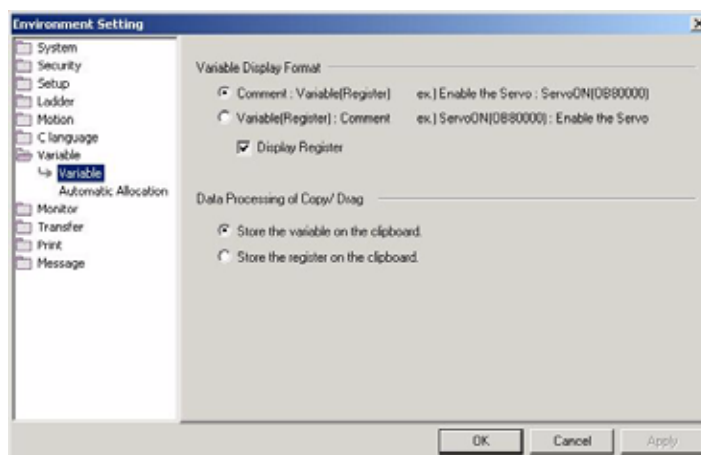
1.9.13 C Language: Linker

Linker is a program that can be used to link to objects produced by compiling. A support contract with Yaskawa is required to use this function.

1.9.14 Variable: Variable

These options can be used to set the variable display format in the Variable and Local Variable Subwindows and to make settings related to data processing when copying and dragging items from the Variable Subwindow.

Select **Variable - Variable** from the tree in the **Environment Setting** Dialog Box to bring up that window and then make the settings. (Refer to *1.9.1 Environment Setting Dialog Box*.)



● Variable Display Format

Comment: Variable (Register)

When this option is selected, variables in the Variable Subwindow are displayed in the *Comment: Variable (Register)* format.

Variable (Register): Comment

When this option is selected, variables in the Variable Subwindow are displayed in the *Variable (Register): Comment* format.

Display Register

When this option is cleared, *(Register)* is no longer displayed for the two variable formats above.

Example:

The format reflecting the settings for the above three items is displayed.

● Data Processing of Copy/ Drag

Store the Variable on the Clipboard

When this option is selected, variables are stored on the clipboard when copied or dragged from the Variable Subwindow to objects.

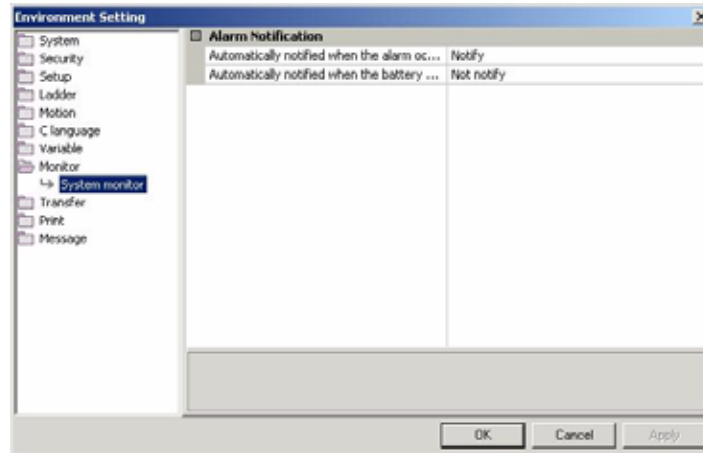
Store the Register on the Clipboard

When this option is selected, registers are stored on the clipboard when copied or dragged from the Variable Subwindow to objects.

- Differences in the above processing result in display differences, e.g., when copying and pasting variables from the Variable Subwindow to the Watch Subwindow. (With variables, the variable name is pasted, and with registers, the register number is pasted.) In addition, when copying and pasting to external applications such as memo pads, the same differences will occur.

1.9.15 Monitor: System Monitor

This option can be used to set the display method for the System Monitor Subwindow. (Refer to 12.6 *System Monitor*.) Select **Monitor - System Monitor** from the tree in the **Environment Setting** Dialog Box to bring up that window, and then make the settings. (Refer to 1.9.1 *Environment Setting Dialog Box*.)



- Alarm Notification

Automatically Notified when the Alarm Occurs

When **Notify** is selected, the System Monitor Subwindow is automatically displayed when an alarm occurs.

Automatically Notified when the Battery Alarm Occurs

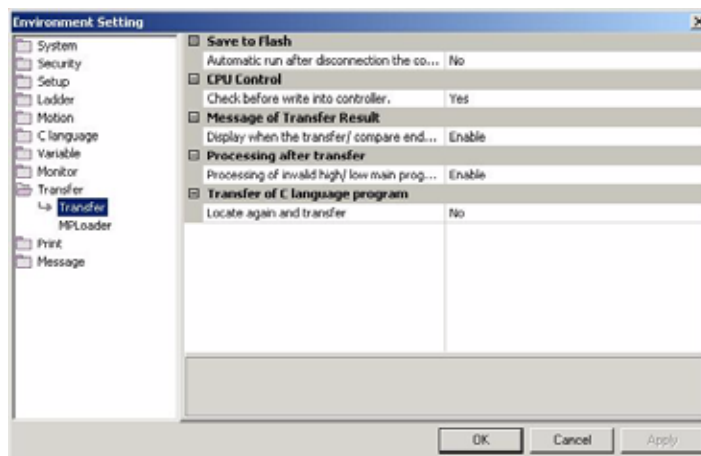
This function is valid when *Automatic notification when an alarm occurs* (above) is set to **Notify**.

When **Notify** is also selected, the System Monitor Subwindow is automatically displayed when a battery alarm occurs.

1.9.16 Transfer: Transfer

Detailed settings can be made for data transfers with the Machine Controller.

Select **Transfer - Transfer** from the tree in the **Environment Setting** Dialog Box to bring up that window, and then make the settings. (Refer to *1.9.1 Environment Setting Dialog Box*.)



- Save to Flash

Automatic Run after Disconnection the Controller

When **Yes** is selected, project files in the Machine Controller RAM are saved to flash memory when the Machine Controller is disconnected.

- CPU Control

Check before Write into Controller

This function is valid when **Individual** is selected in the Transfer Program - Write into **Controller** Dialog Box. (Refer to *10.2.1 Writing to Machine Controllers*.)

When **Yes** is selected, a message is displayed for confirmation before data is transferred to the Machine Controller.

- Message of Transfer Result

Display when Transfer/Compare Ends

When **Yes** is selected, a message is displayed for confirmation when a data transfer or comparison is completed.

- Processing After Transfer

Processing of Invalid High/Low Main Program

When **Disable** is selected, the main program (high-speed or low-speed) in the Machine Controller RAM is invalid when an error occurs during a batch data transfer to the Machine Controller, and the program is not executed even when the CPU is changed to RUN mode.

- Transferring C language programs

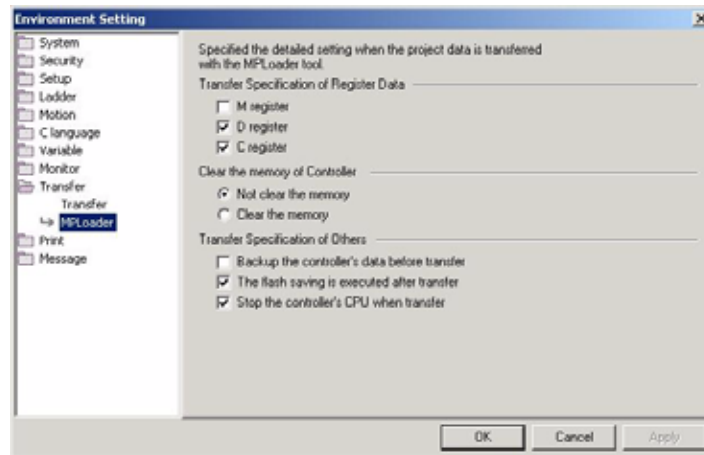
Locate again and transfer

A support contract with Yaskawa is required to use this function.

1.9.17 Transfer: MPLoader

Detailed settings can be made for data transfers with the Machine Controller.

As with MPE720 version 5, you can make detailed settings for data transfer to the Machine Controller using MPLoader. By setting the items described below, programs can be in the same. MAL file format of MPE720 version 5. Select **Transfer - MPLoader** from the tree in the **Environment Setting** Dialog Box to bring up the window, and then make the settings. (Refer to *1.9.1 Environment Setting Dialog Box*.)



- Transfer Specification of Register Data

- M register

- When this check box is selected, M register data is transferred.

- D register

- When this check box is selected, D register data is transferred.

- C register

- When this check box is selected, C register data is transferred.

- Clear the Controller Memory

- Not clear the memory

- When this is selected, the memory will not be cleared after transfer.

- Clear the memory

- When this is selected, the memory will be cleared after transfer.

- Transfer Specification of Others

- Backup the controller data before transfer

- When this check box is selected, the data in the Machine Controller is backed up before transfer.

- The flash waving is executed after transfer

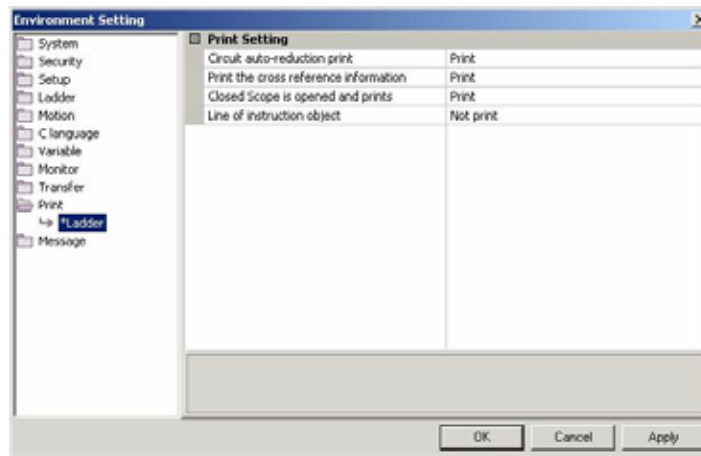
- When this check box is selected, the data will be saved to flash memory after transfer.

- Stop the controller's CPU during transfer

- When this check box is selected, the CPU in the Machine Controller is stopped when the transfer starts.

1.9.18 Print: Ladder

Select **Print - Ladder** from the tree in the **Environment Setting** Dialog Box to bring up that window and then make the settings. (Refer to *1.9.1 Environment Setting Dialog Box*).



- ♦ For other environment settings, refer to *1.9 Environment Settings*.

● Print Setting

Circuit auto-reduction print

When Print is selected, the rungs that cannot fit in one page will be reduced in rung units.

Print the cross reference information

When Print is selected, the cross reference information will be printed on the right side of the ladder program.

- ♦ When there is too much cross reference information to be printed, the distance between rungs will be automatically adjusted so that they will not run into one another. Thus, the ladder circuit and all the cross reference information can be printed.
- ♦ Refer to *9.1.4 Printing Cross-Reference Information* for details.

Open closed Scope and print

When Print is selected, all ladder instructions will be expanded to show the details.

- ♦ Refer to *3.3.10 Inserting Instruction Objects* for information on the **Minimize/Maximize** Button of simplified display (scope).

Line of instruction object

When Print is selected, the frame of each instruction object in ladder programs will be printed.

1.10 Connecting to and Disconnecting from Machine Controllers

This section describes how to connect and disconnect communications between a computer running MPE720 version 6 and a Machine Controller.

1.10.1 Connecting to Machine Controllers

The MPE720 version 6 operations when connecting to a Machine Controller with connection data (Refer to *1.10.1 Connecting to Machine Controllers* for details on the settings in the **Communications Setting** Dialog Box.) are different from when opening a project file and other situations.

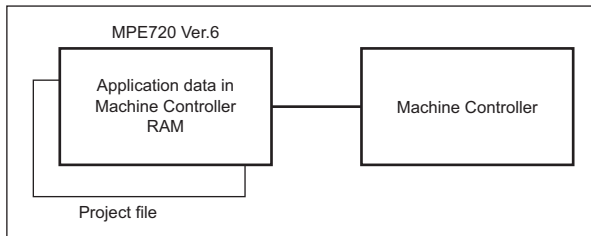
There are two ways to connect MPE720 version 6 and a Machine Controller:

Project Link Connection: Connects a Machine Controller to MPE720 version 6 with an open project file.

Direct Connection: Connects a Machine Controller to MPE720 version 6 without an open project file.

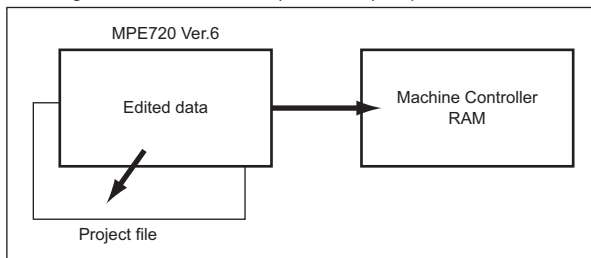
The following diagrams illustrate data transfer images.

• Connecting to the Machine Controller



When a connection is made to a Machine Controller with a project file open, the application data in the Machine Controller RAM is displayed in MPE720 version 6.

• Saving Data while Connected (when Compiled)



When a program is compiled while connected to a Machine Controller or when the connection is closed and the program is compiled, the edited data is written to both the Machine Controller RAM and the open project file.

Before connecting a MPE720 version 6 to a Machine Controller, the settings for the communication processing (refer to *1.3.7 Communication Process Settings*) and the settings for communications (refer to *1.3.6 Communication Settings*) must be completed. The following section describes how to make the settings for communications.

(1) Communications Settings

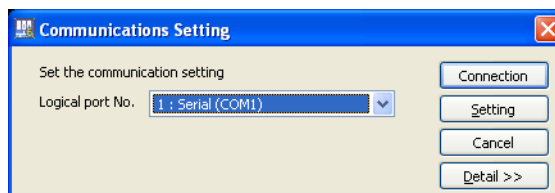
Configure the communications settings for the Machine Controller.

1. Select **Online - Communications Setting** from the Main Menu. Alternatively, click *Communications Setting* under *Controller* (or *Project*) in the Start Window.

The **Communications Setting** Dialog Box will be displayed.

2. Select the logical port number to be used for connecting to the Machine Controller and click the **Setting** Button.

- For details on the logical port numbers that are set, refer to *1.3.7 Communication Process Settings*.



The communications settings will be completed, and the dialog box will be closed.

- The **Connection** Button and the **Setting** Button are invalid while connected to the Machine Controller, and communications cannot be set.

The MPE720 version 6 operations when connecting to a Machine Controller are different from when opening a project file with connection data (settings made in the **Communications Setting** Dialog Box) and other situations.

(2) Project Link Connection

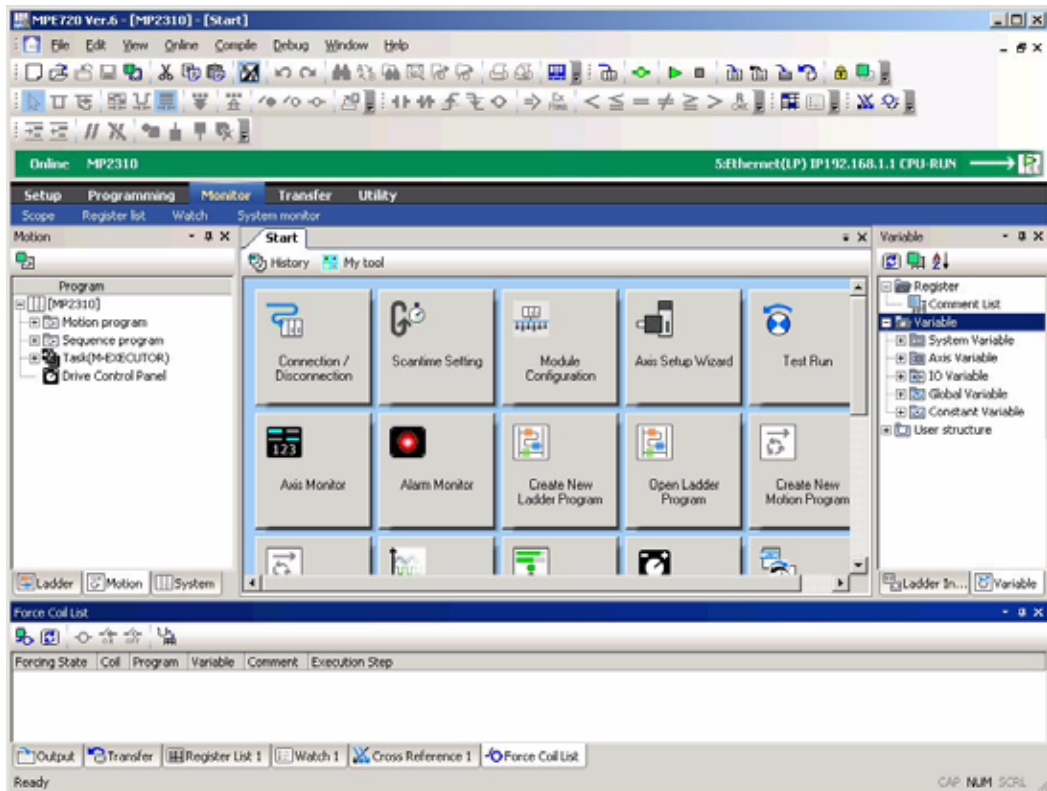
[a] Connecting from MPE720 Version 6 with an Open Project File

Connect to the Machine Controller as described below.

1. Any of the following operations can be used.
 - Select **Online - Connection** from the Main Menu.
 - Click **Connection** under **Project** in the Start Window.

The connection to the Machine Controller will be started. When the connection has been made, the Machine Controller name and a ladder program tree will be displayed in the Ladder Subwindow.

- When **Disconnection** is displayed by selecting **Online** from the Main Menu, the connection with the Machine Controller has been completed.



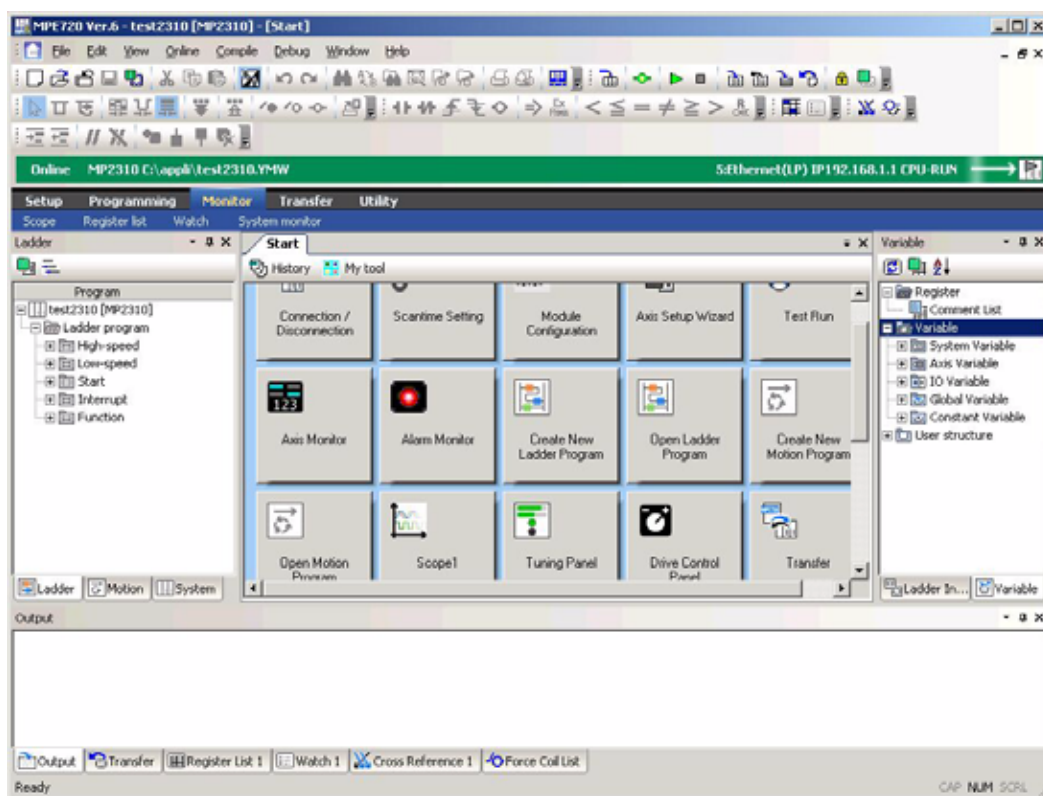
- The program displayed when a ladder program is opened after connecting is the program in the Machine Controller RAM. If the displayed ladder program is edited and saved (compiled), the changes will be overwritten in both the Machine Controller RAM and the open project file (on the computer). For details on saving data while connected, refer to *1.10.1 Connecting to Machine Controllers*.

[b] Opening a Project File Containing Connection Information

When the operation is executed to open a project file containing connection information, the following dialog box will be displayed for confirmation.



The connection to the Machine Controller will be started by clicking the **Connect** Button. When the connection has been made, the Machine Controller name and a ladder program tree will be displayed in the Ladder Subwindow.



- If the **Not connect** Button is clicked, the project file will be opened without connecting to the Machine Controller.
- The program displayed when a ladder program is opened after connecting is the program in the Machine Controller RAM. If the displayed ladder program is edited and saved (compiled), the changes will be overwritten in both the Machine Controller RAM and the open project file (on the computer). For details on writing data while connected, refer to *1.10.1 Connecting to Machine Controllers*.

(3) Direct Connection

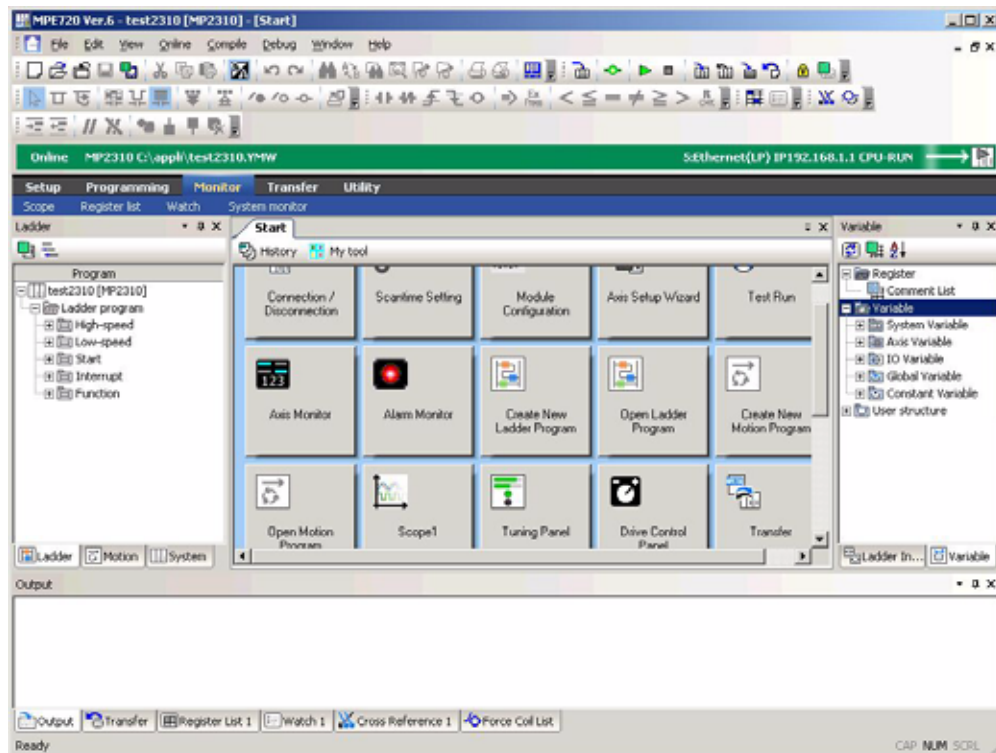
Connect to the Machine Controller as described below.

1. Any of the following operations can be used.

- Select **Online - Connection** from the Main Menu.
- Click **Connection** under **Controller** in the Start Window.
- Select from the connection histories displayed under **Controller - History** in the Start Window.

The connection to the Machine Controller will be started. When the connection has been made, the Machine Controller name and a ladder program tree will be displayed in the Ladder Subwindow.

- When **Disconnection** is displayed by selecting **Online** from the Main Menu, the connection with the Machine Controller has been completed.



- The program displayed when a ladder program is opened after connecting is the program in the Machine Controller RAM, and it is not yet saved in the HDD of the computer. Refer to [10.2.4 Reading from Machine Controllers](#) and save the Machine Controller application data to a project file on the computer.

1.10.2 Disconnecting from Machine Controllers

The procedure for disconnecting a Machine Controller depends on whether or not a project file is open.

(1) When No Project File Is Open

1. Select **Online - Disconnection** from the Main Menu, or select *Disconnection* under *Controller* in the Start Window.

The connection to the Machine Controller will be closed, and the Ladder Subwindow will become blank.

- The connection is also closed by exiting MPE720 version 6.

(2) When a Project File Is Open

1. Select **Online - Disconnection** from the Main Menu, or select *Disconnection* under *Project* in the Start Window.

The connection to the Machine Controller will be closed, and a window will be displayed for the open project file.

- The connection is also closed when by exiting MPE720 version 6 or by closing the project file.

1.11 Stopping (STOP) and Restarting (RUN) the Machine Controller CPU

The CPU must be stopped when transferring data to the Machine Controller or when writing to the Machine Controller flash memory.

This section describes how to stop (STOP) and restart (RUN) the Machine Controller CPU.

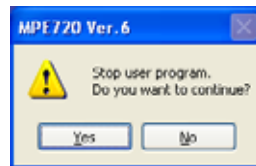
- This function is valid only while connected online to the Machine Controller.

1.11.1 Stopping Machine Controller CPU (STOP)

Use the following procedure to stop the CPU of a Machine Controller.

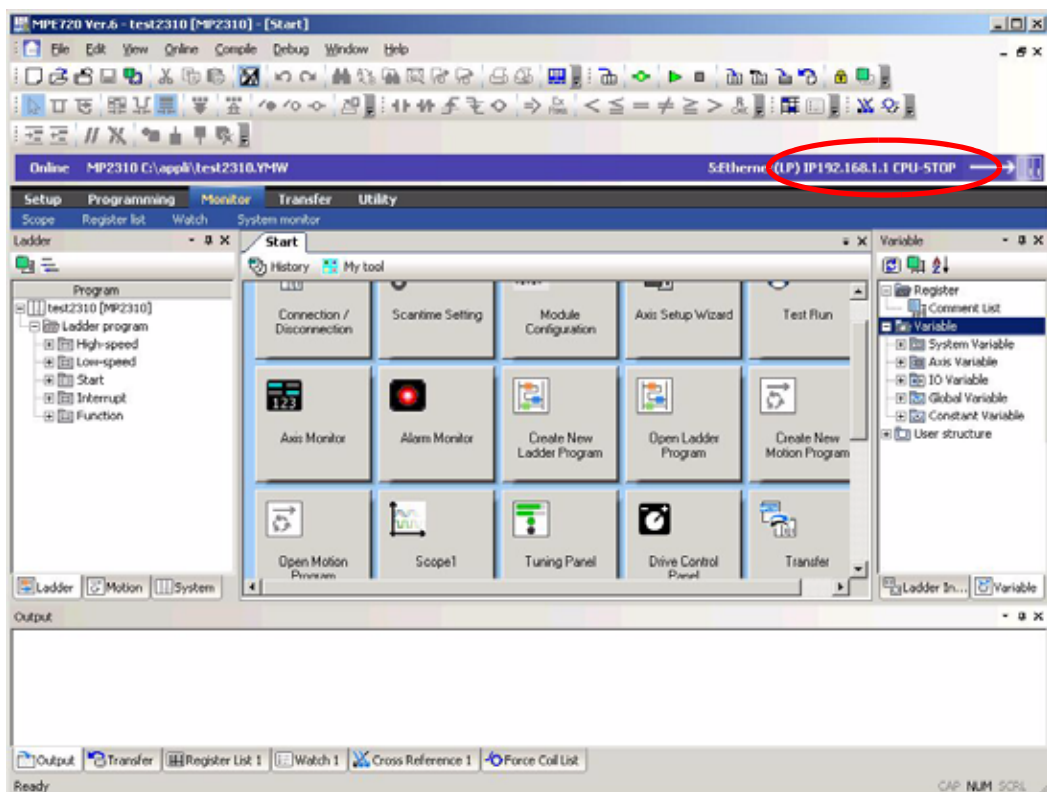
1. Select **Online - CPU STOP** from the Main Menu.

The following dialog box asking for confirmation will be displayed.



2. Click the **Yes** Button.

The display in the project caption bar will be changed to *CPU-STOP*. In addition, the color of the caption bar and the CPU status shown on the right side of the bar will be changed.



1.11.1 Stopping Machine Controller CPU (STOP)

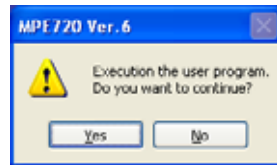
-
- CPU STOP can be set again even after it has been previously set by using this function. This is because of the possibility that multiple users may be connected simultaneously to the same Machine Controller, and that the CPU status may be changed by another user. Even if the CPU status is changed by another user, the CPU can be certainly stopped by setting CPU STOP.
-

1.11.2 Restarting Machine Controller CPU (RUN)

Use the following procedure to restart a Machine Controller CPU that has been stopped.

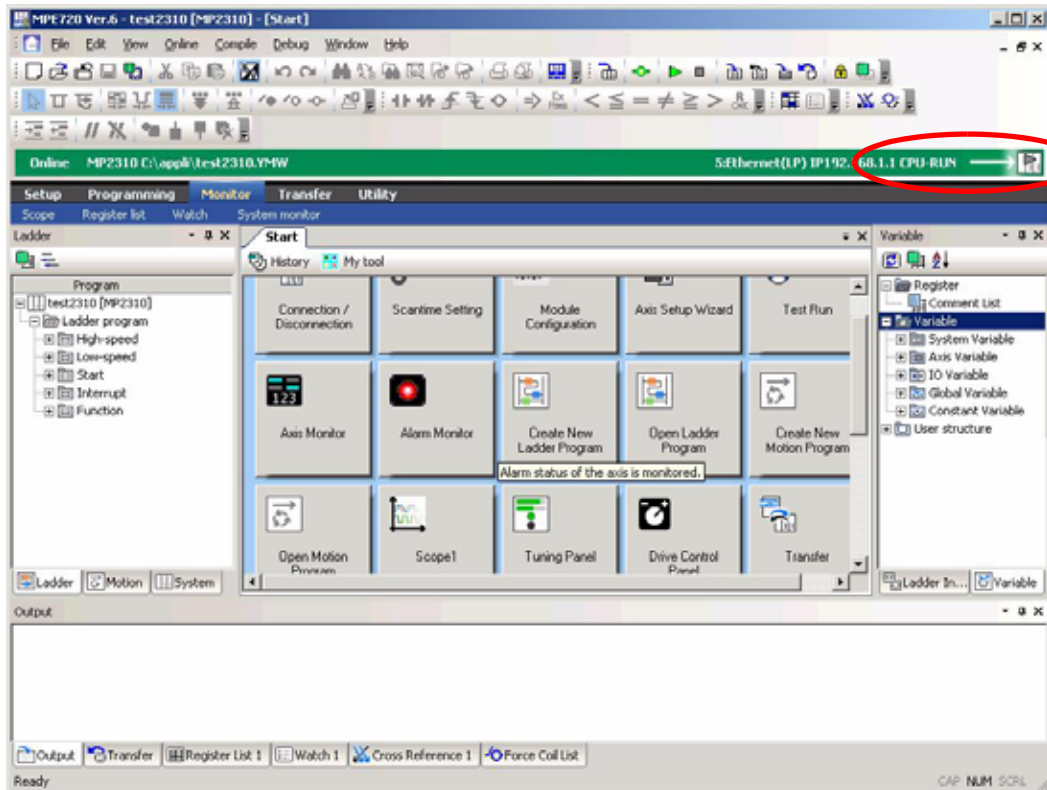
1. Select **Online - CPU RUN** from the Main Menu.

The following dialog box asking for confirmation will be displayed.



2. Click the **Yes** Button.

The display in the project caption bar will be changed to *CPU-RUN*. In addition, the color of the caption bar and the CPU status shown on the right side of the bar will be changed.



- CPU RUN can be set again even after it has been previously set by using Ladder this function. This is because of the possibility that multiple users may be connected simultaneously to the same Machine Controller, and that the CPU status may be changed by another user. Even if the CPU status is changed by another user, the CPU can be certainly restarted by setting CPU RUN.

1.12 Security

1.12.1 Security for User

For details, refer to *1.9.4 Security: User Registration*.

1.12.2 Security for Project Files

For details, refer to *1.9.5 Security: Project Password*.

1.12.3 Setting Passwords for Ladder Programs

Passwords can be set individually for each ladder program. A lock mark is displayed for each program for which a password has been set. To edit the program with a password, it is necessary to first enter the password. The purpose of the password is to control access for editing, and it does not affect the management of program files (copying, cutting, pasting, deleting, or enable/disable settings). (Refer to *3.4.3 Managing Ladder Program Files*.)

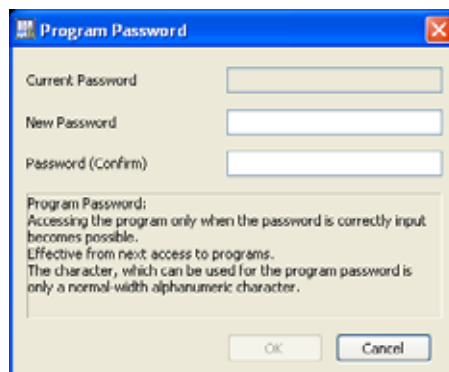


- Once a password has been set, be very careful not to forget it. If a password that has been set is forgotten, there is no way to undo it, and that user will no longer be able to open the project file.
-

(1) Setting a Password

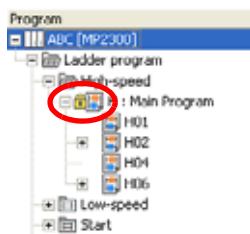
1. Right-click the program for which a password is to be set in the Ladder Subwindow, and select **Set Password** from the pop-up menu that will be displayed.

The **Program Password** Dialog Box will be displayed.



2. Enter a password of 1 to 8 characters in the *New Password* Field. Enter the same password again in the *Password (Confirm)* Field, and click the **OK** Button.
 - ♦ The **OK** Button is valid when one or more characters of the text are entered in the *Password (Confirm)* Field.
 - ♦ No distinction is made between uppercase and lowercase.

The **Program Password** Dialog Box will be closed, and a lock mark will be displayed next to the icon for the ladder program selected in step 1. If the applicable program is displayed in the main window, the program will be closed.



(2) Changing a Password

1. Right-click the program for which the password is to be changed in the Ladder Subwindow, and select **Set Password** from the pop-up menu that will be displayed.

The **Program Password** Dialog Box will be displayed.



2. Enter the current password in the *Current Password* Field. Enter a new password of 1 to 8 characters in the *New Password* Field. Enter the same password again in the *Password (Confirm)* Field, and click the **OK** Button.
 - ♦ The **OK** Button is valid when one or more characters of text are entered in the *Password (Confirm)* Field.

The password will be changed, and the **Program Password** Dialog Box will be closed.

(3) Cancelling the Password

1. Right-click the program for which the password is to be cancelled in the Ladder Subwindow, and select **Cancel Password** from the pop-up menu that will be displayed.

The **Program Password** Dialog Box will be displayed.



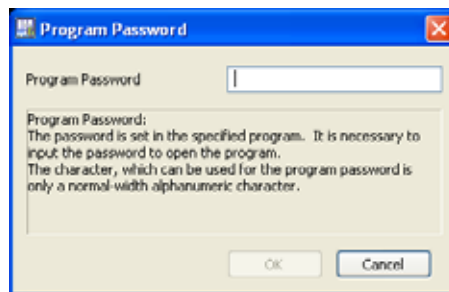
2. Enter the current password in the *Program Password* Field, and click the **OK** Button.

- The **OK** Button is valid when one or more characters of text are entered in the *Program Password* Field.

The lock mark will be removed from icon for the ladder program selected in step 1, and the **Program Password** Dialog Box will be closed.

(4) Opening a Ladder Program for which a Password Is Set

1. When an attempt is made to open a ladder program for which a password is set (i.e., a ladder program indicated by a lock at the icon), the Program Password Dialog Box is displayed.



2. Enter the current password in the *Program Password* Field, and click the **OK** Button.

- The **OK** Button is valid when one or more characters of text are entered in the *Program Password* Field.

The selected ladder program will be opened in the main window.

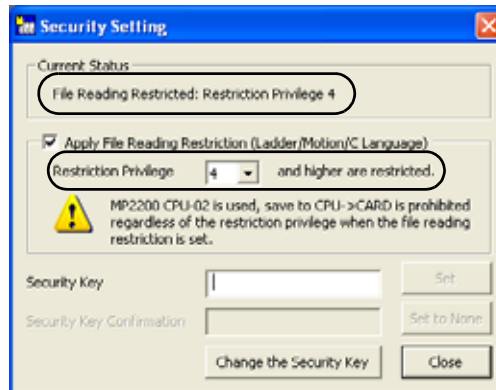


- When opening a CP ladder program or motion program, the password must be cancelled. If a password is required, a new password can be created after the operation is completed.
-

1.12.4 Online Security

(1) What is Online Security?

Online security is a function that prevents data in the Machine Controller from being read. The security key (password) and privilege level for the programs (both set in the **Security Setting** Dialog Box) enable the MPE720 version 6 to prevent unprivileged logged-on users from reading data from the Machine Controller and opening the programs.



Example: When 4 or higher is set for **Restriction Privilege**

Programs with a reading privilege of 4 or higher cannot be opened.

A logged-on user who is allowed to carry out operations related to program security must have writing privilege level 7.

- Refer to *1.10.1 Connecting to Machine Controllers* for online and offline connection to a Machine Controller.
- Refer to *1.9.4 Security: User Registration* for information on file privilege and user privilege.

Current Status

Displays the security setting status.

Apply File Reading Restriction

Select the check box to prevent the data from being read. Set the privilege level to prevent the ladder program, motion program and C-language program from being read.

- If the security key is set without selecting the **Apply File Reading Restriction** check box, only the security key will be set. The privilege (restriction privilege) to prevent the data from being read will not be set.

Restriction Privilege

Privilege level to restrict the files the user may read.

- Note that the user must have a privilege level higher than the set privilege to read files.

Security Key/Security Key Confirmation

The password required to set online security. Enter from 1 to 8 alphanumeric characters. The password is case sensitive.

Change the Security Key

Click this button to change the security key.

Set

Click this button to set the read-file restriction.

Set to None

Click this button to clear the current security setting.

Close

Click this button to close the **Security Setting** Dialog Box.



- When the **Apply File Reading Restriction** check box is selected while the CARD and SAVE DIP switches on Machine Controller MP2200 CPU-02 are set to ON, the function for saving to a CF card will be disabled. For details, refer to *Machine Controller MP2200 User's Manual* (manual no. SIEPC88070014).

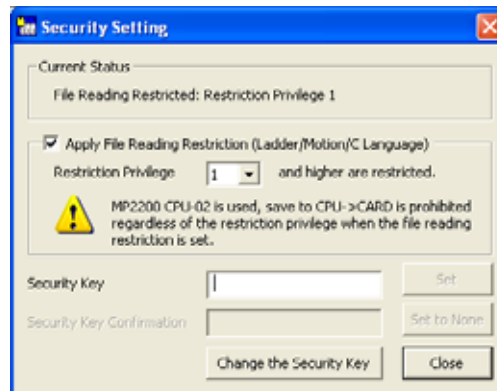
(2) How to Set, Clear, and Change Online Security

[a] Setting Online Security

To restrict users from reading data in the Machine Controller, use the following procedure when setting online security.

1. With the Machine Controller connected to the MPE720 version 6 (online), select **Online - Security Setting** from the main menu.

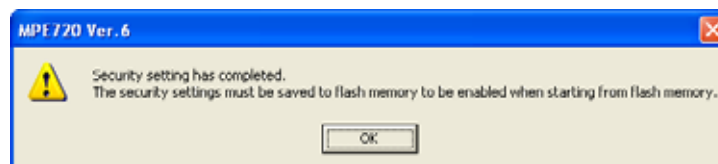
The **Security Setting** Dialog Box will appear.



2. Select the **Apply File Reading Restriction** check box, and then select a program privilege level from the **Restriction Privilege** combo-box list.
3. Enter a security key (password) in the **Security Key** Field, and re-enter it in the **Security Key Confirmation** Field. Then, click the **Set** Button.

The **Set** Button will be activated when one or more characters are entered in the **Security Key** Field.

The file reading restriction and security key will be set, and the following message will be displayed asking for confirmation.



4. Click **OK**.

Click the **Close** Button in the upper-right to close the **Security Setting** Dialog Box.

If saving to flash memory is required, save the settings to the flash memory.

[b] Clearing Online Security Setting

The online security setting can be cleared by using the following procedure.

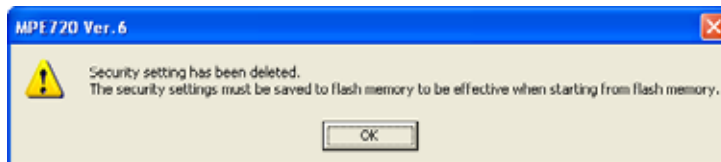
1. With the Machine Controller connected to the MPE720 version 6 (online), select **Online - Security Setting** from the main menu.

The **Security Setting** Dialog Box will appear.



2. Enter the correct security key (password) in the **Security Key** Field, and then click **Set to None**.

The following message will appear asking for confirmation.



3. Click **OK**.

Click the **Close** button in the upper-right to close the **Security Setting** Dialog Box.

If saving to flash memory is required, save the change to the flash memory.

[c] Changing the Online Security Setting

The online security setting can be changed by using the following procedure.

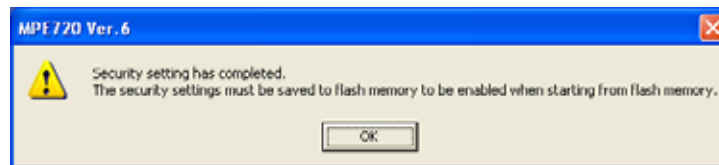
1. With the Machine Controller Connected to the MPE720 version 6 (online), select **Online - Security Setting** from the main menu.

The **Security Setting** Dialog Box will appear.



2. Select or deselect the **Apply File Reading Restriction** check box, or change the level in the **Restriction Privilege** Field, as required.
3. Enter the correct security key (password) in the **Security Key** Field, and then click **Set**.

The following message will appear asking for confirmation.



4. Click **OK**.

Click the **Close** button in the upper-right to close the **Security Setting** Dialog Box.

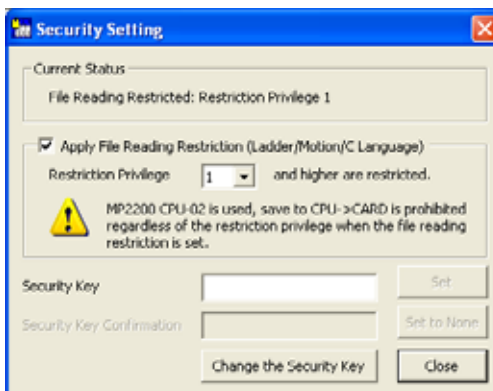
If saving to flash memory is required, save the change to the flash memory.

(3) Changing the Security Key (Password)

The security key for online security can be changed by using the following procedure.

1. With the Machine Controller connected to the MPE720 version 6 (online), select **Online - Security Setting** from the main menu.

The **Security Setting** Dialog Box will appear.



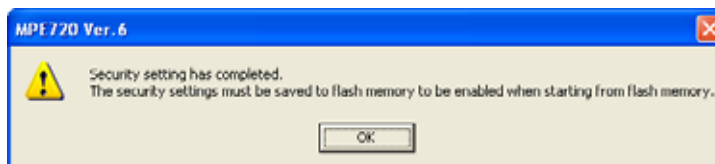
2. Click the **Change the Security Key** Button.

The **Security Key Change** Dialog Box will appear.



3. Enter the currently valid security key (password) in the **Current Security Key** Field and a new security key in the **New Security Key** Field. Re-enter the new security key in the **New Security Key Confirmation** Field. Then click **OK**.

The following message will appear asking for confirmation.



4. Click **OK**.

Click the **Close** button in the upper-right to close the **Security Setting** Dialog Box.

If saving to flash memory is required, save the change to the flash memory.

2

Configuration

This chapter provides an overview of module configuration definitions and motion parameter functions.

2.1 Module Configuration	-----	2-2
2.2 Motion Parameters	-----	2-4
2.2.1 Fixed Parameters	-----	2-4
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2.1 Module Configuration

The Module Configuration Window is used to define the Machine Controller main module (CPU Module) and Option Modules.

When a project file is created, the module configuration must be set and saved. When the module is connected to a Machine Controller (project link connection and direct connection), change the module configuration if necessary and save it.

For details of module configuration definitions, refer to the MPE720 version 5 user's manual *Machine Controller MP900/MP2000 series Programming Software MPE720 User's Manual* (manual number: SIEP C880700 05).

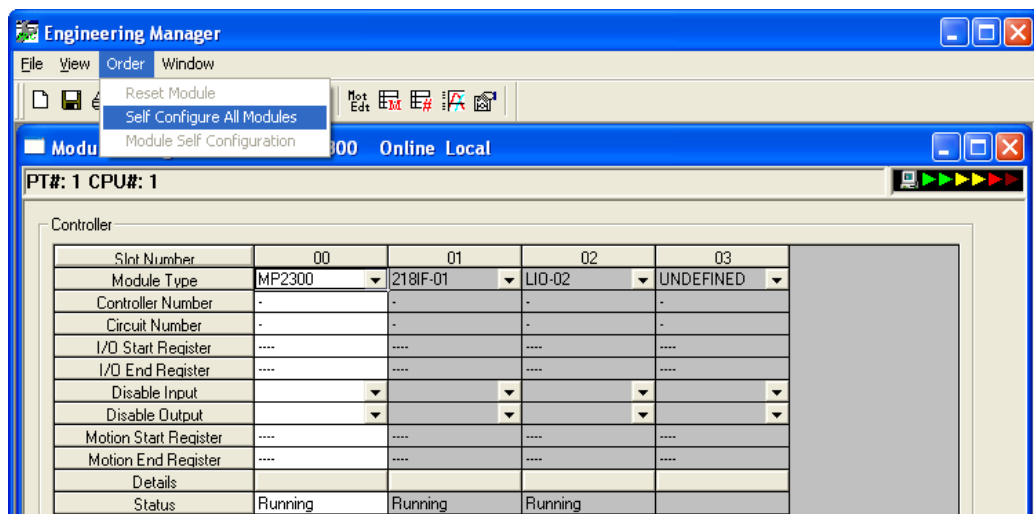
Set and save the module configuration of a Machine Controller with the following procedure.

1. Select **Setup - Module Configuration Definitions** from the Launcher.

The Engineering Manager will be started.

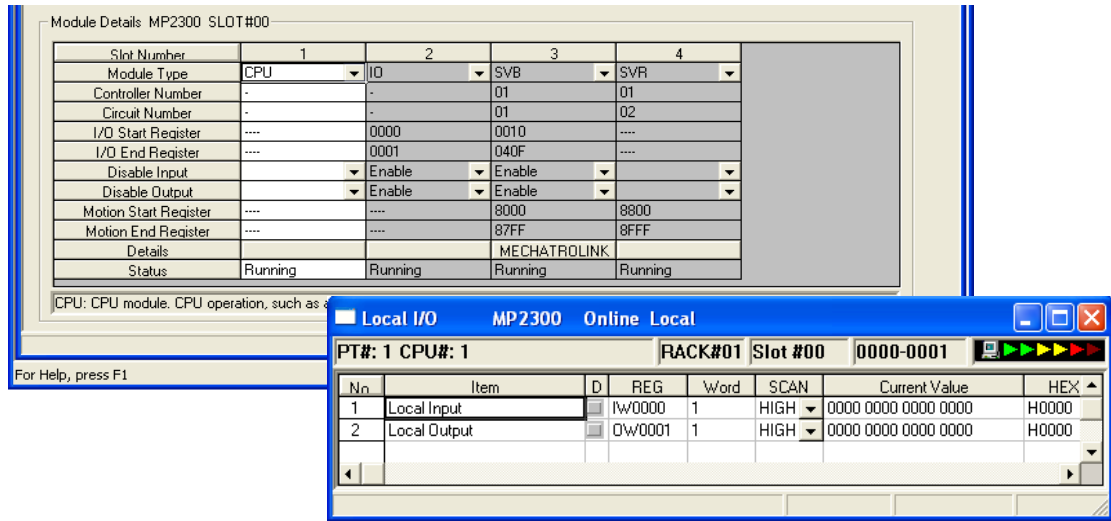
2. When online, select **Order - Self Configure All Modules** from the main menu.

The data for all electrical devices connected to the Machine Controller will be written to the Machine Controller.



- When offline, Self-configuration cannot be executed. Make the settings manually for each Module.

3. Double-click Module detail fields as required to display Configuration Data Area and change the settings.



Module Configuration Definition Example

- For details on Configuration, refer to the relevant Machine Controller or Option Module operation manual.

4. Select **File - Save & FLASH Save** from the main menu.

The Module Configuration will be saved in the Machine Controller flash memory and RAM.

- When offline, execute the save operation by selecting **File - Save**.

2.2 Motion Parameters

Motion parameters include fixed parameters, setting parameters, monitoring parameters, and SERVOPACK parameters. With MPE720 version 6, the variables, comments, and structures that are assigned to each motion parameter can be exported to a CSV file, or imported from the CSV file to the MPE720 version 6.

2.2.1 Fixed Parameters

Fixed parameters are used to define the specifications of the motor and machine to be used.

For details on fixed parameters, refer to *4.2.1 List of Fixed Parameters of Machine Controller MP2200/MP2300 User's Manual Motion Module* (manual number: SIEP C880700 16).

2.2.2 Setting Parameters

Each axis of a servo controller is operated by the setting parameters for the application.

For details on setting parameters, refer to *4.2.2 List of Setting Parameters of Machine Controller MP2200/MP2300 User's Manual Motion Modules* (manual number: SIEP C880700 16).

2.2.3 Monitoring Parameters

Current positions (current values) of moving axes are saved in the monitoring parameters.

For details on monitoring parameters, refer to *4.2.3 List of Monitoring Parameters of Machine Controller MP2200/2300 User's Manual Motion Modules* (manual number: SIEP C880700 16).

2.2.4 SERVOPACK Parameters

A SERVOPACK is operated according to the values set as SERVOPACK parameters.

For details on SERVOPACK parameters, refer to the relevant SERVOPACK manual.

(1) Value (Data) Display

The values (data) of a SERVOPACK that is connected to a Machine Controller are saved in the SERVOPACK parameters. Two types of values are saved in the SERVOPACK parameters: **Current Value** and **Input Data**

Current Value: Current value (data) of the connected SERVOPACK

Input Data: Values stored in a Machine Controller as a backup data

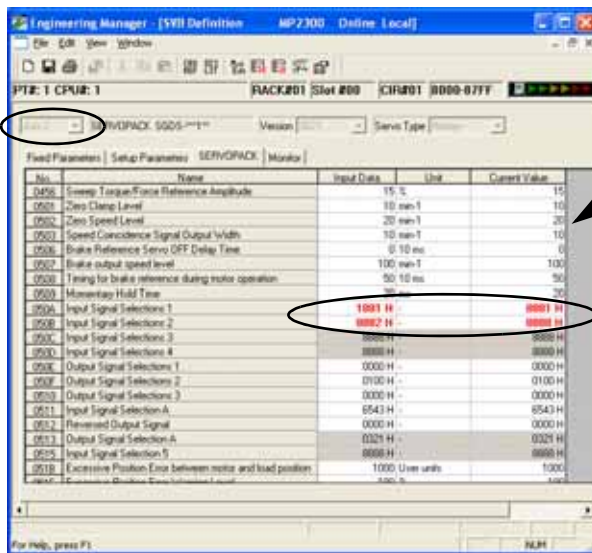
■ SERVOPACK Parameter Unmatched Data Display Function

When MPE720 version 6 is operated using a SERVOPACK, the Current Values may differ from the Input Values. If SERVOPACK parameters are set with a software other than MPE720 version 6, such as SigmaWin+ and digital operator, the Input Values may be adjusted according to the specifications of the software that is used for setting. If a difference is produced, the following message will be displayed in the SERVOPACK parameter setting window of Engineering Manager, and the parameters for which Current Values are different from the Input Values are displayed in red bold characters as shown below.

Alarm Message



SERVOPACK Parameter Setting Window



Unmatched Parameters Displayed in Red

Input Data	Unit	Current Value
⋮		⋮
1881 H	-	8881 H
8882 H	-	8888 H
1333	%	1333
40.0	Hz	40.0

Display of alarm message and unmatched values can be used to prevent incorrect parameters from being written into a SERVOPACK.

Select **Edit - SERVOPACK Current Value** → **Input Data** from the main menu of the Engineering Manager to set the current value as the set value.

Ladder Programming

This chapter provides an overview of ladder programming and describes basic operations.

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3.1 Overview of Ladder Programming

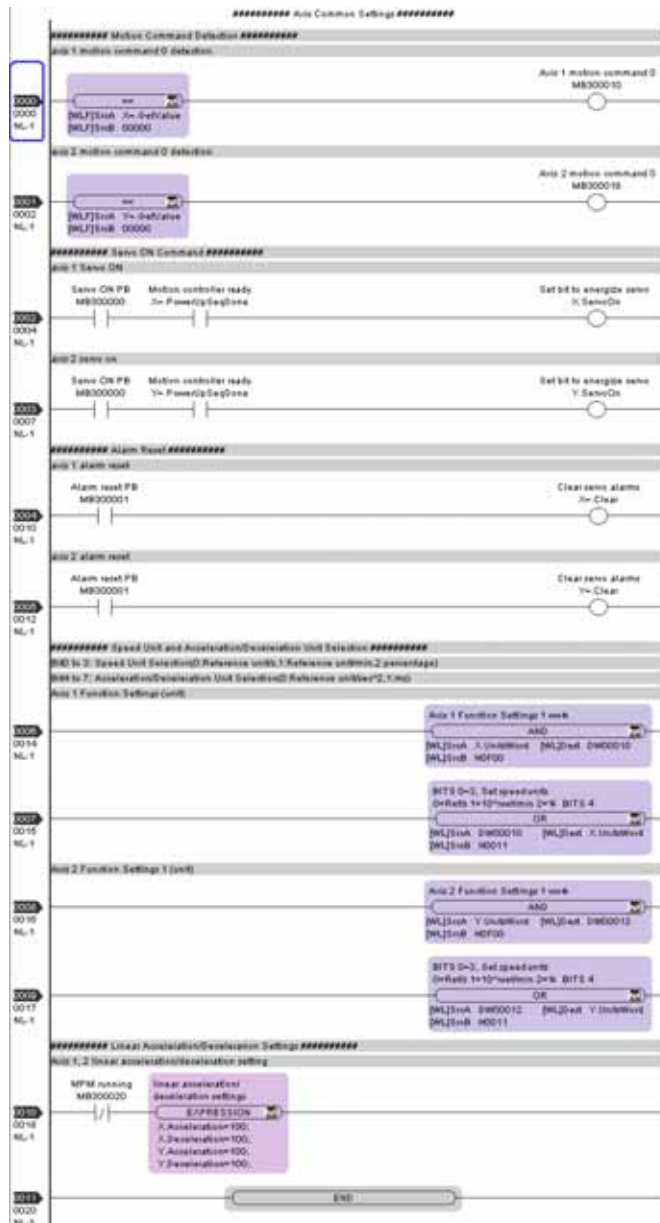
3.1.1 What is Ladder Programming?

A ladder program is a control program for Machine Controllers created using ladder objects. Machine control is executed by combining multiple ladder programs, using high-speed and low-speed scan processing.

Creating and editing ladder programs in the MPE720 version 6 Ladder Program Edit Window is called ladder programming.

When a ladder program has been transferred to the Machine Controller CPU after a ladder program has been compiled in MPE720 version 6, it can be executed.

The following diagram shows an example of a ladder program.



- For details on displaying the Ladder Program Edit Window, refer to 3.2 *Beginning Ladder Programming*.
- For details on editing ladder programs, refer to 3.3 *Editing Ladder Programs*.
- For details on compiling ladder programs, refer to 3.3.17 *Ladder Program Compiling and Compile Options*.
- For details on transferring Machine Controller programs, refer to 1.12 *Security*.

3.1.2 Overview of Ladder Program Functions

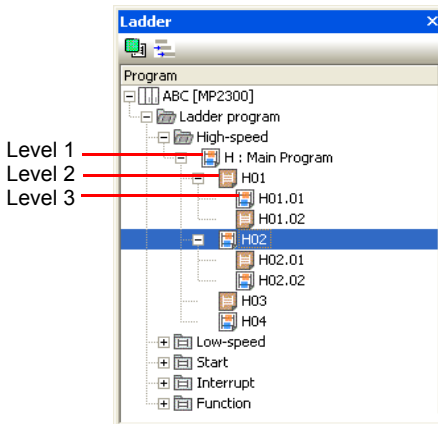
(1) Ladder Program Types and Priorities

The various types of ladder programs are shown below and are executed in order of priority.

- **High-speed Scan Processing Programs (H Programs; Priority 3)**
These are operation control programs that are executed in each high-speed scan.
- **Low-speed Scan Processing Programs (L Programs; Priority 4)**
These are operation control programs that are executed in each low-speed scan.
- **Startup Processing Programs (A Programs; Priority 1)**
These programs are executed only once after the power is turned ON to the Machine Controller and perform the initial settings at startup.
- **Interrupt Processing Programs (I Programs; Priority 2)**
These programs are launched when an interrupt signal is received, and are executed only once per interrupt.
- **Processing Error Processing Programs (X00 Programs; X = A, I, H, L; Priority 2)**
These programs are started automatically by the system program when a processing error occurs in a program (i.e., when an error interrupt signal is received). Only one error program can be created under each A, I, H, and L program.

A folder is displayed for each program type in the Ladder Subwindow.

(2) Hierarchical Structure and Restrictions on Ladder Programs



A, I, H, and L program structures can contain up to three hierarchical levels, from level 1 to level 3.



The level 1 program is called the main program, and only one main program can be created for the A, I, H, and L programs.

Level 2 and level 3 programs can be referenced from higher-level programs using the SEE instruction.

The maximum total number of level 2 and 3 programs depends on the program type, as follows:

- A programs: 62
- I programs: 62
- H programs: 198
- L programs: 498

Fig. 3.1 Ladder Subwindow

- For details on operations and changing the display in the Ladder Subwindow, refer to 3.4.3 *Managing Ladder Program Files*. Ordinary ladder programs are indicated by  in the Ladder Subwindow, and CP ladder programs are indicated by .

(3) Functions and Motion Programs

Functions and motion programs are both programming elements that can be referenced for use from ladder programs. They can be referenced from ladder programs at any hierarchical level, from level 1 to level 3. The features of functions and motion programs are described below.

■ Functions

Functions are a programming element referenced from other ladder programs. They are created in the Function Folder in the Ladder Subwindow. They are also sometimes called user functions. Functions are created by setting the number of input registers, output registers, or registers. In ladder programs, they can be called using FUNC instructions.

- For details on creating functions, refer to 3.3.15 *Creating Functions*. For details on entering and defining functions in a ladder program, refer to 3.3.16 *Calling Functions*.

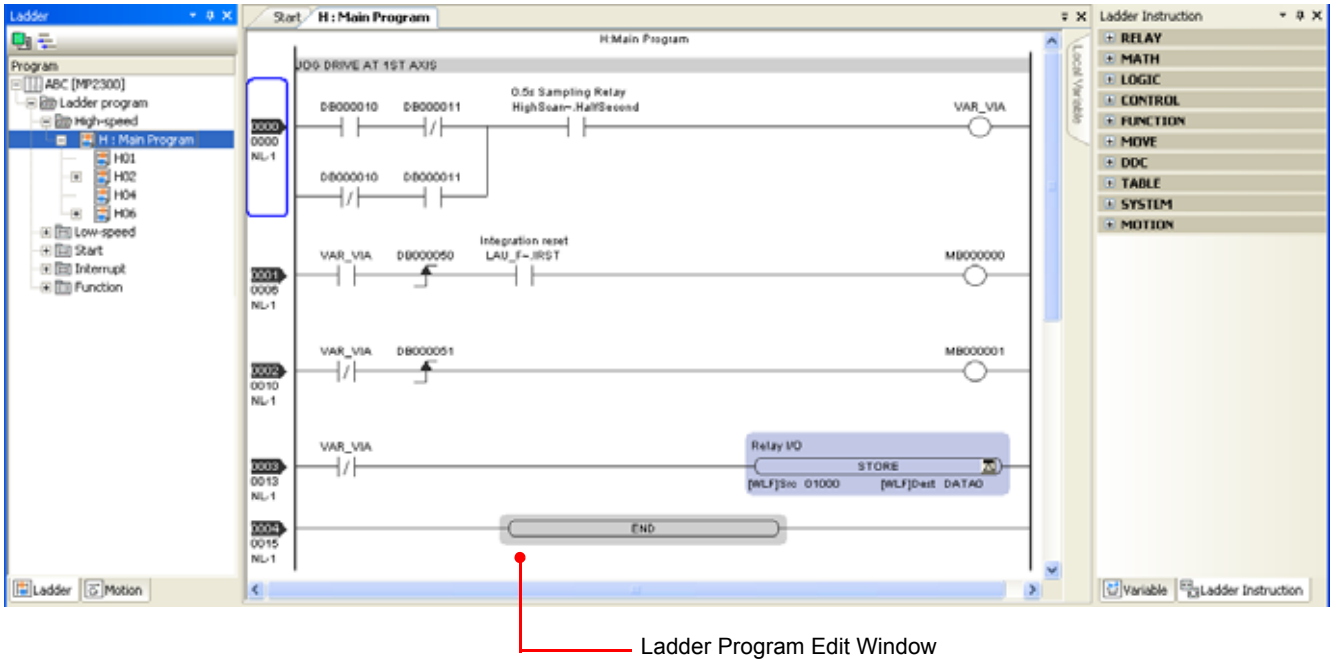
■ Motion Programs

A motion program is a program written in a textual language called motion language. In addition to main programs, it can create sub programs that is called from the main programs.

- For details on motion programs, refer to *Chapter 4 Motion Programming*.

3.2 Beginning Ladder Programming

Ladder programs can be edited by displaying the **Ladder Program Edit** Window in the main window.



The **Ladder Program Edit** Window is displayed to perform either of the following operations:

- Creating new ladder programs
- Opening ladder programs

Both of these operations are described below.

- For details on the **Ladder Program Edit** Window, refer to 3.3.1 *Ladder Program Edit Window*.

3.2.1 Creating New Ladder Programs

1. With a project file open, right-click a program folder from *High-speed* to *Interrupt*, or a level 1 or 2 program in the Ladder Subwindow and select **Create New Program** from the pop-up menu that will be displayed.

The **Create New Program** Dialog Box will be displayed.

2. Set each item, and then click the **OK** Button.

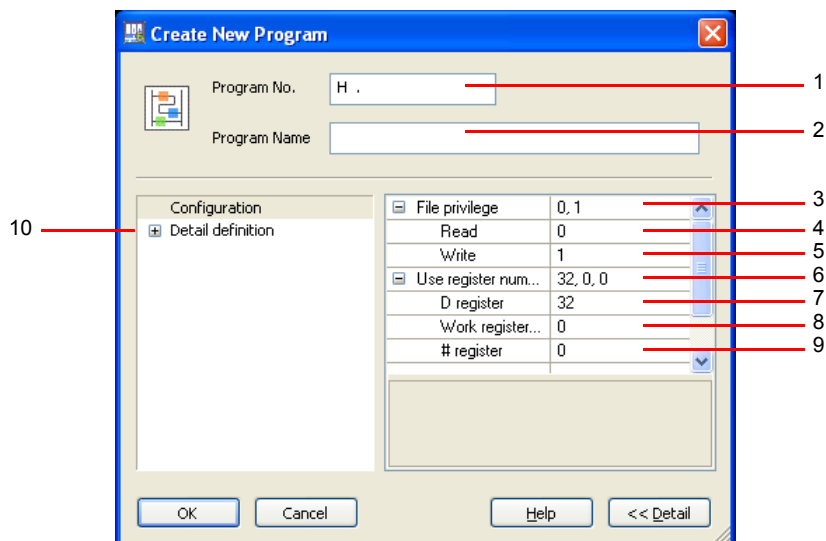


Fig. 3.2 Create New Program Dialog Box

The items to be set and the methods for setting them are described below.

1. Program Number

Enter the program number using alphanumeric characters beginning with the program type (A, I, H, or L). The following rules apply when assigning program numbers.

Level 1 programs (main programs): A, I, H, or L only. Numbers are not allowed.

Level 2 programs: Xnn (X = A, I, H, or L. n = 0 to 9)

Level 3 programs: Xnn.nn (X = A, I, H, or L. n = 0 to 9)

- Only one main program can be created within each of the A, I, H, and L programs.
- Only one X00 program (A, I, H, or L processing error processing program, X = A, I, H, or L) can be created within each of the A, I, H, and L programs.
- When the **Create New Program** Dialog Box is started from a folder or file in the Ladder Subwindow, the program numbers that can be created are displayed.

2. Program Name

Enter a program name using a maximum of 48 characters.

3. File Privileges

The reading privilege level (see 4. *Read*) and writing privilege level (see 5. *Write*) for the program are displayed here.

4. Read

Select a reading privilege level between 0 and 7 for this program. The higher the number, the higher the privilege level will be. Numbers cannot be entered directly.

- A reading privilege level cannot be set higher than the current user privilege level. (For example, if the current user level is 3, a level of 4 or higher cannot be set.)
- For details on user privilege levels and reading privilege levels, refer to ■ *User Privilege Levels and Reading and Writing Privilege Levels*, below.

5. Write

Select a writing privilege level between 0 and 7 for this program. The higher the number, the higher the privilege level will be. Numbers cannot be entered directly.

- A writing privilege level cannot be set higher than the current user level.
- For details on user privilege levels and writing privilege levels, refer to ■ *User Privilege Levels and Reading and Writing Privilege Levels* below.

6. Use Register Number

The number of D registers, work registers, and # registers used by this program are displayed here.

7. D Register

Set the maximum number of D registers (between 0 and 16,384) to be used by this program. The number can be set either by directly entering it or by using the spin buttons.

8. Work Register

The number of D registers used as work registers by the system is displayed here. This number cannot be set.

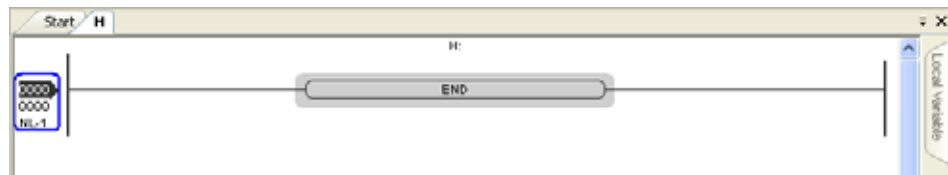
9. # Register

Set the maximum number of # registers (from 0 to 16,384) to be used by this program. The number can be set either by directly entering it or by using the spin buttons.

10. Detail Definition

This setting is not required when creating a new program. Refer to 3.4.3 (5) *Ladder Program Properties*.

Make the above settings, and click the **OK** Button. The **Create New Program** Dialog Box will be closed, and the **Ladder Program Edit** Window will be displayed as shown below with only the program title (by default, the program number), the number 0000 rung, and the END instruction entered. A ladder program can now be created.



- For details on editing ladder programs and on the terminology, refer to 3.3 *Editing Ladder Programs*.



■ User Privilege Levels and Reading and Writing Privilege Levels

Program reading and writing privilege levels are established to maintain program security. To open a particular program, the user must have a privilege level at least as high as the program's reading privilege level. Similarly, to edit and save a program, the user must have a privilege level at least as high as the program's writing privilege level.

- For details on setting and checking user privilege levels, refer to 1.9.4 *Security: User Registration*.

3.2.2 Creating Ladder Programs in the CP Form

A new ladder program can be created using CP ladder language by selecting *Use of Create new CP ladder* option in the **Environment Setting** Dialog Box. Ordinary ladder programs can be included in the same project file along with CP ladder programs.

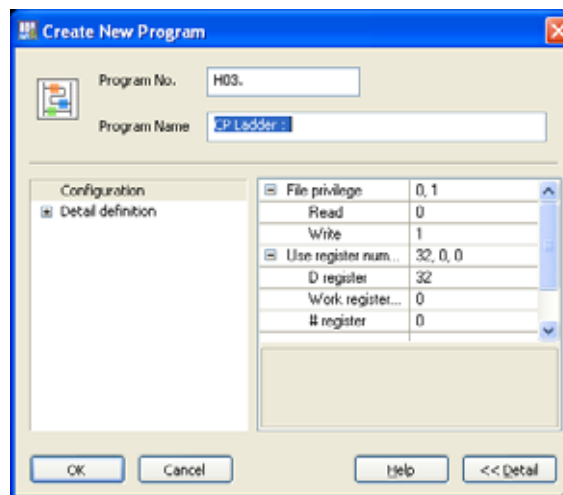
- Ordinary ladder programs are indicated by , and CP ladder programs are indicated by  in the Ladder Subwindow.
- When a ladder program is created in the CP form, use the Engineering Manager to save the program.

(1) Creating New Programs from the Ladder Subwindow

1. In the Ladder Subwindow, right-click a program folder or program from *High-speed* to *Interrupt*, and select **Create new CP ladder** from the pop-up menu that will be displayed.
 - **Create new CP ladder** is displayed only when the *Create new CP ladder: use* Option is selected in the Environment Setting Dialog Box. For details, refer to 1.9.9 *Ladder: General*.

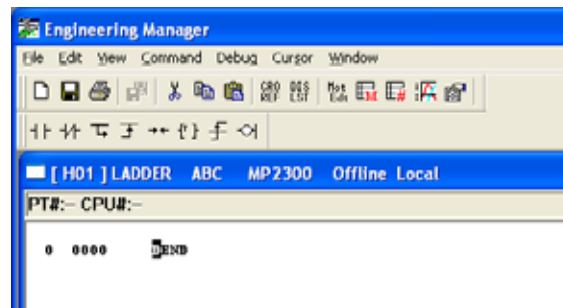
The **Create New Program** Dialog Box will be displayed.

2. Set each item and then click the **OK** Button.



- For details on the items to be set, refer to 3.2.1 *Creating New Ladder Programs*.

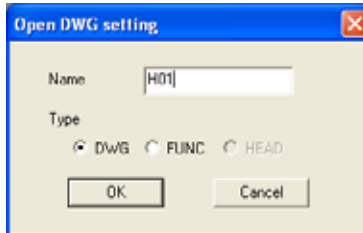
The Engineering Manager will be started, and the Edit Window for CP ladder programs will be displayed.



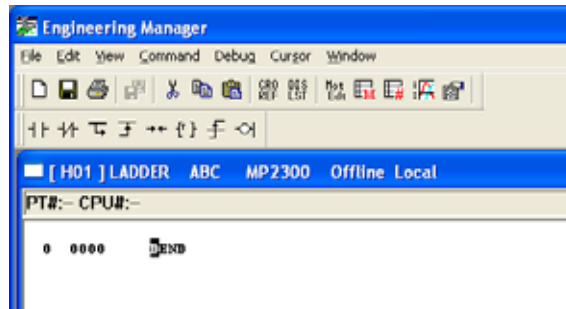
(2) Creating New Programs from the Engineering Manager

After the Engineering Manager has been started, a new CP ladder program can be created.

1. Select **Utility - Engineering builder** from the Launcher.
The Engineering Manager will be started.
2. Select **File - Open - Program - Open New Diagram** from the Main Menu.
The **Open DWG setting** Dialog Box will be displayed.
3. Enter the name of the diagram, and then click the **OK** Button.



The Edit Window for CP ladder programs will be displayed.



3.2.3 Opening Ladder Programs

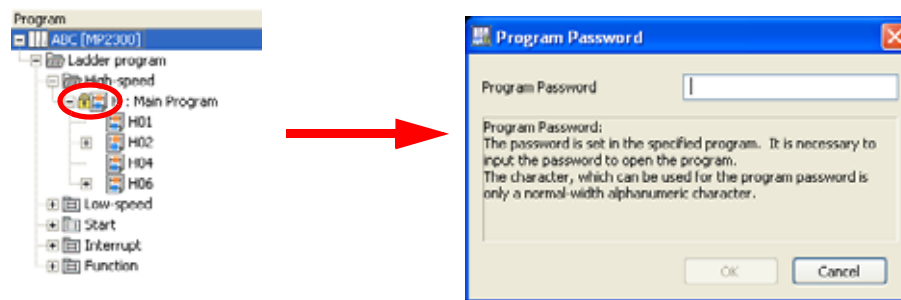
A ladder program can be opened by executing any of the following operations with the project file open.

- In the Ladder Subwindow, double-click the program to be opened.
- In the Ladder Subwindow, right-click the program to be opened, and then select **Open** from the pop-up menu that will be displayed.

The only programs that can be opened, however, are programs for which the reading privilege level is no higher than the current user privilege level. A selected program cannot be opened if the reading privilege level is higher than the user privilege level.

- For details on user, reading, and writing privilege levels, refer to [User Privilege Levels and Reading/Writing Privilege Levels](#).

If an attempt is made to open a ladder program for which a password is set (i.e., a ladder program indicated by a lock at the icon), the **Program Password** Dialog Box will be displayed.



When the dialog box is displayed, enter the password in the *Program Password* Field, and click the **OK** Button.

- The **OK** Button is valid when one or more characters of text are entered in the *Program Password* Field.

CP ladder programs can also be opened. For details, refer to [1.8.4 Opening an MPE720 Version 5 MAL File](#).

■ User Privilege Levels and Reading/Writing Privilege Levels

Program reading and writing privilege levels are established to maintain program security. To open a particular program, the user must have a privilege level at least as high as the program's reading privilege level. Similarly, to edit a program, the user must have a privilege level at least as high as the program's write privilege level.

- For details on setting and checking user privilege levels, refer to [1.9.4 Security: User Registration](#).
-

3.2.4 Opening CP Ladder Programs

CP ladder programs can be opened from Engineering Manager.

A maximum of 16 CP ladder programs can be opened. CP ladder programs are opened in the same way as ladder programs described in [3.2.3 Opening Ladder Programs](#).

3.2.5 Displaying and Editing MPE720 Version 6 Ladder Programs on MPE720 Version 5

To display and edit the ladder programs that were created on MPE720 version 6 on MPE720 version 5, the ladder programs need to be compiled into MPE720 version 5 compatible programs.

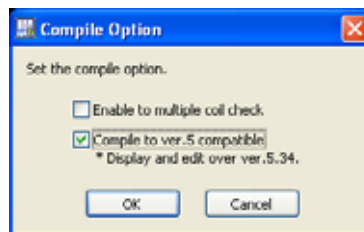
The ladder programs can be compiled into MPE720 version 5 compatible programs by the following methods.

- MPE720 version 5 compatible programs mean that programs originally made with version 6 are compiled into a format that is compatible with MPE720 version 5.
- Refer to 3.3.17 *Ladder Program Compiling and Compile Options* for details.

1. Select **Compile - Compile Option** from the Main Menu.

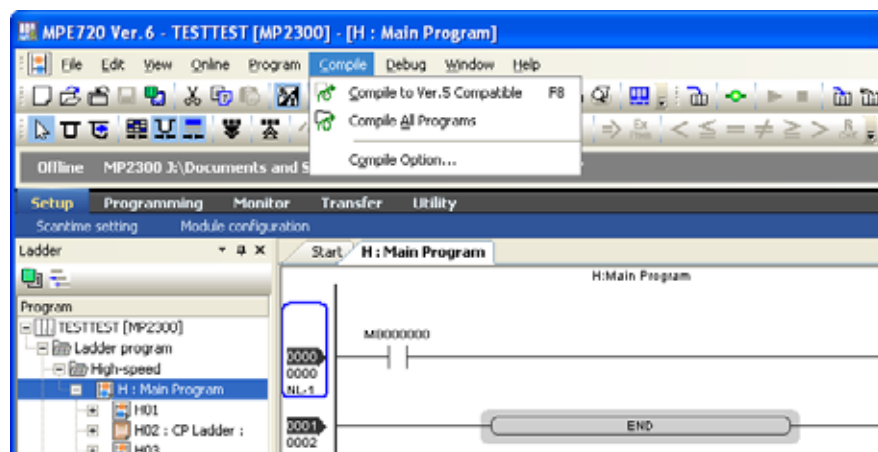
The **Compile Option** Dialog Box will open.

2. Select **Compile to ver.5 compatible**, and then click **OK**.



3. Select **Compile** from the Main Menu again. The **Compile to Ver.5 Compatible** command will appear under Compile menu.

Click **Compile to Ver.5 Compatible** to start compilation.



- Selecting **Compile - Compile All Programs** from the Main Menu will compile all ladder programs at once.

4. Write the ladder program into the Machine Controller and save.

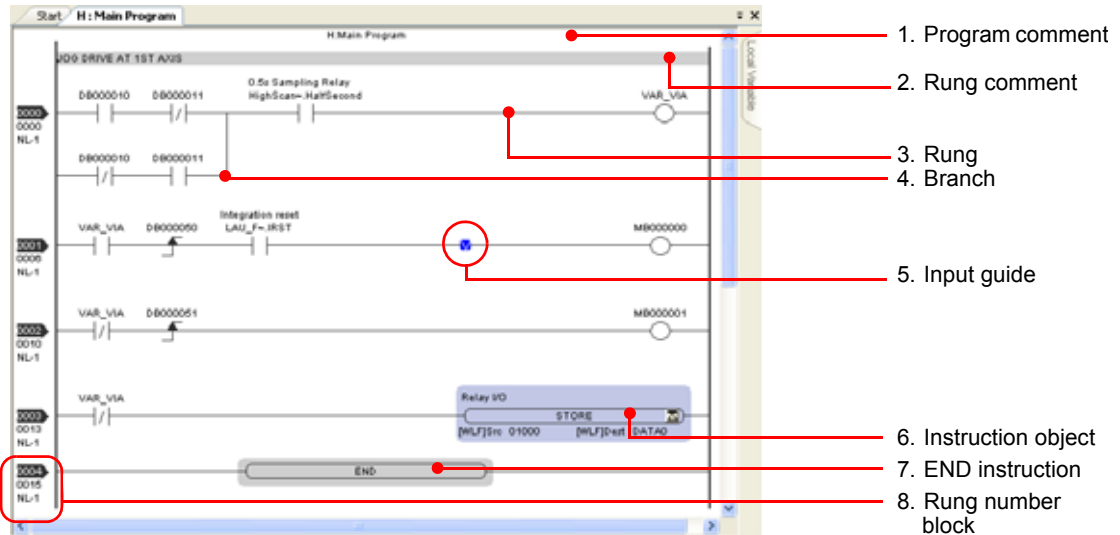
Start MPE720 version 5 and read the data of the ladder program from the Machine Controller.

3.3 Editing Ladder Programs

This section describes the operations in the Ladder Program Edit Window.

3.3.1 Ladder Program Edit Window

The overview and the components of the Ladder Program Edit Window are shown in the following illustration and described below.



1. Program Comments

A comment about the program. The program name is displayed as the program comment when the program is created.

- For details on editing program comments, refer to 3.3.5 *Editing Program Comments*.

2. Rung Comments

A comment about the next rung or rung block. Multiple rung comments can be set for a single rung.

- For details on creating and editing rung comments, refer to 3.3.6 *Inserting and Editing New Rung Comments*.

3. Rungs

A basic line for placing objects, such as instructions and branches.

- For details on inserting and editing rungs, refer to 3.3.7 *Inserting and Editing New Rungs*.

4. Branches

Lines used for arranging instructions in parallel. Further branches can also be created from the original branches.

- For details on inserting and editing branches, refer to 3.3.8 *Inserting Branches* and 3.3.9 *Editing Branches*.

5. Input Guide

Displays the object entry position.

6. Instruction Objects

The instruction name, comment, variable name, and register* are displayed for each instruction object. Different instruction types are distinguished by color.

- * The register can be displayed or hidden. The default is for the register address to be hidden (as in the above window). For details on displaying or hiding addresses, refer to 3.3.4 *Changing Edit Window Displays*.
- For details on inserting and editing instructions, refer to 3.3.10 *Inserting Instruction Objects* and 3.3.11 *Editing Instruction Objects*.

7. END Instruction

Entered when a program is created and indicates the end of the program. Cannot be edited.

8. Rung Number Blocks

Displays Rung information. Rung information cannot be edited.

Line 1, rung number: The rung number is displayed.

Line 2, step number: The total number of steps up until that rung is displayed.

Line 3, nesting number: The nesting level is displayed.

Objects

All components used in creating ladder programs are called objects.

3.3.2 Main Functions Used in Editing Ladder Programs

The following toolbars and subwindows can be used when editing ladder programs.

- Ladder Editor Toolbar
- Ladder Instruction Toolbar
- Ladder Instruction Subwindow
- Variable Subwindow

(1) Ladder Editor Toolbar



The Ladder Editor Toolbar is used for editing ladder program objects.

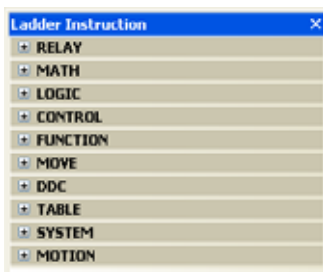
(2) Ladder Instruction Toolbar



The Ladder Instruction Toolbar is used for entering instruction objects into ladder programs. Instruction objects can be entered by simply clicking the icons.

- For details on entering instruction objects, refer to 3.3.10 *Inserting Instruction Objects*.

(3) Ladder Instruction Subwindow



The Ladder Instruction Subwindow is used for entering instruction objects into ladder programs. Instructions can be entered by dragging and dropping them in edit subwindows.

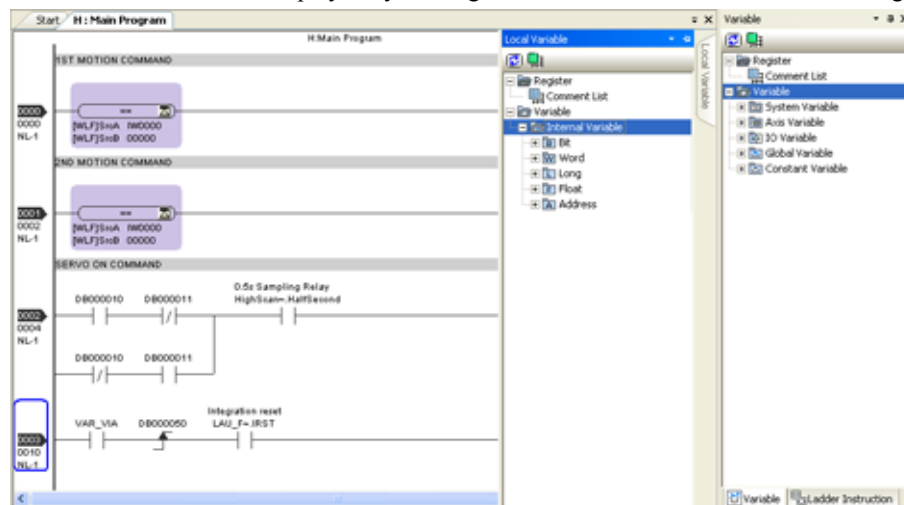
Click the Expand Button (+) to enlarge the ladder instruction stored in the Ladder Instruction Subwindow, and click the Contract Button (–) to shrink the instruction.

- For details on entering instruction objects, refer to 3.3.10 *Inserting Instruction Objects*.

(4) Variable Subwindow

The Variable Subwindow is used for entering comments and variables for instruction objects. A variable tree is displayed. Variables and comments are expanded to display by clicking the Expand Button (+). The original display is restored by clicking the Contract Button (–).

The Local Variable Subwindow is displayed by moving the cursor to the **Local Variable** Tab Page.



- For details on entering variables in ladder programs, refer to 3.3.12 *Entering and Changing Variables and Registers*.
- For details on variables, refer to *Chapter 5 Variables*.

3.3.3 Updating Subwindow Displays

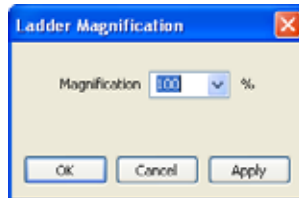
The data displayed in a Ladder, Motion, or Variable Subwindow, or in a comment list, can be updated either by selecting **View - Update** from the Main Menu or by pressing the **F5** Key. (For information on comment lists, refer to 5.7 *Comment Lists*.)

3.3.4 Changing Edit Window Displays

The Ladder Program Edit Window can be used to change the magnification and either hide or display variables, registers, and comments for objects. In addition, various elements (object colors, fonts, etc.) in the Ladder Program Edit Window can be set optionally.

(1) Changing the Display Magnification

The magnification of the Ladder Program Edit Window can be changed by selecting **View - Zoom** from the Main Menu in the **Ladder Magnification** Dialog Box that will be displayed.



The display magnification can be changed to 10%, 25%, 50%, 75%, 100%, 125%, 150%, 175%, or 200% by clicking the drop-down arrow and selecting the magnification from the list. The number of the display magnification is set in 1% increments by directly entering the number (10% to 500%) into the *Magnification* Box.

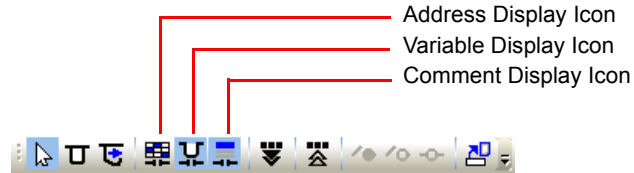
Click the **OK** Button to close the dialog box and change the display magnification.

Click the **Cancel** Button to cancel the setting and close the dialog box.

Click the **Apply** Button to change the display magnification while leaving the dialog box open so that the display magnification can be changed again.

(2) Displaying or Hiding Addresses, Variables, and Comments

Registers, variables, and comments for instruction objects can be either displayed or hidden by clicking their respective icons in the Ladder Editor Toolbar. (When variables are hidden, the registers will be displayed at their display location.) Each click toggles between display and hide. When *Display* is in effect, the background color of the icon is blue.



The display/hide function for registers, variables, and comments can be used in the following combinations.

Addresses	Variables	Comments	Object Display	Addresses	Variables	Comments	Object Display
√	√	√		√	-	-	
√	√	-		-	√	-	
√	-	√		-	-	√	
-	√	√		-	-	-	

- √ : Display - : Hide
- Even if variables are set to be *Displayed*, the register will be displayed if no variable is set for that address.

(3) Changing Edit Window Displays (Editor Options)

Object colors, fonts, display methods, and key allocations can be changed by selecting **View - Editor Option** from the Main Menu in the **Editor Option** Dialog Box that will be displayed, and then using the four tab pages (Color, Font, Ladder, and Key Allocation).

The following operations are executed by clicking the buttons.

When the **Default** Button Is Clicked:

The set values on the currently selected tab page will be restored to the default values. The set values on the other tab pages will not be changed.

When the **OK** Button Is Clicked:

The current settings in all the tab pages will be overwritten, the **Editor Option** Dialog Box will be closed, and the changed contents will be reflected in the **Ladder Program Edit** Window.

When the **Cancel** Button Is Clicked:

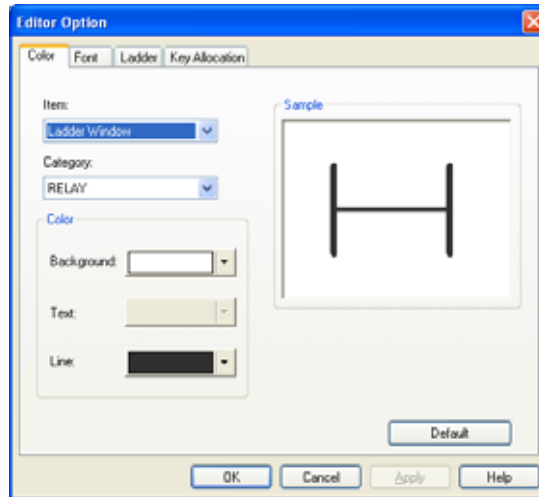
Changes to the settings (in all tab pages) will be cancelled, and the **Editor Option** Dialog Box will be closed.

When the **Apply** Button Is Clicked:

Changes to the settings in all tab pages are overwritten and are immediately reflected. The **Editor Option** Dialog Box remains open, allowing further settings to be made.

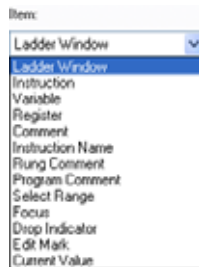
- Be careful when clicking the **Apply** Button, because changes made to settings in other tab pages will be overwritten at the same time.

[a] Color Tab Page



The following items can be set.

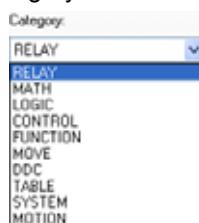
Item:



Click the drop-down arrow and select the item to be set. (Refer to the illustration on the left.)

When an item is selected, the display in the Sample Field will be changed to the current value of the selected object.

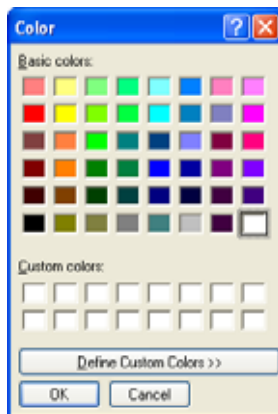
Category:



Click the drop-down arrow and select the instruction category to be set. (Refer to the illustration on the left.)

If **Instruction** or **Instruction Name** is selected from the *Item* Combo box and the instruction category is selected from the *Category* Comb box, the display in the *Sample* Field will be changed to the current value of the selected instruction.

Color:



Click the *Background*, *Text*, or *Line* color box or drop-down arrow to display the **Color** Dialog Box shown on the left.

Select or create a color in the **Color** Dialog Box, and click the **OK** Button. The **Color** Dialog Box will be closed, and the color will be changed in the *Background*, *Text*, or *Line* color box. The color of the object in the *Sample* Field will be replaced by the selected color.

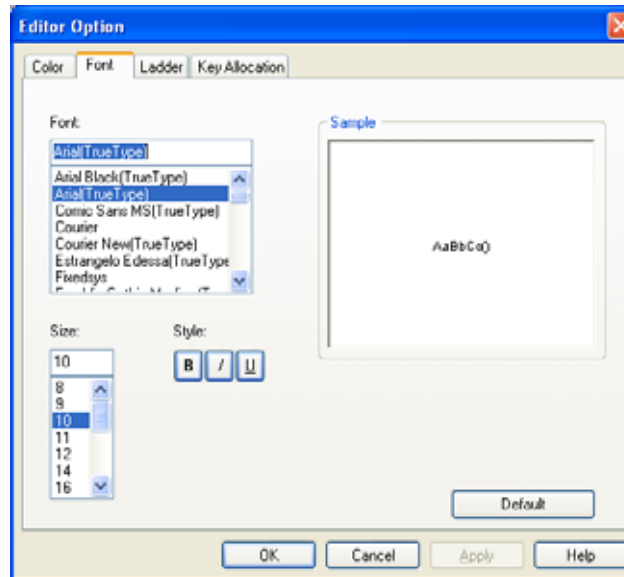
- For information on how to create colors, refer to help by clicking the ? Button in the **Color** Dialog Box.

Sample:



Displays preview.

[b] Font Tab Page



The following items can be set. When a setting is changed, the change is reflected in the text in the *Sample* Field.

Font:

Select from the list the font that is to be used in the **Edit** Window. The fonts displayed in the list will vary depending on which fonts are installed in the computer.

Size:

Select from the list the font size (points) that is to be used in the **Edit** Window. The text cursor is displayed by clicking inside the comb box and then a number from 1 to 128 can be entered directly.

If an out-of-range number is entered, and the **OK** Button or the **Apply** Button is clicked, the previously set number will be restored.

Style:

Use the **B**, **I**, and **U** Buttons to set the font styles to be displayed in the **Edit** Window.

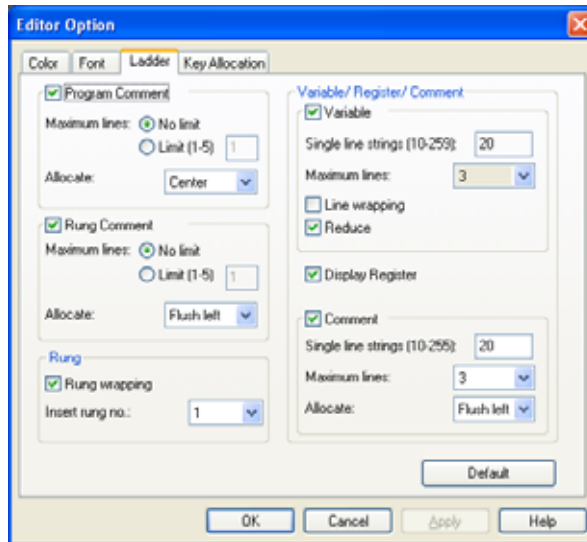
Each of these buttons can be set independently. The setting is toggled between ON and OFF each time a button is clicked.

B: Bold

I: Italic

U: Underline

[c] Ladder Tab Page



The following items can be set.

Program Comment:

Check Box:

When the check box is selected, program comments are displayed in the **Edit** Window. The maximum number of lines for entering comments can be set. When the check box is unchecked, program comments are not displayed and the maximum number of lines cannot be set.

- Even when the check box is not cleared, the program comment information is retained without being deleted.

Maximum Number of Lines:

If a *Limit* is set, click inside the box to display the text cursor and then enter the maximum number of lines from 1 to 5.

Allocate:

Comments in the program comment line formatted as *Center*, *Flush Left*, or *Flush Right*.

Rung Comment:

Check Box:

When the check box is selected, rung comments are displayed in the **Edit** Window. The maximum number of lines for entering rung comments can be set. When the check box is unchecked, rung comments are not displayed and the maximum number of lines cannot be set.

- Even when the check box is not cleared, the rung comment information is retained without being deleted.

Maximum Number of Lines:

If a *Limit* is set, click inside the box to display the text cursor and then enter the maximum number of lines from 1 to 5.

Allocate:

Comments in the rung comment line formatted as *Center*, *Flush Left*, or *Flush Right*.

Rung:

Rung Wrapping:

When the check box is selected, rungs will wrap when they are too long. If this check box is cleared, rungs in displays may be long. Use the scroll bar in the **Edit** Window to show the required sections.

Insert Rung No.:

The number of rungs that can be inserted in the **Edit** Window with one insertion operation can be set between 1 and 10.

Variable:

Check Box:

When the check box is selected, variables are displayed in instruction objects. The method for displaying variables can also be set. When the check box is unchecked, variables are not displayed and the setting fields are also invalid.

This setting is linked with the operation of the **Variable Display** Button in the Ladder Editor Toolbar. Refer to 3.3.4 *Changing Edit Window Displays* and (2) *Displaying or Hiding Addresses, Variables, and Comments*.

Single line strings:

The maximum number of characters that can be entered in one line in the variable name display for an instruction object can be set from 10 to 259.

Maximum Number of Lines:

The maximum number of lines that can be entered in the variable name display for an instruction object can be set from 1 to 5, or to *No limit*. Numbers cannot be entered.

Wrapping and Reduce:

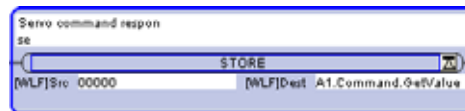
Both of these are valid for structure variables (e.g., axis variables such as A1 axis, motion command, motion command status, and command execution flag variables).

When *Wrapping* is selected, variables are wrapped at periods.

When *Reduce* is selected, only the beginning and end of a variable are displayed, and the symbol "~" is displayed in the middle.

The structure variable displays are as shown below.

Without Wrapping or Reducing



Without Wrapping; With Reducing



With Wrapping; Without Reducing



With Wrapping and Reducing

**Display Register:**

When the check box is selected, register addresses are displayed in instruction objects. This setting is linked with the operation of the **Address Display** Button in the Ladder Editor Toolbar. (Refer to 3.3.4 *Changing Edit Window Displays* and (2) *Displaying or Hiding Addresses, Variables, and Comments*.)

Comment:**Check Box:**

When the check box is selected, comments are displayed in instruction objects. The method for displaying comments can also be set. When the check box is unchecked, comments are not displayed and the setting fields are also invalid.

This setting is linked with the operation of the **Comment Display** Button in the Ladder Editor Toolbar. (Refer to 3.3.4 *Changing Edit Window Displays* and 3.3.4 (2) *Displaying or Hiding Addresses, Variables, and Comments*.)

Single line strings:

The maximum number of characters that can be entered in one line in the *Comment* Field for an instruction object can be set from 10 to 255.

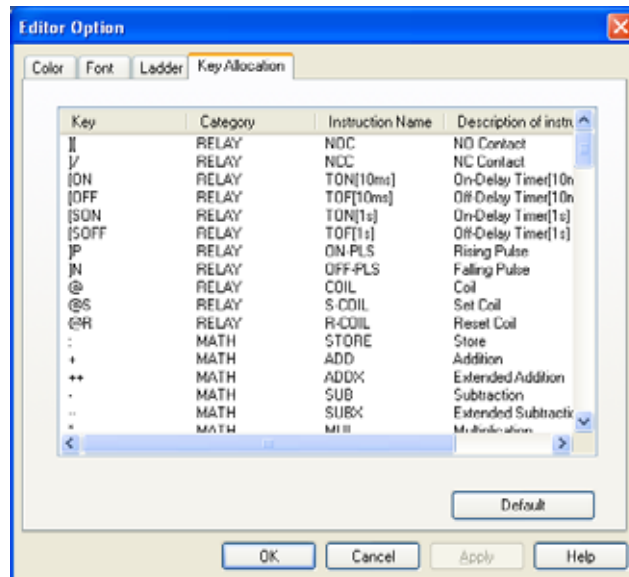
Maximum Number of Lines:

The maximum number of lines that can be entered in the *Comment* Field for an instruction object can be set from 1 to 5, or to *No limit*. Numbers cannot be entered.

Allocate:

Comments in the instruction object *Comment* Field formatted as *Center*, *Flush Left*, or *Flush Right*.

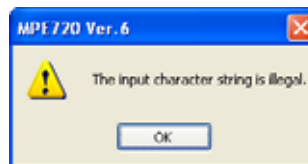
[d] Key Allocation Tab Page



The key allocations used for entering instructions for objects can be changed.

Double-click in the *Key* Field for the instruction that is to be changed, as shown in the window above. When the text cursor is displayed, enter the key that is to be allocated.

If a key that is already being used is allocated or deleted, the following error message will be displayed.

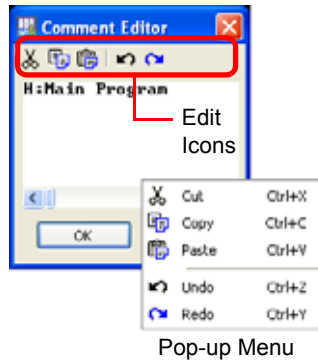


3.3.5 Editing Program Comments

The program name is displayed when the new program is created.

The comment can be edited either by using the Comment Editor or by direct editing in the *Program Comment* Field.

(1) Using the Comment Editor



Double-click a program comment to display the Comment Editor (shown to the left). The following operations can then be executed.

- Characters can be entered.
- Icons, short-cut keys, and pop-up menus (accessed by right-clicking on selected character strings) can be used for *Cut*, *Copy*, *Paste*, *Undo*, and *Redo* operations.
 - For description purposes, all of the icons and menu items shown in the illustration to the left are shown as active.
- Use the **Enter** Key to start a new line.

Click the **OK** Button to complete the comment entering and editing.

(2) Editing Comments Directly in the Program Comment Field

1. Click a program comment to select it, and then select **Program - Edit Program Comment** from the Main Menu. Alternatively, right-click the program comment and select **Edit Program Comment** from the pop-up menu that will be displayed.

The mode will be changed to the Program Comment Edit Mode, and the entered text will be selected.



2. Edit the text.

- Characters can be entered.
- Main Toolbar icons, short-cut keys, and pop-up menus (accessed by right-clicking on selected character strings) can be used for *Cut*, *Copy*, *Paste*, *Undo*, and *Redo* operations.
- Use the **Ctrl + Enter** Keys to start a new line.

3. Press the **Enter** Key to exit the edited program comment.

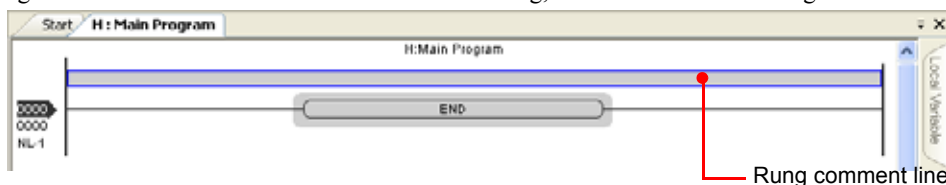
3.3.6 Inserting and Editing New Rung Comments

(1) Inserting New Rung Comments

A comment regarding a selected rung can be inserted before that rung. A separate new rung comment can be inserted for a rung that already has a comment inserted.

1. Click to select the rung number block for the rung where the rung comment is to be inserted.
2. Select **Program - Insert Rung Comment** from the Main Menu. Alternatively, right-click the rung number block and select **Insert Rung Comment** from the pop-up menu that will be displayed.

The rung comment will be inserted before the selected rung, as shown in the following illustration.

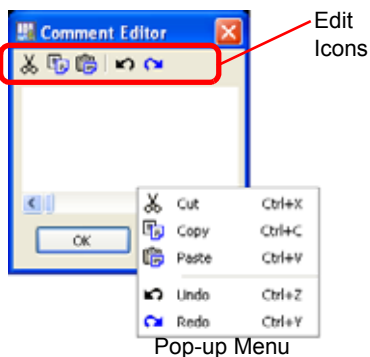


3. Enter or edit the comment.

Rung comments can be entered or edited either by using the Comment Editor or by editing directly in the *Rung Comment Field*. For details on these two methods, refer to (2) *Using the Comment Editor* and (3) *Editing Directly in the Rung Comment Line*.

- Click the left side of the rung comment line to display an oval. That oval can then be used to edit (copy, paste, move, or delete) the rung comment as an object. Refer to 3.3.7 (4) *Deleting Rungs*.

(2) Using the Comment Editor



Double-click a rung comment to display the Comment Editor (shown to the left). The following operations can then be executed.

- Characters can be entered.
- Icons, short-cut keys, and pop-up menus (accessed by right-clicking on selected character strings) can be used for *Cut*, *Copy*, *Paste*, *Undo*, and *Redo* operations.
 - For description purposes, all of the icons and menu items shown in the illustration to the left are shown as active.
- Use the **Enter** Key to start a new line.

Click the **OK** Button to complete the comment entering and editing.

(3) Editing Directly in the Rung Comment Line

1. Click to select the rung comment line, and either select **Program - Edit Rung Comment** from the Main Menu or press the **F2** Key. Alternatively, right-click the rung comment line and select **Edit Rung Comment** from the pop-up menu that will be displayed.

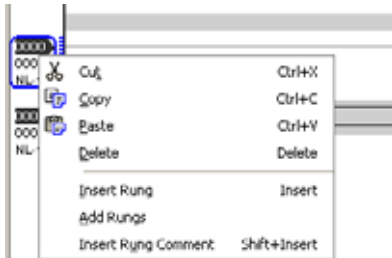
The mode will be changed to the Rung Comment Edit Mode. If any text has already been entered, it will be selected.

2. Edit the text.

- Characters can be entered.
- Main Toolbar icons, short-cut keys, and the rung comment pop-up menu can be used for *Cut*, *Copy*, *Paste*, *Undo*, and *Redo* operations.
- Use the **Ctrl + Enter** Keys to start a new line.

3. Press the **Enter** Key to exit the edited rung comment and also press the **Esc** Key to cancel the editing operation.

3.3.7 Inserting and Editing New Rungs



Rung Number Block Pop-up Menu

Click to select the rung number block for the new rung that is to be inserted or edited.

Right-click the rung number block to display a pop-up menu with the rung editing operations listed.

- If multiple rungs are selected, only **Cut**, **Copy**, and **Delete** will be valid in the pop-up menu.

(1) Inserting (Adding) New Rungs

1. Click to select the rung number block at the insertion position.
2. Any of the following operations can be used.
 - Select **Program - Insert Rung** or **Add Rungs** from the Main Menu.
 - Right-click the rung number block and select **Insert Rung** or **Add Rungs** from the pop-up menu that will be displayed.
 - Press the **Insert** Key on the keyboard.

With any of the above operations, a new rung will be inserted before the selected rung (or after, for **Add**), and the rung number in the inserted position will be advanced by one.

When **Insert Rung** or **Add Rungs** is selected, or when the **Insert** Key is pressed, an input guide will be displayed for the inserted rung.

- The number of rungs that can be inserted with a single insertion operation can be changed using the Ladder Tab Page in the **Editor Option** Dialog Box. For details, refer to 3.3.4 (3) *Changing Edit Window Displays (Editor Options)*.

(2) Cutting, Copying, and Pasting Rungs

1. Click to select the rung number block to be cut (or copied).
2. With the rung number block selected, select **Edit - Cut** (or **Copy**) from the Main Menu. Alternatively, right-click the rung number block and select **Cut** or **Copy** from the pop-up menu that will be displayed.
 - After the rung has been cut, it must be pasted before another cut or copy operation is executed or else the branch that was cut first will be deleted.
3. Select the rung number block for the insertion position, and select **Edit - Paste** from the Main Menu. Alternatively, right-click the rung number block for the insertion position, and then select **Paste** from the pop-up menu that will be displayed.
 - Rungs from other ladder programs and program files can also be pasted.

(3) Moving Rungs by Dragging

1. Select and drag the number block of the rung that is to be moved.

An UP pointer “^” between the rungs will be displayed where the moved rung will be dropped.

2. Release the mouse button when the “^” symbol is displayed at the destination position.

(4) Deleting Rungs

1. Select the number block of the rung to be deleted, and then select **Edit - Delete** from the Main Menu. Alternatively, right-click the rung number block and select **Delete** from the pop-up menu that will be displayed. Another method is to press the **Delete** Key on the keyboard.
 - Rung comment objects can be moved and deleted using the same methods as in (3) and (4).

3.3.8 Inserting Branches

There are four ways of inserting new branches:

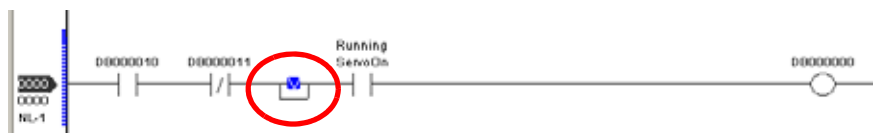
- Individually inserting an empty branch
- Inserting an empty branch by using the branch cursor
- Copying instructions and arranging them in parallel
- Arranging any instructions in parallel
 - Branches can only be inserted on the same rung. Branches cannot be created that straddle multiple rungs.

(1) Individually Inserting an Empty Branch

This method individually inserts an empty branch object.


1. Click the position where the branch is to be inserted to display an input guide.
2. Select **Program - Insert Branch** from the Main Menu. Alternatively, right-click the input guide and select **Insert Branch** from the pop-up menu that will be displayed. Another method is to press the **Ctrl+B** Keys.

An empty branch will be inserted with branch points before and after the input guide.



(2) Inserting an Empty Branch by Using the Branch Cursor

This method specifies the branch starting and ending points and inserts an empty branch.

1. Click one end of the position where the branch is to be inserted, to display an input guide.
2. Either click the **Create Branch Mode Icon** () in the Ladder Edit Toolbar, or select **Program - Create Branch Mode** from the Main Menu. Alternatively, press the **Ctrl+I** Keys.

The cursor will be changed for creating branches.

3. Click the input guide.
4. Move the cursor to display a **V** symbol for the branch end point, and click the **V**.



An empty branch will be inserted around the instruction objects.

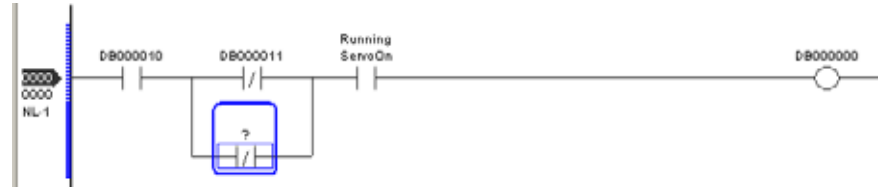


(3) Copying Instructions and Arranging Them In Parallel

This method can be used to copy a selected instruction object and create a parallel branch.

1. Click to select an instruction object to be copied to a branch.
2. Right-click the selected instruction object and select **Insert Branch** from the pop-up menu that will be displayed. Alternatively, select **Program - Insert Branch** from the Main Menu. Another method is to press the **Ctrl+B** Keys.

A branch with that instruction will be inserted in parallel to the selected instruction object.



- Only one instruction can be arranged on a branch using this operation.
- Items such as variable names and addresses will not be copied for the instruction arranged in parallel.
- For details on entering comments and registers for the inserted instruction, refer to 3.3.13 *Editing Comment Fields* and 3.3.12 *Entering and Changing Variables and Registers*.
- For information on the meanings and uses of ladder instructions, refer to the *Machine Controller MP900/MP2000 Series New Ladder Editor User's Manual* (SIEZ-C887-13.2).

(4) Arranging Any Instructions in Parallel

A branch with any instruction can be inserted in parallel to the selected instruction object.

1. Click to select the instruction object at the branch insertion position.

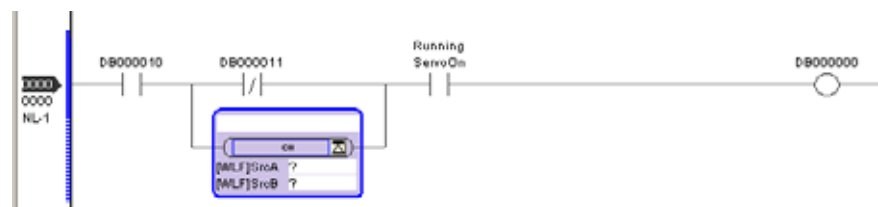


- If more than one instruction object is selected, the last one selected will be taken as the selected object.
2. From the Ladder Instruction Toolbar, click the object to be arranged on the branch.



Alternatively, right-click the selected instruction object and select **Add Parallel Instruction - [Instruction Type] - [Instruction]** from the pop-up menu that will be displayed. Another method is to select **Program - Add Parallel Instruction - [Instruction Type] - [Instruction]** from the Main Menu. Another method is to drag and drop an instruction from the Instruction Subwindow into the instruction object of step 1.

A branch with the instruction selected in step 2 will be inserted in parallel with the instruction object selected in step 1.




- For details on entering comments and registers for the inserted instruction, refer to 3.3.13 *Editing Comment Fields* and 3.3.12 *Entering and Changing Variables and Registers*.
- For information on the meanings and uses of ladder instructions, refer to the *Machine Controller MP900/MP2000 Series New Ladder Editor User's Manual* (SIEZ-C887-13.2).

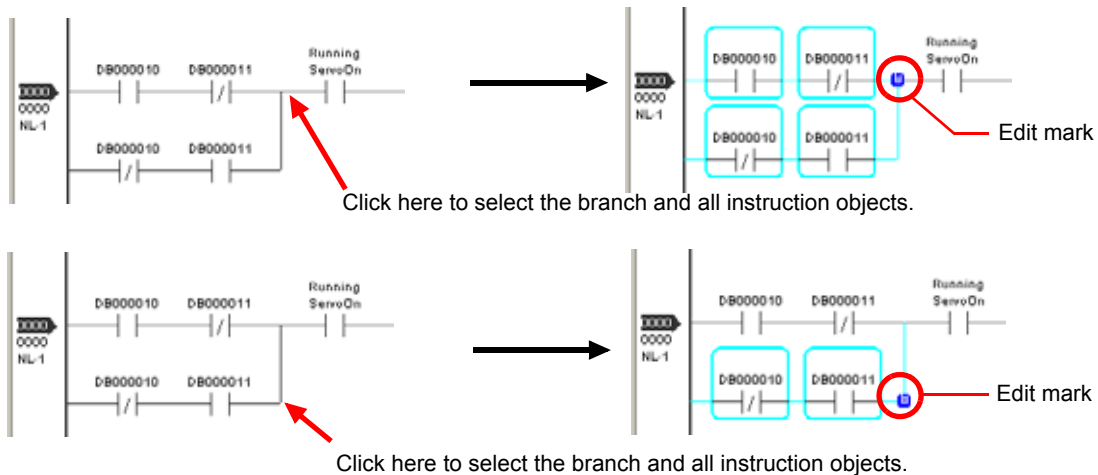
3.3.9 Editing Branches

The following editing operations can be used for branches.

- Cutting, copying, and pasting
- Moving branches by dragging
- Changing branch positions
- Deleting branches

(1) Cutting, Copying, and Pasting Branches


1. Click the branching point of the branch that is to be edited. A branch edit mark () will be displayed and the branch that is to be edited will be selected. Be careful when clicking the branching point, because the object that is selected will differ as shown below depending on which place is clicked.





2. Select **Edit - Cut** or **Copy** from the Main Menu. Alternatively, right-click the edit mark and select **Cut** or **Copy** from the pop-up menu that will be displayed. Another method is to press the **Ctrl+X** Keys (Cut) or the **Ctrl+C** Keys (Copy).
 - After a branch has been cut, it must be pasted before another cut or copy operation is executed or else the branch that was cut first will be deleted.
3. Click the insertion position to display an input guide on the rung.
 - Rungs with other ladder programs displayed in the Ladder Subwindow can also be used.
4. Select **Edit - Paste** from the Main Menu. Alternatively, right-click the edit mark and select **Paste** from the pop-up menu that will be displayed. Another method is to press the **Ctrl+V** Keys.

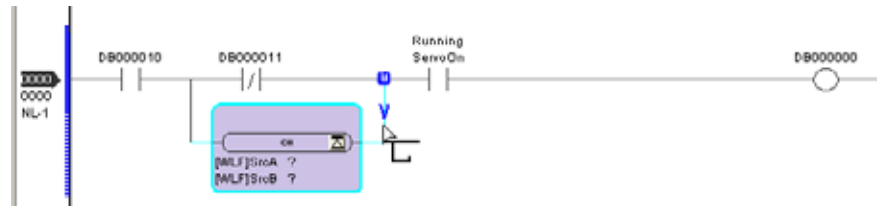
When any of the above is executed, the cut or copied branch will be inserted at the input guide position.

(2) Moving Branches by Dragging

1. Select the branch to be moved. The edit mark () will be displayed. (For details on objects of edit marks, refer to 3.3.9 (1) *Cutting, Copying, and Pasting Branches*.)
2. Drag the edit mark to display the input guide at the destination position, and release the mouse button.
 - Rungs with other ladder programs displayed in the Ladder Subwindow can also be used.

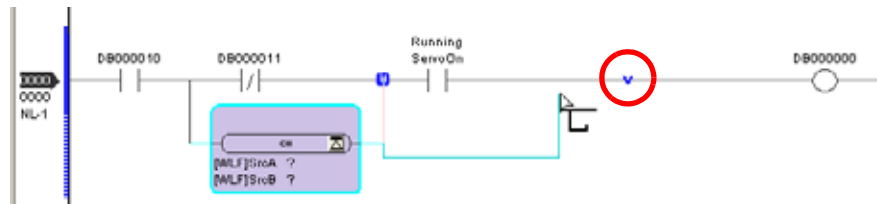
(3) Changing Branch Positions

1. Select the branch position to be changed. The edit mark () will be displayed. (For details on applicable objects of edit marks, refer to 3.3.9 (1) *Cutting, Copying, and Pasting Branches*.)
2. Click the **Branch Edit Mode** Icon () in the Ladder Editor Toolbar. Alternatively, select **Program - Branch Edit Mode** from the Main Menu.
The cursor will be changed for editing branches.
3. Move the cursor to display the Up or Down Arrow at either the input or output side of the branch, whichever side is to be changed, and click the edit mark.

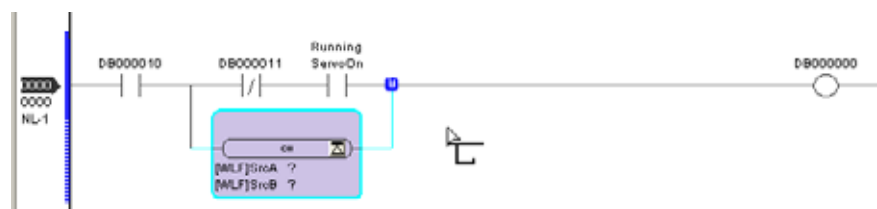


The branch point will then move with the cursor.


4. Move the cursor to display the replacement position **V**.



5. Click the **V** to change the branch point.




- The change of branch positions can be cancelled by pressing the **Esc** Key.

6. Click the **Normal Edit Mode** Icon () in the Ladder Editor Toolbar to exit the Branch Edit Mode and return the cursor to its normal form.

- The cursor will be also returned to its normal form by pressing the **Esc** Key.

(4) Deleting Branches

1. Select the branch to be deleted. The edit mark () will be displayed. (For details on applicable objects of edit marks, refer to 3.3.9 (1) *Cutting, Copying, and Pasting Branches*.)
2. Select **Edit - Delete** from the Main Menu. Alternatively, right-click the edit mark and select **Delete** from the pop-up menu that will be displayed. Another method is to press the **Delete** Key.

3.3.10 Inserting Instruction Objects

- For information on the meanings and uses of ladder instructions, refer to *Machine Controller MP900/MP2000 Series New Ladder Editor Programming Manual* (SIEZ-C887-13.1).

There are three ways of inserting new ladder instructions:

- Specifying the entry position (input guide or instruction object)
- Entering directly to the input guide
- Inserting a new instruction in parallel with an instruction that is already entered (Inserting branches)

For details on inserting branches, refer to 3.3.8 (3) *Copying Instructions and Arranging Them In Parallel* and 3.3.8 (4) *Arranging Any Instructions in Parallel*.

(1) Specifying the Entry Position

This section describes how to insert a ladder instruction at an input guide position or before a selected instruction object.

■ Inserting at an Input Guide Position

Click the entry position that the ladder instruction is inserted to display the input guide, and then execute any of the following operations.

- Click an icon in the Ladder Instruction Toolbar.
- Drag and drop an instruction from the Ladder Instruction Subwindow to the input guide.
- Right-click the input guide and select **Instruction - [Instruction Type] - [Instruction]** from the pop-up menu that will be displayed.
- Select **Program - Insert Instruction - [Instruction Type] - [Instruction]** from the Main Menu.
- Paste a cut or copied instruction object.

■ Inserting before an Instruction Object

Click to select the instruction object at the insertion position, and then execute any of the following operations.

- Right-click the selected object, and select **Insert Instruction - [Instruction Type] - [Instruction]** from the pop-up menu that will be displayed.
- Select **Program - Insert Instruction - [Instruction Type] - [Instruction]** from the Main Menu.
- Paste a cut or copied instruction object. (In this case, a branch is inserted.)

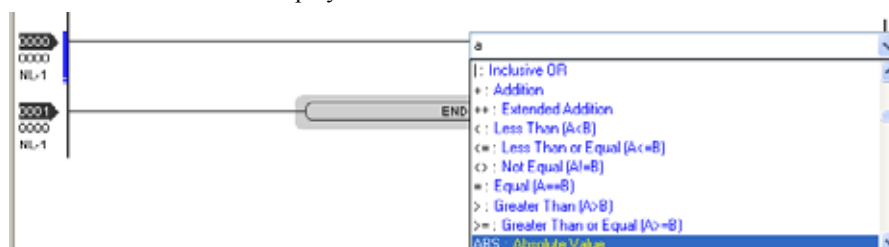
(2) Entering Directly to the Input Guide

This method is used to directly enter the instruction name and instruction key allocation* to the input guide. The instruction name and instruction key allocation can be selected from the list.

- * The instruction key allocation is the allocation of shortcut keys for instruction objects. Example: N.O. contact
The instruction key allocation can be changed. For details, refer to 3.3.4 (3) *Changing Edit Window Displays (Editor Options)*.

1. Click the position that the ladder instruction is inserted to display the input guide.
2. Enter the instruction name or instruction key allocation. Alternatively, press any key on the keyboard.

A list of instruction names will be displayed as shown below.



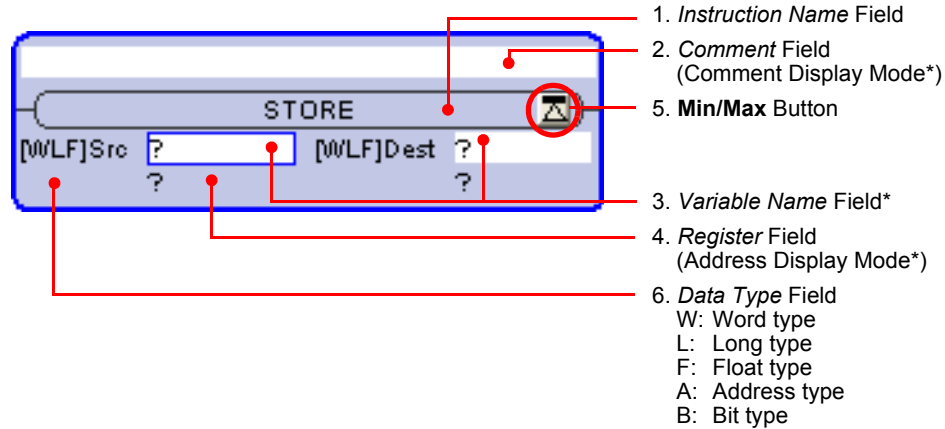
3. Enter the instruction name and instruction key allocation and press the Enter Key, or select the instruction name and instruction key allocation from the list.

The instruction object will be inserted at the input guide position.

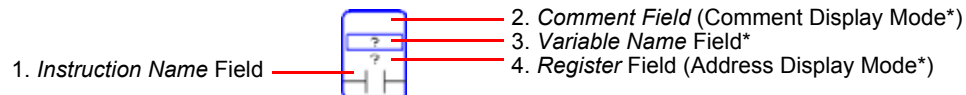
- Insertion of the instruction can be cancelled by pressing the **Esc** Key or clicking outside of the list and field in the Ladder Edit Window before pressing the **Enter** Key or clicking in the list.

(3) Instruction Object Component Names

The following illustration shows the names of the components in an example of a newly inserted instruction object.



The names will be as follows when the instruction type is RELAY:



- * The *Comment Field* and *Register Address Field* can be displayed or hidden by toggling the icons in the Ladder Editor Toolbar. Also, whether the *Variable Name Field*, which shows the variable names or addresses, can be displayed or hidden by the same method. For details, refer to 3.3.4 (2) *Displaying or Hiding Addresses, Variables, and Comments*.

The components are described below.

1. *Instruction Name Field*

The names of inserted instructions are displayed here. For RELAY instructions, the RELAY type is displayed.

- For details on changing instructions that have been entered, refer to 3.3.11 *Editing Instruction Objects*.

2. *Comment Field*

Comments for instruction objects can be edited and displayed here.

- Comments cannot be edited if the registers are not set.
- For details on entering and editing comments, refer to 3.3.13 *Editing Comment Fields*.

3. *Variable Name Field*

Variable names for registers used for referencing instructions or storing execution results can be entered and displayed here. (Registers are displayed for registers for which no variables are assigned.)

- For details on entering and editing variables, refer to 3.3.12 *Entering and Changing Variables and Registers*.
- For details on variables, refer to *Chapter 5 Variables*.

4. *Register Field*

Registers are displayed here.

5. Minimize Button

Instruction objects can be minimized the display as shown below. The original display size (more detailed) can be restored by clicking the **Maximize** Button.



3.3.11 Editing Instruction Objects

The following editing operations can be executed for instruction objects.

- Cutting, copying, and pasting
- Moving objects by dragging
- Deleting
- Changing instructions

(1) Cutting, Copying, and Pasting

1. Click to select the instruction objects to be cut (or copied).
2. Select **Edit - Cut or Copy** from the Main Menu. Alternatively, right-click the selected instruction objects and select **Cut** or **Copy** from the pop-up menu that will be displayed. Another method is to press the **Ctrl+X** Keys (Cut) or the **Ctrl+C** Keys (Copy).
 - After an instruction object has been cut, it must be pasted before another cut or copy operation is executed or else the branch that was cut first will be deleted.
3. Either click the insertion position to display an input guide, or select the instruction object at the insertion position.
 - Objects from other ladder programs and other project files can also be used.
4. Select **Edit - Paste** from the Main Menu. Alternatively, right-click the selected instruction object and select **Paste** from the pop-up menu that will be displayed. Another method is to press the **Ctrl+V** Keys.

If an input guide was displayed in step 3, then the instruction object selected in step 1 will be inserted at that position.

If an instruction object was selected in step 3, then the instruction object selected in step 1 will be inserted in parallel with that object.

(2) Moving Objects by Dragging

1. Select the instruction object that is to be moved, and then drag it.

A **V** symbol will be displayed at the rung where the instruction object is dragged.
2. Release the mouse button when the **V** is displayed at the destination position.

(3) Deleting Instruction Objects

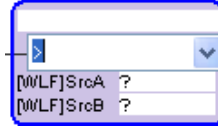
1. Select the instruction object that is to be deleted, and then either select **Edit - Delete** from the Main Menu or right-click the instruction object and select **Delete** from the pop-up menu that will be displayed. The instruction object can also be deleted by pressing the **Delete** Key.

(4) Changing instructions

Instructions that have already been entered can be changed to other instructions.

1. Select the instruction object that is to be changed, and click the *Instruction Name* Field. Alternatively, select **Program - Edit Instruction** from the Main Menu. Another method is to right-click the instruction object and select **Edit Instruction** from the pop-up menu that will be displayed.

The instruction name will be selected, and the **List** Button will be displayed.



2. Enter an instruction name and instruction key allocation and press the **Enter** Key, or select an instruction name and instruction key allocation from the list.

The instruction object selected in step 1 will be replaced by the instruction object entered in step 2.

- Insertion of the instruction can be cancelled by pressing the **Esc** Key or clicking outside of the list or field in the Ladder Edit Window before pressing the **Enter** Key or clicking in the list.

3.3.12 Entering and Changing Variables and Registers

When a variable is entered for an instruction object, a register and comment can be entered at the same time. Variables can be entered in the following ways.

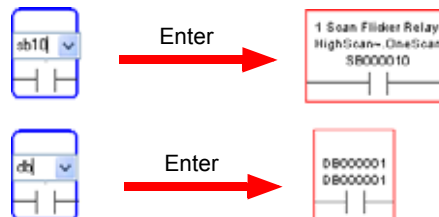
- Directly entering the address or variable name
- Copying and pasting the variable
- Dragging and dropping the variable

Variables that have already been entered can be changed to other variables.

- Variables are assigned in a database with names called variable names given to combinations of comments, register types, and registers. Six types of variables can be referenced from any project file: system variables, axis variables, I/O variables, global variables, and local variables assigned for individual programs. For details on variables, refer to *Chapter 5 Variables*.

(1) Directly Entering Addresses or Variable Names

1. Click to select the *Variable Name* Field of the instruction object for which the variable is to be entered or changed, and then enter the register or variable name.
2. Press the **Enter** Key to save the variable or address.



When a variable is set for the address that is entered

When no variable is set for the address that is entered

- If the entered variable name is too long, ~ is displayed in the spellings.
- When entering addresses, the leading zeroes can be omitted.
- Variable names can be entered in place of addresses for variables assigned as global or local variables.

(2) Copying and Pasting Variables

1. Select the variable that is to be entered or changed in the Variable Subwindow, and then select **Edit - Copy** from the Main Menu. Alternatively, right-click the variable to be entered in the Variable Subwindow, and then select **Copy** from the pop-up menu that will be displayed.

- Click to select the *Variable Name* Field of the instruction object for which the variable is to be entered, and then select **Edit - Paste** from the Main Menu. Alternatively, right-click the *Variable Name* Field of the instruction object, and then select **Paste** from the pop-up menu that will be displayed.

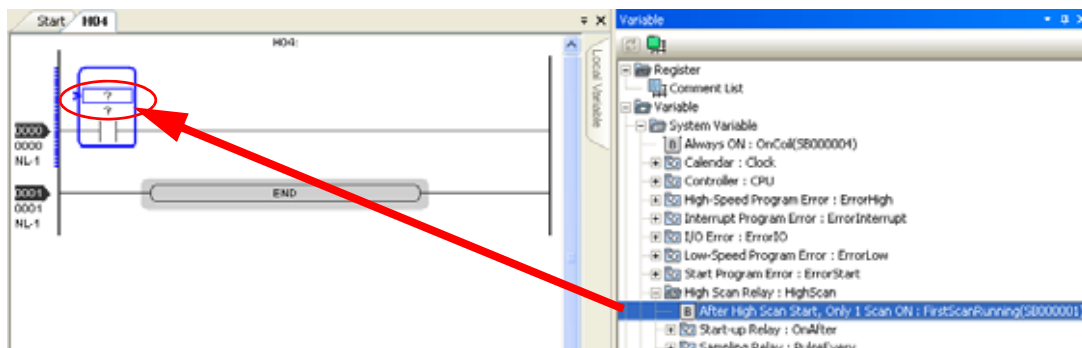
The variable will be entered in the instruction object.



- The variable cannot be entered when anything other than the *Variable Name* Field is selected.

(3) Dragging and Dropping Variables

- Select the variable that is to be entered or changed in the Variable Subwindow, and then drag it to the instruction object.
- When > is displayed in the *Variable Name* Field of the instruction object, release the mouse button to enter the variable.



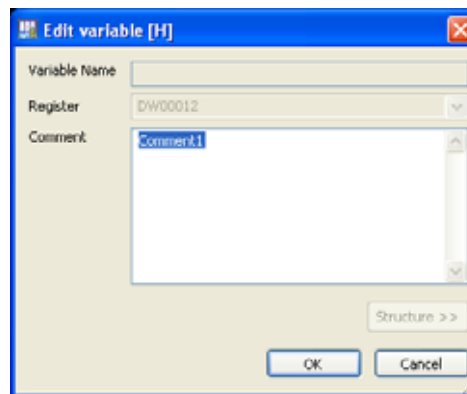
3.3.13 Editing Comment Fields

The *Comment* Field for an instruction object can be edited. The method for editing a *Comment* Field differs depending on whether or not a variable comment is being used in the *Comment* Field.

- A "variable comment being used in the *Comment* Field" means that an instruction belonging to the RELAY, MATH, LOGIC (excluding RCHK instructions), FUNCTION, MOVE, or DDC category is used.
- Even when no variable comment is being used in the *Comment* Field, comments for SEE and FUNC instructions cannot be edited using the Comment Editor. The names for the specified programs are displayed.

■ Variable Comments

Comments can be edited by double-clicking the *Comment* Field to display the **Edit variable** Dialog Box. For details, refer to 5.2.3 (3) *Editing I/O Module Names and Comments*.



■ Comments Other Than Variable Comments

Editing is enabled by double-clicking the *Comment* Field to display the Comment Editor.

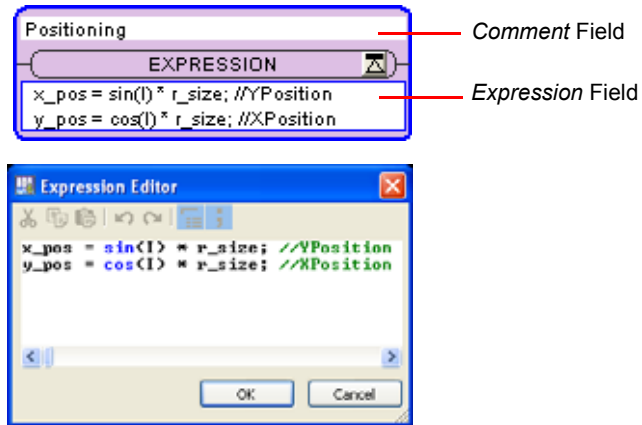


When any of the following operations is performed while the *Comment* Field is selected, the mode will be changed to Comment Edit Mode. If any text has already been entered, that text will be selected.

- Select **Program - Edit Comment** from the Main Menu.
- Press the **F2** Key.
- Right-click a comment and select **Edit Comment** from the pop-up menu that will be displayed.

3.3.14 Entering and Editing Expressions for EXPRESSION Instructions

The Expression Editor will be displayed. Editing can then be enabled by double-clicking the Expression Field in an EXPRESSION instruction object.



Comments are displayed in green in the Expression Editor. Reserved words are displayed in blue.

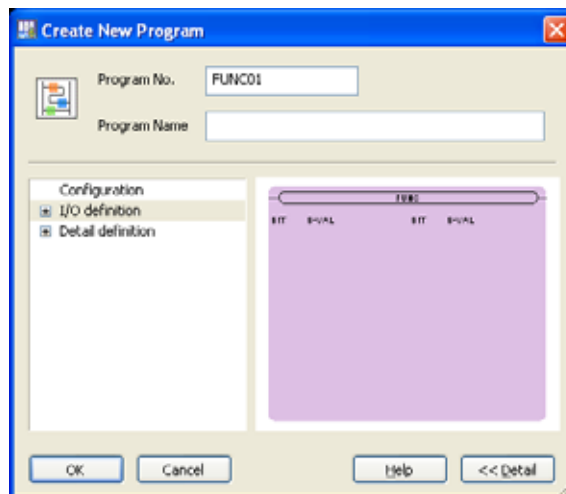
3.3.15 Creating Functions

Functions are also sometimes called "user functions." These are sub programs that can be referenced from any ladder program, and they are created in the Function Folder in the Ladder Subwindow. Once a function has been created, it can be entered into a ladder program as a FUNC instruction.

1. Right-click the Function Folder in the Ladder Subwindow and select **Create New Program** from the pop-up menu that will be displayed.

The **Create New Program** Dialog Box will be displayed.

2. Click *I/O definition* on the left side of the dialog box to display *Function input no.*, *Address input no.*, and *Function output no.*



3. Click these to display the respective detail definition windows, and then set the details.

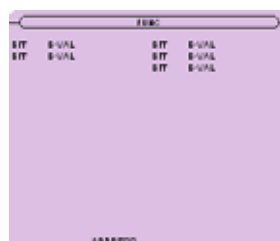


Function Input No.: Set the number of data items to be entered for FUNC instruction objects in the ladder program. Click the *Type* Field and then select BIT, WORD, LONG, or FLOAT as the data type.

Addresses Input No.: Set the number of addresses for FUNC instruction objects.

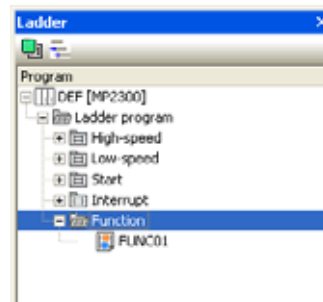
Function Output No.: Set the number of data objects to be output from FUNC instruction objects. Click the *Type* Field and then select BIT, WORD, LONG, or FLOAT as the data type.

After a function has been set, it will be displayed in the right side of the **Create New Program** Dialog Box.



Example of function with 2 inputs,
3 outputs, and 1 address

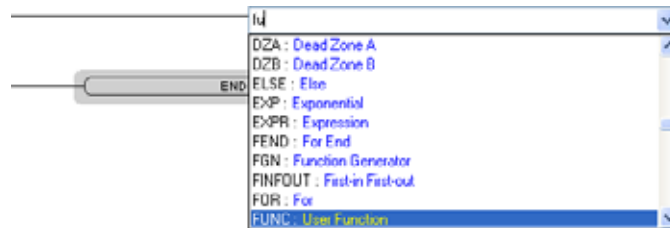
4. Click the **OK** Button in the **Create New** Program Dialog Box. The function will be created and will be displayed under the Function Folder in the Ladder Subwindow.



3.3.16 Calling Functions

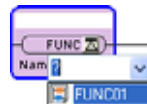
The following procedure can be used to call functions that have been created under the Function Folder in the Ladder Subwindow for the ladder program.

1. Click the position where the function is to be entered in the **Ladder Program Edit** Window. The pointer will change to a “V” to show where the data is to be entered.
2. Select *FUNC: User Function* from the entry list for the instruction.

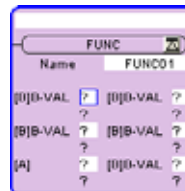


The FUNC instruction object will be entered at the ladder input guide position.

3. Double-click the *Name* Field and enter the function name to be used. Alternatively, select the function name to be used from the list displayed in the *Name* Field.



The FUNC instruction object will be entered.



4. Set the function's I/O registers.

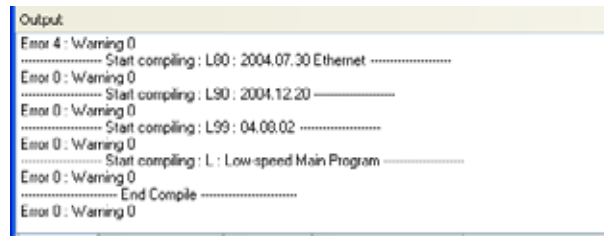
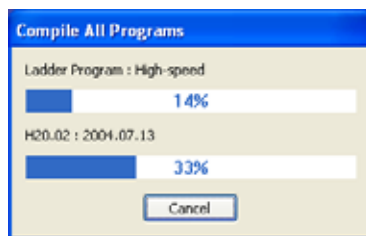
3.3.17 Ladder Program Compiling and Compile Options

Before transferring a ladder program to the Machine Controller, use the following procedure to compile it, and to create and save compile data. Programs can be compiled individually or all together.

1. Any of the following operations can be used.

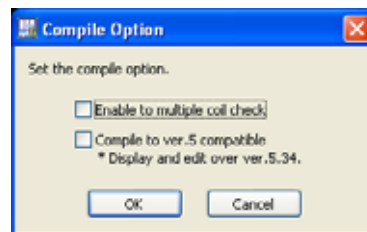
- Select **Compile - Compile** from the Main Menu.
→ The program displayed in the foreground of the main window will be compiled.
- Select **Compile - Compile All Programs** from the Main Menu.
→ All programs, including motion programs, will be compiled.
- Select the file name of the ladder program in the Ladder Subwindow, and then right-click and select **Compile All Programs** from the pop-up menu that will be displayed.
→ All ladder programs will be compiled.
- Select a folder or program in the Ladder Subwindow, and then right-click and select **Compile** from the pop-up menu that will be displayed.
→ All programs included in the selected folder or program will be compiled.

After the ladder programs have been compiled, the compile log will be displayed in the Output Subwindow.



■ Compile Options

With a ladder program displayed in the main window, select **Compile - Compile Option** from the Main Menu. The **Compile Option** Dialog Box will be displayed as shown below. Either of the compile options can then be set. This setting will be applied to all programs.



Enable to Multiple Coil Check:

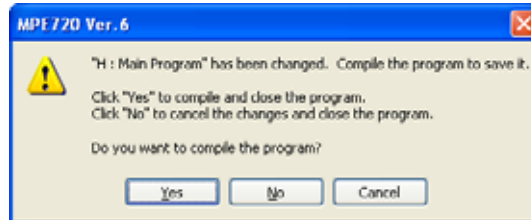
When this option is selected, duplicate coils will be detected during the compile operation.

Compile to Ver.5 Compatible:

When this option is selected, programs can be opened programs in MPE720 version 5.

3.3.18 Compiling when Exiting

Ladder programs are saved when project files are compiled. If any program has not yet been compiled when MPE720 version 6 is exited, or if an edited program is closed without having been compiled, the following message will be displayed.



Yes Button: The applicable program will be compiled and saved.

No Button: The applicable edited contents will not be saved.

Cancel Button: The program will not be compiled and saved, and the **Edit** Window will be displayed again.

- For details on saving program files, refer to *1.8.5 Saving Project Files*.

3.4 Managing Programs in the Ladder Subwindow

The Ladder Subwindow is used for managing ladder programs.

The contents of the Ladder program Folder in a project file are displayed in a tree hierarchy.

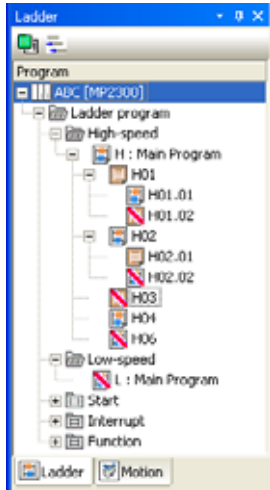


Fig. 3.3 Ladder Subwindow

The following operations can be executed for ladder programs in the Ladder Subwindow:

- Creating programs (Refer to 3.2.1 *Creating New Ladder Programs.*)
- Opening edit windows for ladder programs (Refer to 3.2.3 *Opening Ladder Programs.*)
- Cutting, copying, and pasting
- Deleting
- Changing names
- Compiling (Refer to 3.3.17 *Ladder Program Compiling and Compile Options.*)
- Enabling or disabling
- Displaying properties
- Setting and cancelling passwords

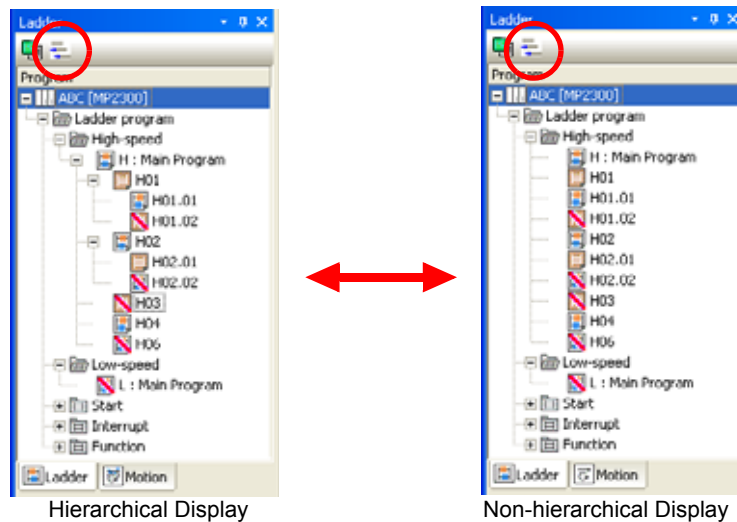
This section describes how to change the display and manage ladder programs in the Ladder Subwindow.

3.4.1 Changing Ladder Subwindow Displays

The Ladder Subwindow display can be changed by the two buttons at the top of the subwindow.

(1) Hierarchical or Non-hierarchical Display

Ladder programs are displayed in a hierarchical structure by default in the Ladder Subwindow. To change to a non-hierarchical structure, click the **Hierarchical Structure Display** Button. The display is toggled each time the buttons are clicked.

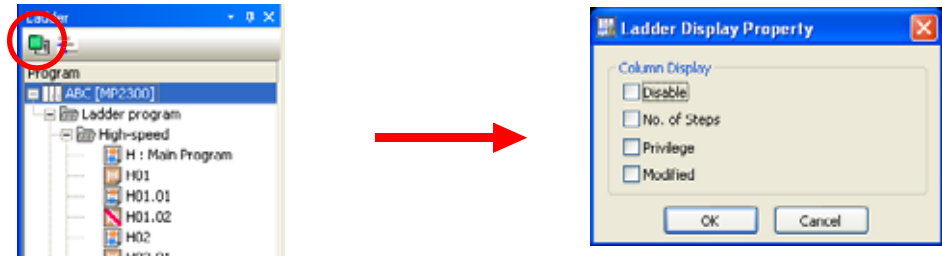


Hierarchical Display

Non-hierarchical Display

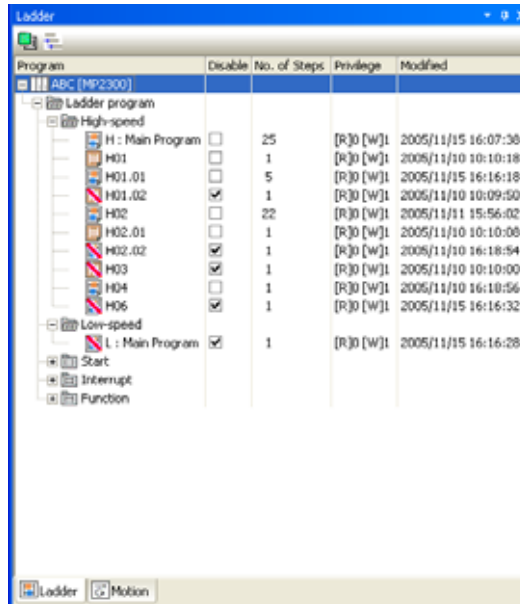
(2) Displaying Properties

The **Ladder Display Property** Dialog Box will be displayed by clicking the **Ladder Program Properties** Button.



- All of the check boxes are not selected by default.
- For details on the *Disable* setting, refer to 3.4.3 (4) *Enabling or Disabling Ladder Programs*.
- For details on the *No. of Steps* and *Modified* settings, refer to 3.4.3 (5) *Ladder Program Properties*.
- For details on the *Privilege* setting, refer to 3.2.1 *Creating New Ladder Programs*.

If information that is to be displayed in the Ladder Subwindow is selected (i.e., if the check box is selected) and the **OK** Button is clicked, that information will be displayed in the Ladder Subwindow.



3.4.2 Setting Passwords for Ladder Programs

Refer to 1.12.3 *Setting Passwords for Ladder Programs* for details.

3.4.3 Managing Ladder Program Files

In the Ladder Subwindow, ladder programs can be cut, copied, pasted, deleted, and renamed. They can also be set to be enabled or disabled the ladder programs in the Machine Controller.

(1) Cutting, Copying, and Pasting Ladder Programs

An entire ladder program can be cut or copied and then pasted into either the same project file or another project file.

- This function is valid only when not connected to the Machine Controller (i.e., when offline).
- Before cutting a ladder program, finish editing and close the ladder program.
- Copying (or cutting) and pasting is not possible between function programs and other programs.

1. Open the project file for which the ladder program is to be cut or copied, and display the Ladder Subwindow. (Refer to *1.8.3 Opening Project Files*.)
2. If the paste destination is a separate project file, open that project file in a separate window and display the Ladder Subwindow.
3. In the Ladder Subwindow for the project file that was opened in step 1, select the program that is to be cut or copied.
 - A folder, such as the Ladder program Folder of the High-speed Folder, can also be selected. In that case, the operation will apply to all of the ladder programs under the folder. The folder itself cannot be cut or copied.
 - When a program is selected, the operation will apply to all of the programs belonging to that program.
4. In the Ladder Subwindow for the project file where the ladder program is to be pasted, select the destination program folder.
5. Right-click the paste destination folder and select **Paste** from the pop-up menu that will be displayed. Alternatively, select **Edit - Paste** from the Main Menu.

The ladder program cut or copied in step 3 will be over written to the program folder selected in step 4.

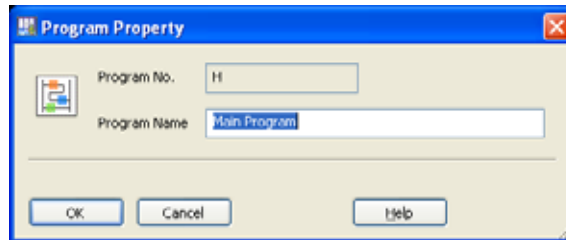
(2) Deleting Ladder Programs

- Before using this operation, first close the ladder program that is to be deleted.
1. In the Ladder Subwindow, select the ladder program that is to be deleted.
 2. Either select **Edit - Delete** from the Main Menu, or right-click the selected program file and select **Delete** from the pop-up menu that will be displayed. Alternatively, press the **Delete** Key.

(3) Renaming Ladder Programs

- Before using this operation, first close the ladder program that is to be renamed.

1. Select the ladder program that is to be renamed in the Ladder Subwindow.
2. Right-click the selected program and select **Rename** from the pop-up menu that will be displayed.
The **Program Property** Dialog Box will be displayed.



3. Change the name displayed in the *Program No.* Field, and click the **OK** Button.

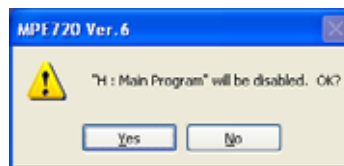
(4) Enabling or Disabling Ladder Programs

A ladder program can be toggled between enabling and disabling. A disabled program cannot be executed even if it is transferred to the Machine Controller.

- This operation can be used even for edited ladder programs.

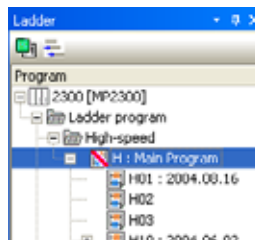
1. Select the program or program folder that is to be enabled or disabled in the Ladder Subwindow.
If a program folder is selected, the operation will apply to the main program in that folder.
2. Right-click the selected program (or folder) and select **Enable/Disable** from the pop-up menu that will be displayed. (If a folder is selected, select *Enable Main Program* or *Disable Main Program*.)

A message asking for confirmation will be displayed.



3. Click the **Yes** Button in the message box. Disable or Enable will be set.

The  icon will be displayed for disabled programs.



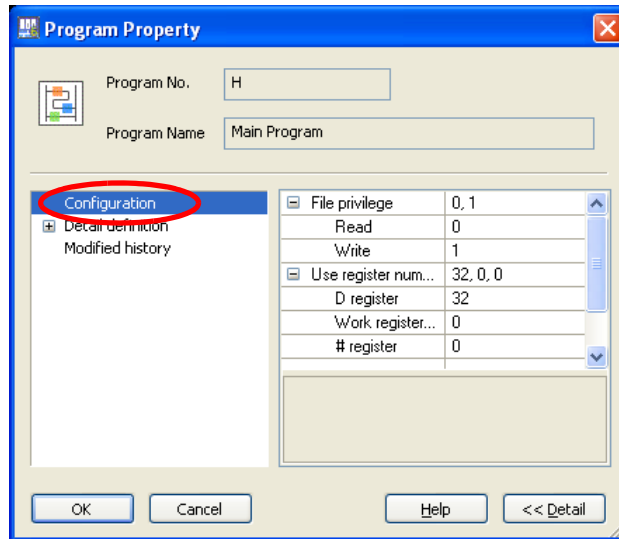
(5) Ladder Program Properties

The properties (configuration, detail definitions, and modified history) of ladder programs can be confirmed.

1. Select the ladder program file for which the properties are to be displayed in the Ladder Subwindow.
2. Right-click the selected program and select **Property** from the pop-up menu that will be displayed.
The **Program Property** Dialog Box will be displayed.

[a] Configuration

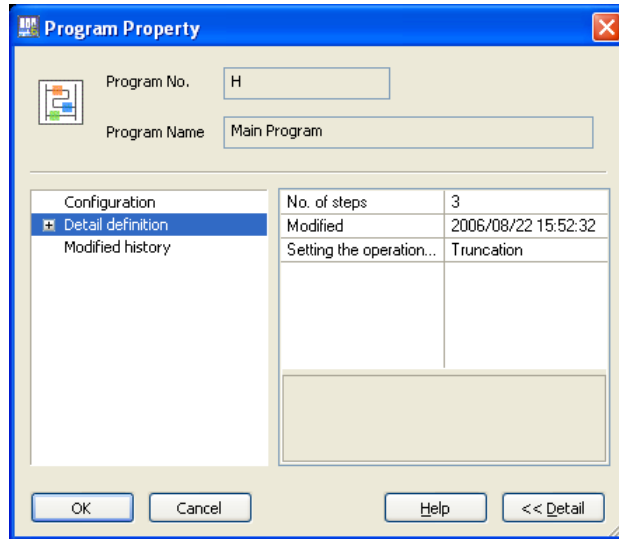
The file privilege and number of registers to be used can be set.



- For details on the items to be set for the *Configuration*, refer to 3.2.1 *Creating New Ladder Programs*.
- The numbers can be set by clicking the *Read*, *Write*, *D register*, and *# register* Fields.
- For details on renaming ladder programs, refer to 3.4.3 (3) *Renaming Ladder Programs*.

[b] Detail Definition

The number of steps being executed and the date and time of the latest modification of the program are displayed. The operation to convert data from real-numbers to integers can be displayed and set.

**No. of steps**

Displays the number of steps being executed. Cannot be edited.

Modified

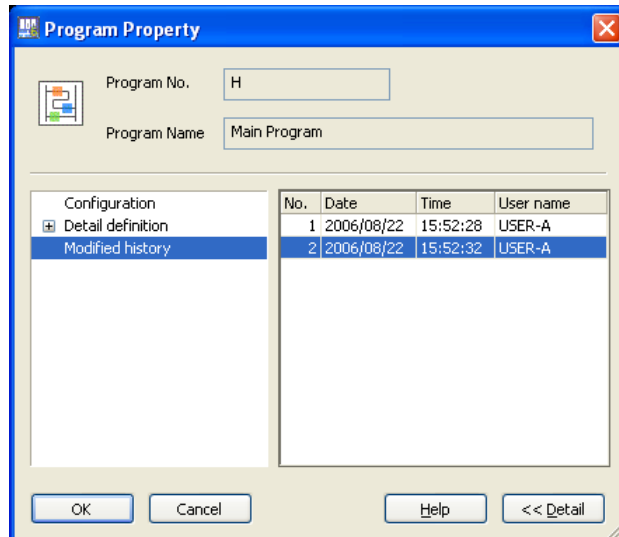
Displays the date and time of the latest modification of the program. Compiling the program will refresh the displayed date and time. Cannot be edited.

Setting the operations

The operation to convert data from real-numbers to integers can be set.

[c] Modified History

The revision history can be confirmed.

**Modified history**

The latest 10 revision records of the program can be displayed.

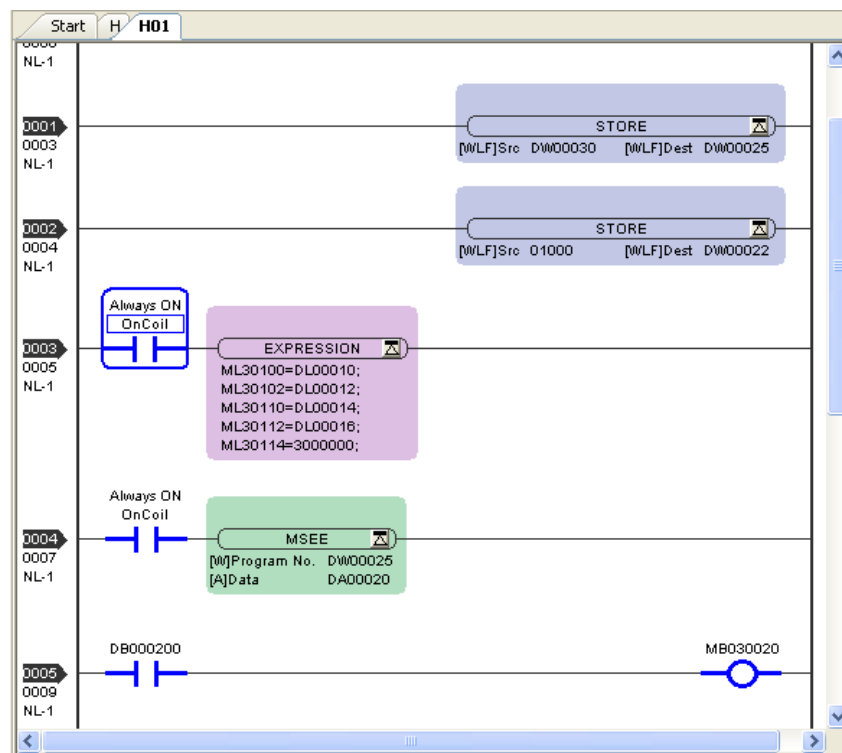
3.5 Debugging Ladder Programs

MPE720 version 6 has the following debugging functions.

- Execution monitoring (Refer to 3.5.1 *Monitoring Ladder Program Execution.*)
- Searching and replacing program variables, instructions, and comments (Refer to 3.5.2 *Searching and Replacing in a Program.*)
- Searching and replacing variable names in project files (Refer to 3.5.3 *Searching and Replacing in a Project File.*)
- Searching registers being used (Refer to 3.5.4 *Cross Reference Searching.*)
- Searching duplicate coils (Refer to 3.5.5 *Searching for Duplicate Coils.*)
- Forcing coils ON/OFF (Refer to 3.5.6 *Forcing Coils ON/OFF.*)
- Referencing called programs using the SEE instructions (Refer to 3.5.7 *Referencing Called Programs.*)

3.5.1 Monitoring Ladder Program Execution

When a ladder program is transferred to the Machine Controller and executed, the instruction currently being executed will be indicated by a blue line* and values for data currently stored in addresses will be displayed in blue.



- For details, refer to 12.4.2 *Displaying Online Current Value.*
- Register status during execution can be monitored in a register list. For details, refer to 12.2 *Register Lists.*
- * The display color for execution monitoring can be changed by selecting **View - Editor Option** from the Main Menu, and then selecting **Color - Focus**. (The default setting is blue.) For details, refer to 3.3.4 (3) *Changing Edit Window Displays (Editor Options).*

3.5.2 Searching and Replacing in a Program

It is possible to search for variables, instructions, and comments used in the program. Registers and comments can be searched and replaced.

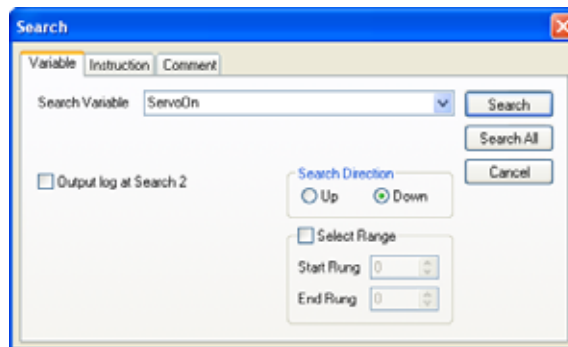
The procedures for searching and replacing are described below.

(1) Searching in a Program

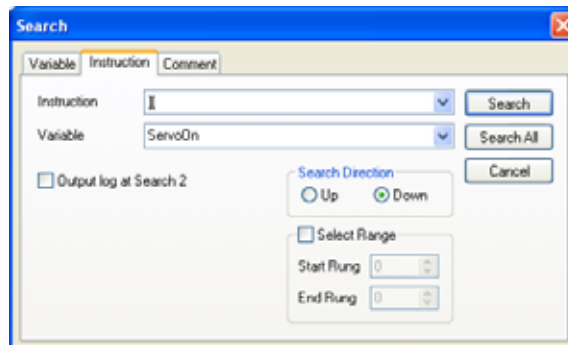
1. Display the program that is to be searched in the foreground of the **Ladder Edit** Window, and select **Edit - Search** from the main menu.

The **Search** Dialog Box will be displayed.

2. Click the **Variable**, **Instruction**, or **Comment** Tab Page, and specify the content of the search.



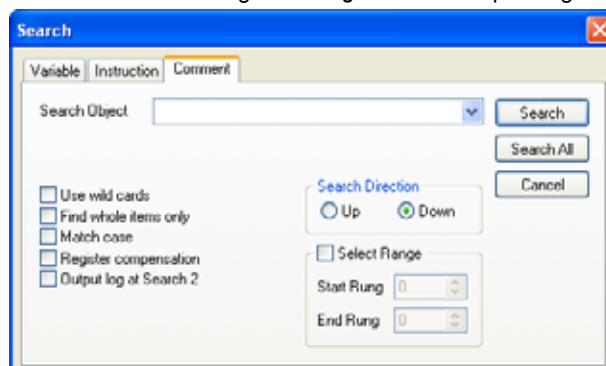
The **Variable** Tab Page is used to search for variables and register addresses. Variables can be copied and pasted from the Variable Subwindow.



In the **Instruction** Tab Page, enter an instruction name or instruction key allocation in the *Instruction* Field.

Variables can also be entered by copying and pasting from the Variable Subwindow.

The *Variable* Field will be changed to *Program Name* depending on the search object.



The **Comment** Tab Page is used to search for object, rung, and program comments, and for comments in expressions.

Use wild card: When selected, the wildcards * and ? can be used in searches.

Search agree completely item: When selected, only exact matches between character strings in comments and search objects will be searched. Whether distinctions are made between uppercase and lowercase, however, depends on the *Case-sensitive* setting.

Case-sensitive: When selected, a distinction is made between uppercase and lowercase characters.

Register compensation: When selected, a character string that was entered as a search object is converted to the correct register notation when it is recognized as a register.

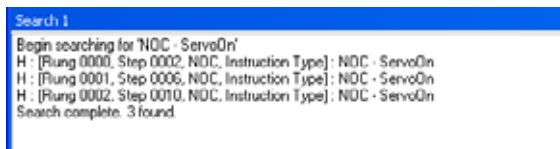
Output log at Search 2: If *Output log at Search 2* is selected, the search results will be output in the Search 2 Subwindow, and the output contents of the Search 1 Subwindow will not be changed. If *Output log at Search 2* is not selected, the search results will be output in the Search 1 Subwindow.

Select range: When selected, the search range can be set by specifying the start rung and end rung.

3. Start the search.

If the **Search** Button is clicked, the relevant instruction object will be searched and selected.

If the **Search All** Button is clicked, the search results will be displayed in the Search 1 or Search 2 Subwindow.



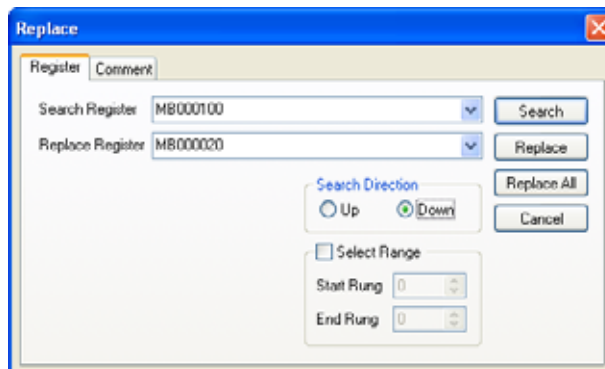
4. End the search by clicking the **Cancel** Button or the **Close** Button (X).

(2) Replacing in a Program

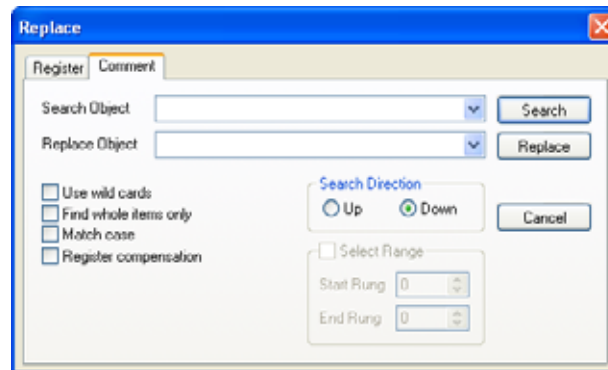
1. Display the program that is to be searched and replaced in the foreground of the Ladder Edit Window, and select **Edit - Replace** from the Main Menu.

The **Replace** Dialog Box will be displayed.

2. Select the **Register** or **Comment** Tab Page, and specify the search object and the replace object.



The **Register** Tab Page is used to find and replace registers.



The **Comment** Tab Page is used to find and replace object, rung, and program comments, and comments in expressions.

Use wild card: When selected, the wildcards * and ? can be used in searches.

- If either * or ? is used in the *Replace Object*, it will be treated not as a wildcard but as a character.

Select range: When selected, the search range can be set by specifying the start rung and end rung.

3. Start the search and replace operation.

When the **Search** Button is clicked, the relevant instruction object will be searched and selected. When the **Replace** Button is clicked, the selected item will be replaced by the characters in either the *Replace Register* Field or the *Replace Object* Field.

If the **Replace All** Button is clicked on the **Register** Tab Page, all of the relevant registers will be replaced and the replacement results will be displayed in the Output Subwindow.

```

Output
Begin replacing 'MB000100' with 'MB000020'
Success : H [Rung 0000, Step 0002, NOC, Operand 00] : [Source]MB000100 -> [Destination]MB000020
Success : H [Rung 0001, Step 0006, NOC, Operand 00] : [Source]MB000100 -> [Destination]MB000020
Success : H [Rung 0002, Step 0010, NOC, Operand 00] : [Source]MB000100 -> [Destination]MB000020
Replace complete, 3 replacements made.
Success 3, Failure 0
  
```

4. End the replace operation by clicking the **Cancel** Button or the **Close** Button (X).

3.5.3 Searching and Replacing in a Project File

All ladder programs and motion programs (or in specified programs) within a project file can be searched for variables. Registers and addresses can be searched and replaced.

- This function is enabled only when not connected to a Machine Controller (i.e., when offline).
- CP ladder programs cannot be the objects of search and replace operations in a project file.

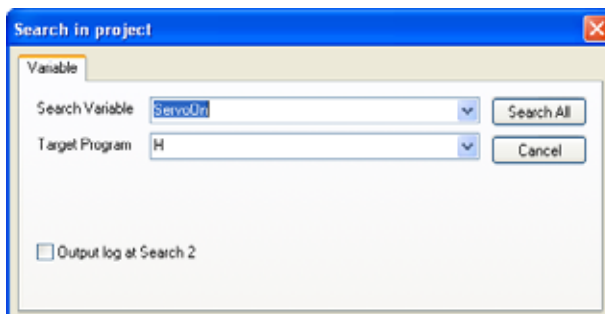
The procedures for searching and replacing in a project file are described below.

(1) Searching in a Project File

1. Display the program that is to be selected in the foreground of the **Ladder Edit** Window, and select **Edit - Search in Project** from the main menu.

The **Search in Project** Dialog Box will be displayed.

2. Set the variable (or address) to be searched and the name of the target program.



Variables can also be entered by copying and pasting from the Variable Subwindow.

Multiple programs can be specified in the *Target Program* Field by separating them with commas and spaces.

Asterisks (*) can also be used as wildcards in the *Target Program* Field, as follows:

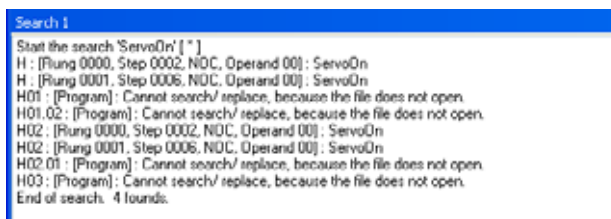
* , H, L* , I* , A* , F* (all functions), MPM* , MPS*

- Wildcards can be used only in the above forms. They cannot be used in forms such as H01.*.

If *Output log at Search 2* is selected, the search results will be output in the Search 2 Subwindow, and the output contents of the Search 1 Subwindow will not be changed. If *Output log at Search 2* is not selected, the search results will be output in the Search 1 Subwindow.

3. Click the **Search All** Button to start searching.

A progress bar will be displayed during the search, and the search results will be displayed in the Output Subwindow.



(2) Replacing in a Project File



- After a replace operation in a project file has been completed, compiling and saving will be executed. The replace operation cannot be undone to restore the project to its previous status, so be sure to back up any essential files before performing the operation.

- If a motion program is opened by the Engineering Manager before a replace operation, the program will not be automatically updated. Close any open motion programs before executing a replace operation.

1. Display the program that is to be selected in the foreground of the **Ladder Edit** Window, and select **Edit - Replace in Project** from the main menu.

The Replace in the **Project** Dialog Box will be displayed.

2. Set the variable (or address) to be searched and the name of the target program.

Variables can also be entered by copying, pasting from the Variable Subwindow.

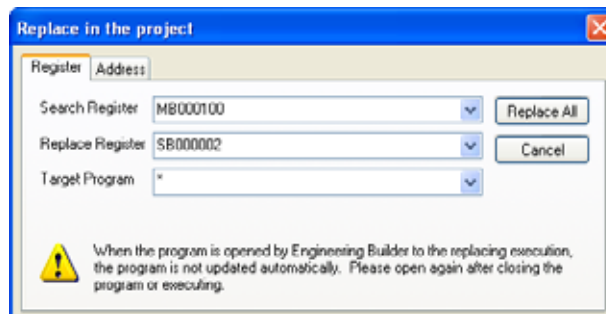
Multiple programs can be specified in the *Target Program* Field by separating them with commas and spaces.

Asterisks (*) can also be used as wildcards in the *Target Program* Field, as follows:

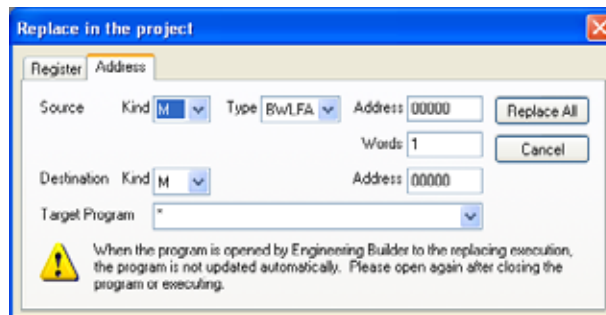
, H, L, I*, A*, F* (all functions), MPM*, MPS*

- Wildcards can be used only in the above forms. They cannot be used in forms such as H01.*.

3. Click the **Register** or **Address** Tab Page, and specify the search object and the replace object.



The **Register** Tab Page is used for simple register replacements.



The **Address** Tab Page is used to replace registers that match certain conditions.

Asterisks (*) can also be used as wildcards in the *Target Program* Field, as follows:

, H, L, I*, A*, F*, MPM*, MPS*

4. Click the **Replace All** Button to start searching and replacing.

The relevant registers or addresses will be replaced. A progress bar will be displayed during the operation, and the results will be displayed in the Output Subwindow.

```
Output
Start the replace "S8000004" is replace with "S8000002". [ * ]
Success: H [Rung 0000, Step 0000, NOC, Operand 00]: [Source]S8000004 -> [Destination]S8000002
Success: H [Rung 0001, Step 0002, NOC, Operand 00]: [Source]S8000004 -> [Destination]S8000002
----- Start compiling: H: Main Program -----
warning C5001: [Rung 0000, Step 0001, Operand 00]: D8000001 is used with multiple coil.
warning C5001: [Rung 0001, Step 0003, Operand 00]: D8000001 is used with multiple coil.
Error 0: Warning 2
End of replace. 2 founds.
Successful 2, Failed 0
```

- The replace operation can be aborted by clicking the **Cancel** Button in the dialog box of the progress bar, but the program will be compiled and saved with whatever items have already been replaced up to that point.
- If an error occurs while the program is being compiled, the items will not be replaced.

After the replace operation has been completed, the register or variable replacements will be displayed.

3.5.4 Cross Reference Searching

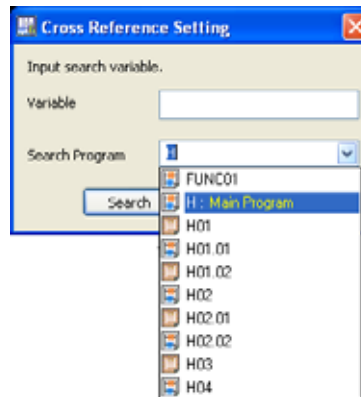
Variables or registers used in a program can be searched.

1. Select **Debug - Cross Reference** from the Main Menu.

The **Cross Reference Setting** Dialog Box will be displayed.

2. Set the variable (or register) to be searched and the name of the target program.

The target program can be selected from the list. Variables can also be entered by copying and pasting from the Variable Subwindow.

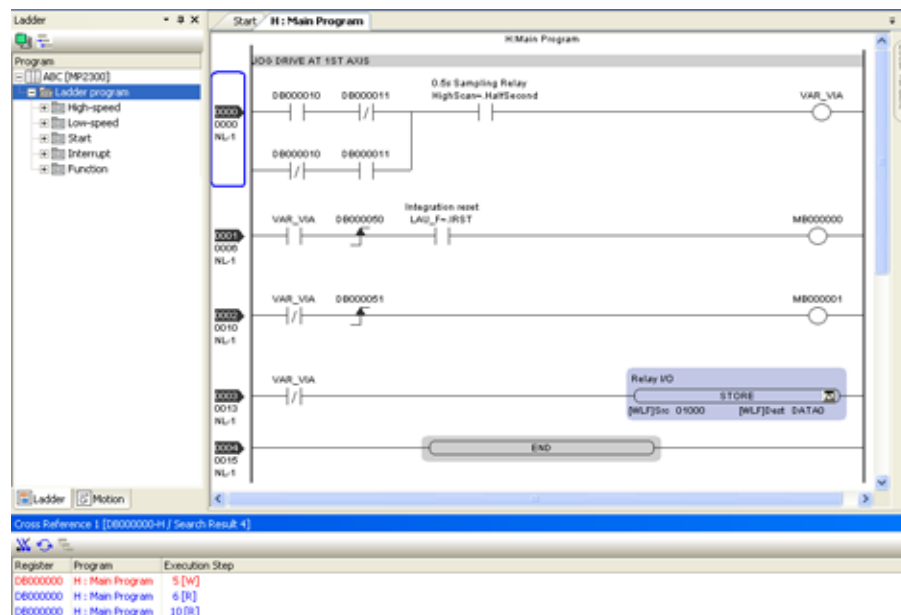


3. Click the **Search** Button.

The cross reference searching will be executed, and the search results will be displayed in the Cross Reference 1 Subwindow. Input registers will be displayed in blue, and output registers in red.

Register	Program	Execution Step
DB000000	H : Main Program	5 [W]
DB000000	H : Main Program	6 [R]
DB000000	H : Main Program	10 [R]

The program will be opened and the objects in the selected register will be selected by double-clicking on a displayed register.



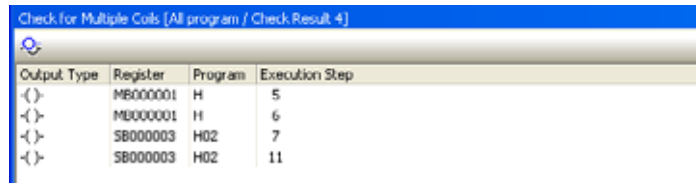
3.5.5 Searching for Duplicate Coils

A search for duplicate coils (coils using the same register) can be done in all the ladder programs, and the search results can be displayed.

- If the Project Link Connection is used, and the data in the project file does not match the data in the Machine Controller, then the results in the Machine Controller may differ when the search for duplicate coils is executed. To search for duplicate coils when the Project Link Connection is used, transfer the data to the project file by executing the **Read from Controller** command in advance.

1. Select **Debug - Check for Multiple Coils** from the Main Menu.

The search will be started, and the results will be output to the Check for Multiple Coils Subwindow.



The screenshot shows a subwindow titled "Check for Multiple Coils [All program / Check Result: 4]". It contains a table with the following data:

Output Type	Register	Program	Execution Step
<->	M000001	H	5
<->	M000001	H	6
<->	S000003	H02	7
<->	S000003	H02	11

- If *Enable to Multiple Coil Check* is selected in the compile options, a search for duplicate coils will also be executed while the program is being compiled and the results will be displayed in the Output Subwindow as a warning.
- For details on the compile options, refer to 3.3.17 *Ladder Program Compiling and Compile Options*.

3.5.6 Forcing Coils ON/OFF

(1) Setting Coils to Forced ON/OFF in the Ladder Program

Programs can be monitored by forcibly turning specified coil objects ON or OFF in the **Ladder Program Edit** Window.

1. Select the coil to be forcibly turned ON or OFF.
2. Select **Debug - Force ON** or **Force OFF** from the main menu.

The selected coil will be forcibly connected or disconnected.



3. To clear the forced ON or forced OFF, select **Debug - Clear Forced ON/OFF** from the main menu.



(2) Changing ON/OFF Status of Forced Coil

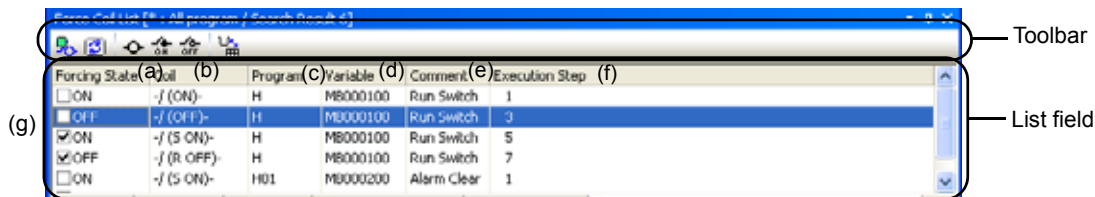
The ON/OFF status of the forced coil in all ladder programs can be displayed in a list.

In the Forced Coil List Subwindow, the ON or OFF status of forced coils in all programs can be changed or cleared.

The search results are displayed in the Forced Coil List Subwindow.

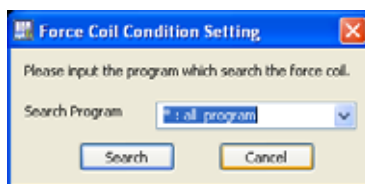
The components of the Forced Coil List Subwindow are as follows:

The Forced Coil List Subwindow consists of the list field and the toolbar containing buttons, each with a distinctive icon, to search for forced coils, re-search, and change the forced status.



Forced Status Coil Search Condition Setting Button ()

Click this icon to display the **Forced Coil Condition Setting** Dialog Box. Specify the programs where forced status coil search is to be executed, and click the **Search** Button to start the search.



Research Button ()

Click this icon to research forced status coils in the programs specified in the Forced Coil Condition Setting Subwindow.

Forced Status Clear Button ()

Select the check boxes of the coils for which forced status is to be cleared, and click this icon to clear the forced status of the selected coils.

Forced ON Button ()

Select the check boxes of the coils to be forcibly turned ON, and click this icon to forcibly turn ON the selected coils.

Forced OFF Button ()

Select the check boxes of the coils to be forcibly turned OFF, and click this icon to forcibly turn OFF the selected coils.

Variable Display Switching Button ()

Click this icon to switch the display method of registers that the coil uses from/to Register to/from Variable.

(a) Forcing State

Indicates whether the searched coil is forced ON or OFF.

(b) Coil

Displays the searched coils.

The following six coil symbols are used according to coil type and status.

Coil Type	Coil Symbol	
	ON	OFF
Coil	-/ (ON)-	-/ (OFF)-
Set coil	-/ (S ON)-	-/ (S OFF)-
Reset coil	-/ (R ON)-	-/ (R OFF)-

(c) Program

Displays the name of the program where the coil is searched.

- (d) Variable
Displays the variables or registers that are set for the searched coil.
- (e) Comment
Displays the comments set for the variable.
- (f) Execution Step
Displays the execution step number where the searched coil is located.
Refer to 3.3.1 Ladder Program Edit Window for details.
- (g) Check Box
Select the check boxes of the coils for which forced operations such as Forced ON, Forced OFF, and Forced Status Clear are to be executed. Select an icon on the toolbar or select a command from the pop-up menu to set or change the forced status of all the selected coils.


[a] Search in Forced Coil List Subwindow

1. Display the Forced Coil List Subwindow.

- The Forced Coil List Subwindow can be displayed or hidden by selecting **View - Other Windows - Forced Coil List** from the Main Menu.

2. Select **Debug - Forced Coil List** from the main menu.

The forced status coils will be searched in all programs, and the search results will be displayed in the Forced Coil List Subwindow.

To specify the programs in which the search is to be executed, click the icon  (forced coil search condition setting) to display the **Forced Coil Condition Setting** Dialog Box.



Search Program

Select the program for which the search for forced status coils is to be executed. Type the program name or select the program from the drop-down list box.

Search

Click this button to start search for forced status coils in the selected program and to display the forced status coils in a list.

Cancel

Click this button to cancel the search operation.

3. The search results will be displayed in the Forced Coil List Subwindow.

Forcing State	Coil	Program	Variable	Comment	Execution Step
<input type="checkbox"/> ON	-/ (ON)-	H	MB000100	Run Switch	1
<input checked="" type="checkbox"/> OFF	-/ (OFF)-	H	MB000100	Run Switch	3
<input checked="" type="checkbox"/> ON	-/ (S ON)-	H	MB000100	Run Switch	5
<input checked="" type="checkbox"/> OFF	-/ (R OFF)-	H	MB000100	Run Switch	7
<input type="checkbox"/> ON	-/ (S ON)-	HD1	MB000200	Alarm Clear	1
<input type="checkbox"/> OFF	-/ (R OFF)-	HD1	MB000200	Alarm Clear	3

- Right-click in the list field of the Forced Coil List Subwindow and select **Check All** or **Uncheck All** from the pop-up menu that appears. All the check boxes of forced status coils will be selected or cleared at once.

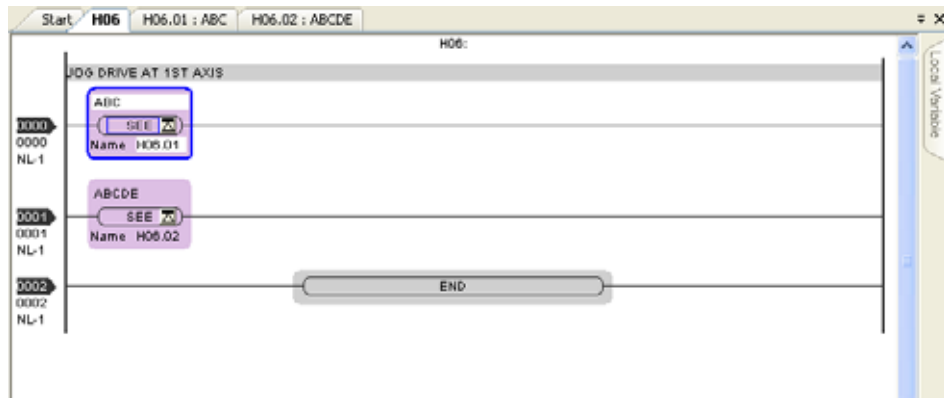
3.5.6 Forcing Coils ON/OFF

- ♦ In the list in the Forced Coil List Subwindow, select or double-click a row to jump to the corresponding coil in the ladder program. Alternatively, select a row and right-click to display the pop-up menu, and select **Jump** from the pop-up menu.
If the corresponding ladder program is not already open, it will be automatically opened to jump to the corresponding coil.
- ♦ Right-click in the list field of the Forced Coil List Subwindow and select **Cross Reference** from the pop-up menu that appears. Alternatively, select **Debug - Cross Reference** from the Main Menu. The registers set for the forced status coil will be searched and the search results will be displayed in the Cross Reference Subwindow.
- ♦ If a ladder program is edited while the search results are displayed, the coils of the program that being edited is shown in gray.

3.5.7 Referencing Called Programs

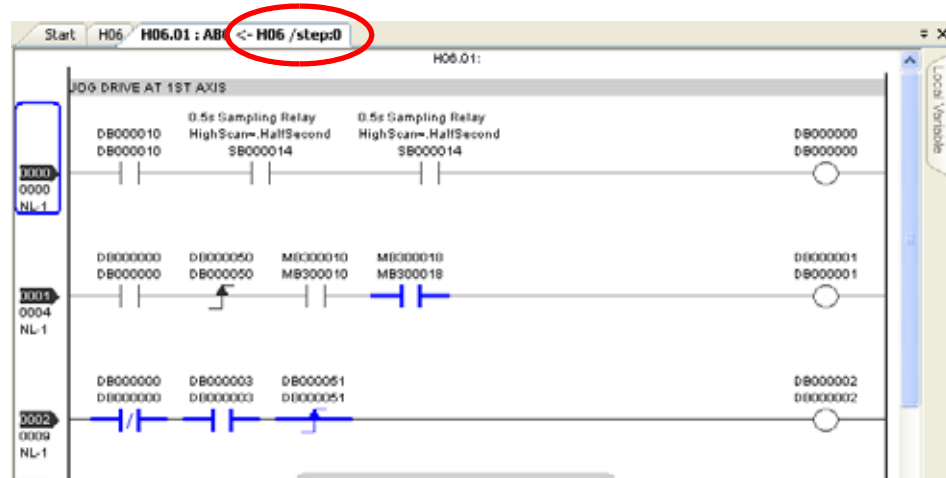
Programs called using the SEE or FUNC instructions can be opened and confirmed.

1. Select the SEE or FUNC instruction object for the program to be checked, and select **Debug - REFER** from the Main Menu.



2. The referenced program will be displayed in the Edit Window.

Program information such as **<-H06/step:0** in the diagram below will be displayed in the tab for the referenced program.



3.6 Converting CP Ladder Programs to Ordinary Ladder Programs

The ladder programs created using CP ladder language (CP ladder programs) can be converted to ordinary ladder programs. When converting a CP ladder program, DWG properties and comments in the program will be converted at the same time.

An individual program, or multiple programs, selected from the Ladder Subwindow can be converted, and the results will be output to the Output Subwindow.

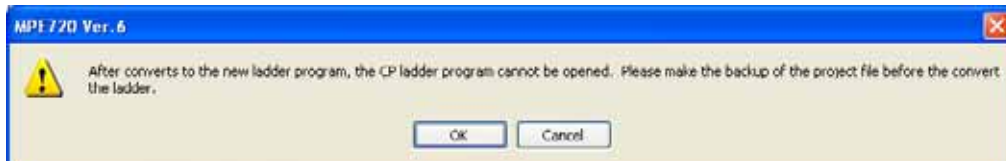
The CP ladder program conversion function is enabled only when offline. (The function is disabled when a Machine Controller is connected to the MPE720 version 6 (online).)

The security setting and enable/disable ladder program setting made for the CP ladder program remain valid after the CP ladder program is converted.



- Once a CP ladder program has been converted to an ordinary ladder program, the CP ladder program cannot be opened any more.
- If the CP ladder program is needed, use either of the following methods to save the project file.
 - Copy the project file from Windows Explorer and paste.
 - Select **Edit - Save Project As** from the main menu.
- If a security setting has been set for the CP ladder program, it needs to be cleared before converting the CP ladder program to a ladder program.

- Refer to *1.9.4 Security: User Registration* for details on security settings, and *3.4.3 (4) Enabling or Disabling Ladder Programs* for details on enabling or disabling ladder programs.
- When executing CP ladder program conversion for the first time, the following message will appear.

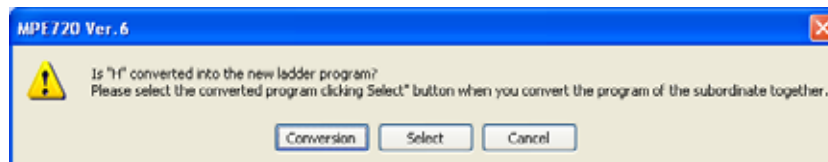


3.6.1 Converting CP Ladder Programs as a Batch

Select a program folder, such as High-speed, Low-speed, Start, Interrupt, and Function, that contains programs of the lower hierarchical levels, or a ladder program that contains CP ladder programs from the Ladder Subwindow. All the CP programs in the selected folder or program will be converted at once.

1. Select a program folder (High-speed, Low-speed, Start, Interrupt, or Function) or select a program that contains programs of the lower hierarchical levels. Then, right-click the selected folder or program and select **Conversion of CP ladder** from the pop-up menu.

When the selected program contains programs of lower hierarchical levels, the following message will appear asking for confirmation.



Conversion: Click this button to convert the current program and all lower level programs to new ladder programs.

Select: Click this button to display the **Conversion of CP ladder** Dialog Box. See step 2 for details on setting.

Cancel: Click this button to cancel program conversion.

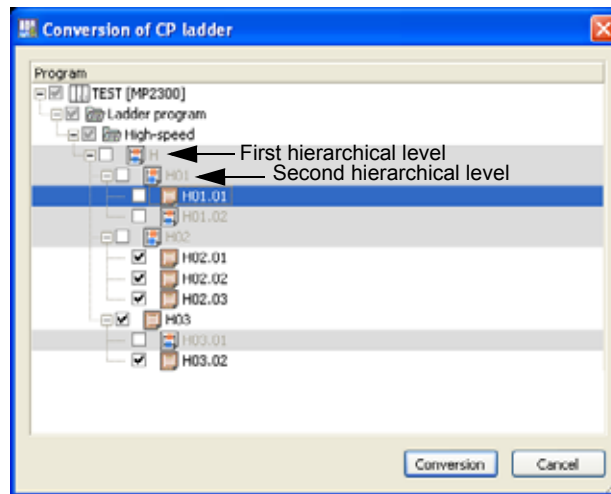
2. Click **Select**.

The **Conversion of CP ladder** Dialog Box will appear.

The check box of the CP ladder program specified in step 1 or the check boxes of the CP ladder programs that are displayed under the ladder program specified in step 1 will be selected.

When a program from the second hierarchical level is specified in step 1, the check box of the programs of first hierarchical level will also be selected.

- After deselecting the check boxes of the CP ladder programs not to be converted in step 3, the check boxes of the project file, ladder program folder, High-speed, Low-speed, Start, Interrupt, or Function folder to which non-selected CP ladder programs belong will be shaded. This is because some of CP ladder programs in the file or folder are selected and the rest are not selected.



3. Clear the check boxes of CP ladder programs not to be converted.

- Ordinary Ladder programs are shaded, and cannot be selected.

4. Click **Conversion**. All the selected CP ladder programs will be converted to new ladder programs.

If you click the **Cancel** Button, the CP ladder program conversion will be cancelled.

An error code (0xAxxxxxxx) and an error name may be displayed in the Output Subwindow in accordance with the changed program.

Select the error code (0xAxxxxxxx) and press the **F1** Key. **Error Generating Information** will appear.

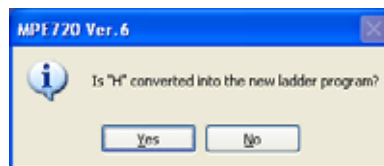
Check the error causes and take corrective action.

3.6.2 Converting a Program Individually

Select a CP ladder program that does not contain programs of lower hierarchical levels, or a CP ladder program under which no hierarchical structure is displayed, from the Ladder Subwindow. The selected CP ladder program can be individually converted to a new ladder program.

1. Select a CP ladder program that does not contain programs of lower hierarchical levels, or a CP ladder program under which no hierarchical structure is displayed, from the Ladder Subwindow. Then, right-click the selected program and select **Conversion of CP ladder** from the pop-up menu.
2. Click **OK**.

The following message will appear asking for confirmation.



- When the selected program contains programs of lower hierarchical levels, refer to 3.6.1 *Converting CP Ladder Programs as a Batch*.

3. Click **Yes**. The selected CP ladder program will be converted to an ordinary ladder program.

Motion Programming

This chapter describes an overview of motion programs and how to develop motion programs.

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4.1 Overview

4.1.1 What Is a Motion Program?

A motion program is written in a text language called motion language.

Such a program can be executed either by referencing (calling) it from a ladder program using an MSEE command, or by registering it in the M-EXECUTOR module using the **Task Allocation** Window.

A combined total of 256 programs of the motion program and sequence program types can be created.

```

Start MPM001
LINE  BLOCK  MVS [axis1]Position [axis2]Position ... Finter
1      1      "Servo Enable"
2      0      OB80000 = 1;
3      1      OB80800 = 1;
4      1      "MAXIMUM INTERPOLATION FEED SPEED"
5      2      FMX T500000;
6      1      "ABSOLUTE MODE"
7      3      ABS;
8      1      "SUBSTITUTE"
9      4      mw100=1;
10     1      "Repeat Commands"
11     5      WHILE MW100<=4:
12     6      "LINEAR INTERPOLATION"
13     6      MVS [A1]0 [B1]0 F100000;
14     6      "LINEAR INTERPOLATION"
15     7      MVS [A1]0 [B1]3000;
16     7      "LINEAR INTERPOLATION"
17     8      MVS [A1]3000 [B1]3000;
18     8      "LINEAR INTERPOLATION"
19     9      MVS [A1]3000 [B1]0;
20     9      "LINEAR INTERPOLATION"
21    10     MVS [A1]0 [B1]0;
Debug Mode >>> Suspend

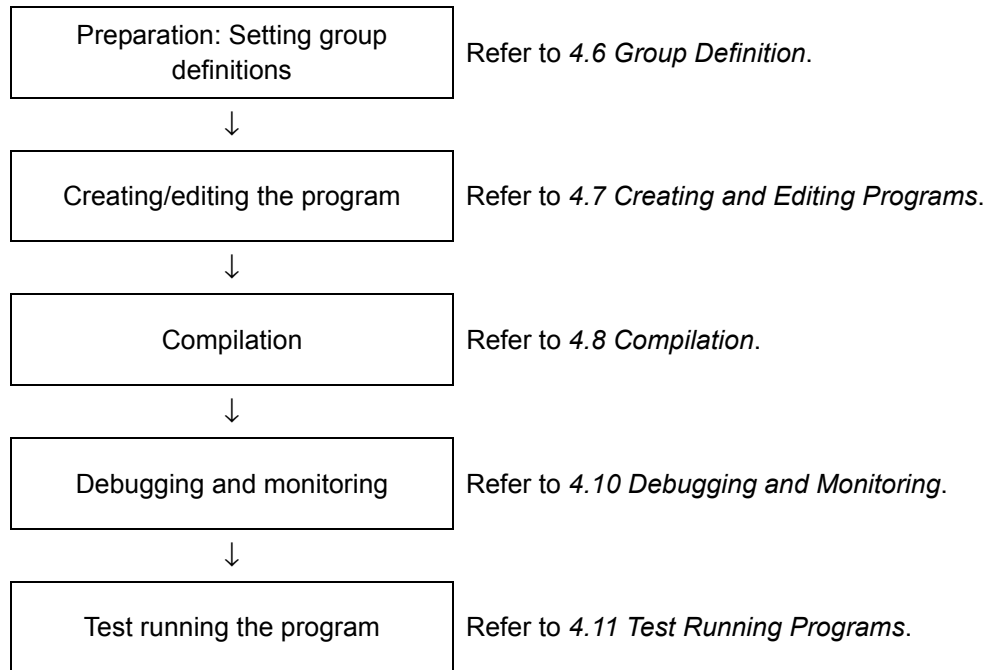
```

Motion programs consist of main programs (MPMxxx) and sub programs (MPSxxx). Main programs are called directly from ladder programs, and sub programs are called from either main programs or other sub programs.

- The "xxx" represents a number from 1 to 256.

4.1.2 Flow from Program Creation to Execution

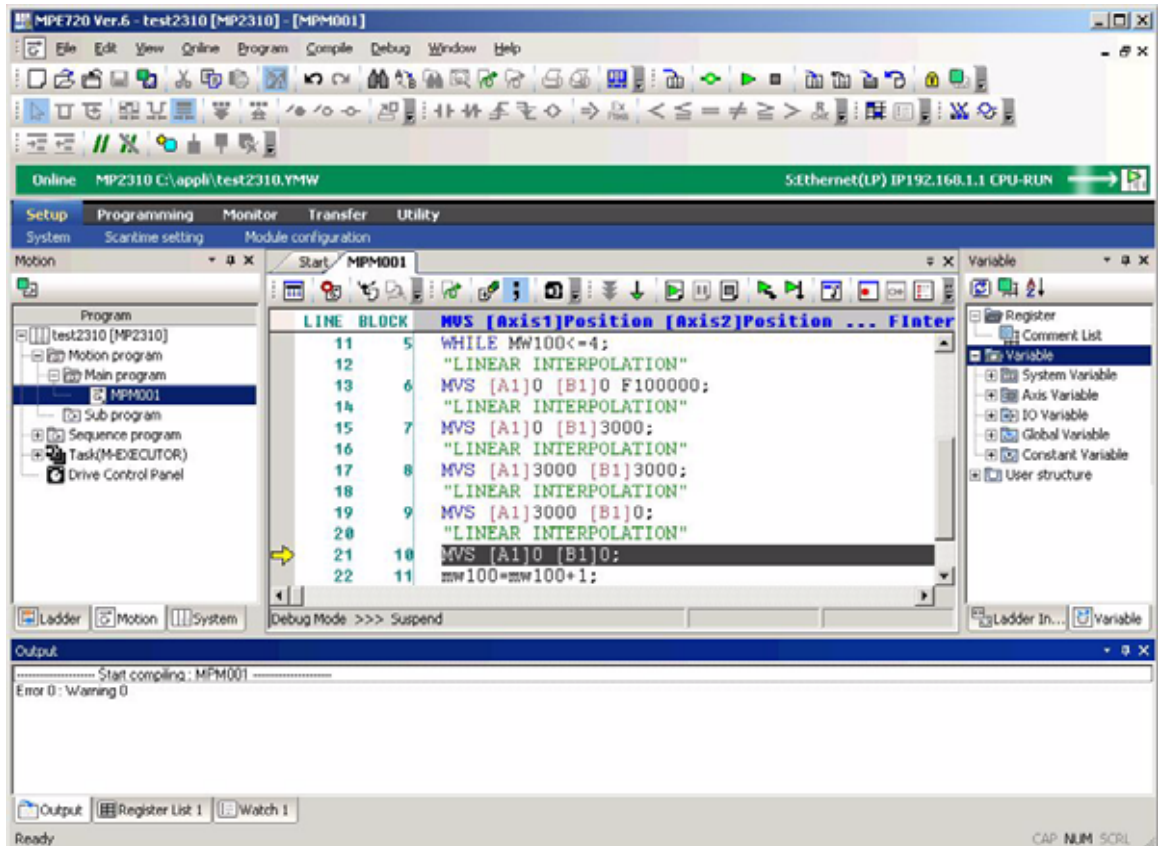
The flow of the procedure from creating a motion program to debugging it is shown below.



4.1.3 Differences Compared with Existing Motion Programs

The motion editor of the Engineering Manager has been integrated into the **MPE720 Ver. 6** Window. Addition of the autocomplete function and guidance function when inputting commands has made program editing work easier.

Note that you can continue to use motion programs that you have created up until now without any conversion.



4.2 Starting a Motion Program

Start the **XY Trace** Window in the main window.

1. Starting from the Motion Subwindow

Double-click the motion program that you want to open.

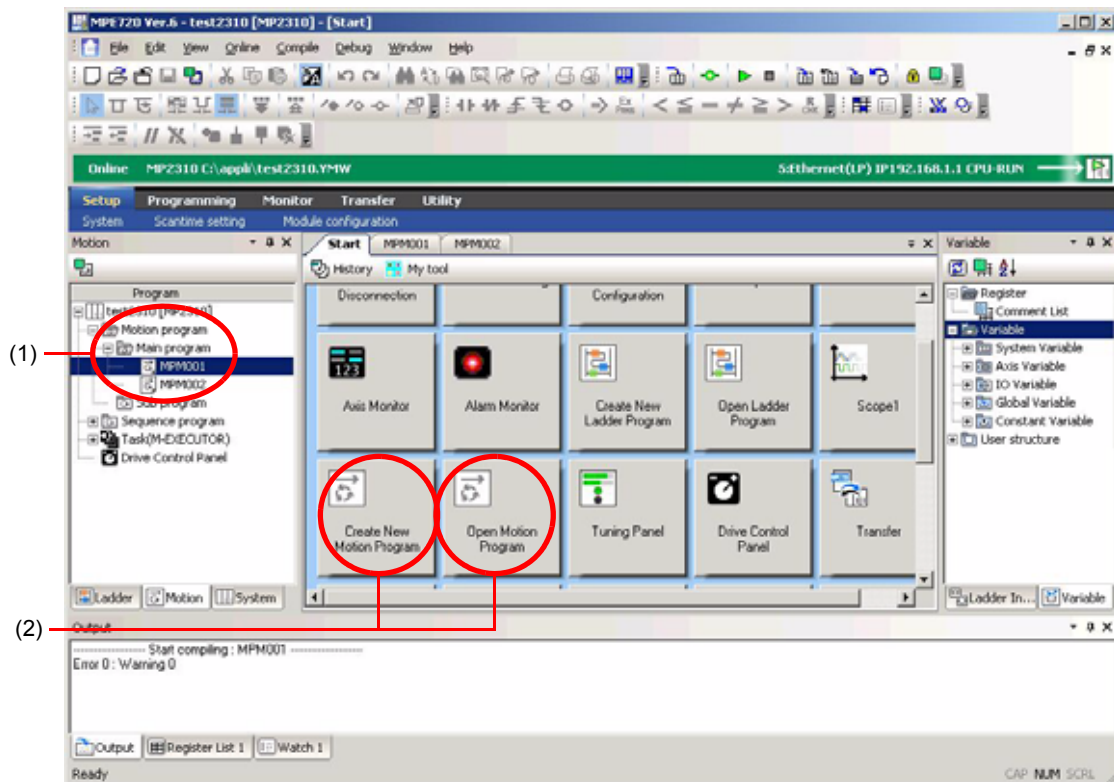
2. Starting from My Tool

Opening an existing motion program:

Click the **Open Motion Program** Button registered in the **My Tool** Window, then select the program number from the program selection window.

Creating a new motion program:

Click the **Create New Motion Program** Button registered in the **My Tool** Window, then enter the program number in the new program creation window.

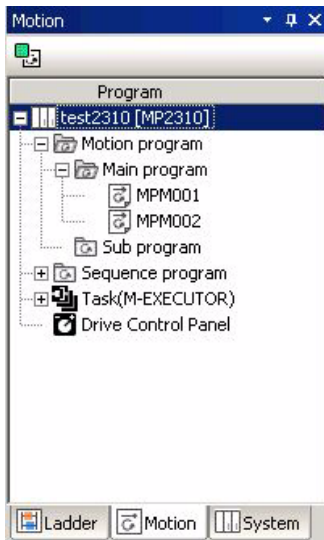


4.3 Motion Program Part Names and Functions

4.3.1 Motion Subwindow

The Motion Subwindow is a subwindow for managing motion programs.

The contents of the motion program folder in a project file are displayed in a tree hierarchy.



In the Motion Subwindow, the following operations can be performed in relation to the motion program.

Motion program

- Creating programs (Refer to *4.7 Creating and Editing Programs.*)
- Opening
- Cutting, copying, and pasting
- Deleting
- Changing names
- Compiling (Refer to *4.8 Compilation.*)
- Displaying properties
- Setting and cancelling passwords

Task (M-EXECUTOR)

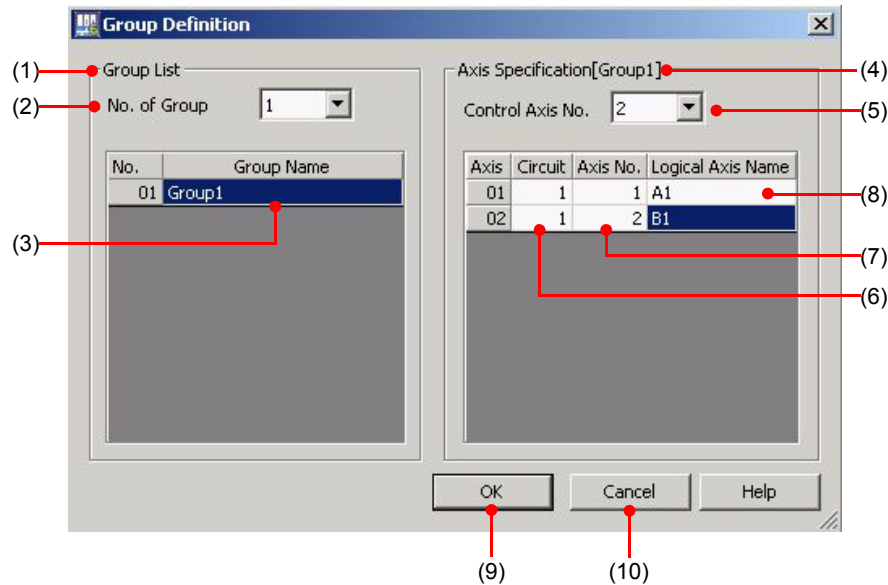
- Allocating tasks (Refer to *4.9.2 Allocation to the Task Allocation Function.*)

Drive Control Panel

- Operation control panel (Refer to *4.11 Test Running Programs.*)

4.3.2 Group Definition Window

This is a definition window in which multiple axes are assembled into one group.



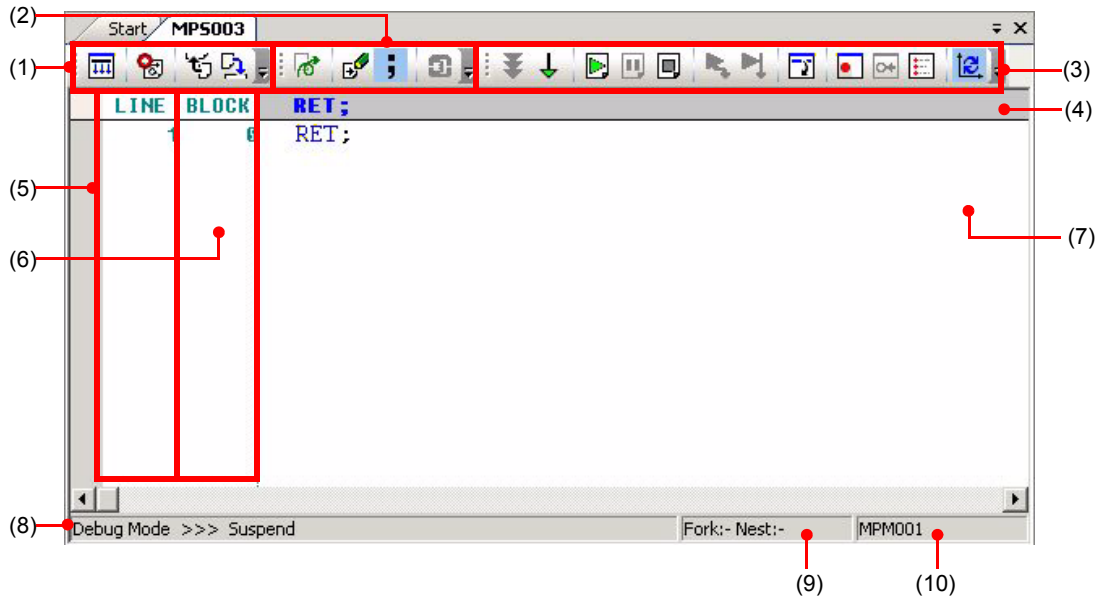
Number	Name	Details
(1)	Group List	Displays the group rows (group numbers and names) for the number of groups entered in the No. of Group field.
(2)	No. of Group	Sets the number of groups that you want to create. A maximum of 8 groups can be created.
(3)	Group Name	Assigns a name to each group. Names of up to 16 characters can be assigned.
(4)	Axis Specification	Sets the axis specifications for the selected group. When the number of controlled axes is entered in the Control Axis No. field, setting rows for the specified number of axes will be displayed.
(5)	Control Axis No.	Sets the number of axes that can be controlled in one group.
(6)	Circuit (number)	Sets the circuit numbers assigned to each module.
(7)	Axis No.	Sets the numbers assigned to each axis.
(8)	Logical Axis Name	Sets the logical axis names. The set of the circuit (number) and axis number is called the “physical axis”. The name assigned to this physical axis is called the “logical axis name.”
(9)	OK	Sets the group definitions and return to the MPE720 Ver. 6 Window.
(10)	Cancel	Returns you to the MPE720 Ver. 6 Window without setting the group definitions.

4.3.3 Motion Editor Tab Page













The window where motion programs are created is called the Motion Editor.

The window display for the Motion Editor is as follows.

- The explanation given here relates to the **Motion Subprogram** Window.

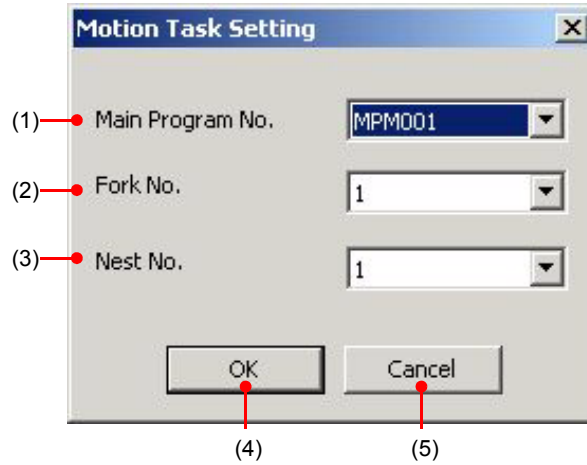


Number	Name	Details	
(1)	Monitor toolbar		Follows up the block being executed and always displays the block in the window.
			Displays the Motion Alarm Window.
			References a motion subprogram.
			Displays the Motion Task Window.
(2)	Program toolbar		Compiles the open program.
			Displays the Motion Command Assist Window.
			Automatically appends a semicolon.
			Displays the Task Allocation Window.

Number	Name	Details
(3)	Motion debugging toolbar	 Activates the debug mode.
		 Activates the normal operation mode.
		 Executes a program.
		 Stops the execution of a program.
		 Forcibly terminates the program being executed.
		 Activates the step-in mode.
		 Activates the step-over mode.
		 Changes the selection of the line from which execution is started.
		 Sets/cancels a break point.
		 Activates/deactivates a break point.
		 Displays a list of break points.
		 Updates to the latest status.
		(4)
(5)	Line number	This is the line number counting the number of the lines of stated character strings (commands, comments, blank lines, etc.).
(6)	Block number	This is the line number counting only the executable lines. (Comments, blank lines and so on are not counted.)
(7)	Editing (entry) area	This is the area in which programs are input.
(8)	Status bar	Displays the current operation mode and alarm occurrence status. [Normal operation mode] Executing: Execution in progress Alarm: An alarm has occurred. [Debug mode] Running in the debug mode: Debug Mode Single block stop in effect: Debug Mode >>> Suspend Alarm has occurred: Debug Mode >>> Alarm
(9)	Fork/Nest	Displays fork numbers and nest numbers.
(10)	Main program	Displays the number of the main program referencing this motion program.

4.3.4 Motion Task Setting Window

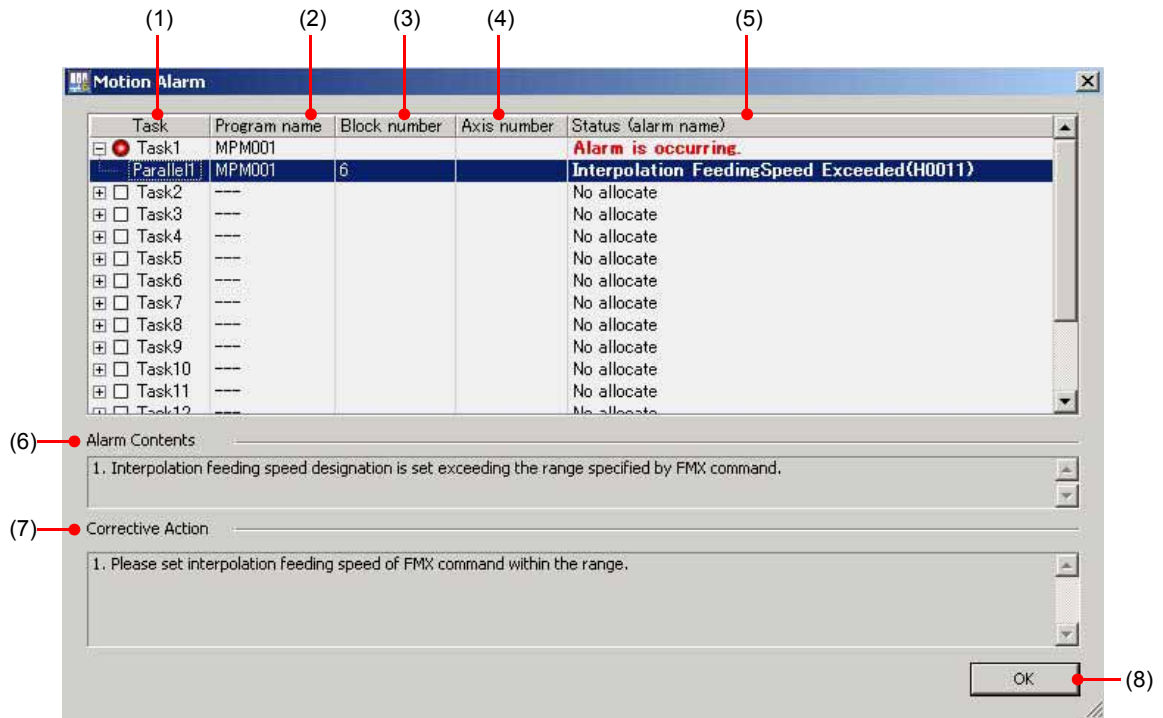
This is the window in which you make the following and other settings for a subprogram: the main program from which it is to be called, and the fork from which it is to be called.



Number	Name	Details
(1)	Main Program No.	Sets which main program a subprogram is to be called from.
(2)	Fork No.	Sets which fork of the main program a subprogram is to be called from.
(3)	Nest No.	Sets the nesting level at which the subprogram is to be called.
(4)	OK	Sets the motion task and returns you to the Motion Editor Tab Page.
(5)	Cancel	Returns you to the Motion Editor Tab Page without setting the motion task.

4.3.5 Motion Alarm Window

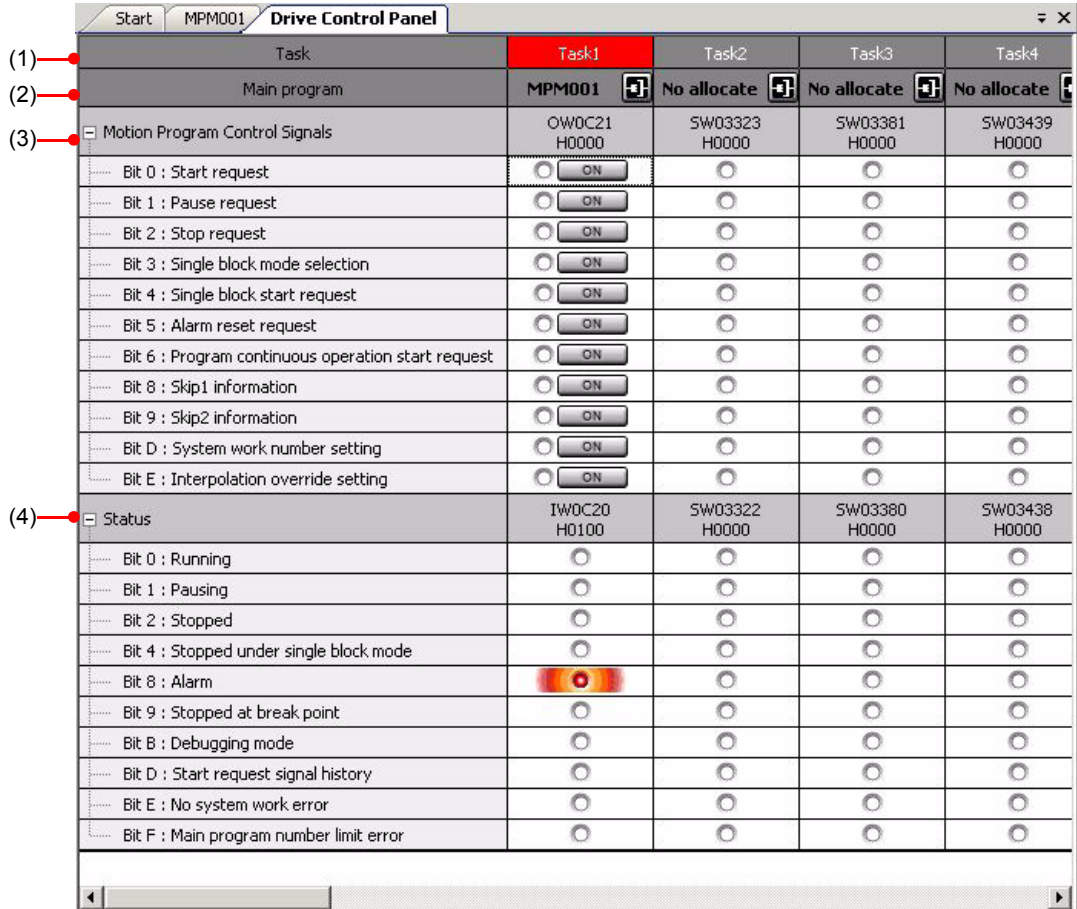
This is the window in which you check alarms while a motion program is being executed.





Number	Name	Details
(1)	Task	Displays the task number.
(2)	Program name	Displays the program number.
(3)	Block number	Displays the block number in which an alarm has occurred.
(4)	Axis number	Displays the axis number where an alarm has occurred.
(5)	Status (alarm name)	Displays the alarm name.
(6)	Alarm Contents	Displays the details of the alarm.
(7)	Corrective Action	Displays the corrective action for the alarm that has occurred.
(8)	OK	Closes the Motion Alarm Window and returns you to the Motion Editor Tab Page.

4.3.6 Drive Control Panel Tab Page

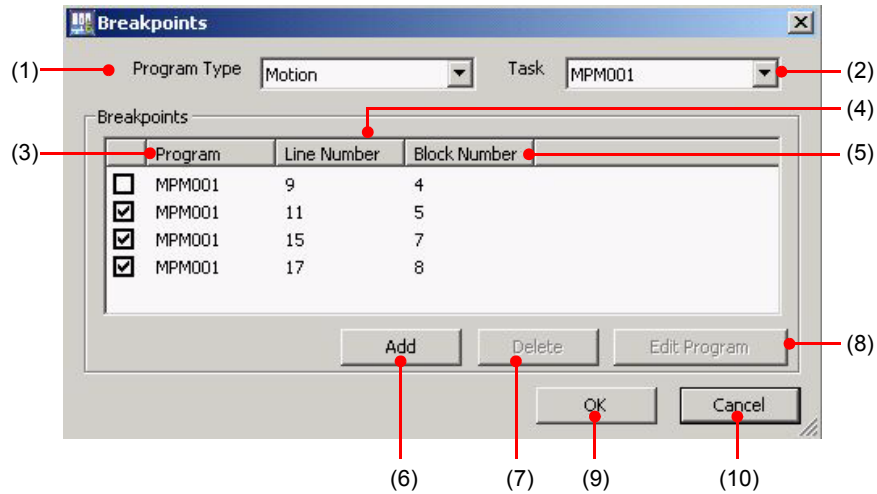
This is a window in which you can run a test operation before executing a program, and monitor the operating status of a program that is being executed.



Number	Name	Details
(1)	Task	Displays the task number.
(2)	Main program	Displays the main program number.
(3)	Motion Program Control Signals	Displays the status for control signals.
(4)	Status	Displays the status for control signals.  : This is the status when the system is operating normally.  : This is the status when an error has occurred at this bit.

4.3.7 Breakpoints Window

This is the window for setting or canceling break points.



Number	Name	Details
(1)	Program Type	Displays the type of program.
(2)	Task	Displays the task number.
(3)	Program	Displays the program number of the program where the break point is set.
(4)	Line Number	Displays the line number where the break point is set.
(5)	Block Number	Displays the block number where the break point is set.
(6)	Add	Sets a new break point.
(7)	Delete	Cancel a set break point and removes it from the list.
(8)	Edit Program	Opens the selected program.
(9)	OK	Sets the break point and returns you to the Motion Editor Tab Page.
(10)	Cancel	Returns you to the Motion Editor Tab Page without setting the break point.

4.4 Main Menu List



4.4.1 Program

The menu options used for program operations are shown below.

Item	Function
Motion command assist	Displays the Motion Command Assist Window.
Add semicolons	Automatically appends a semicolon.
Line comment	Inserts a line comment.
Cancel line comment	Cancels a line comment.
Line indent	Inserts a line indentation.
Cancel line indent	Cancels a line indentation.
Set/cancel bookmark	Sets/cancels a bookmark.
Next bookmark	Moves you to the next bookmark.
Previous bookmark	Moves you to the previous bookmark.
Clear bookmark	Cancels a set bookmark.

4.4.2 Debug

The menu options used for debugging operations are shown below.



Item	Function
Debug mode	Activates the debug mode.
Normal operation mode	Activates the normal operation mode.
Execute	Executes a program.
Break	Stops the execution of a program.
Forced termination	Forcibly terminates the program being executed.
Step-in	Activates the step-in mode.
Step-over	Activates the step-over mode.
Move execution start line	Changes the selection of the line from which execution is started.
Set/cancel break point	Sets/cancels a break point.
Activate/deactivate break point	Activates/deactivates a break point.
List break points	Displays a list of break points.
Update current position	Updates to the latest status.
Set motion task	Displays the Motion Task Window.
Reference motion subprogram	References a motion subprogram.
Motion alarm	Displays the Motion Alarm Window.
Add to watch	Adds a register to the watch.
Add to trace	Adds a register to the trace.

4.5 Toolbar List

4.5.1 Monitor

(1) Monitor Auto Scroll

The monitor auto scroll function follows up the block being executed and always displays the block in the window.

Icon		
	Monitor auto scroll ON	Follows up the block being executed and always displays the block in the window.
	Monitor auto scroll OFF	Automatic scrolling is not performed.

Automatic scrolling is cancelled by performing the following operations as well as turning the monitor auto scroll OFF.

- Pressing any key on the keyboard
- Left or right-clicking with the mouse
- Moving the mouse wheel
- Moving the vertical scroll bar of the **Program** Window

(2) Motion Alarm

Displays the **Motion Alarm** Window.

For details on motion alarms, refer to *4.10.4 Alarm Display*.

(3) Reference Motion Subprogram

Displays the subprogram being referenced.

(4) Set Motion Task

Displays the dialog box for motion task settings.

For details on motion task settings, refer to *4.10.5 Setting Motion Tasks*.

4.5.2 Program

(1) Compile

Compiles the open program.

(2) Motion Command Assist



Displays the **Motion Command Assist** Window.

(3) Add Semicolons

This is a function whereby semicolons can be automatically appended at the end of lines on pressing the Enter key when entering a motion command.

By clicking icons you can select the mode in which semicolons are automatically appended.

If there is already a semicolon at the end of a line, no semicolon is appended.

Icon		
	Automatically append semicolon	Semicolons are automatically appended at the ends of lines.
	Don't automatically append semicolon	Semicolons are not automatically appended at the ends of lines.

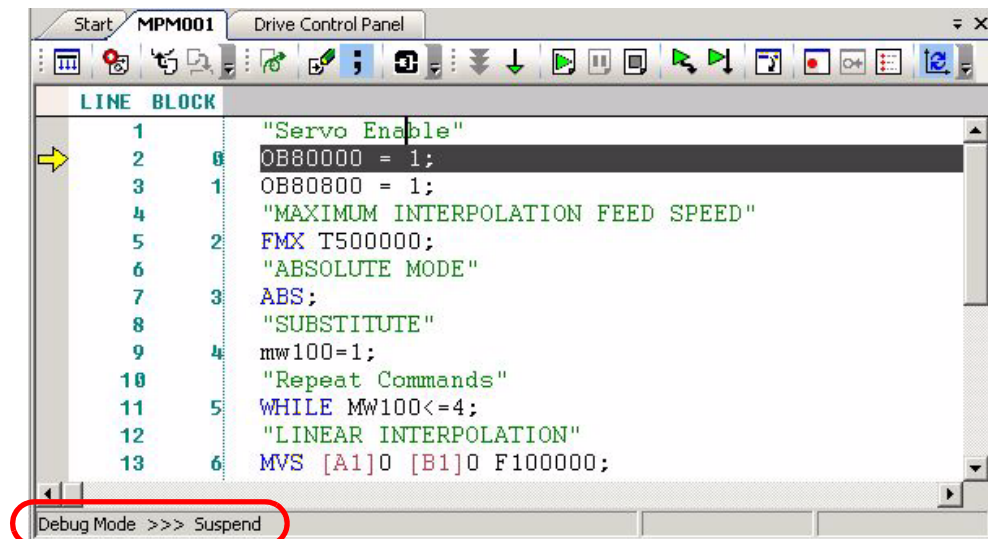
(4) Allocate Task

Displays the **Task Allocation** Window.

4.5.3 Motion Debugging

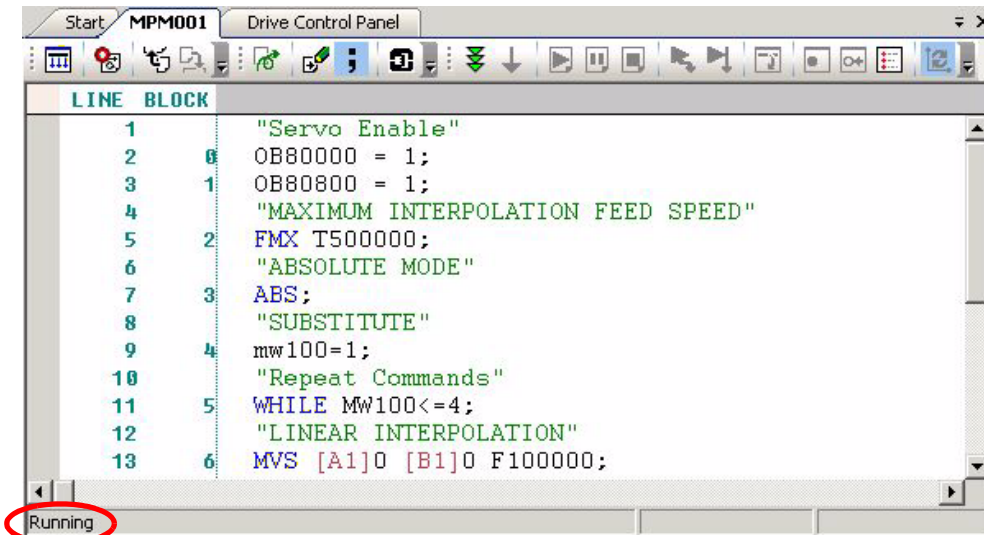
(1) Debug Mode

Selects the debug mode.



(2) Normal Operation Mode

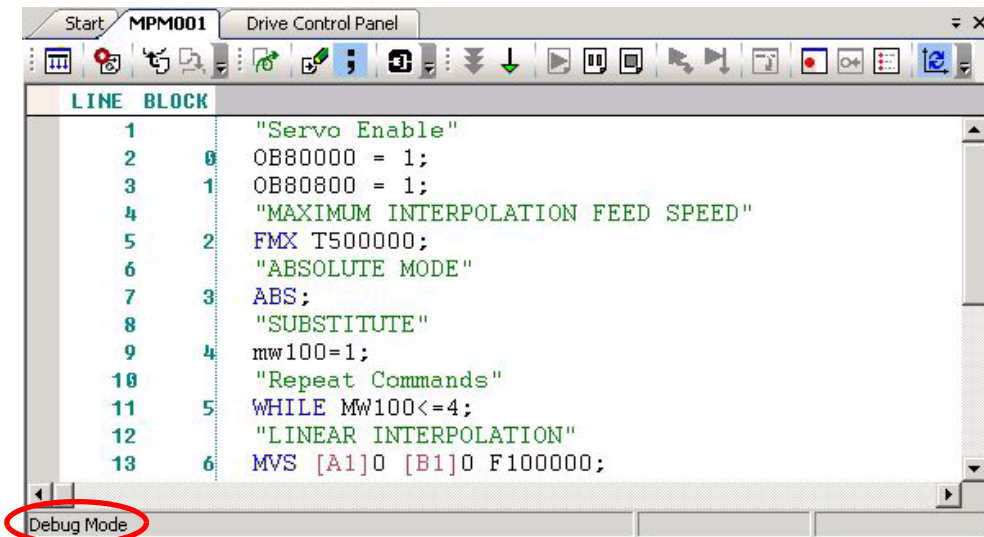
Selects the normal mode.



(3) Execute Program

Runs a program continuously.

On reaching a breakpoint line, execution stops at that line. Execution continues until break, forced termination or normal operation is invoked.



(4) Break

Temporarily stops the program during debug operation.

(5) Forced Termination

Forcibly terminates execution of the program during debugging.

Processing beyond the line of the program that is currently being executed is not executed.

(6) Step In

Executes one line of a program.

When an MSEE command or SSEE command is executed in the step-in mode, the control moves to the initial line of the subprogram.

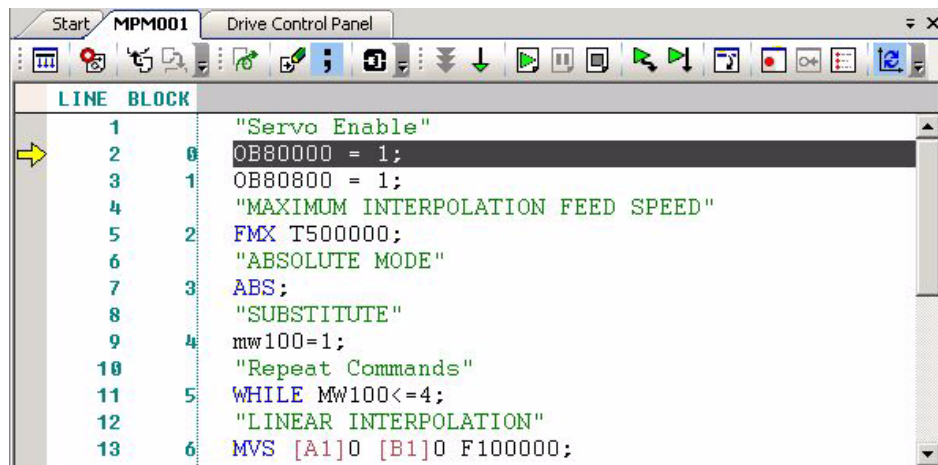
(7) Step Over


Executes one line of a program.

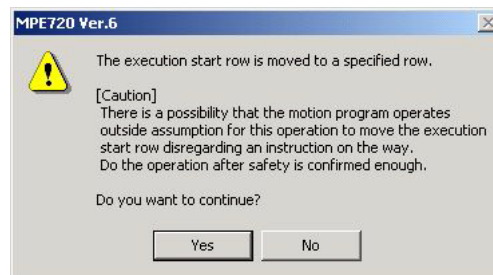
When an MSEE command or SSEE command is executed in the step-over mode, the control moves to the next line after execution of the subprogram.

(8) Move Execution Start Line

Changes the selection of the line from which program execution is started to the line where the cursor is located.

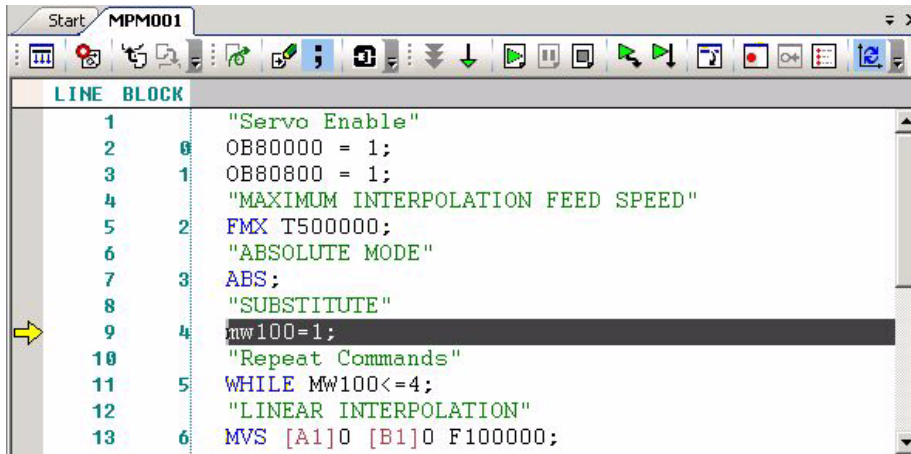


1. Place the cursor on the line where you want program execution to start.
2. Click the Move Execution Start Line icon ().
3. A confirmation message for moving the execution start line is displayed.



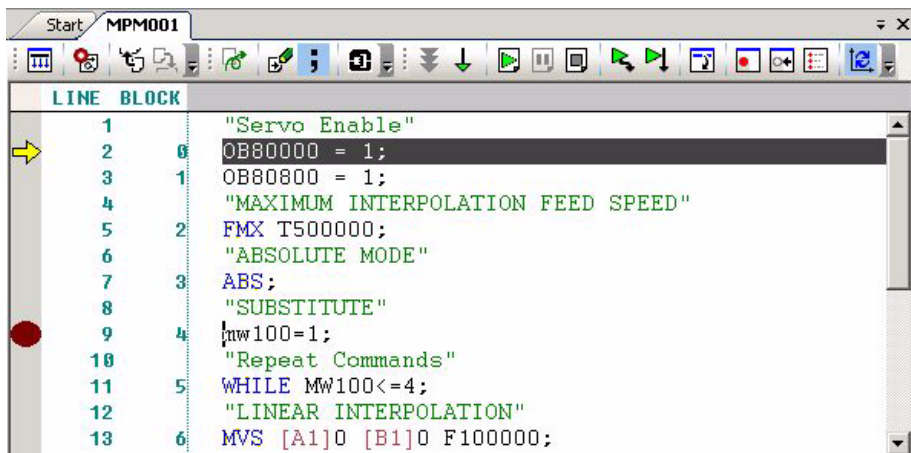
4. On clicking the **Yes** Button, the execution start line is moved to the point where the cursor is located.

* "OB88000 = 1" is not executed.



(9) Set/Delete Breakpoint

Sets/deletes breakpoints.



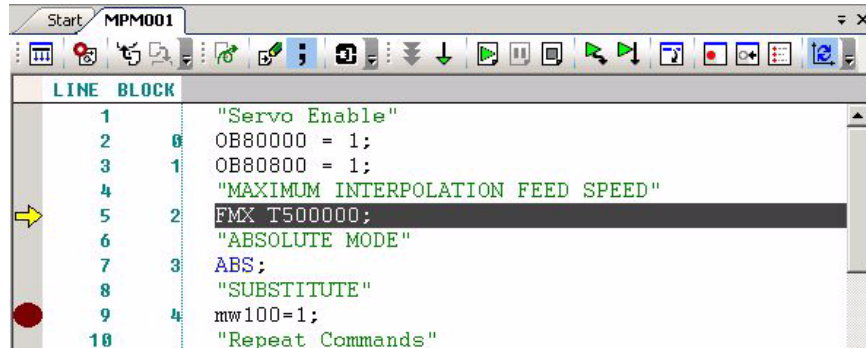
Set breakpoint: Sets a breakpoint. Up to four breakpoints can be set in one motion program.

Delete breakpoint: Clicking the icon again on a line where a breakpoint has been set deletes that breakpoint.

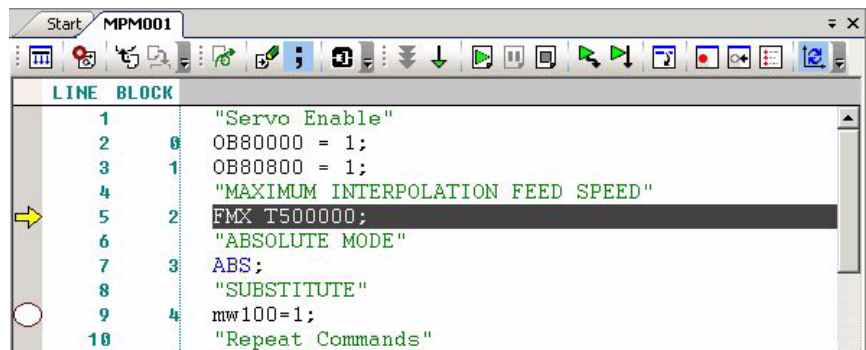
(10) Activate/Deactivate Breakpoint

Activates and deactivates breakpoints.

Activate breakpoint: Activates the selected breakpoint.



Deactivate breakpoint: Deactivates the selected breakpoint.

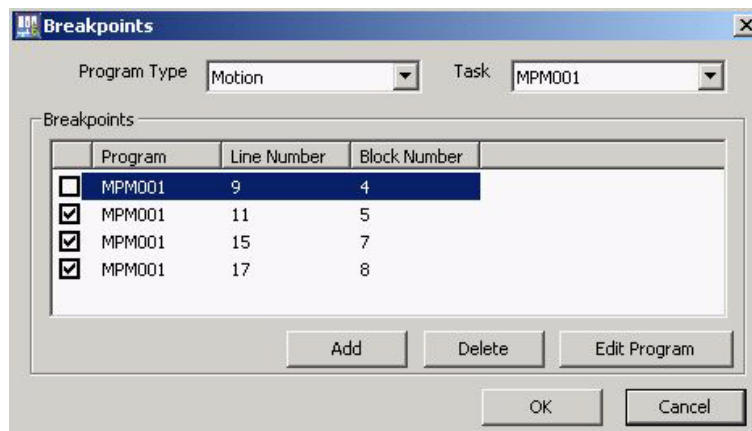


(11) Breakpoints Window

The set breakpoints are listed here.

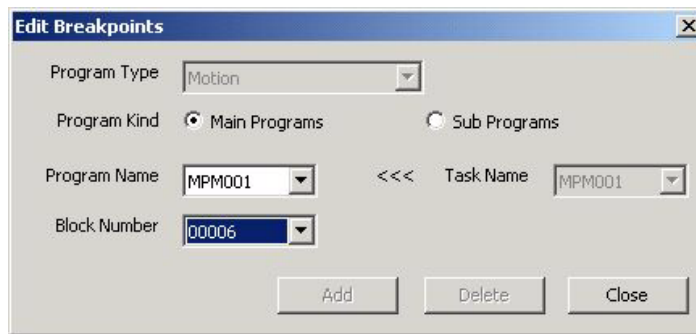
The check boxes of the lines where breakpoints are activated are checked here. The check boxes of lines where breakpoints are deactivated are not checked.

Breakpoints can also be set and deleted in the **Breakpoints** Window.



[a] Setting a Breakpoint

1. Click the **Add** Button in the **Breakpoints** Window.
The **Edit Breakpoints** Window will be displayed.
2. Set the **Program Kind**, the **Program Name**, and the **Block Number** where you want to set the breakpoint, then click the **Add** Button.



[b] Deleting a Breakpoint

1. Select the breakpoint to be deleted in the **Breakpoints** Window, then click the **Delete** Button.
The selected breakpoint will be deleted.

(12) Update Current Position

Updates the display to the latest status.

This has the same function as the PLD command. While this icon is selected, the current position is updated on pressing the icon for step in, step over, or execute operations.

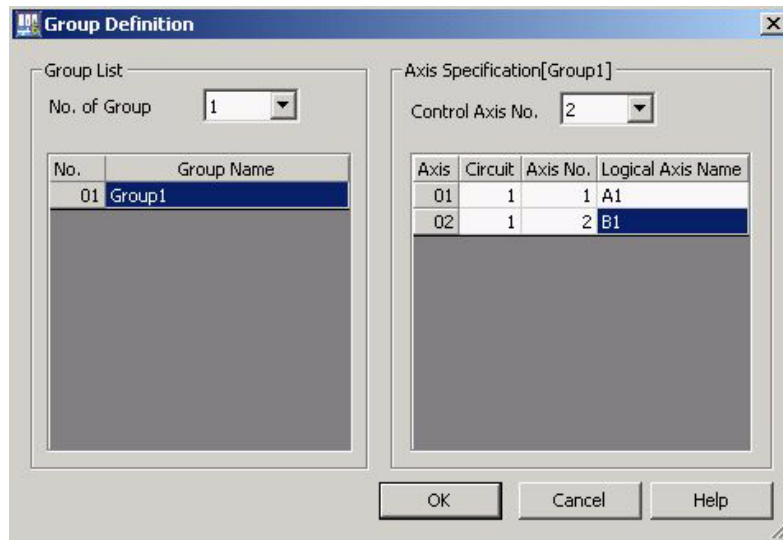
- ♦ For details on the PLD command, refer to *Machine Controller MP2000 series User's Manual for Motion Programming* (manual No.: SIEP C88070038) 8.3.3 Program Current Position Update (PLD).

4.6 Group Definition

Group definition means definition whereby multiple axes are organized into one group.

With motion programs, the axes that operate in conjunction with each other are organized into individual groups, and programs can be created for each group.

For each of these axes, a **Circuit** (number) and **Axis No.** is set, and this is used as the “physical axis.” This physical axis with a name assigned is called the “logical axis name.”



4.7 Creating and Editing Programs

Use the procedure described below to create and edit motion programs.

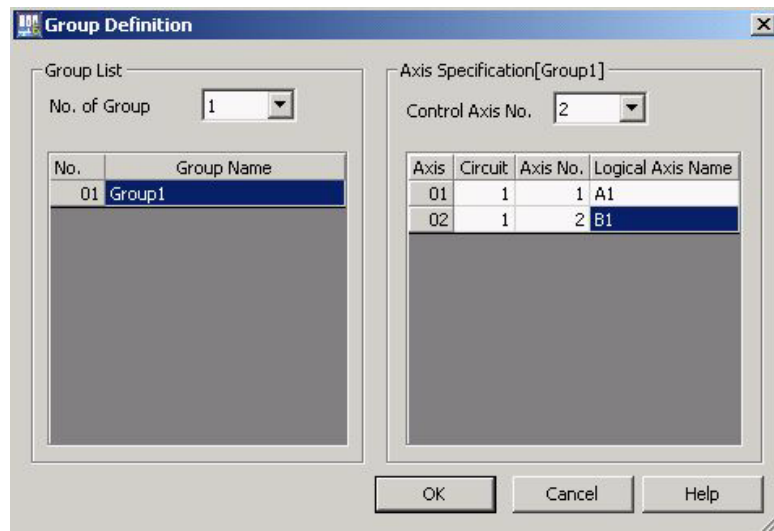
- The Module Configuration must be defined for a new motion program to be created. Refer to 2.1 *Module Configuration* and set the Module Configuration.

4.7.1 Setting a Group Definition

The group definition has to be set before creating a motion program.

Use the procedure described below to set a group definition.

1. Double-click the **Motion program** folder in the Motion Subwindow. Alternatively, right-click on **Motion program** and select **Group Definition** from the pop-up menu.
Or, double-click the **Axis Variable** folder in the Variable Subwindow.
The **Group Definition** Dialog Box will be displayed.
2. Set the items, and then click the **OK** Button.
 - In the **Logical Axis Name** field, enter a string of up to 8 alphanumeric characters with a letter of the alphabet as the leading character. Do not use a numeral as the leading character.

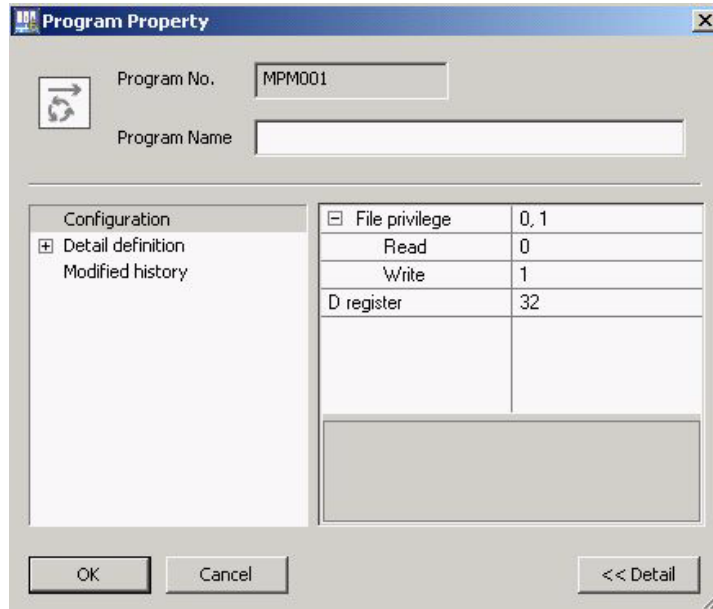


4.7.2 Creating a New Program

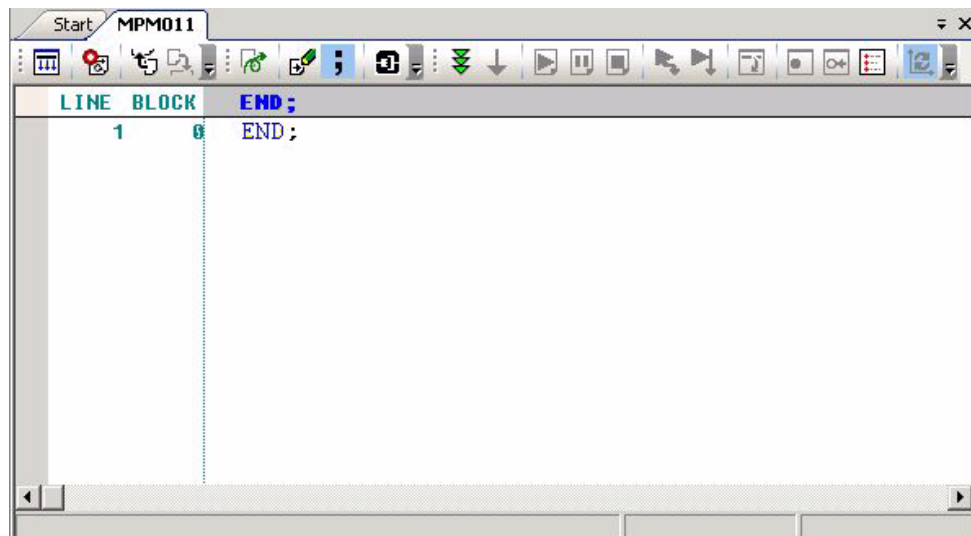
1. In the Motion Subwindow, right-click on the **Main program** folder or **Sub program** folder under the **Motion program** folder, and then select **New** from the pop-up menu.

The **Program Property** Dialog Box will be displayed.

2. Set each item in the **Configuration**, and then click the **OK** Button.
 - For details on **Detail definition** and **Modified history**, refer to 4.12.4 *Properties of Motion Programs*.



The **Motion Editor** Tab Page is displayed in the main window, enabling editing of the motion program.



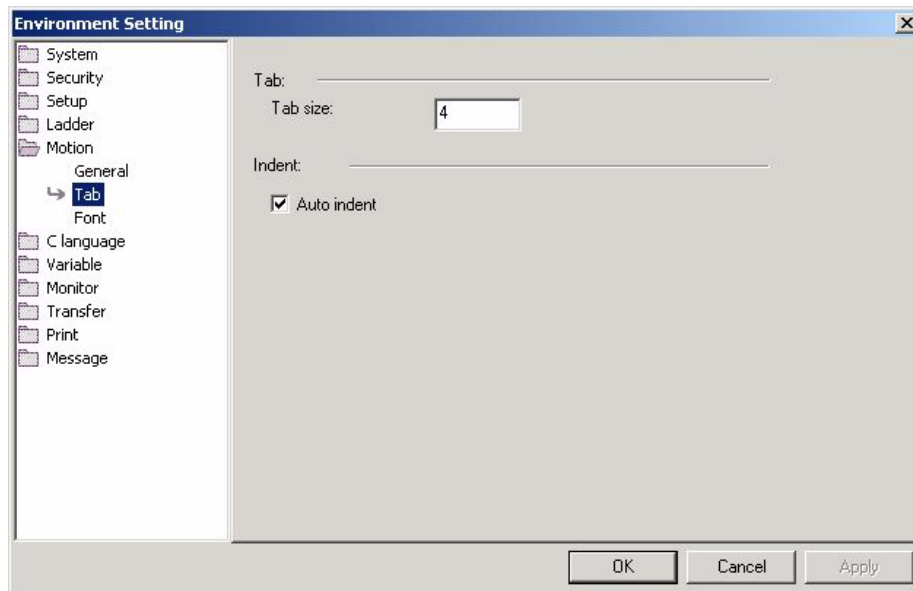
4.7.3 Editing

(1) Environment Setting

[a] Motion/Tab

The tab stop position and the size of automatic indentation.

Select **Motion - Tab** from the tree of the **Environment Setting** Dialog Box.



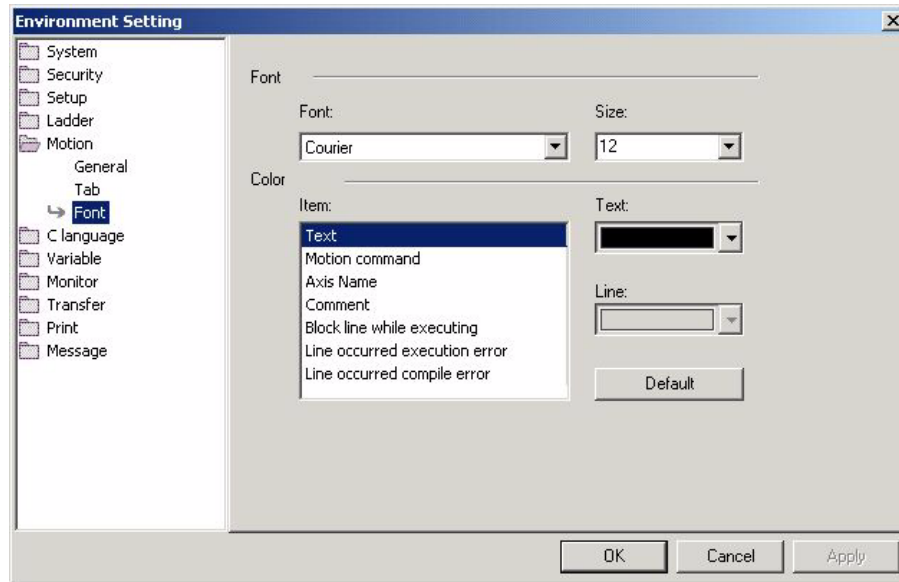
Tab: Sets the tab stop position. The tab stop position and the size of automatic indentations share the same setting.

Indent: Automatic indentation is a function to indent the start position of the next line to the tab stop position of the current line when the Enter key is pressed. When the **Auto indent** check box is selected, automatic indentation is activated. The tab stop position and the size of automatic indentations share the same setting.

[b] Motion/Font

Different colors can be used for motion commands, logical axis names, comments to distinguish them from other text strings in programs. This makes it possible to comprehend the program code at a glance.

Select **Motion - Font** from the tree in the **Environment Setting** Dialog Box and then change the settings.



Item	Default Character Color	Default Background Color
Text	Black	-
Motion command	Blue	-
Axis Name	Dark red	-
Comment	Green	-
Block line while executing	White	Black
Line occurred execution error	White	Red
Line occurred compile error	White	Red

(2) Edit

The Windows standard editing functions are as follows.

[a] Undo

Undoes the last operation performed.

[b] Redo

Performs the last operation performed again.

[c] Cut

Cuts the selected range and stores it on the clipboard.

[d] Copy

Copies the selected range and stores it on the clipboard.

[e] Paste

Pastes the contents of the clipboard.

[f] Delete

Deletes the selected range.

[g] Select All

Selects all the programs in the file.

[h] Find

Searches for a character string in the program. Enter the character string to be searched for as it is written in the program.

Example: If the character string in the program is “MW1,” enter “MW1.” If you enter “MW01” or “MW00001,” “MW1” will not be searched for.

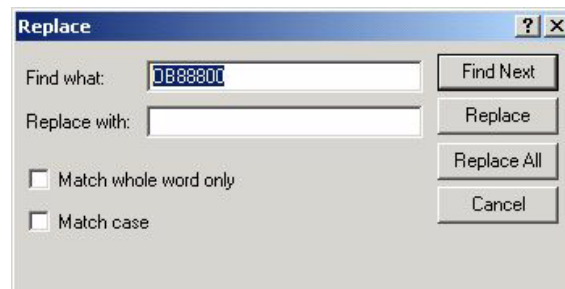


- This function is usable when the connection with the Machine Controller is broken (when offline).

[i] Replace

Replaces a character string in the program with another character string. Enter the character string to be searched for as it is written in the program.

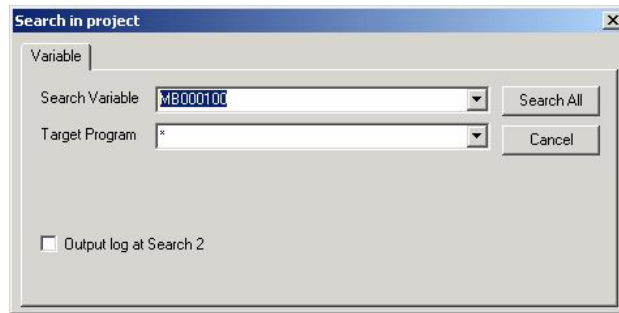
Example: If the character string in the program is “MW1,” enter “MW1.” If you enter “MW01” or “MW00001,” “MW1” will not be searched for.



- This function is usable when the connection with the Machine Controller is broken (when offline).

[j] Search in Project

All motion programs and ladder programs (or specified programs) within a project file can be searched for registers.

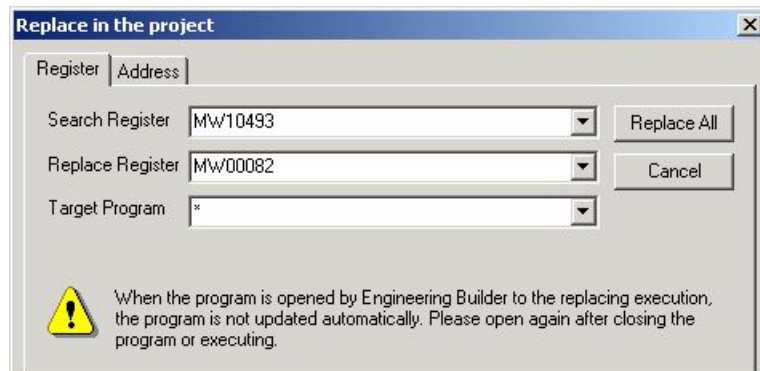


You can specify multiple programs at **Target Program** by separating them with a comma or a space. You can also use “*” (the wild card) in the **Target Program** field, as shown below.

- *, MPM*, MPS*
- Wildcards can be used only in the above forms. They cannot be used in forms such as “MPM001.*”
- This function is usable when the connection with the Machine Controller is broken (when offline).

[k] Replace in the Project

Registers and addresses can be searched for and replaced in all the motion programs or ladder programs (or specified programs) within a project file.



You can specify multiple programs at **Target Program** by separating them with a comma or a space. You can also use “*” (the wild card) in the **Target Program** field, as shown below.

- *, MPM*, MPS*
- Wildcards can be used only in the above forms. They cannot be used in forms such as “MPM001.*”
- This function is usable when the connection with the Machine Controller is broken (when offline).

(3) Programs

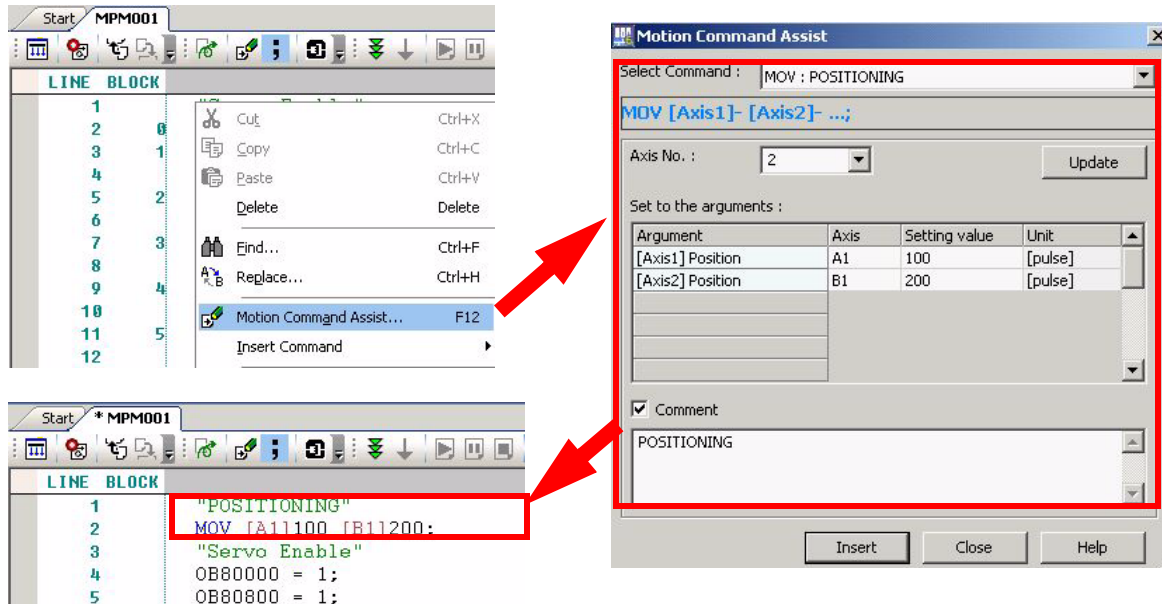
[a] Entering Commands

There are two method for entering motion commands: entry by using the motion command assist function and entry by direct entry from the keyboard.


■ When Using the Motion Command Assist Function

This is a function that assists you with the entry of motion commands. By using this function you can understand the command setting method, and you can enter motion commands easily.

- The motion command assist function is available in MPE720 Ver.6.04 and later versions.



1. Display the **Motion Command Assist** Dialog Box by using any of the following methods.

- Select **Program - Motion Command Assist** from the Main Menu.
- Click the Motion Command Assist icon () in the toolbar.
- Select **Motion Command Assist** from the pop-up menu.
- Select **Insert Command** and then a desired command from the pop-up menu.
- Press the **F12** Key in the **Motion Editor** Tab Page.

2. On completing the necessary settings, click the **Insert** Button.

The motion command for which the value has been set will be inserted at the cursor position in the motion program.

You can insert multiple motion commands in succession.

- The servo ON, servo OFF and alarm clear commands can be set easily by selecting **Insert Command - Servo ON/ Servo OFF/Alarm Clear** from the pop-up menu.

3. After completing the insertion of motion commands, click the **Close** Button.

■ When Using Direct Entry

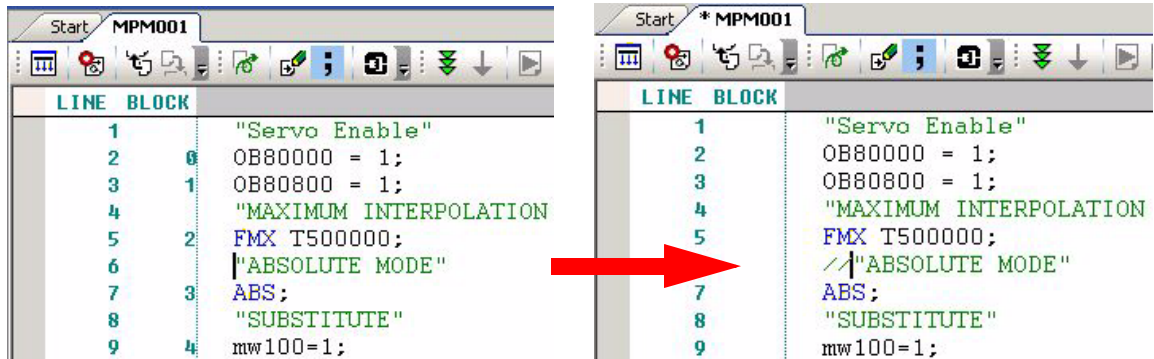
Type in the motion command directly from the keyboard.

- For details on motion commands, refer to *Machine Controller MP2000 series User's Manual for Motion Programming* (manual No.: SIEP C88070038).

[b] Setting Line Comments

1. Move the cursor to the start of the range of lines to be commented out.
2. Select **Program - Line Comment** from the Main Menu.

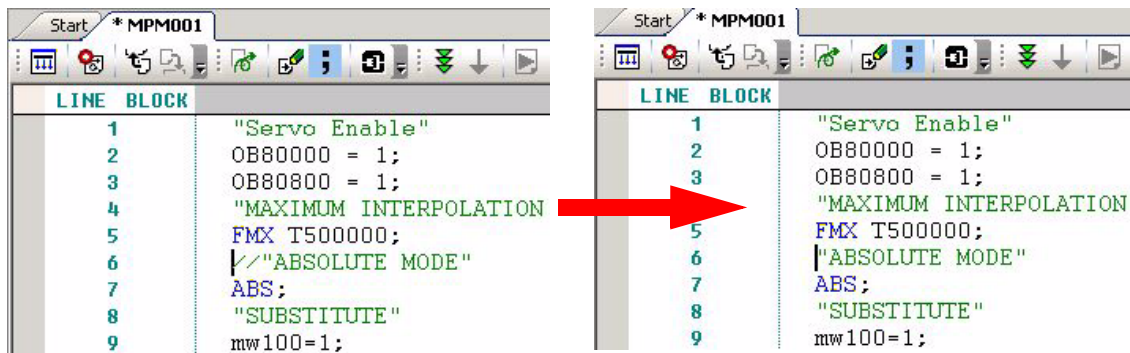
The selected range of lines is set as a comment.



[c] Canceling Line Comments

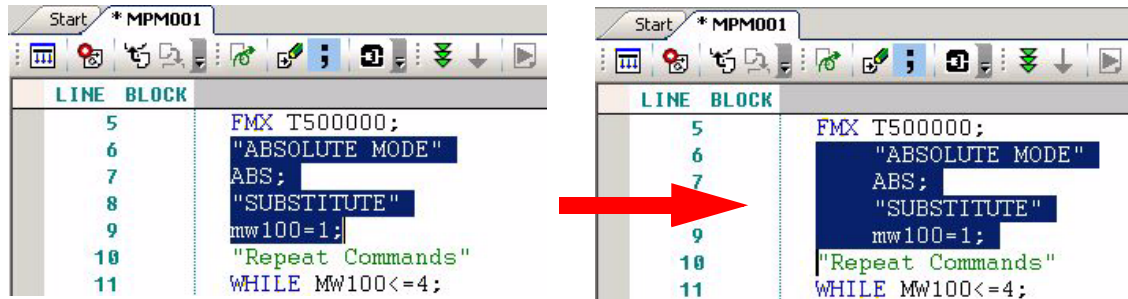
1. Move the cursor to the start of the commented out line to be retrieved as code.
2. Select **Program - Cancel Line Comment** from the Main Menu.

The comment is retrieved as code.



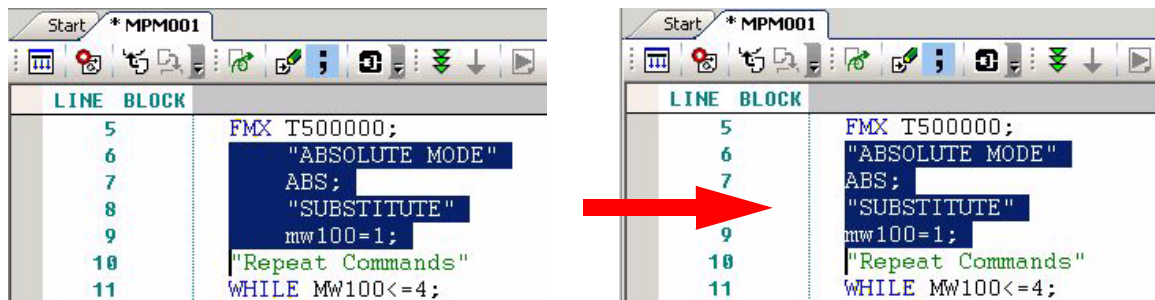
[d] Setting Line Indents

1. Select the range where you want to set an indent.
2. Select **Program - Line Indent** from the Main Menu.



[e] Canceling Line Indents

1. Select the range in which you want to cancel the indent.
2. Select **Program - Cancel Indent** from the Main Menu.



[f] Bookmarks

This is a “bookmark” function that can be used within motion programs.

Bookmarks can be set in line units. By pressing the **F2** Key, you can jump to the location where a bookmark has been set.

- Bookmarks that have been set remain in effect until the **Editor** Window is closed.

Setting and canceling bookmarks Select **Program - Set/Cancel Bookmark** from the Main Menu.
Press the **Ctrl + F2** Keys.

Clearing bookmarks Select **Program - Clear Bookmark** from the Main Menu.

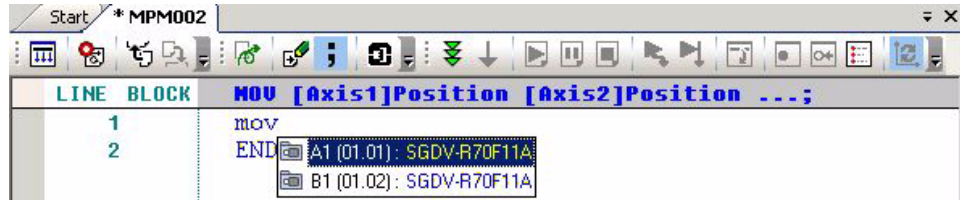
Jumping to the next bookmark Select **Program - Next Bookmark** from the Main Menu.
Press the **F2** Key.

Jumping to the previous bookmark Select **Program - Previous Bookmark** from the Main Menu.
Press the **Shift + F2** Keys.



(4) Other

[g] Autocomplete

This is a function that assists you with the entry of motion commands. When you want to use a logical axis or a subprogram, you can select the available logical axes and subprograms.




There are the following two methods for autocomplete.

<p>Logical axis autocomplete:</p> 	<p>On entering a space or pressing the “[” key after a motion command for which a logical axis needs to be selected, the available logical axes are shown in a pop-up display.</p>
<p>Program autocomplete:</p> 	<p>On entering a space after an MSEE command or SSEE command, the subprograms that can be referenced are shown in a pop-up display.</p>

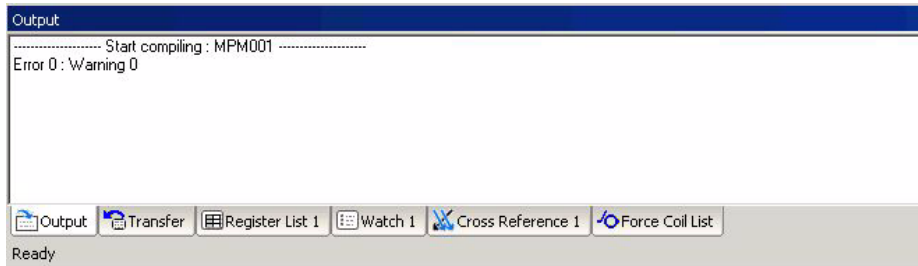
4.8 Compilation

This is the checking and saving of created motion programs.

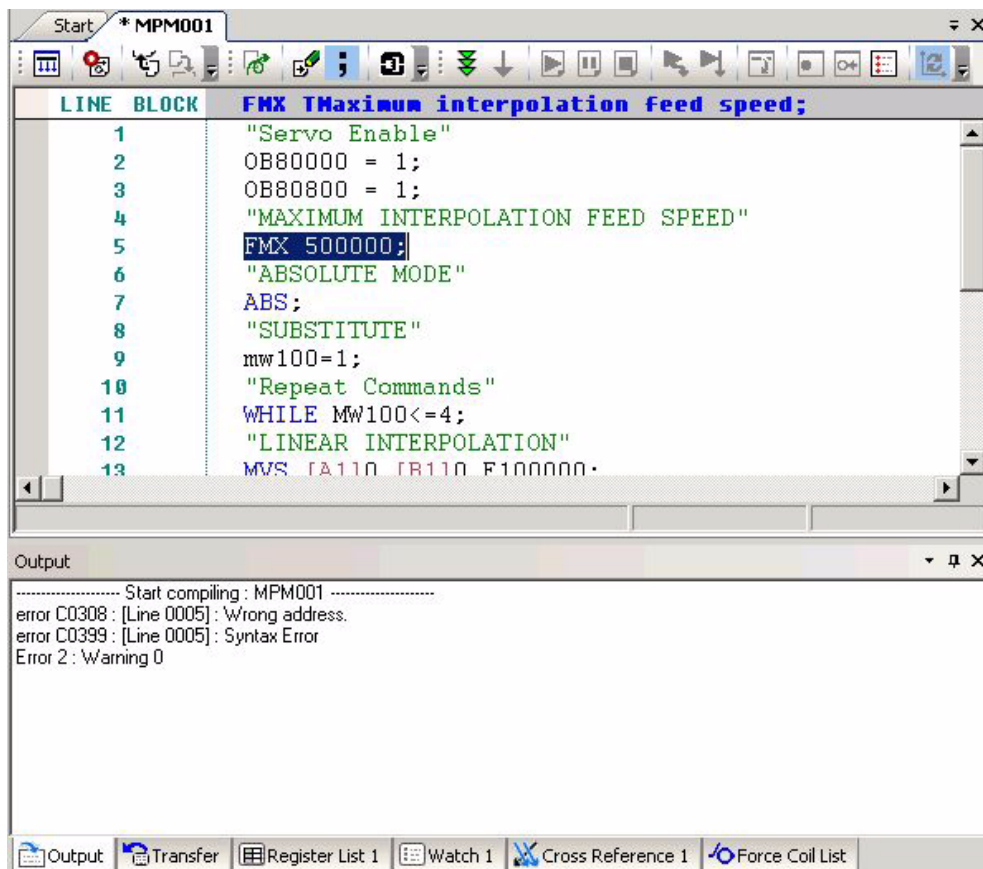
1. Compile the motion programs using any of the following operations.

- Select **Compile - Compile** from the Main Menu.
→ The program displayed in the foreground of the main window will be compiled.
- Select **Compile - Compile All Programs** from the Main Menu.
→ All programs, including motion programs, will be compiled.
- Select a project file name in the Motion Subwindow, and then right-click and select **Compile All Programs** from the pop-up menu that will be displayed.
→ All motion programs will be compiled.
- Select a folder or program in the Motion Subwindow, and then right-click and select **Compile** from the pop-up menu that will be displayed.
→ All of the programs that belong to the selected folder or program are compiled.
- Click the compile icon () in the program toolbar.
→ The program displayed in the foreground of the main window will be compiled.
- While connected to the Machine Controller, it is not possible to compile entire folders or use **Compile All Programs**.

Motion program compilation is executed and the result of the compilation is output to the Output Subwindow.



If an error or alarm occurs at compilation, double-click the error indication in the Output Subwindow. The program line in which the error or alarm has occurred will be shown in red.



! When compiling while connected to the Machine Controller, the following restrictions apply.

- During program execution
 - Compilation is not possible while the program is being executed.
- During program debugging
 - It is possible to compile a program during a single block stop. However, compilation is not possible when a subprogram has been called with an MSEE (SSEE) command.

4.9 Preparing for Executing a Program

In order to execute a motion program, it is necessary to have allocated the motion program to a ladder program or M-EXECUTOR module in advance.

When the program is executed from a ladder program:

See 4.9.1 Allocation to a Ladder Program.

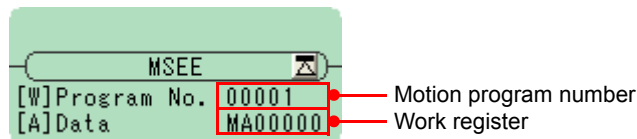
When the program is executed from an M-EXECUTOR module:

See 4.9.2 Allocation to the Task Allocation Function.

4.9.1 Allocation to a Ladder Program

When executing a motion program from a ladder program, use the MSEE command in the ladder program.

1. Enter the MSEE command in the ladder program.
2. Enter the program number of the motion program to be executed and the work register for execution and then compile the ladder program.



4.9.2 Allocation to the Task Allocation Function

This allows you to execute a program without using a ladder program.

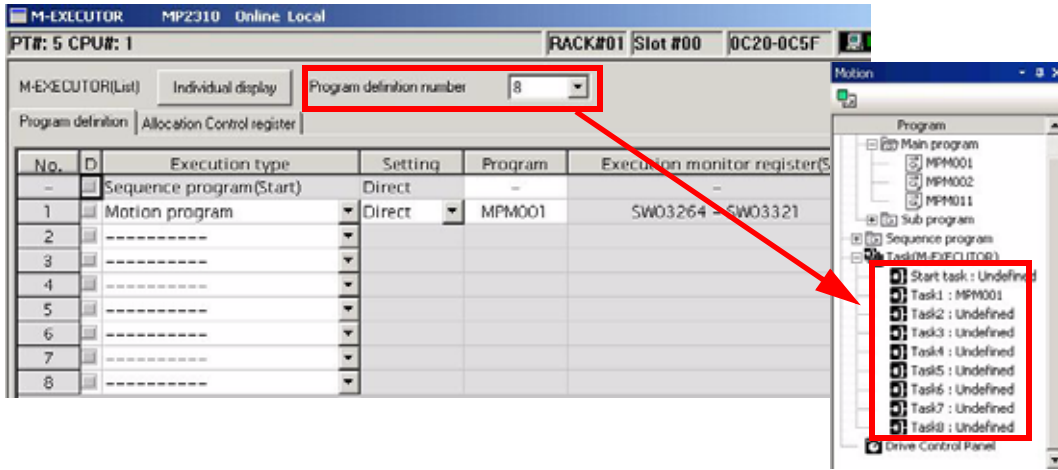
Allocating programs to the Task Allocation Function makes it possible to directly control the motion programs, and enables sequence programs to be started easily.


The procedure for allocating a program to the Task Allocation Function is as follows.

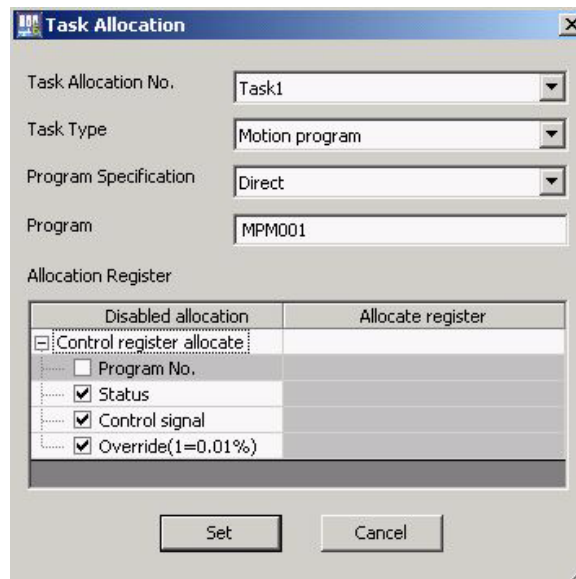
1. Open the **Module Configuration** Window and allocate and save the M-EXECUTOR module.
At the initial startup, M-EXECUTOR is only allocated for Machine Controllers MP2300S and MP2400.
2. Double-click the M-EXECUTOR module.
The **Program definition** Tab Page in the **M-EXECUTOR Module** Window opens.


- Set the number of tasks to be allocated (1 to 16) at **Program definition number**, and save.

The number of tasks set at **Program definition number** becomes the number of task allocations in the Motion Subwindow.



- Close the **M-EXECUTOR Module Window**.
- Press the **F5** Key in the Motion Subwindow, or right-click and then select **Update** from the pop-up menu.
The Motion Subwindow is updated with the latest information.
- At **Task (M-EXECUTOR)** in the Motion Subwindow, double-click the task number where you want to register the program. If the motion program is open, click the task allocation icon () in the **Motion Program Window**.
The **Task Allocation** Dialog Box will be displayed.
- Make the following settings, then click the **Set** Button.



Task Allocation No.: The task number to which the program is to be allocated is shown here. If you have clicked the task allocation icon () in the toolbar of the **Motion Program Window**, you can select the task number from the combo box.

Task Type: Set the type of the program to be executed here.

Task Type	Program to be Executed	Execution Conditions
Sequence program (start)	Sequence program	Executed once only when the power is turned on.
Sequence program (L scan)		Executed every low-speed scan time.
Sequence program (H scan)		Executed every high-speed scan time.
Motion Programs	Motion program	Executed when the “program operation start request” control signal is on.

Program Specification: Select the method for specifying the program here.

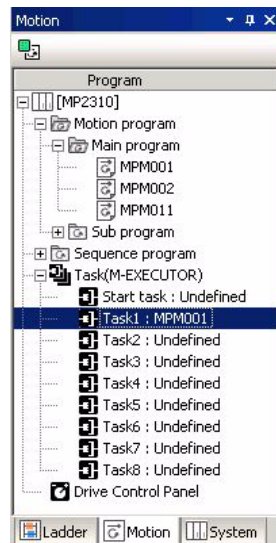
Direct: The method where a program number is specified (for example MPM001)

Indirect: The method where a register in which the program number is stored is specified (for example: register types that can be entered, such as MW01000)

Program: Set the program number here.

Allocation Register: Set the allocated registers here. You can set any kind of register: I registers, O registers or M registers.

Programs are registered in tasks.



4.10 Debugging and Monitoring

4.10.1 What is Debugging and Monitoring?

This is a function that makes it easy to find bugs in a program by monitoring the line that is currently being executed online.

Debugging and monitoring can also be performed by checking the operating status at the Drive Control Panel.

LINE	BLOCK	Code
4		"MAXIMUM INTERPOLATION FEED SPEED"
5	2	FMX T500000;
6		"ABSOLUTE MODE"
7	3	ABS;
8		"SUBSTITUTE"
9	4	mw100=1;
10		"Repeat Commands"
11	5	WHILE MW100<=4;
12		"LINEAR INTERPOLATION"
13	6	MVS [A1]0 [B1]0 F100000;
14		"LINEAR INTERPOLATION"
15	7	MVS [A1]0 [B1]3000;
16		"LINEAR INTERPOLATION"
17	8	MVS [A1]3000 [B1]3000;
18		"LINEAR INTERPOLATION"

There are two types of debugging and monitoring: the debug mode and the normal operation mode.

Debug mode: This is the mode in which the program is executed line by line while checking. While operating in the debug mode you can check the operation status at the Drive Control Panel.

Normal operation mode: This is the mode in which the program is executed continuously from start to end.

4.10.2 Debug Mode

This is the mode in which the program is executed line by line while checking.

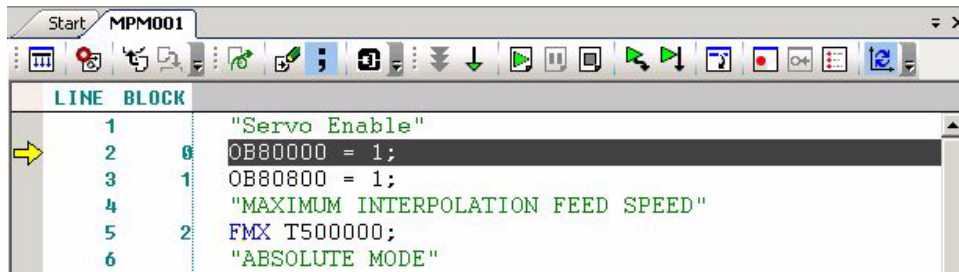
LINE	BLOCK	Code
6		"ABSOLUTE MODE"
7	3	ABS;
8		"SUBSTITUTE"
9	4	mw100=1;
10		"Repeat Commands"
11	5	WHILE MW100<=4;
12		"LINEAR INTERPOLATION"
13	6	MVS [A1]0 [B1]0 F100000;
14		"LINEAR INTERPOLATION"
15	7	MVS [A1]0 [B1]3000;
16		"LINEAR INTERPOLATION"
17	8	MVS [A1]3000 [B1]3000;
18		"LINEAR INTERPOLATION"
19	9	MVS [A1]3000 [B1]0;
20		"LINEAR INTERPOLATION"

4.10.3 Normal Operation Mode

This is the mode in which the program is executed continuously from start to end. Blocks are monitored individually.

(1) Block Monitor

When a program is executed, the block being executed is highlighted.



[a] With a Subprogram

For subprograms, a motion task has to be set in advance.

- Monitoring will not be executed with respect to subprograms for which no motion task is set. For details on setting motion tasks, see *4.10.5 Setting Motion Tasks*.

[b] With a Sequence Program

In the case of sequence programs, the block being executed is highlighted only in the debug mode.

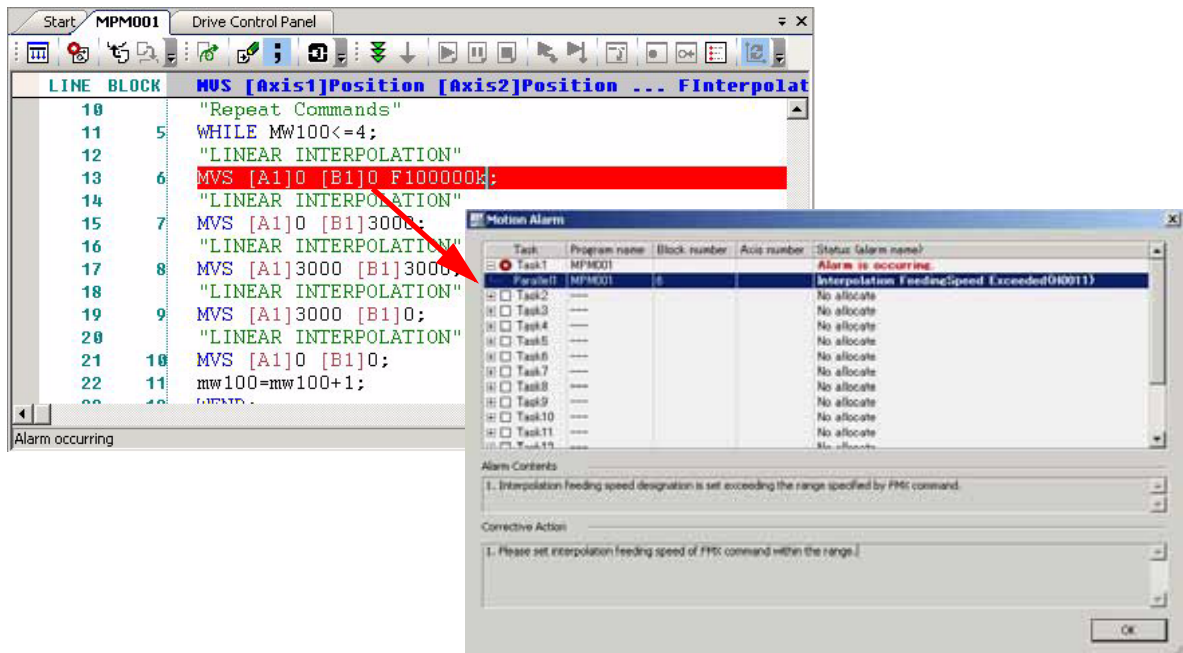
[c] When the Program is Being Edited

When a program is edited while it is being executed, the block monitor function operates as shown below.

- | | |
|---|--|
| When the program has been edited: | The block being executed is not highlighted. |
| When the Ctrl + Z Keys are pressed during program editing: | The block being executed is highlighted. |
| On compilation after editing the program: | The block being executed is highlighted. |

4.10.4 Alarm Display

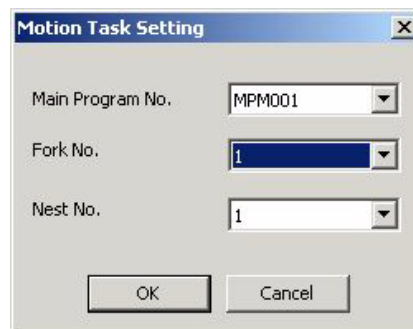
When an alarm occurs during execution of a motion program, the line that was being executed is displayed in red.



1. Double-click the line that is displayed in red.
The **Motion Alarm** Dialog Box will be displayed.
The location where the alarm occurred, the details of the alarm and the method for correcting the alarm are displayed.
2. Click the **OK** Button.
3. Close the **Motion Alarm** Dialog Box and correct the alarm in the motion program.

4.10.5 Setting Motion Tasks

When a subprogram is used in a motion program, the following settings have to be made for the subprogram.



- Main Program No.:** The number of the main program that calls the subprogram
- Fork No.:** The number of the fork that calls the subprogram (default: No setting)
- Nest No.:** The nest number that calls the subprogram (default: No setting)

There are two methods for setting motion tasks.

- Simple monitor:** Set only the main program number.
- Detailed monitor:** Set the main program number, the fork number and the nest number.

4.11 Test Running Programs

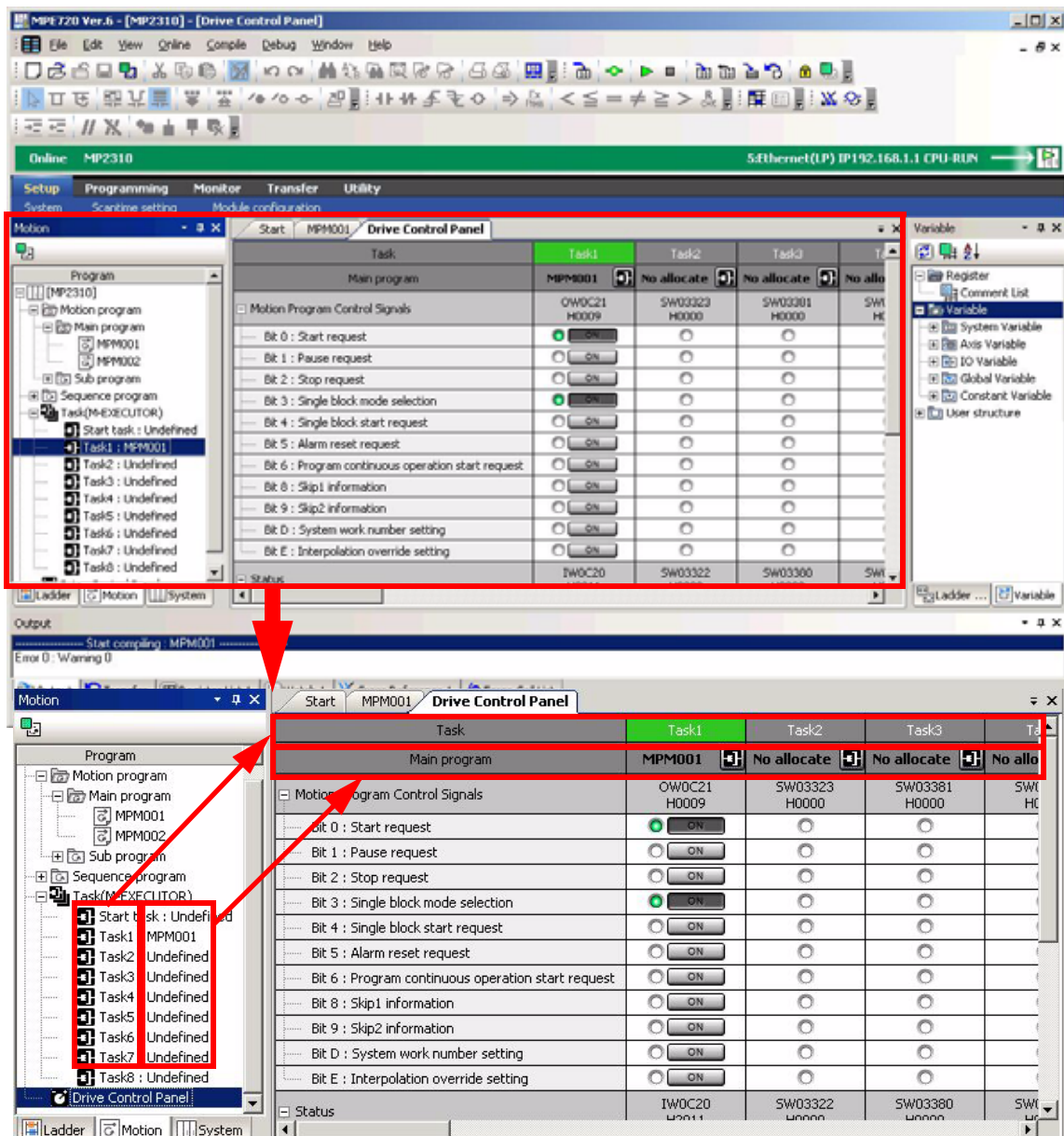
To test run a program, use the Drive Control Panel function.

4.11.1 Explanation of the Drive Control Panel

This is a function that allows you to test run a program before executing it, and to monitor the operating status of the program while it is being executed.

On the Drive Control Panel you can issue commands for each bit, including operation start and stop requests, alarm reset requests and so on. You can also monitor the status of the program that is being executed.

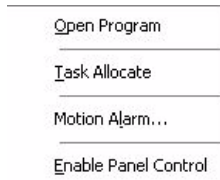
- The Machine Controllers permit test running only of the motion programs registered in the M-EXECUTOR module.



4.11.2 Operations on the Drive Control Panel

The following operations can be performed on the Drive Control Panel.

(1) Pop-up Menu



- Open Program:** Opens the registered main program.
Task Allocate: Opens the **Task Allocation** Window for the selected task number.
Motion Alarm: Opens the **Motion Alarm** Window.
Enable Panel Control: Enables panel operations.

(2) ON/OFF Status of Bits

After panel operations have been enabled, button operations are possible.

- : This is the status when the bit is OFF.
 : This is the status when the bit is ON.

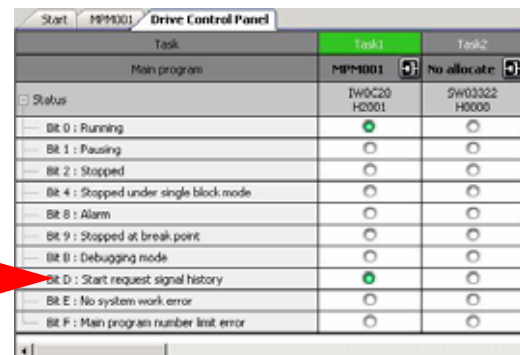
4.11.3 Test Running and Monitoring

Before executing a motion program from a ladder program or M-EXECUTOR module, you can test run it manually. You can easily perform a test run by simply clicking a button (), while at the same time checking the operating status.

Turn the bit ON.



The operating status monitor comes ON.




1. Click **Drive Control Panel** in the Motion Subwindow.

The **Drive Control Panel** Tab Page will be displayed.

- It is necessary that the program has been registered in advance at **Task (M-EXECUTOR)**. For the setting method, see 4.9.2 *Allocation to the Task Allocation Function*.

- Right-click in the row of the task number under which the program is registered, then select **Enable Panel Control** from the pop-up menu.

This will enable operation of the buttons ().

- If **Enable Panel Control** in the pop-up menu is not checked, the buttons are disabled.

- When panel operation is enabled, you can perform operations on the following bit registers.

Bit Name	Reference Register
Start request	Bit 0
Pause request	Bit 1
Stop request	Bit 2
Single block mode selection	Bit 3
Single block start request	Bit 4
Alarm reset request	Bit 5
Program continuous operation start request	Bit 6
Skip1 information	Bit 8
Skip2 information	Bit 9
System work number setting	Bit D
Interpolation override setting	Bit E

The operating status of the bit registers whose registers have been operated can be checked at status.

Bit Name	Reference Register
Running	Bit 0
Pausing	Bit 1
Stopped	Bit 2
Stopped under single block mode	Bit 4
Alarm	Bit 8
Stopped at breakpoint	Bit 9
Debugging mode	Bit B
Start request signal history	Bit D
No system work error	Bit E
Main program number limit error	Bit F



- When the test run has ended, disable panel operation in order to prevent misoperation.
Select **Enable Panel Control** from the pop-up menu.

4.11.4 When an Alarm has Occurred During a Test Run

If an alarm has occurred during a test run, the task number and the **Bit8 : Alarm** alarm status are displayed in red. You can check information such as the line where the alarm occurred and its cause in the **Motion Alarm** Window. To display the **Motion Alarm** Window, right-click the column of the task number where the alarm occurred and select **Motion Alarm** from the pop-up menu.

- For details on the **Motion Alarm** Window, see 4.3.5 *Motion Alarm Window*.

Task	Task1	Task2	Task3
Main program	MPM001	No allocate	No allocate
Status	IW0C20 H2104	SW03322 H0000	SW03380 H0000
Bit 0 : Running	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bit 1 : Pausing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bit 2 : Stopped	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bit 4 : Stopped under single block mode	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bit 8 : Alarm		<input type="radio"/>	<input type="radio"/>
Bit 9 : Stopped at break point	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bit B : Debugging mode	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bit D : Start request signal history	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bit E : No system work error	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bit F : Main program number limit error	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

4.12 Program Management in the Motion Subwindow

4.12.1 Editing Motion Program Files

While the Machine Controller is disconnected (i.e., while offline), motion programs can be cut, copied, pasted, deleted, or renamed in the Motion Subwindow.

- When the **Save As** command is used in the Engineering Manager, the operation may not be reflected in the Motion Subwindow display. Before performing operations, be sure to update the Motion Subwindow information by selecting **Display - Update** from the Main Menu, or by right-clicking in the Motion Subwindow and selecting **Update**.

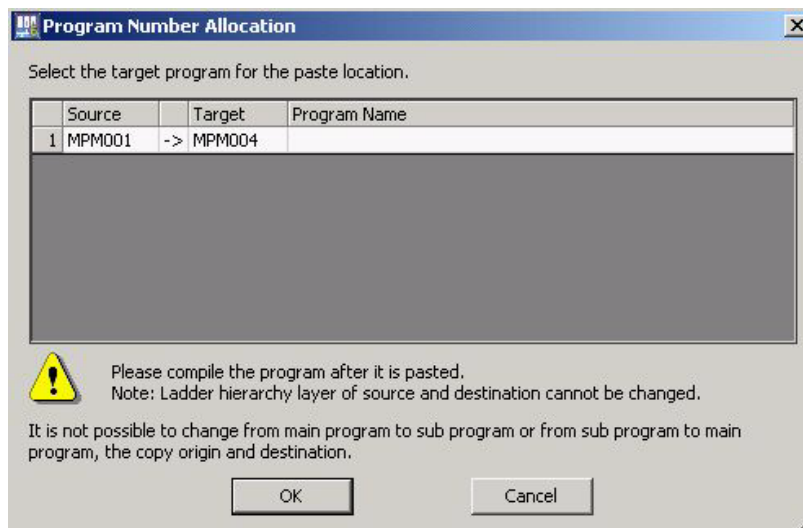
(1) Cutting, Copying and Pasting

An entire motion program can be cut or copied and then pasted into either the same project file or another project file.

1. In the Motion Subwindow, select the motion program that is to be edited, and then select **Edit - Cut** (or **Copy** or **Paste**) from the Main Menu. Alternatively, right-click and then select **Cut**, **Copy** or **Paste** from the pop-up menu.
 - Programs cannot be cut, copied, or pasted between main programs and sub programs.
 - Before cutting a ladder program, finish editing and close the ladder program.

	Same Project File	Between Project Files	Between Main Program and Subprogram	Between Groups (within the Same Project File)
Cut	<input type="radio"/>	<input type="radio"/>	×	<input type="radio"/>
Copy	<input type="radio"/>	<input type="radio"/>	×	<input type="radio"/>
Paste	<input type="radio"/>	<input type="radio"/>	×	<input type="radio"/>

When **Paste** is selected, the following confirmation message will be displayed. Click the **OK** Button to go ahead with pasting.



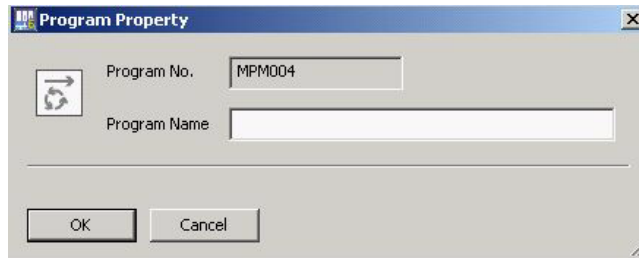
(2) Deleting

- Before using this function, first close the motion program that is to be deleted.
1. In the Motion Subwindow, select the program that is to be deleted.
 2. Either select **Edit - Delete** from the Main Menu, or right-click the selected program file and select **Delete** from the pop-up menu that will be displayed. Alternatively, press the **Delete** Key.



(3) Renaming

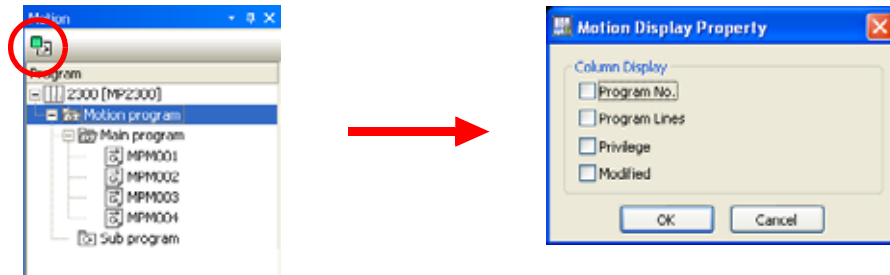
- Before using this function, first close the motion program that is to be renamed.
1. Select the program that is to be renamed in the Motion Subwindow.
 2. Right-click the selected program and select **Rename** from the pop-up menu that will be displayed. The **Program Property** Dialog Box will be displayed.



3. Change the program name displayed in the **Program Name** field, then click the **OK** Button.
 - The program number cannot be changed.

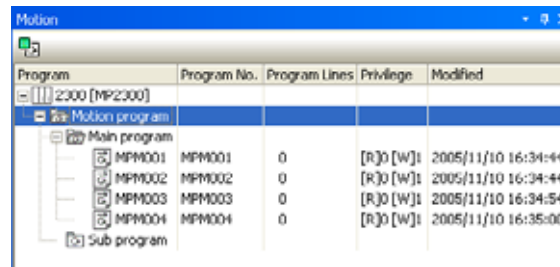
4.12.2 Displaying Property Columns

The **Motion Display Property** Dialog Box will be displayed by clicking the **Motion Program Properties** Button.



- All of the check boxes are cleared by default.
- For details on privileges, refer to [4.12.4 \(1\) Configuration](#).

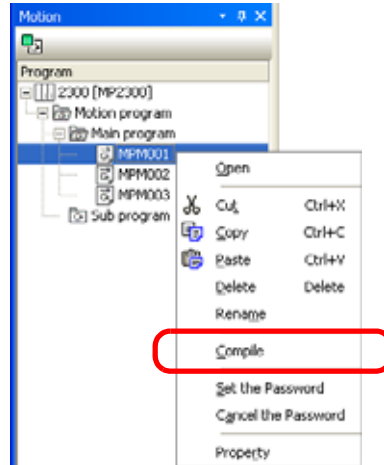
To display information in the Motion Subwindow, select the appropriate check box and then click the **OK** Button. A column for that information will then be displayed in the Motion Subwindow.



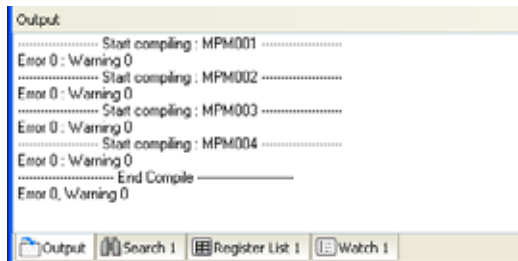
4.12.3 Compiling Motion Programs

A motion program can be compiled by first selecting the program in the Motion Subwindow, and then right-clicking and selecting **Compile** from the pop-up menu.

- When an individual program is selected, only that program will be compiled.
- When a folder is selected, all of the programs in that folder will be compiled.



The results of the compile operation will be output in the Output Subwindow.



4.12.4 Properties of Motion Programs

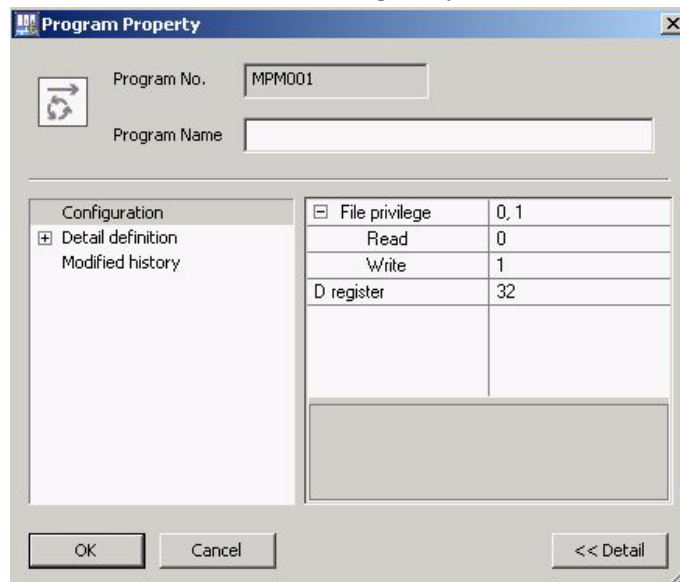
The properties (configuration and detail definitions, and update history) of motion programs can be confirmed.

1. In the Motion Subwindow, select the motion program file whose properties are to be displayed.
2. Right-click the selected program and select **Property** from the pop-up menu that will be displayed.
The **Program Property** Dialog Box is displayed.

(1) Configuration

The file privilege and number of D registers can be set.

On clicking the numerical value field for **Read**, **Write**, or **D register**, you can set a numerical value.



File privilege:

The reading privilege level and writing privilege level for the program are displayed here.

Read:

Select a reading privilege level between 0 and 7 for this program. The higher the number, the higher the privilege level will be. Numbers cannot be entered directly.

- A reading privilege level cannot be set higher than the current user privilege level. (For example, if the current user level is 3, a level of 4 or higher cannot be set.)
- For details on user privilege levels and reading privilege levels, refer to **User Privilege Levels and Reading and Writing Privilege Levels** below.

Write:

Select a writing privilege level between 0 and 7 for this program. The higher the number, the higher the privilege level will be. Numbers cannot be entered directly.

- A writing privilege level cannot be set higher than the current user level.
- For details on user privilege levels and writing privilege levels, refer to **User Privilege Levels and Reading and Writing Privilege Levels** below.

D register:

Set the maximum number of D registers (between 0 and 16384) to be used by this program. The number can be set either by directly entering it or by using the spin buttons.

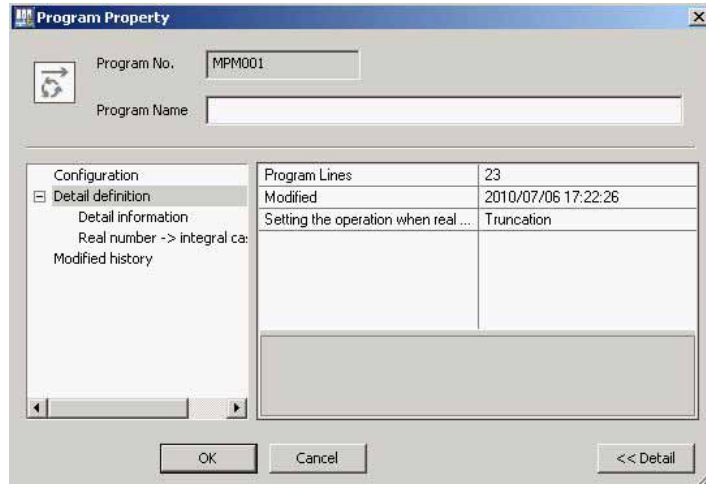
■ User Privilege Levels and Reading and Writing Privilege Levels

Program reading and writing privilege levels are established to maintain program security. To open a particular program, the user must have a privilege level at least as high as the program's reading privilege level. Similarly, to edit and save a program, the user must have a privilege level at least as high as the program's writing privilege level.

- For details on setting and checking user privilege levels, refer to *1.9.4 Security: User Registration*.

(2) Detail Definition

You can check the number of steps executed and the date and hour of updates, and you can display and set the operation settings for casting real numbers.



Program Lines:

The number of steps that have been executed is indicated here. This entry cannot be changed.

Modified:

The date and hour when the program was updated are shown here. On compiling the program, the date and hour are updated. This entry cannot be changed.

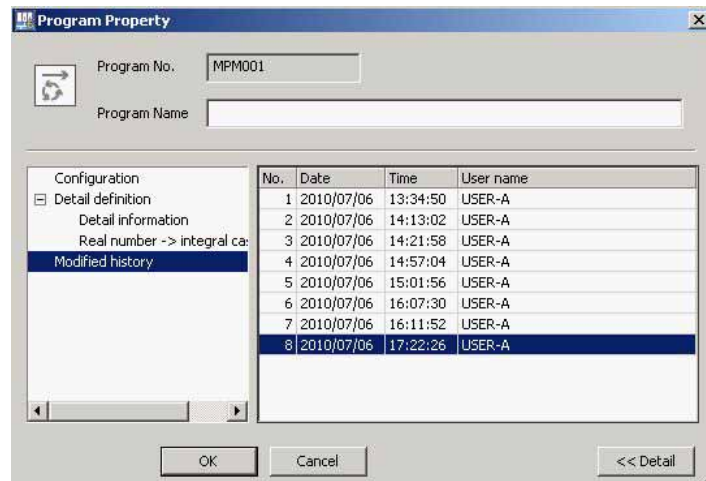
Setting the operation when real...:

You can set the operation when converting the data from real numbers to integers.

(3) Modified History

You can confirm the update history.

- * This is not displayed when creating a new program.



Modified history:

A maximum of ten entries can be displayed in the program update history.

5

Variables

This chapter describes the variables used in ladder programs.

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5.1 Overview

5.1.1 Types of Variables

Variables are used to assign names (called variable names) and comments to registers. When a variable is input for an instruction object in a ladder program, the register and comment are entered at the same time.

- ♦ For details on entering variables for instruction objects, refer to 3.3.12 *Entering and Changing Variables and Registers*.
- ♦ MPE 720 Version 6 does not support for the #, X, Y, and Z registers.

Several types of variables can be used:

Variables that Are Automatically Assigned by System

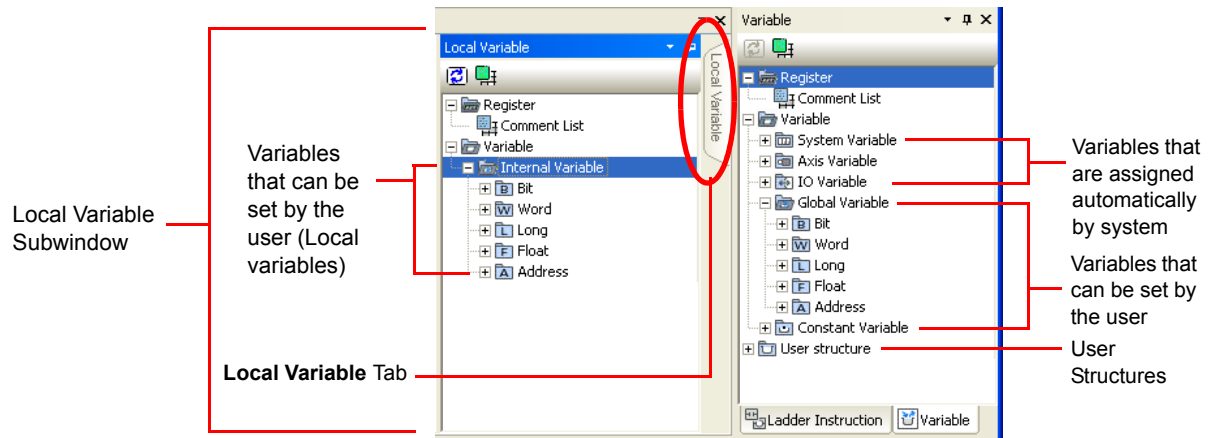
- System Variables (S Registers)
Prepared in the system, and displays the operation status of the controller
- Axis Variables (I/O Registers)
Displays the setting parameters for axes, and the monitor parameters.
- I/O Variables (I/O Registers)
Prepared according to the numbers of I/O modules.

Variables that Can Be Set by the User

- Global Variables (M Registers)
- Global Constants (C Registers)
- Internal Variables (D Registers)
- Function External Variables (A Registers)

5.1.2 Displaying Variables

Variables are displayed in the Variable Subwindow and the Local Variable Subwindow as shown below.



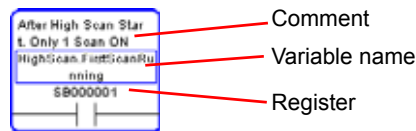
- The Local Variable Subwindow is displayed by moving the cursor to the **Local Variable** Tab Page displayed when the ladder program is opened.

The display for each variable in the folders in the variable tree provides the following information.

<Example> Always ON: On coil (SB000004)



When a variable is entered for an instruction object, the variable name and comment are displayed as follows:



- Registers are displayed when the address indicator icon on the ladder editor toolbar is ON. Refer to 3.3.4 (2) *Displaying or Hiding Addresses, Variables, and Comments* for details on selecting the display for addresses, variables, and comments.

The variables are described in more detail on the following pages.

5.2 Variables that Are Automatically Assigned by System

Among the variables displayed in the Variable Subwindow, the following three types cannot be assigned by the user.

- System variables
- Axis variables
- I/O variables

They are described in more detail below.



- Note that the user cannot edit comments for system variables and axis variables.
- Note that changing the module configuration definitions or register range will automatically delete the variables. The comments will not be deleted.
- Changing the registers of already set variables will not replace the variables used in the ladder program.

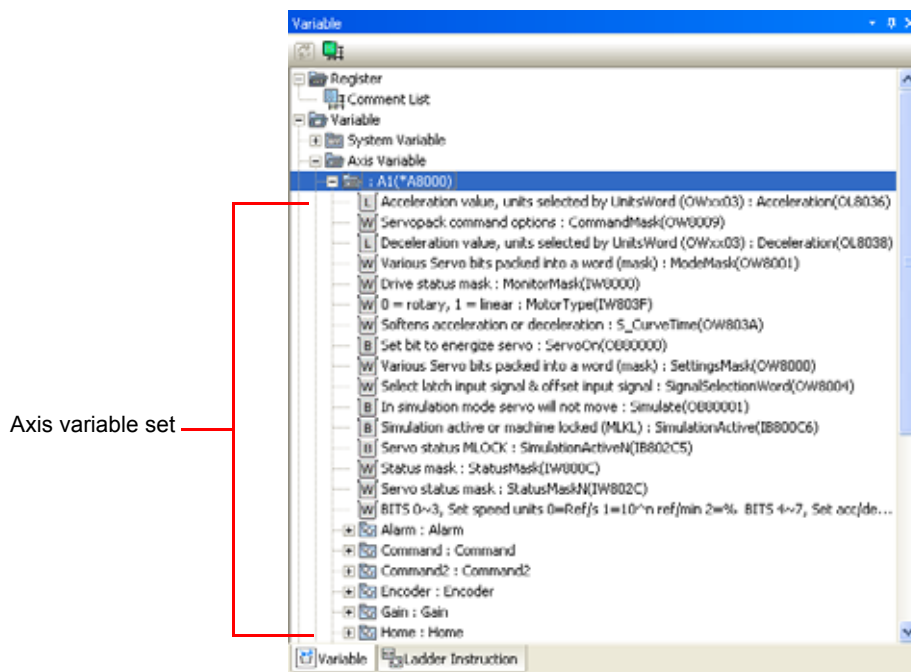
- S registers (system variables) and I/O registers (axis variables and I/O variables) can be assigned for trace. However, those registers that can be assigned are limited to registers of BIT, WORD, LONG, and FLOAT type data.

5.2.1 System Variables (S Registers)

System registers (S registers) are assigned as variables, so system variables are preset for MPE720 version 6. For a list of the system variables, refer to *A.1 Variables that are Automatically Assigned by System*.

5.2.2 Axis Variables (I/O Registers)

Axis groups with related operations can be assigned. The logical axis variable set for all assigned groups is displayed in the *Axis Variable* tree in the Variable Subwindow.



- The contents of the variable set is the same for each axis. It consists of Monitor Parameters and Setting Parameters.
- Group names and logical axis names can be set optionally, but the contents of the axis variable set cannot be changed.
- The logical axis variables set in the Group Definitions are displayed by default.
- Refer to *A.2 Axis Variable Details* for details on axis variable sets.

(1) Registering and Editing Groups and Logical Axes

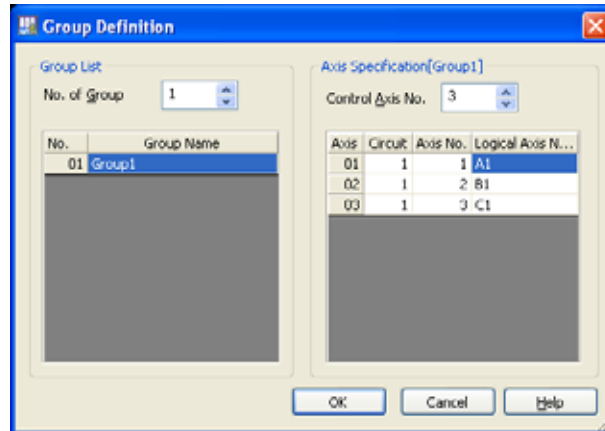
Use the following procedure to define group numbers and names, and the logical axes and names that are to be used with each group. Groups and logical axes that are already assigned can also be edited.



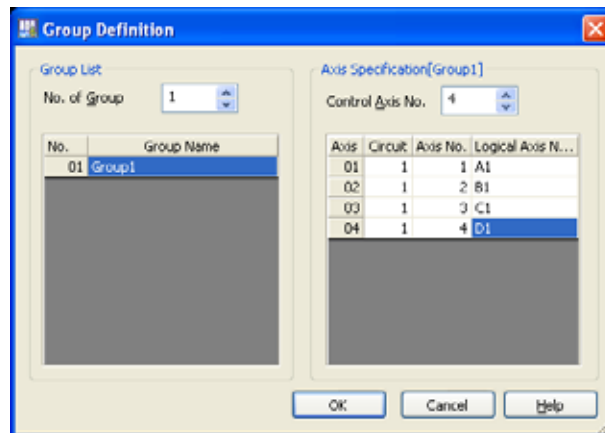
Do not use the name that is same as the register name for the logical port. Otherwise, axis variables can not be used, and the error message will occur.

1. Double-click the Axis Variable Folder in the Variable Subwindow.

The **Group Definition** Dialog Box will be displayed.



2. Set the items, and then click the **OK** Button.



Group List

When a number is entered for *No. of Group*, the group number and name will be displayed. The group name can be changed by clicking the cell to display the text cursor and then changing the name.

When the group name is clicked, the specified axes for that group will be displayed in the *Axis Specification* Field.

Axis Specification [Group Name]

Set the axis specifications for the selected group.

When the number of controlled axes is entered in the *Control Axis No.* Field, the fields for setting that number of axes will be displayed.

For the *Logical Axis Name*, double-click the cell to display the text cursor. Then enter the name and press the **Enter** Key.

- In the *Logical Axis Name* Field, enter up to eight alphanumeric characters starting with a letter of the alphabet. Do not use a number for the leading character.

When the **OK** Button is clicked, the contents that have been set will be displayed under *Axis Variable* in the Variable Subwindow.

(2) Axis Variable Set Details

Refer to *A.2 Axis Variable Details for details* on axis variable sets.

5.2.3 I/O Variables (I/O Registers)

I/O variables are automatically assigned by the system for I register and O register addresses and displayed for variables of I/O points for the I/O Modules set in the Module Configuration.

- For information in setting the Module Configuration, refer to *2.1 Module Configuration*.

The following table lists the I/O register functions and the I/O Modules that support them.



Note that executing any of the following operations will delete the set registers:

1. If the LIO Module that is assigned in the Module Configuration is saved by setting to UNDEFINE, the I/O variables that are assigned will be deleted.
2. If the register range (leading I/O register numbers and end input register number) that is assigned for the subplot in the Module Configuration Window is changed, the I/O variables that were out of the range will be deleted.

(1) I/O Variable Tables

For more information on each of the I/O variables, refer to *A.3 I/O Variables*.

The following example shows a display with 16-point local I/O variables.

The screenshot shows a tree view of variables. The 'I/O Variable' folder is expanded, showing two main sections: 'Local IO 16digital Input : IO_IN(IA0000)' and 'Local IO 16digital Output : IO_OUT(OA0001)'. Each section contains a list of 16 variables (Input0-15 and Output0-15) with their respective addresses. Red lines connect labels to these elements: 'I/O Module name' points to 'IO_IN(IA0000)', 'Leading input address' points to '(IA0000)', 'Input variables' points to the list of Input0-15, 'Leading output address' points to '(OA0001)', and 'Output variables' points to the list of Output0-15.

- The I/O Module name shown in the Module Configuration Definitions is displayed for the I/O Module name by default.
- When the Module Configuration Definitions are changed, the changes are displayed by executing **Update (F5)**.

Variable names and registers cannot be changed for I/O variables, but the following items can be edited.

- I/O Module name
- I/O leading address comments
- I/O variable comments

The next section describes how to edit these items.

(2) I/O Modules that Can Use Variables

The following table shows the I/O Modules that can be used on MPE720 version 6.

Type	Module		Can be displayed on MPE720 Version 6	
	Main Slot	Sub Slot	I/O Variables	Axis Variables
CPU Modules	MP2100	CPU	NO	NO
		IO	YES	NO
		SVB*	YES	YES
		SVR		YES
		BUSIF	YES	NO
	MP2100M	CPU	NO	NO
		IO	YES	NO
		SVB*	YES	NO
		SVR	NO	YES
	MP2200	CPU	NO	NO
		SVR	NO	YES
	MP2200-02	CPU	NO	NO
		SVR	NO	YES
		CARD	NO	NO
		USB	NO	NO
	MP2200-03	CPU	NO	NO
		SVR	NO	YES
		CARD	NO	NO
		218IFA	YES	NO
		BUSIF	NO	NO
	MP2300	CPU	NO	NO
		IO	YES	NO
		SVB*	YES	YES
		SVR	NO	YES
	MP2310	CPU	NO	NO
		218IFA	YES	NO
		SVB*	YES	YES
		SVR	NO	YES
MP2300S	CPU	NO	NO	
	218IFA	YES	?	
	SVB*	YES	YES	
	SVR	NO	YES	
	M-EXECUTOR	YES	NO	
MP2400	CPU	NO	NO	
	218IFA	YES	NO	
	SVB*	YES	YES	
	SVR	NO	YES	
	M-EXECUTOR	YES	NO	

Type	Module		Can be displayed on MPE720 Version 6	
	Main Slot	Sub Slot	I/O Variables	Axis Variables
Option Modules	LIO-01/LIO-02	LIO	YES	NO
		CNTR	YES	NO
	LIO-04/LIO-05	LIO32	YES	NO
	LIO-06	MIXIO	YES	NO
		CNTR-A	YES	NO
	DO-01	DO	YES	NO
	AI-01	AI	YES	NO
	AO-01	AVO	YES	NO
	CNTR-01	CNTR01	YES	NO
	218IF-01	217IF	NO	NO
		218IF	NO	NO
	218IF-02	217IF	NO	NO
		218IFB	NO	NO
	217IF-01	217IF	NO	NO
	216AIF-01	216IF	YES	NO
	215AIF-01	217IF	NO	NO
		MPLINK	YES	NO
	260IF-01	217IF	NO	NO
		260IF	YES	NO
	261IF-01	217IF	NO	NO
		261IFS	YES	NO
	262IF-01	FL-net	YES	NO
	263IF-01	EtherNetIP	YES	NO
	PCLINK-01	PC-LINK	YES	NO
	MNET-01	217IF	NO	NO
		MNET	YES	NO
	AFMP-01	ANYWIRE	YES	NO
	AFMP-02	CC-LINK	YES	NO
		ANYWIRE	YES	NO
	AFMP-02-C	CC-Link	YES	NO
	MPANL00-0	A-net	YES	NO
		A-Link	YES	NO
	MPALL00-0	A-Link	YES	NO
		A-Link	YES	NO
MPAL000-0	A-Link	YES	NO	
MPAN000-0	A-net	YES	NO	
SVA-01	SVA01	NO	YES	
SVB-01	SVB01*	YES	YES	
SVC-01	SVC01*	YES	YES	
PO-01	PO	NO	YES	
CSIF-01	CSIF	YES	NO	

* Modules that can be allocated to the MECHATROLINK.

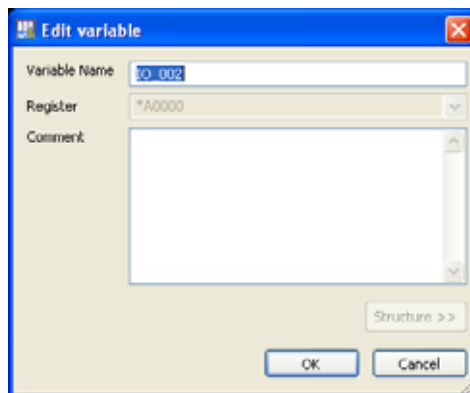
(3) Editing I/O Module Names and Comments

The following procedure can be used to edit I/O Module names and comments for I/O variables.

1. Right-click the I/O module name, leading I/O address, or I/O variable that is to be edited, and then select **Edit** from the pop-up menu that will be displayed. Alternatively, double-click the item to be edited.

The **Edit variable** Dialog Box will be displayed.

2. Edit the text in the field that is to be changed, and then click the **OK** Button.



- Input the I/O Module name, using a maximum of 16 alphanumeric characters. Use a letter of the alphabet for the leading character.
- Carriage returns or line feeds cannot be used in the comments.

The display in the Variable Subwindow will be changed. If the selected variable is entered in the program, the comment for that variable will also be changed.

5.3 Variables that Can Be Set by the User

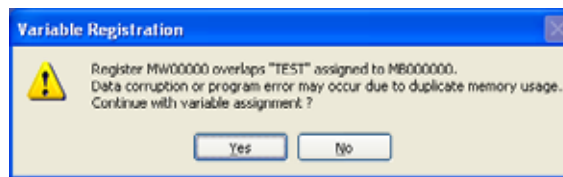
User variables can be assigned and edited by the user. There are four types of user variables:

- Global variables (M registers)
Global variables can be referenced in any project file.
- Global Constants (C registers)
Global Constants can be referenced in any project file.
- Internal variables (D registers)
Internal variables are local variables that are enabled only in the ladder program where they are set.
- Function external variables (A registers)
Function external variables are local variables that are enabled only in the function where they are set.
- M registers (global variables) and D registers (internal variables) can be assigned for trace. However, those that can be assigned for trace are limited to registers of BIT, WORD, LONG, and FLOAT type data. D registers cannot be used in motion programs.



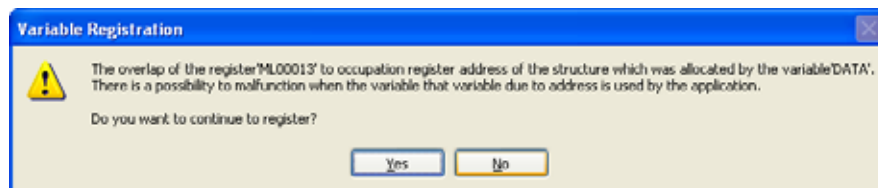
■ Precautions on Assigning Variables

- If the register already assigned to a variable is also used for a variable to be added, the following message will appear.



- Yes: Assigns the register to the variable to be added
- No: Cancels new variable assignment.

- If the register already included in a structure is also used for a variable to be added, the following message will appear.

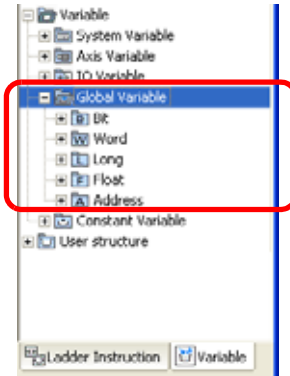


- Yes: Assigns the register to the variable to be added.
- No: Cancels new variable assignment.

The following sections describe how to register each of these variables.

5.3.1 Variables that Can be Referred from Any Program

(1) Global Variables (M Registers)



M register addresses can be assigned as variables and they are displayed in folders classified by data type in the Variable Subwindow. They can be referenced in any project file.

[a] Assigning Global Variables

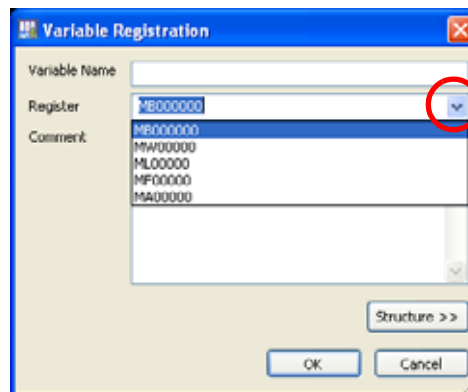
Use the following procedure to assign global variables.

1. In the Variable Subwindow, right-click the Global Variable Folder or the folder of the data type to be registered (Bit, Word, Long, Float, or Address), and select **Add** from the pop-up menu.

The **Variable Registration** Dialog Box will be displayed. In the *Register* Field, the lowest address among the M registers for which variable assignment on is currently possible will be displayed.

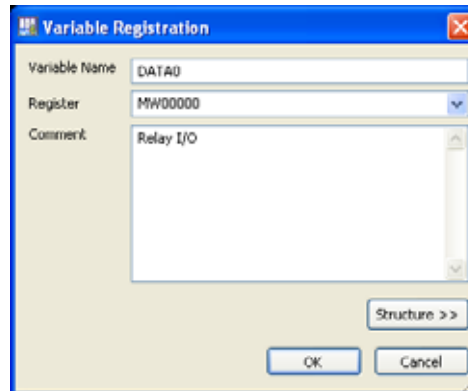
2. Enter the register in the *Register* Field.
 - Make the settings within the range for M registers.
 MB: 000000 to 65534F
 MW: 00000 to 65534
 ML: 00000 to 65533
 MF: 00000 to 65533
 - When the **OK** Button is clicked and there is an input error in the *Register* Field, the *Register* Field will return to the state it was in before the input.
 - Register addresses of the same data type as already being used cannot be entered.

Click the **Structure** Button. A list of data structures will be displayed. By giving a variable name (folder name) to the structure, the variables that are included in that structure can be assigned together.



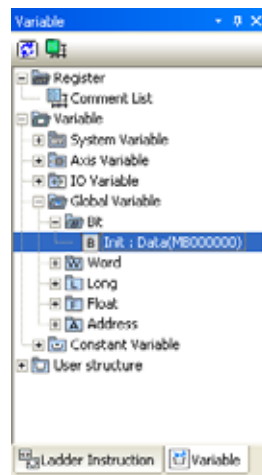
- For details on structures, refer to 5.3.1(1) [b] *Creating System Structures* on the next page.

3. Enter the variable name in the *Variable Name* Field and comment in the *Comment* Field, and click the **OK** Button.



- In the *Variable Name* Field, enter up to 64 alphanumeric characters starting with a letter of the alphabet. An error will occur if the leading character in the name is a number.
- An error will occur if a name identical to a register, such as MB (mb0) or IW00000 (iw00000), is used at the beginning of the variable.
- A variable name that is already assigned cannot be used again.
- Reserved words, such as motion instructions, cannot be used. For a list of reserved words, refer to *Appendix B Reserved Words*.
- The same address can be assigned for different data types (e.g., MB00000 and MW00000). When the address is assigned, however, a message will be displayed notifying that “A malfunction may occur.”
- A maximum of 255 alphanumeric characters can be entered in the *Comment Field*.
- Carriage returns and line feeds cannot be used in the comments.

Click the **OK** Button. The **Variable Registration** Dialog Box will be closed, and the assigned variable will be displayed in the Variable Subwindow.



In the program where the assigned variable is used, the assigned variable name will be displayed for the instruction object of the applicable address.

[b] Creating System Structures

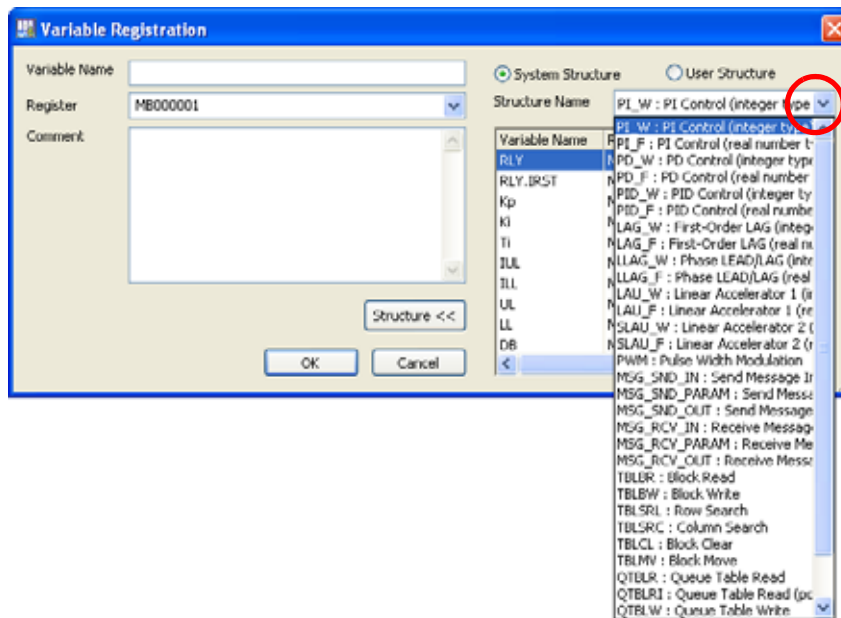
There are two types of structure: *System Structure* and *User Structure*.

A *System Structure* is a set of variables prepared in advance with a ladder instruction of the address type. In contrast, a *User Structure* is a set of variables that the user can register without restrictions. Click the **Structure** Button in the **Variable Registration** Dialog Box to create a structure.

Use the following procedure to create a system structure in the **Variable Registration** Dialog Box.

- For details on user structures, refer to 5.6 *User Structures*.

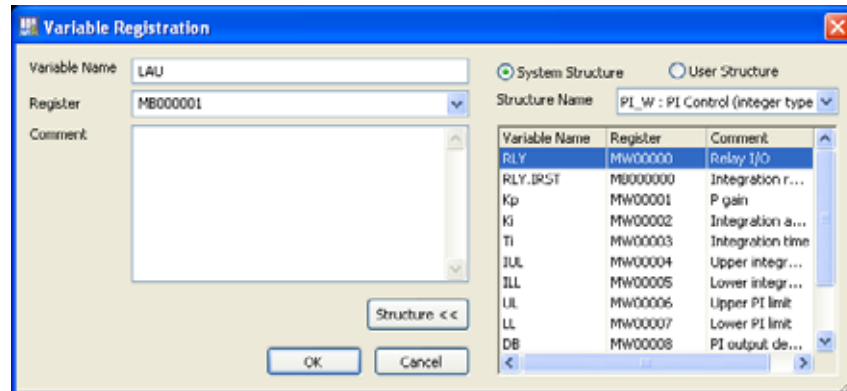
1. Select **System Structure** or **User Structure**, and select a pre-registered structure name from the list in the **System Structure** or **User Structure** field.



The variables included in that system structure will be displayed in a list.

- For details on the variables in each system structure, refer to 5.3.1 [c] *Editing I/O Module Names and Comments*.

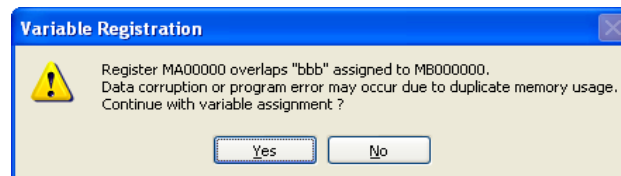
- Enter the variable name in the *Variable Name* Field and comment in the *Comment* Field, specify the address type (MA****) in the *Register* Field, and click the **OK** Button.



- In the *Variable Name* Field, enter up to 64 alphanumeric characters starting with a letter of the alphabet. An error will occur if the leading character in the name is a number.
- An error will occur if a name identical to a register, such as MB0 (mb0) or IW00000 (iw00000), is used.
- A variable name that is already assigned cannot be used again.
- Reserved words, such as motion instructions, cannot be used. For a list of reserved words, refer to *Appendix B Reserved Words*.
- An address that is already used for another data type cannot be assigned again.
- A maximum of 255 alphanumeric characters can be input in the *Comment* Field.
- Carriage returns and line feeds cannot be used in the comments.

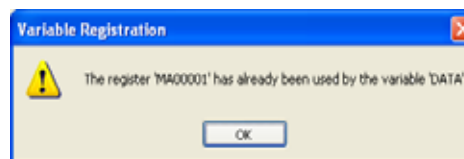
■ If a register with the same address already exists

If a register with the same address already exists in one project file, the following message will appear asking for confirmation.

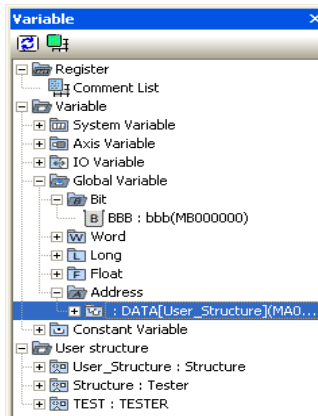


■ If a register with the same address type already exists

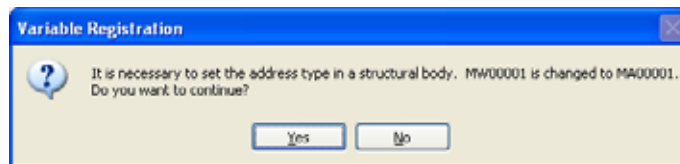
If a register with the same address type already exists in one project file, the following message will appear asking for confirmation. Change the register because the same register cannot be assigned in one project file.



The variable included in the assigned user structures will appear in the Variable Subwindow.



If the data type in the register is not the ADDRESS type, the following message will be displayed. Click the **Yes** Button to complete the assignment.



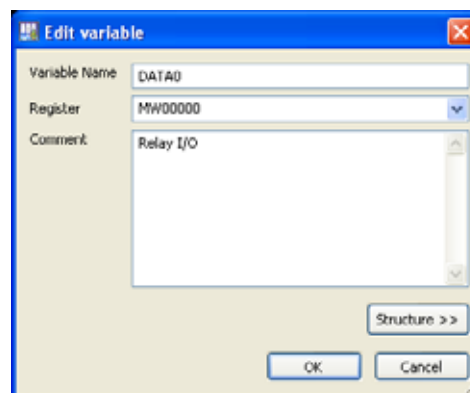
[c] Table of System Structures

Refer to *A.4 System Structures* for details on variables included in each system structure.

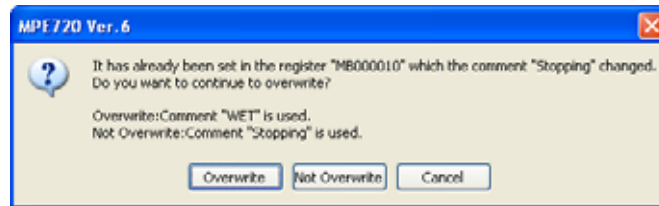
[d] Editing Global Variables

Variable names, registers, and comments can be edited.

1. In the Variable Subwindow, right-click the global variable to be edited and select **Edit** from the pop-up menu. Alternatively, double-click the global variable to be edited. The **Edit variable** Dialog Box will be displayed.
2. Just as with assigning variables, edit the variable name, the registers, and the comment, and click the **OK** Button.



If there is a comment already on the register to be edited, a message will appear asking for confirmation to overwrite the comment.



Overwrite: Overwrites the comment with the comment of the edited register.

Not Overwrite: The comment will not be overwritten and the previous comment will remain unchanged.

Cancel: Cancels the comment editing operation and closes the dialog box.

- If there is a comment on the register before being edited, and no unmatched comment on the edited register, the previous comment will remain unchanged.



- For global variables (M, I, O, and C), comments are saved in two different files: One for BIT type data and one for other data types (WORD, LONG, FLOAT, and ADDRESS).
- For local registers (D, #, X, Y, Z, and A), comments are saved in a file for each program regardless of data type (BIT, WORD, LONG, FLOAT, and ADDRESS).
- Before transferring data (Write into Controller or Read from Controller), the data in the reading source and in the saving destination must be matched so that the data in the Machine Controller will not be lost.

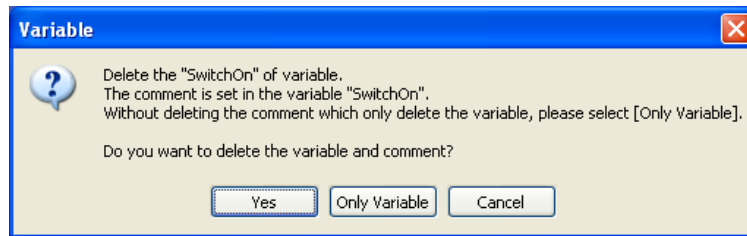
[e] Deleting Global Variables

Variables can be deleted. In a program where a deleted variable is used, the variable will be replaced with the register address the next time it is displayed.

1. In the Variable Subwindow, select the variable to be deleted and press the **Delete** Key. Alternatively, right-click the variable to be deleted and select *Delete* from the pop-up menu that appears.

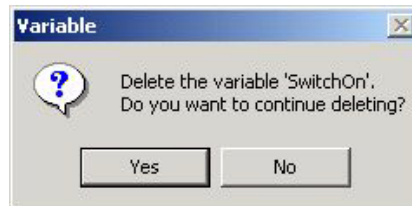
A dialog box for confirmation will be displayed.

2. Click the **Yes** Button. The selected variable will be deleted from the Variable Subwindow.



When a comment has been set

- Yes** Button: Deletes variables and comments.
Only Variable Button: Deletes only variables.
Cancel Button: Cancels the deleting operation and closes the dialog box.



When no comment is set

- Yes** Button: Deletes variables.
No Button: Cancels the deleting operation and closes the dialog box.

(2) Global Constants(C Registers)

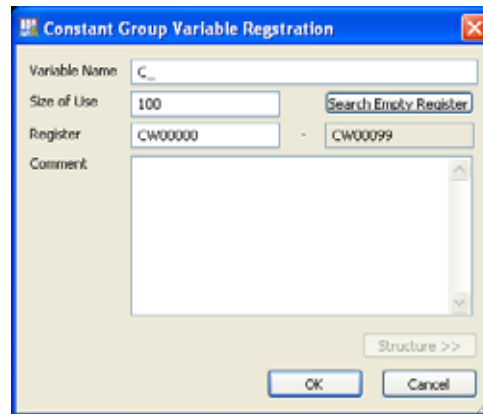
After ranges of C registers are assigned as a group, the C registers in that range can be named, and constant values (WORD, LONG, FLOAT), their units (pulse, mm, deg, inch, μm), and comments can be set.

[a] Assigning Global Constant Groups

Use the following procedure to assign the variable groups first.

1. In the Variable Subwindow, right-click the Constant Variable Folder and select **Add** from the pop-up menu that will be displayed.

The **Constant Group Variable Registration** Dialog Box will be displayed.



2. Set the following items as described.

Variable Name

Enter the group name with up to eight alphanumeric characters. “C_” will be automatically displayed at the beginning of the variable name.

Size of Use

Enter, the number of Words to be used beginning from the leading address set in the *Register* Field.

Click the **Search Empty Register** Button. Available registers of the size to be used will be found, and the leading address will be automatically entered in the *Register* Field.

Register

Enter, in WORD type, the leading address of the C register group to be assigned.

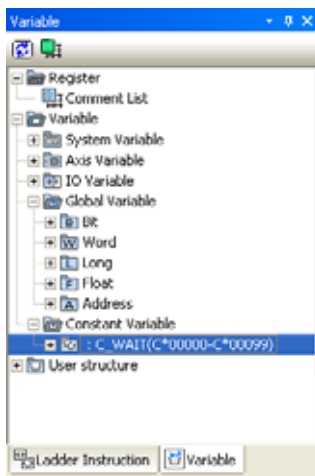
Comment

Enter a comment for this group. A maximum of 255 alphanumeric characters can be entered.

- Carriage returns and line feeds cannot be used.

3. Click **OK**.

The global constant group variable will be created, and it will be displayed under the Constant Variable Folder.



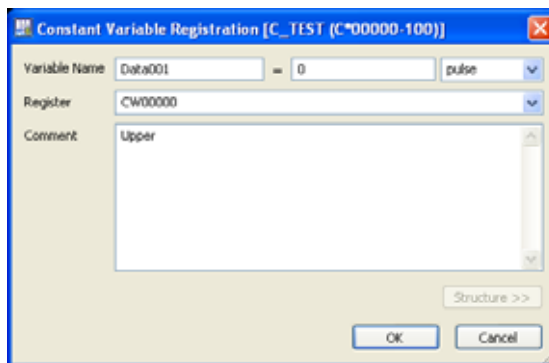
[b] Assigning Global Constants

Use the following procedure to assign a constant variable to a group.

1. In the Variable Subwindow, right-click the global constant group variable to which the variable is to be assigned and select *Add* from the pop-up menu.

The **Constant Variable Registration** Dialog Box will be displayed.

2. Set the following items as described.



Variable Name, Number, Unit

Enter the variable name to be given to the C registers being assigned and the value to be stored in that register.

Enter the variable name with up to 64 alphanumeric characters.

Click the drop-down arrow to display a list of units from which to select.

The number can be set within the following ranges, depending on the register data type.

WORD values: -32,768 to 32,767

LONG values: -2,147,483,648 to 2,147,483,647

FLOAT values: \pm (1.175495 to 3.402283), 0

- Enter a letter of the alphabet for the leading character of the variable name. An error will occur if a number is entered first.
- An error will occur if a name identical to a register, such as MB0 (mb0) or IW00000 (iw00000), is used at the beginning of the variable.
- Variable names that have already been assigned cannot be used again in the same group.
- Reserved words, such as motion instructions, cannot be used. For a list of reserved words, refer to *Appendix B Reserved Words*.

Register

Enter the address of the C register for which the name is to be assigned. Click the drop-down arrow and select the data type from the list. Cxnnnn will be input. (x: W, L, or F; nnnn: the lowest number used for the selected data type within the address range of the group)

Comment

A maximum of 255 alphanumeric characters can be entered for the comment for this variable.

- Carriage returns and line feeds cannot be used.

3. Click the **OK** Button.

The name will be assigned and displayed under the selected group.



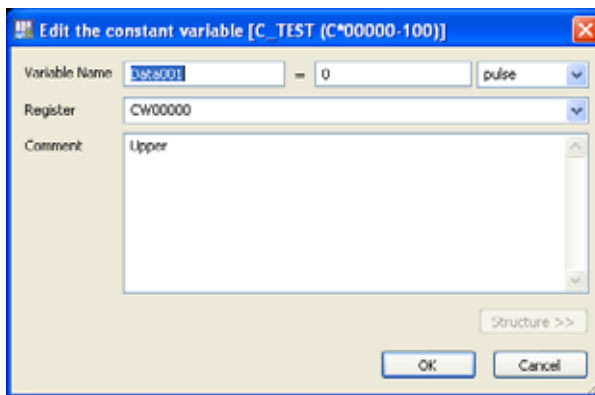
[c] Editing Global Constants

Variable names, registers, and comments can be edited. The size can also be edited.

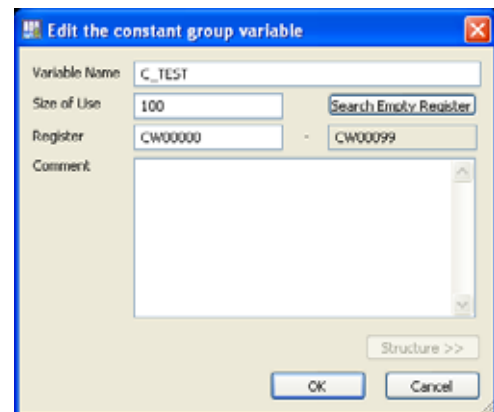
1. In the Variable Subwindow, right-click the global constant folder or global constant group variable to be edited and select **Edit** from the pop-up menu that will appear. Alternatively, double-click the global constants or global variable constant group to be edited.

The **Edit constant** Dialog Box will appear.

2. Just as with assigning global constants, edit the variable name, register, or the comment, and click the **OK** Button.



When Global Constant is Selected



When Global Constant Group Variable is Selected

- If the user attempts to assign a register out of the possible range when the *Register* Field is being edited, a message will be displayed notifying that “The out-of-range constants are to be deleted. Yes or No?” Click the **Yes** Button. The constants that are out of range will be deleted.

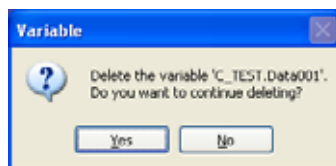
[d] Deleting Global Constants or Global Constant Group Variables

Global constants can be deleted. In a program where a deleted constant is used, the constant will be replaced with the register when it is displayed.

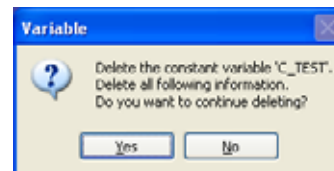
When global constant group variables are deleted, all of the constants included in that group will be deleted.

1. In the Variable Subwindow, select the global constants to be deleted and press the **Delete** Key. Alternatively, right-click the global constants to be deleted and select **Delete** from the pop-up menu that will be displayed.

A dialog box asking for confirmation will be displayed.



When Global Constant is Being Deleted

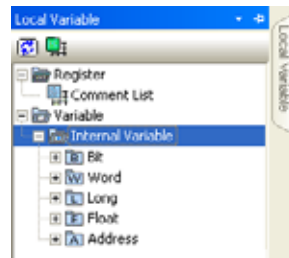


When Global Constant Group Variable is Being Deleted

2. Click the **Yes** Button. The selected global constants or global constant group variables will be deleted from the Variable Subwindow.

5.3.2 Local Variables for Use in One Variable

D registers and A registers have different contents for each ladder program. For function programs, however, D registers can be assigned as internal variables, and A registers can be assigned as function external variables. For other programs, D registers can be assigned as internal variables. These variables are local variables and are valid only in the programs in which they are assigned. They are displayed in the Local Variable Subwindow.



The following sections describe how to assign and edit internal variables and function external variables.

(1) Internal Variables (D Registers)

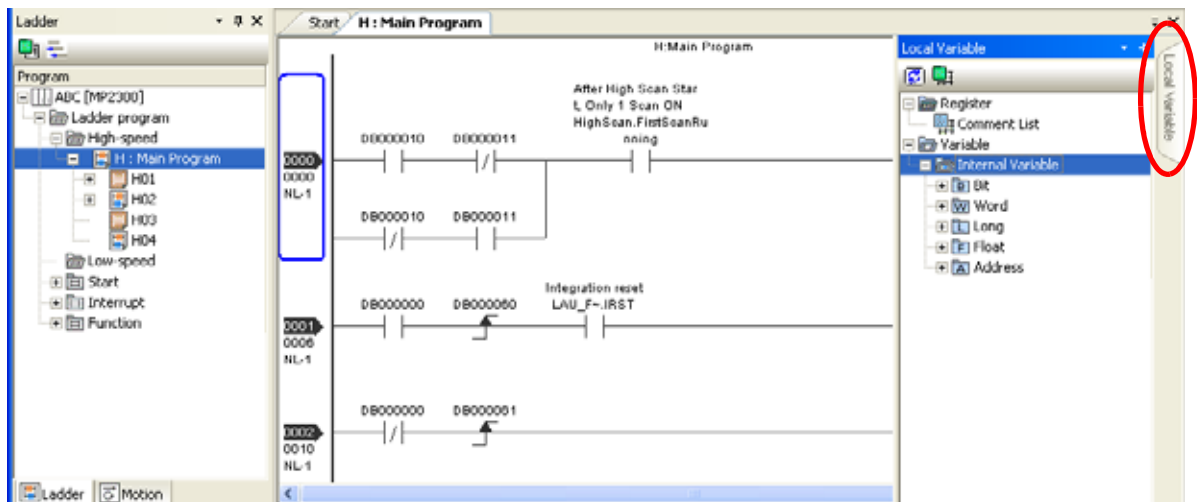
D registers can be assigned as variables for individual programs. An assigned variable is valid only for the program for which it is assigned.

[a] Assigning Internal Variables

Use the following procedure to assign internal variables.

- If needed, more addresses than those set for use in the Configuration Definition screen of the **Program Property** Dialog Box can be assigned (refer to 3.2.1 *Creating New Ladder Programs*). If so, increase the number of addresses to be used to the same number as the variable to be used in the **Program Property** Dialog Box before using variables in a ladder program.

1. Open the relevant ladder program and display in the foreground of the main window. Line up the mouse cursor with the **Local Variable** Tab Page to display the Local Variable Subwindow.

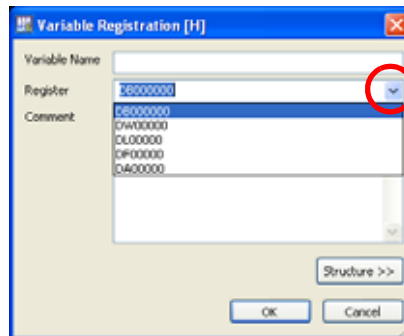


2. Right-click the Internal Variable Folder, and select **Add**.

The **Variable Registration** Dialog Box will be displayed. In the *Register* Field, the lowest address used for each data type among the D registers for which variables can currently be assigned will be displayed.

3. Input the register in the *Register* Field.

Click the **Structure** Button. A list of structures will be displayed. By assigning a variable name (folder name) to the structure, the variables that are included in that structure can be assigned together.



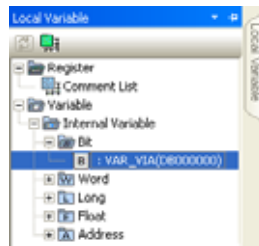
- For details on system structures, refer to 5.3.1(1) [b] *Creating System Structures*.

4. Enter the variable name in the *Variable Name* Field and comment in the *Comment* Field, and click the **OK** Button.

- In the *Variable Name* Field, enter up to 60 alphanumeric characters (or up to 64 characters if the name begins with VAR_).
- Variable names that have already been assigned cannot be used again in the same program.
- Reserved words, such as motion instructions, cannot be used. For a list of reserved words, refer to *Appendix B Reserved Words*.
- The same address can be assigned for different data types (e.g., DB00000 and DW00000). When the address is assigned, however, a message will be displayed notifying that “A malfunction may occur.”
- A maximum of 255 alphanumeric characters can be entered in the *Comment* Field.
- Carriage returns and line feeds cannot be used in the comments.

Click the **OK** Button. The **Variable Registration** Dialog Box will be closed, and the assigned variable will be displayed in the Local Variable Subwindow.

- VAR_ will be displayed at the beginning of the variable name to indicate that it is a local variable.



In the program where the assigned variable is used, the assigned variable name will be displayed for the instruction object of the applicable address.

[b] Editing and Deleting Internal Variables

The following procedure can be used to edit or delete an internal variable.

1. Open the relevant ladder program and display it in the foreground of the main window.
2. In the Local Variable Subwindow, right-click the variable to be edited (or deleted) and select **Edit** (or **Delete**) from the pop-up menu that will be displayed.

Edit: The **Edit Variable** Dialog Box will be displayed.

Delete: A dialog box asking for confirmation will be displayed. Click the **Yes** Button to delete the variable.

- Variables can also be edited by double-clicking in the Local Variable Subwindow.
- Variables can also be deleted by selecting a variable in the Local Variable Subwindow and then pressing the **Delete** Key.

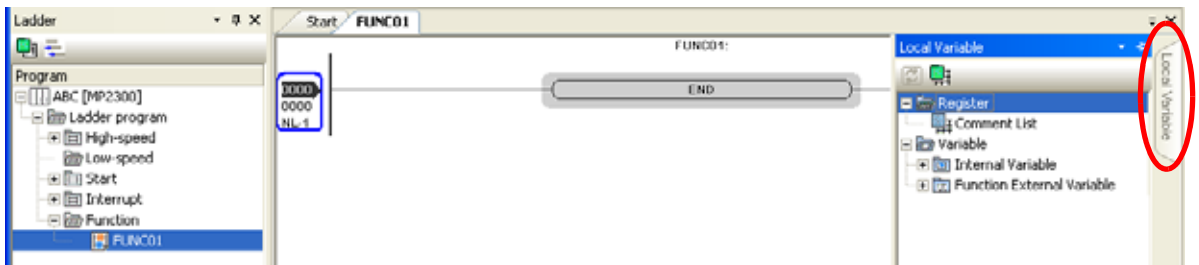
(2) Function External Variables (A Registers)

“A” registers can be assigned as variables for individual function programs. A function external variable is valid only for the function program for which it is registered. “A” registers use memory that is specified using the address reference input to the function. The programmer should take care not to overlap the memory usage (processing).

[a] Assigning Function External Variables

Use the following procedure to assign function external variables.

1. Open the relevant function and display in the foreground of the main window. Line up the mouse cursor with the **Local Variable** Tab Page to display the Local Variable Subwindow.



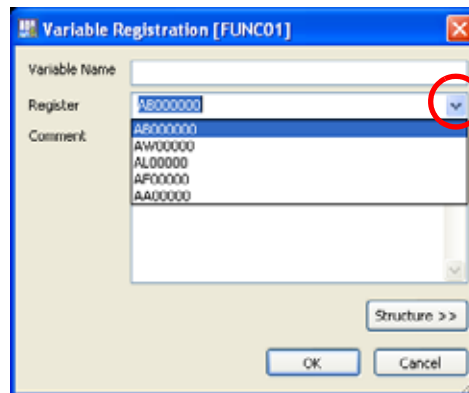
2. Right-click the Function External Variable Folder, and select **Add**.

The **Variable Registration** Dialog Box will be displayed. In the *Register* Field, the lowest address used for each data type among the A registers for which variables can be assigned will be displayed.

- The **Variable Registration** Dialog Box can be displayed even if the character string for the variable to be registered has been entered and confirmed in the *Variable Name* Field for the user object in the main window.

3. Enter the register address in the *Register* Field.

Click the **Structure** Button. A list of structures will be displayed. By giving a variable name (folder name) to the structure, the variables that are included in that structure can be assigned together.



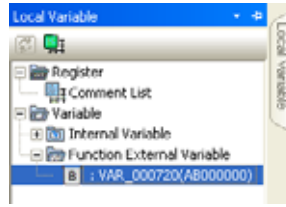
- For details on system structures, refer to 5.3.1(1) [b] *Creating System Structures*.

4. Enter the variable name in the *Variable Name* Field and comment in the *Comment* Field, and click the **OK** Button.

- Enter up to 60 alphanumeric characters in the *Variable Name* Field.
- Variable names that have already been assigned cannot be used again in the same program.
- The same address can be assigned for different data types (e.g., AB000000 and AW000000). When the address is assigned, however, a message will be displayed notifying that “A malfunction may occur.”
- A maximum of 255 alphanumeric characters can be entered in the *Comment* Field.
- Carriage returns and line feeds cannot be used in the comments.

Click the **OK** Button. The **Variable Registration** Dialog Box will be closed, and the assigned variable will be displayed in the Local Variable Subwindow.

- VAR_ will be displayed at the beginning of the variable name to indicate that it is a local variable.



In programs where the assigned variable is used, the assigned variable name will be displayed for the instruction object for the applicable register.

[b] Editing and Deleting Function External Variables

The following procedure can be used to edit or delete a function variable.

1. Open the relevant function program and display it in the foreground of the main window.
2. In the Local Variable Subwindow, right-click the variable to be edited (or deleted) and select **Edit** (or **Delete**) from the pop-up menu that will be displayed.

Edit: The **Edit Variable** Dialog Box will be displayed. The same procedure can be used for editing as is used for assignment.

Delete: A dialog box asking for confirmation will be displayed. Click the **Yes** Button to delete the variable.

- Variables can also be edited by double-clicking in the Local Variable Subwindow.
- Variables can also be deleted by selecting a variable in the Local Variable Subwindow and then pressing the **Delete** Key.

5.4 Using Variables and Comments

5.4.1 Using Variables

Variables can be entered for use in instruction objects and subwindows. Variables can be used in the following operations. For details on entering variables, refer to the following items.

- Entering ladder objects → 3.3.12 *Entering and Changing Variables and Registers*
- Entering in the **Search** Dialog Box → 3.5.2 (1) *Searching in a Program*
- Entering in the **Replace** Dialog Box → 3.5.2 (2) *Replacing in a Program*
- Entering in the **Search in Project** Dialog Box → 3.5.3 *Searching and Replacing in a Project File - (1) Searching in a Project File*
- Entering in the **Replace in Project** Dialog Box → 3.5.3 *Searching and Replacing in a Project File - (2) Replacing in a Project File*
- Entering in the Cross-reference Subwindow → 3.5.4 *Cross Reference Searching*
- Entering in the Watch Subwindow → 12.3 *Watch Function*

5.5 Using Comments

5.5.1 Saving Comments

The comments that were edited on MPE720 version 6 can be saved by selecting **File - Save** from the main menu. The comments set for variables can also be saved in the same way.

The following table shows the destination where the comments can be read and written, online or offline for each register.



- When online by project link connection, if the registers saved in the project file from which data is to be read are unmatched with those saved in the project file and Machine Controller to which data is to be written, the data in the writing destination may be overwritten by the read data and some data may be deleted.

Connection Status	Register	Comments to be Read From...	Comments to be Written Into...
Offline	S/Motion (I, O)	Fixed by the system.	Cannot write
	M, I, O	Project file	Project file
	C	Project file	Project file
	D, #, X, Y, Z, A	Each program of a project file	Each program of a project file
Project Link Connection (Online)	S/Motion (I, O)	Fixed by the system.	Cannot write
	M, I, O	Project file	Project file and Machine Controller
	C	Machine Controller	Machine Controller
	D, #, X, Y, Z, A	Each program of a Machine Controller	Each program of a Machine Controller
Direct Connection (Online)	S/ Motion (I, O)	Fixed by the system.	Cannot write
	M, I, O	Machine Controller	Machine Controller
	C	Machine Controller	Machine Controller
	D, #, X, Y, Z, A	Each program of a Machine Controller	Each program of a Machine Controller

5.5.2 Linking with CP Ladder Programs

As comments on CP ladder programs are linked with those on MPE720 version 6, it is possible to display the CP ladder program comments on MPE720 version 6 or vice-versa.

- Symbols used in MPE720 version 5 are different from Comments used in MPE720 version 6. The comments that can be displayed and edited on the Comment bar or Comment list of MPE720 version 5 correspond to the comments used in MPE720 version 6.



- During direct connection, if a comment of the S register is edited in the comment bar or comment list of the Engineering Manager, the comment will be invalid and not saved.

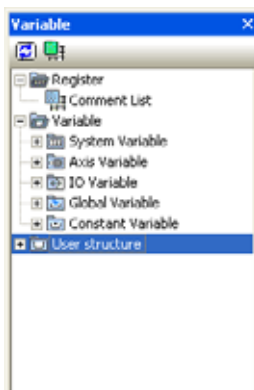
5.6 User Structures

5.6.1 What is User Structure?

A user structure is used to manage a set of variables, registers, and comments that are entered by the user. The registers assigned to a user structure can easily be viewed on screen.

Registers assigned to a user structure are called “Structure Members”, and up to 100 structure members can be assigned to one user structure.

User structures are used by assigning them to ADDRESS type global or local variables.

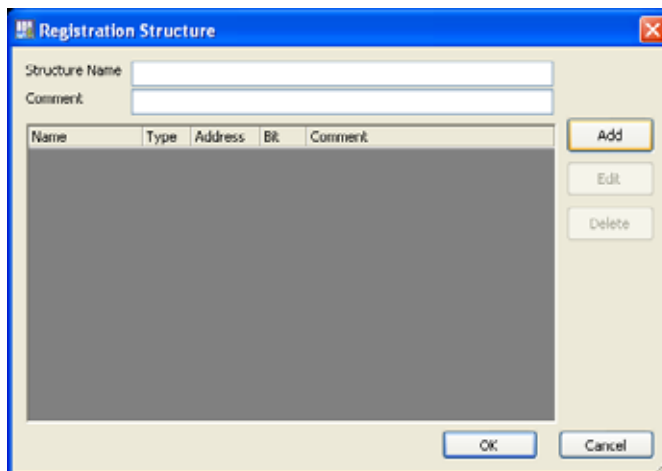


5.6.2 Creating User Structures

A user structure can be created by assigning specified variables, registers, comments, etc. in the **Registration Structure** Dialog Box.

Use the following procedure to create a user structure.

1. Right-click the **User structure** Folder in the Variable Subwindow and select **Add** from the pop-up menu.
The **Registration Structure** Dialog Box will be displayed.
2. Enter a structure name in the **Structure Name** Field, and comments in the **Comment** Field. Then, click **Add**.



The **Add Structure Member** Dialog Box will appear.

3. Enter a member name in the **Member Name** Field, an offset address in the **Offset Address** Field, and comments in the **Member Comment** Field. Then, click **OK**.

Click the ▼ Button in the **Member Type** Field to open the list and select the data type **BIT**, **WORD**, **LONG**, **FLOAT**, or **ADDRESS**.

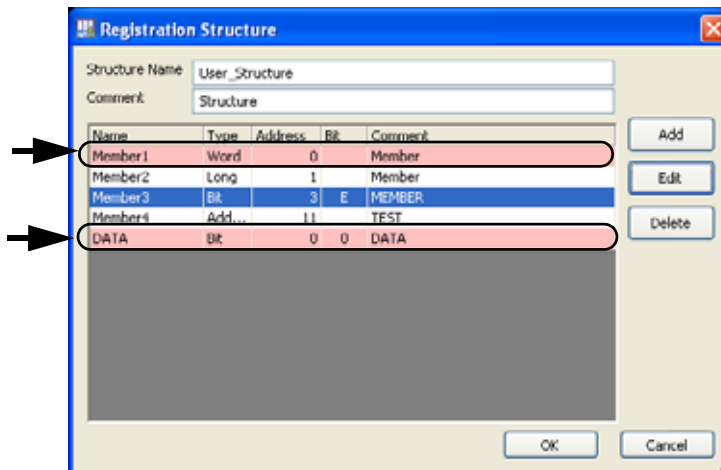
- In the **Structure Name** Field, enter up to 64 characters starting with an alphabetic letter. An error will occur if a name starting with a number is entered.
- An error will occur if a register name such as MB0 (mb0) and IW00000 (iw00000) is used for a structure name.
- A unique name must be used for each structure. A structure name that is already registered cannot be used more than once. (Nor can the system structure names provided by MPE720 version 6 be used.)
- Reserved words, such as motion instructions, cannot be used for structure names. Refer to *Appendix B Reserved Words* for details on the reserved words.
- A maximum of 255 alphanumeric characters can be entered in the **Comment** Field.
- Carriage returns and line feeds cannot be used when entering comments.
The **Registration Structure** Dialog Box will appear.
The assigned structure members will be displayed in a list.

Name	Type	Address	Bit	Comment
Member1	Word	0		Member
Member2	Long	1		Member
Member3	Bit	3	0	MEMBER
Member4	Add...	11		TEST

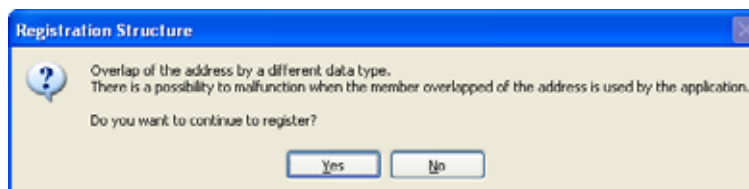
■ When Values in Address or Bit Column Overlap in a Structure Member List

When values in *Address* and/or *Bit* Column overlap in one user structure, the lines of overlapping structure members will be displayed in pink as shown below.

In the example below, the data types (BIT, WORD, LONG, FLOAT) are not overlapping.



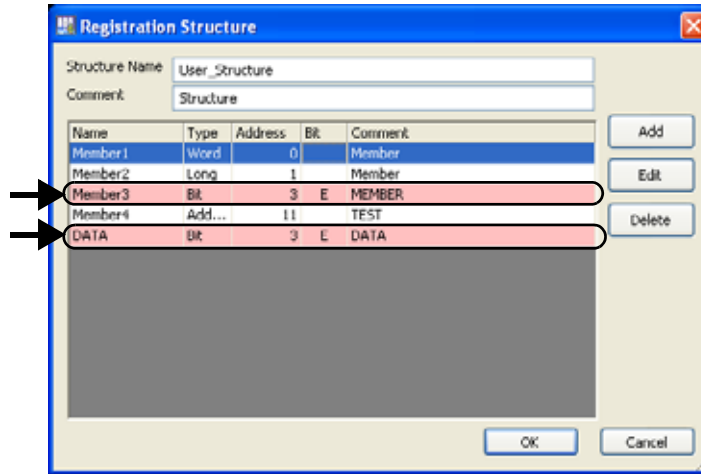
If you click **OK**, the following message will appear asking for confirmation.



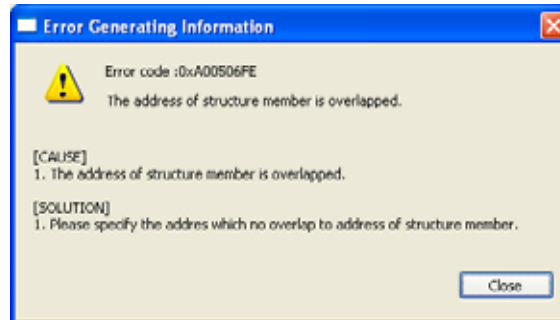
Click **Yes** to register the newly created structure.

■ When One Register is Assigned to Different Structure Members

When the data type (Type), address (Address), and bit (Bit) of one structure member overlaps with those of another member, the lines of the overlapped structure members are displayed in pink as follows.

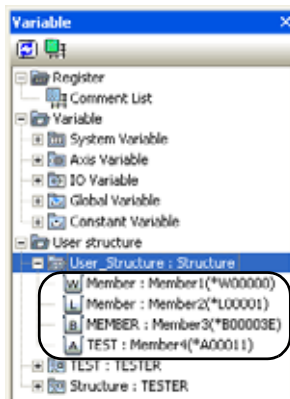


If you click **OK**, the following error message will appear. Change either of the overlapped registers, as one register can only be assigned once in one user structure.

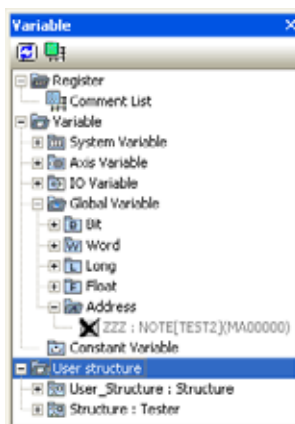


4. Click **OK** in the **Registration Structure** Dialog Box.

The **Registration Structure** Dialog Box will close. The new user structure is displayed in the Variable Subwindow.



- If a user structure has already been assigned to the variable, the user structure will not be deleted and its name will remain unchanged. However, the display will be deactivated.



- When a structure member of the user structure that has already been assigned to a variable is deleted in the **Registration Structure** Dialog Box, the structure member will also be deleted from the tree structure under the variable in the Variable Subwindow.
- When the name of a structure member is changed, the change will be written in the user structure that has already been assigned to the variable.
- When the comments for a structure member are changed, the change will not be written to the comments for the variable that has already been assigned. Change the comments of the variable that has already been assigned accordingly after having assigned the structure member.

5.6.3 Assigning User Structures

When adding a global or local variable in the **Variable Registration** Dialog Box opened from the Variable Subwindow, a user structure can be assigned to the added global or local variable. Refer to *5.3.1(1) [b] Creating System Structures* for information on how to assign user structures.

5.6.4 Transferring User Structures

User structures can be transferred individually or as a batch, and compared using the program transfer function.

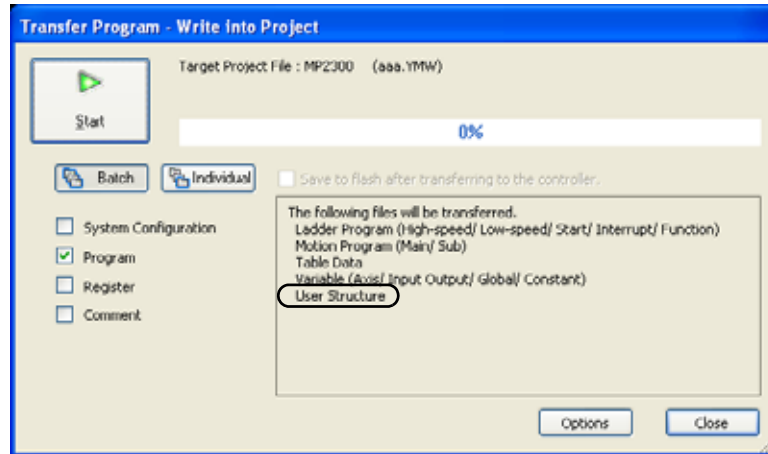
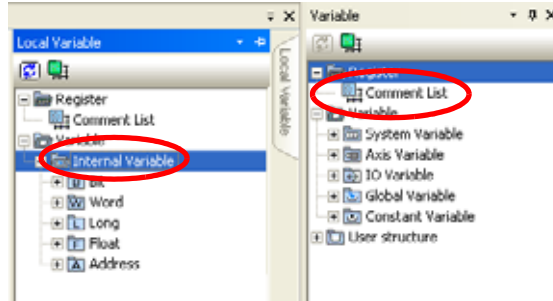


Fig. 5.1 Program Transfer Dialog Box when Write to Project is Selected

- Refer to *1.12 Security* for details on program transfer.

5.7 Comment Lists

Comments assigned to each register can be referenced and edited by data type from the *Comment List* in the Variable Subwindow and Local Variable Subwindow.



- The same comment list can be referenced regardless of whether the comment list is opened from the Variable Subwindow or the Local Variable Subwindow.

5.7.1 Referencing Comment Lists

Comment lists can be displayed by the following procedure, and comments can be referenced by register and data type.

(1) Referencing S, I, O, M, and C Register Comments

1. Double-click *Comment List* in the Variable Subwindow or the Local Variable Subwindow. Alternatively, right-click the *Comment List* in the **Local Variable** Window and select **Edit** from the pop-up menu that appears.

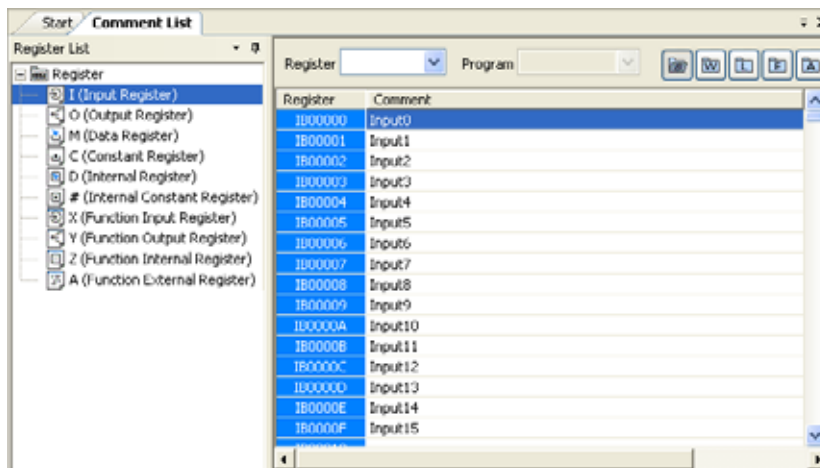
The comment list will open in the main window.

2. Select the register that is to be referenced from the *Register List*, or select **Open** from the pop-up menu that appears.

The comment list for the selected register will be displayed.

3. Specify the data type to be referenced using the **BIT**, **WORD**, **LONG**, **FLOAT**, or **ADDRESS** Button.

The comment list for the specified register and data type will be displayed.



Scroll the list to refer to the comment for the target register.

Click the Close Button for the **Comment List** Tab Page to exit the list display.

- Enter the desired register in the Register input field in the **Comment List** Tab Page. The list will scroll to display the entered register.

(2) Referencing D, A, #, X, Y, and Z Register Comments

For the D, A, #, X, Y, and Z registers, use the following procedure to specify the program to be referenced and to display the comment list.

1. Double-click *Comment List* in the Variable Subwindow or the Local Variable Subwindow.
The comment list will be opened in the main window.
2. Select from the *Register List* the register that is to be referenced, or select **Open** from the pop-up menu that will be displayed.
The comment list for the selected register will be displayed.
3. Specify the data type to be referenced using the **BIT, WORD, LONG, FLOAT, or ADDRESS** Button.
4. Click the drop-down arrow for the *Program* Field, and select from the list the program to be referenced.
The comment list for the specified program, register, and data type will be displayed.

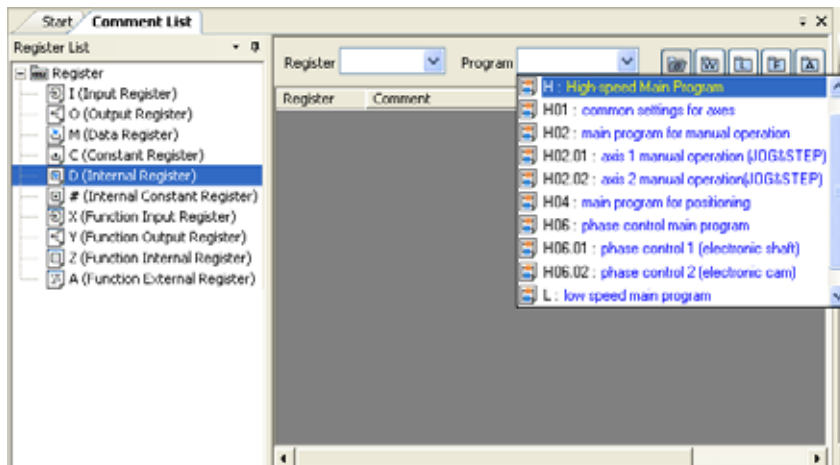


Fig. 5.2 Display Example: Comment List for D Register and BIT Data

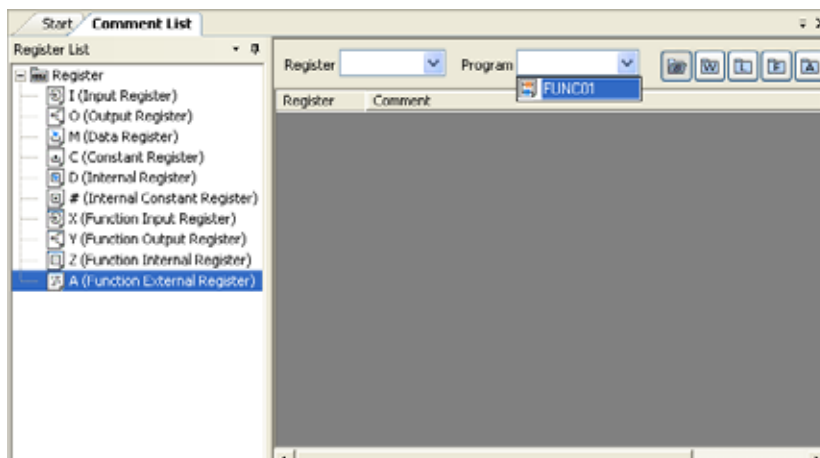


Fig. 5.3 Display Example: Comment List for A Register and BIT Data

Scroll the list to refer the comment for the target register.

Click the Close Button for the **Comment List** Tab Page to exit the list display.

- Enter the desired register in the Register input field in the **Comment List** Tab Page. The list will scroll to display the entered register.

(3) Editing Comment Text

Double-click the *Comment* Field in the comment list or press the **F2** Key. The text cursor will be displayed, and the comment can then be edited. Press the **Enter** Key to save the edited comment.

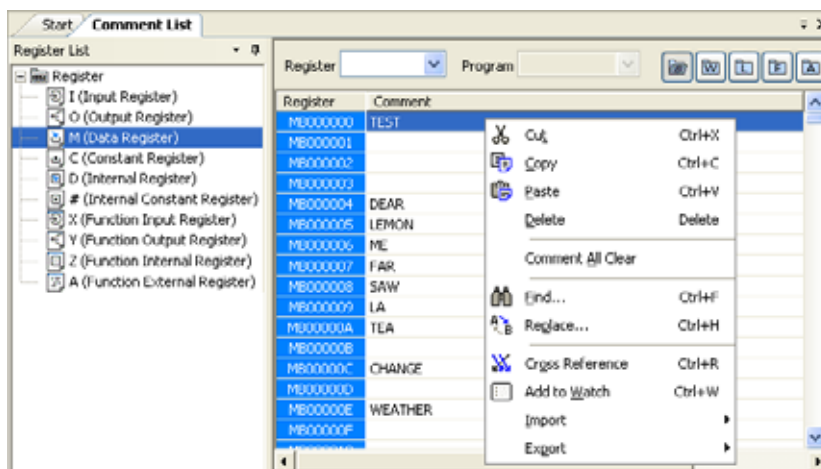
After editing, the comments will be changed for all object subwindows using the applicable register.

Select **File - Save** from the Main Menu with the **Comment List** Tab Page open, or press the **Ctrl + S** Keys. The comment data will be stored in the project file or in the Machine Controller.

- A maximum of 255 alphanumeric characters can be entered in the *Comment* Field.
- Carriage returns and line feeds cannot be used in the comments.

(4) Editing with Pop-up Menus

The *Comment* Field can be edited by selecting it and right-clicking to display a pop-up menu. Multiple *Comment* Fields can be selected by dragging while holding down the **Shift** + an arrow Key.



Cut, Copy, Paste, and Delete

Comments selected in the *Comment* Field can be cut, copied, pasted, or deleted. If multiple comments are to be pasted after cutting or copying them, they can be pasted in multiple *Comment* Fields starting from the selected *Comment* Field.

Comment All Clear

All comments displayed in the main window will be deleted. Comments cannot be recovered once they have been deleted.

Find

The comments in the registers displayed in the **Comment List** Tab can be searched.

Replace

The comments in the registers displayed in the **Comment List** Tab can be replaced.

Cross Reference and Add to Watch

The register for the comment selected will be added to the Cross reference Subwindow or the Watch Subwindow.

- For cross references, refer to 3.5.4 *Cross Reference Searching*. For the watch function, refer to 12.3 *Watch Function*.

Import

The CSV, CTF, and YST files in which the comments assigned to each variable are saved will be imported into MPE720 version 6.

Export

The comments assigned to each variable will be saved in a CSV, CTF, and YST files.

- Refer to 6 *Exporting/Importing* for details on import and export functions.


After editing, the comments will be changed for all objects and subwindows using the applicable register.

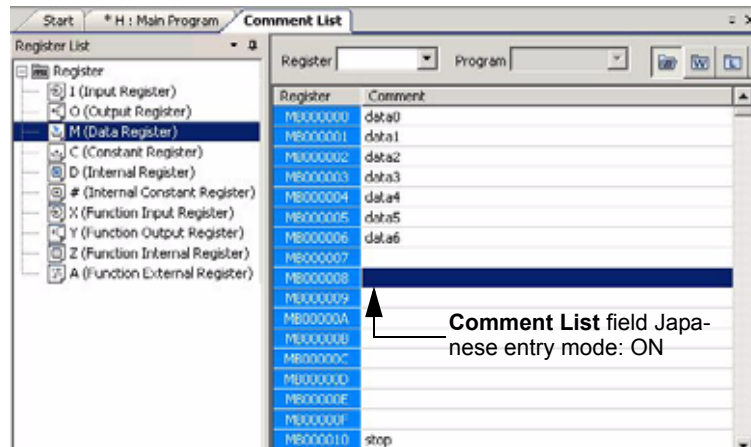
(5) Linking with External Editors


Text can be copied and pasted from external editors, such as Notepad.

(6) Automatic Selection of the IME Entry Mode



You can select whether or not the IME (Input Method Editor to enter Japanese characters) entry mode is automatically selected or not using the toolbar icon.

When automatic selection of the IME entry mode is set to ON (), the IME entry mode is ON in the **Comment List** field. On clicking a data type the cursor moves to the **Comment List** field, and the IME entry mode in the **Comment List** field is selected as shown below.



- When automatic selection of the IME entry mode is set to OFF (), the entry mode cannot be selected automatically.



- When using an English font on an English operating system, you can change the status of the IME entry mode automatic selection icon to ON () or OFF (), but automatic selection of the entry mode is not available.

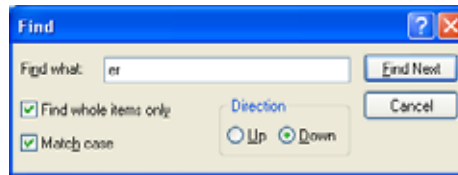
5.7.2 Search/Replace/Delete in Comment List

(1) Search in Comment List

The comments in the registers displayed in the **Comment** column can be searched.

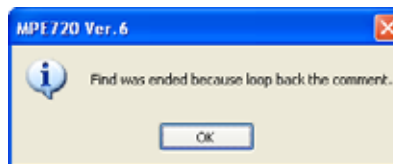
1. Double-click the **Comment List** Tab in the Variable Subwindow and then select the **Comment** column.
2. Select **Edit - Find** from the main menu, or right-click the **Comment** column and select **Find** from the pop-up menu.

The **Find** Dialog Box will appear.



3. Enter a character string to search for, and then click **Find Next**. The cursor will move to the corresponding character string.

When the search completes, the following message will appear.



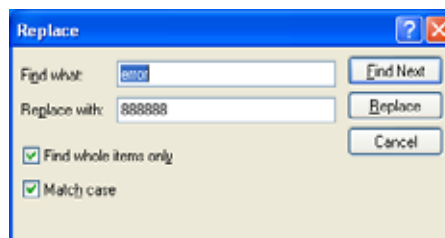
(2) Replace in Comment List

The comments in the registers displayed in the **Comment** column can be replaced with another character string.

1. Double-click the **Comment List** Tab in the Variable Subwindow, and then select the **Comment** column.
2. Select **Edit - Replace** from the main menu, or right-click the **Comment** column and select **Replace** from the pop-up menu.

The **Replace** Dialog Box will appear.

3. Enter a character string to search for, and a character string to replace it with, and then click **Replace**.



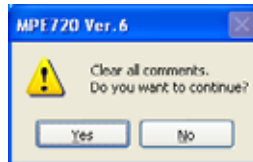
4. The character string that is input in the **Find what** text box will be searched for and replaced with the character string entered in the **Replace with** text box.

(3) Deleting All Comments

All the comment data in the **comment** column will be deleted.

1. Right-click the **Comment** column in the **Comment List** Tab of the Variable Subwindow, and select **Comments All Clear** from the pop-up menu.

The following message will appear asking whether or not to delete all comments.



Click **Yes** to delete all the comments in the **Comment** column.

Exporting/Importing

This chapter describes the functions for exporting and importing parameters, variables and register data.

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6.1 Types of Export/Import

In MPE720 version 6, you can import/export the following three types of data.

- Motion parameters (Refer to *6.2 Motion Parameters*.)
- Variable (Refer to *6.3 Variables*.)
- Register data (Refer to *6.4 Register Data*.)

These functions are described in detail on the following pages.

6.2 Motion Parameters

6.2.1 Exporting/Importing Motion Parameters

Motion parameter data can be exported from MPE720 version 6 to a CSV file, or imported from the CSV file to MPE720 version 6.

Export means saving data to a CSV file. The CSV file data can be easily edited using Microsoft Excel (hereinafter, referred to as Excel).

Import means loading the CSV file data to the MPE720 version 6.

- *Import* is enabled for all models of the Machine Controller.
- A file with CTF or YST extension cannot be edited.

The parameters that are applicable for import and export functions are fixed parameters, setting parameters, and SERVOPACK parameters of SVB-01, SVA-01, PO-01, and SVR Modules.

The following table shows the parameters of each module that are applicable for import and export function.

Module	Fixed Parameters	Setting Parameters	SERVOPACK Parameters
SVB-01	Applicable	Applicable	Applicable
SVA-01	Applicable	Applicable	Not applicable
PO-01	Applicable	Applicable	Not applicable
SVR	Applicable	Applicable	Not applicable

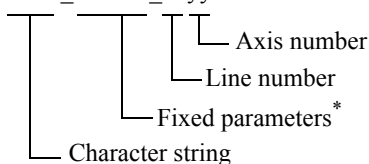
(1) CSV File

The specified name is set for each CSV file according to the motion parameter type, regardless of module type such as SVB-01, SVA-01, PO-01, and SVR, and a line number xx and axis number yy are added to the name.

A character string can be added in the beginning of each CSV file name as required.

Example: CSV file name with a character string MPE, for fixed parameters

CSV file name: MPE_FixPrm_xxyy.csv



* Fixed parameter = FixPrm, Setting parameter = SetPrm, SERVOPACK parameter = SrvPrm

A CSV file data consists of an array with array elements separated by commas.

The following table shows the details of the structure of the CSV file data.

	A (No.)	B (Parameter name)	C (Input (set) data)	D (Units)
Export	Outputs the parameter number in the window.	Outputs the parameter name in the window.	Outputs the input data in the window.	Outputs the units in the window.
Import	Will not be read.	Will not be read.	The data of the parameter in the CSV file will be read and written to the corresponding parameter.	Will not be read.

Motion parameters are classified into three types: *BIT* type, *Combo* type, and *Others*. The CSV file data format differs depending on these parameter types.

The display examples when the above types of parameters are exported to CSV files are shown below.

■ Parameters Set in Bits (BIT Type)

Save the parameter window displayed in the foreground of the **Engineering Manager** Window, and then export to a CSV file. If the CSV file is opened after exporting, the input data are displayed in hexadecimal notation.

No.	Name	REG	Input Data
0	Run command setting	Dw8000	0000 0000 0000 0001 0001 H
1	Mode setting 1	Dw8001	0000 0000 0000 0000 0000 H
2	Mode setting 2	Dw8002	0000 0000 0000 0000 0000 H
3	Function setting 1	Dw8003	0000 0000 0001 0001 0011 H
4	Function setting 2	Dw8004	
5	Function setting 3	Dw8005	
6	Option Setting	Dw8006	
8	Motion command	OL8008	
9	Motion command control flag	Dw8009	
10	Motion subcommand	Dw800A	
12	Torque/Thrust reference setting	OL800C	
14	Speed limit setting at the torque/thrust reference	Dw800E	
16	Speed reference setting	OL8010	
20	Positive side limiting torque/thrust setting at the speed refer	OL8014	

	A	B	C
1	0	Run command setting	0001 H
2	1	Mode setting 1	0000 H
3	2	Mode setting 2	0000 H
4	3	Function setting 1	0011 H
5	4	Function setting 2	0033 H
6	5	Function setting 3	0000 H
7	8	Motion command	0
8	9	Motion command control flag	0000 H
9	10	Motion subcommand	0
10	12	Torque/Thrust reference setting	0 %
11	14	Speed limit setting at the	150 %

Export, then... (arrow pointing to the second table)

Displayed in Hexadecimal (arrow pointing to the second table)

■ Parameters Selected from Combo Box (Combo Type)

Save the parameter window displayed in the foreground of the **Engineering Manager** Window, and then export to a CSV file. If the CSV file is opened after exporting, the input data are displayed in decimal notation.

No.	Name	REG	Input Data
0	Run command setting	Dw8000	0000 0000 0000 0001 000
1	Mode setting 1	Dw8001	0000 0000 0000 0000 000
2	Mode setting 2	Dw8002	0000 0000 0000 0000 000
3	Function setting 1	Dw8003	0000 0000 0001 0001 001
4	Function setting 2	Dw8004	0000 0000 0011 0011 003
5	Function setting 3	Dw8005	0000 0000 0000 0000 000
6	Option Setting	Dw8006	0000 0000 0000 0000 000
8	Motion command	Dw8008	Position Mode
9	Motion command control flag	Dw8009	No Command
10	Motion subcommand	Dw800A	Position Mode
12	Torque/Thrust reference setting	OL800C	Latch target positioning
14	Speed limit setting at the torque/thrust reference	Dw800E	Zero Point Return
16	Speed reference setting	OL8010	Interpolation
20	Positive side limiting torque/thrust setting at the speed refer	OL8014	Last interpolation segment
22	Secondly Speed Compensation	OL8016	
24	Override	Dw8018	

	A	B	C
1	0	Run command setting	0001 H
2	1	Mode setting 1	0000 H
3	2	Mode setting 2	0000 H
4	3	Function setting 1	0011 H
5	4	Function setting 2	0033 H
6	5	Function setting 3	0000 H
7	8	Motion command	1
8	9	Motion command control flag	0000 H
9	10	Motion subcommand	0

Export, then... (arrow pointing to the second table)

Displayed in decimal (Input Value 1 = Positioning) (arrow pointing to the second table)

Parameters Set by Inputting Numerical Values (Others)

Save the parameter window displayed in the foreground of **Engineering Manager** Window, and then export to a CSV file. If the CSV file is opened after exporting, the input data are displayed as they were displayed in the **Engineering Manager** Window (numerical values).

No.	Name	REG	Input Data	U
16	Speed reference setting	OL8010	3000	10 ³ n refer
20	Positive side limiting torque/thrust setting	OL8014	300.00	%
22	Secondly Speed Compensation	OL8016	0.00	%
24	Override	OW8010	100.00	%
28	Position reference setting	OL8018	0	User units
30	Width of positioning completion	OL801E	100	User units
32	NEAR signal output width	OL8020	0	User units
34	Error count alarm detection	OL8022	2147483647	User units
38	Positioning completion check time	OW8020	0	ms
40	Phase correction setting	OL8028	0	User units
42	Latch zone lower limit setting	OL802A	-2147483648	User units
44	Latch zone upper limit setting	OL802C	2147483647	User units
46	Position loop gain	OW802E	30.0	/s

Export, then...

	A	B	C	D
12	16	Speed reference s	3000	10 ³ n refer
13	20	Positive side limitin	300	%
14	22	Secondly Speed C	0	%
15	24	Override	100	%
16	28	Position reference	0	User units
17	30	Width of positionin	100	User units
18	32	NEAR signal outpu	0	User units
19	34	Error count alarm	2.15E+09	User units
20	38	Positioning comple	0	ms
21	40	Phase correction s	0	User units
22	42	Latch zone lower li	-2.1E+09	User units
23	44	Latch zone upper li	2.15E+09	User units
24	46	Position loop gain	30	/s
25	47	Speed loop gain	40	Hz

Displayed in numerical values

- When the number of digits of input data before export to a CSV file exceeds the space allowed, this value is displayed in exponent form such as “E+09”, when the CSV file is opened. This is because the display is limited by the cell width of the CSV file. (See the window shown above on the right.)
- Refer to *Machine Controller MP2200/2300 Motion Modules User's Manual* (manual number: SIEP C880700 16) for details of Input data.

The procedures to export and import motion parameters are described on the following pages.

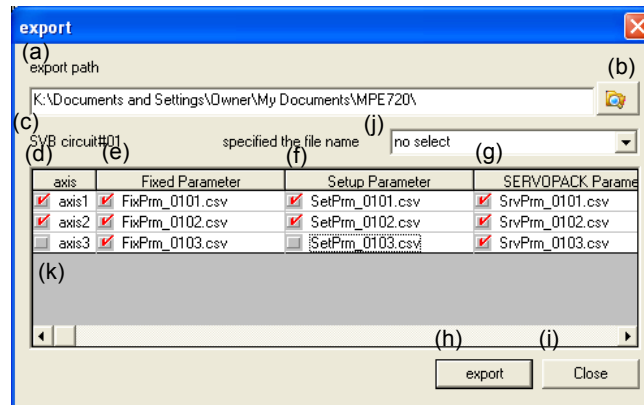
6.2.2 Export

Select the CSV files created for each type of parameter, and then export the selected CSV files to MPE720 version 6.

1. Select **File - Export** from the main menu.

The **export** Dialog Box will appear.

2. Set the required items.



The setting items and methods are as follows.

(a) Export Path

Specify the path of the folder for saving the selected CSV file data. Either directly input the path or click the browse button (b) to select from the **Select Folder** Dialog Box.

When the dialog box is opened, either the previously set path or MyDocument\MPE720 is displayed.

(b) Browse Button

Click this button to display the **Select Folder** Dialog Box. Select a folder and the selected folder will be set as export path (a).

(c) Module Name

Displays the module name and line number of the motion parameter setting window displayed in the foreground of **Module Configuration Definition** Window.

Module Name

The module name for which a line number is assigned in the subplot, SVB01, SVA01, PO, or SVR, is displayed.

Line Number

Displays the line number defined in the Module Configuration Definition. (Line #xx: xx = 1 to 16)

* Refer to *Machine Controller MP900/MP2000 series Programming Software MPE720 User's Manual* (manual number: SIEP C880700 05) for details on subplot and line number.

(d) Axis

Displays the axis assigned for the module. The information given in the axis combo box in the motion parameter setting window of Engineering Manager is displayed.

(e) Fixed Parameter

Displays CSV file names "FixPrm_xxxy.csv" for fixed parameters of CSV file data. xx indicates a line number, and yy indicates an axis number.

(f) Setup Parameter

Displays CSV file names "SetPrm_xxxy.csv" for setting parameters of CSV file data. xx indicates a line number, and yy indicates an axis number.

(g) **SERVOPACK Parameter**

Displays CSV file names “SrvPrm_xxyy.csv” for SERVOPACK parameters of CSV file data. xx indicates a line number, and yy indicates an axis number.

(h) **Export Button**

Click this button to export the files selected with check marks.

(i) **Close Button**

Click this button to close the dialog box. Export will not be executed.

(j) **Specifying the File Name**

Add an unique character string at the beginning of the motion parameter file name to specify the file name.

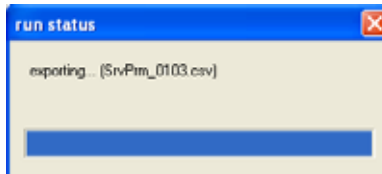
Example: Fixed parameter file name when MPE is specified: MPE_FixPrm_xxyy.csv

(k) **Check Box**

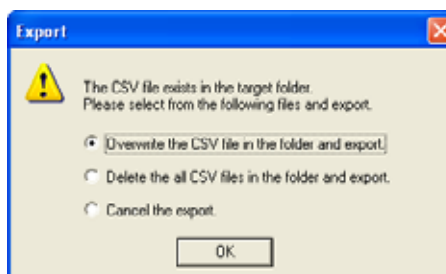
Click the box to select the file to be exported.

3. Click the **export Button.**

Exporting of the selected files will start and the progress indicator will display the percentage of the process that has been completed.



If a duplicate file name exists in the export destination folder, the following message will appear. Select one of the options shown in the following image, and then click **OK**.



Overwrite the CSV file in the folder and export:

The data at the export destination will be overwritten with the new file data.

Delete the all CSV files in the folder and export:

All the data at the export destination will be deleted and the new file data will be exported.

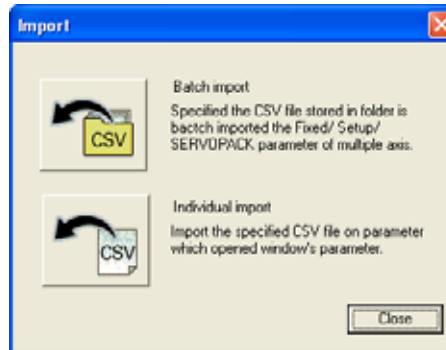
Cancel the export:

The export operation will be cancelled and the dialog box will close.

6.2.3 Import

Multiple parameters can be imported at one time, or each CSV file can be imported individually.

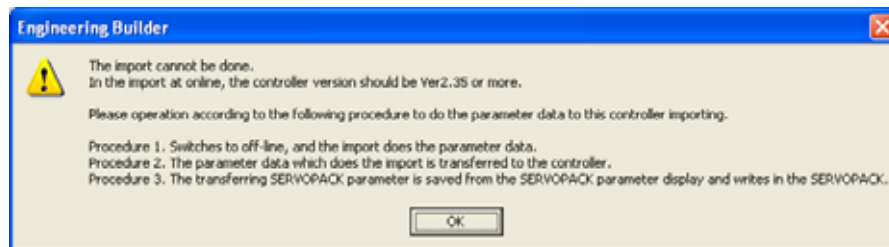
On the main menu in the Engineering Manager, select **File-Import**. The **Import** Dialog Box will appear. Select **Batch import** or **Individual import**.



- Online Import Operation, Applicable Machine Controller Versions

When online (connected to a Machine Controller), the import operation is disabled by some Machine Controller versions. The following Machine Controller versions are applicable for online import operation: Machine Controller with SVB built-in CPU version 2.35 or later, and Machine Controllers with option SVB modules version 1.13 or later. With a Machine Controller with SVB built-in CPU versions earlier than 2.35 or a Machine Controller with option SVB modules versions earlier than 1.13, the following error message will appear if an attempt is made to import files.

Example: When connected to Machine Controller with SVB built-in CPU



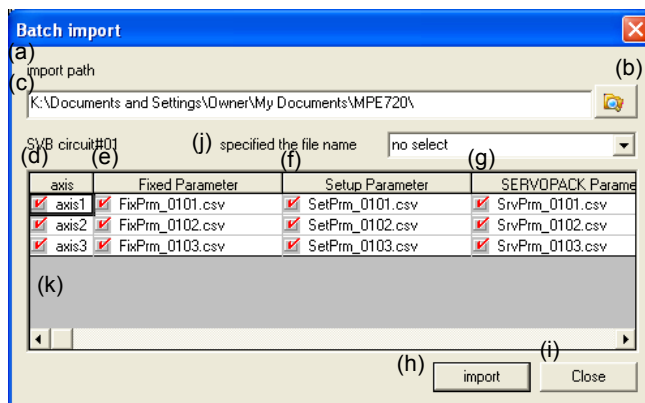
The following sections describe how to import CSV files individually or in a batch.

(1) Batch Import

1. Select **File - Import** on the main menu. Then in the **Import** box click the **Batch Import** (button).

The **Batch import** Dialog Box will appear.

2. Set the required items.



The setting items and methods are as follows:

(a) Import Path

Specify the path of the folder in which CSV files are to be saved. Either directly input the path or click the browse button (b) to select from the **Select Folder** Dialog Box.

When the dialog box is opened, either the previously set path or MyDocument\MPE720 is displayed.

(b) Browse Button

Click this button to display the **Select Folder** Dialog Box. Select a folder and the selected folder will be set for import path (a).

(c) Module Name

Displays the module name and line number of the motion parameter setting window displayed in the foreground of the **Module Configuration Definition** Window.

Module Name

The module name for which a line number is assigned in the subplot, SVB01, SVA01, PO, or SVR, is displayed.

Line Number

Displays the line number defined in the Module Configuration Definition. (Line #xx: xx = 1 to 16)

For details on subplot and line numbers, refer to *Machine Controller MP900/MP2000 series Programming Software MPE720 User's Manual* (manual number: SIEP C880700 05).

(d) Axis

Displays the axis assigned for the module. The information given in the axis combo box in the motion parameter setting window of Engineering Manager is displayed.

(e) Fixed Parameters

Displays CSV file names "FixPrm_xxxy.csv" for fixed parameters of CSV file data. xx indicates a line number, and yy indicates an axis number. If no file exists, no CSV file name is displayed.

(f) **Setup Parameters**

Displays CSV file names “SetPrm_xxyy.csv” for setting parameters of CSV file data. xx indicates a line number, and yy indicates an axis number. If no file exists, no CSV file name is displayed.

(g) **SERVOPACK Parameters**

Displays CSV file names “SrvPrm_xxyy.csv” for SERVOPACK parameters of CSV file data. xx indicates a line number, and yy indicates an axis number. If no file exists, no CSV file name is displayed.

(h) **Import Button**

Click this button to import the files selected with check marks.

(i) **Close Button**

Click this button to close the dialog box. Import will not be executed.

(j) **Specifying the File Name**

Add an unique character string at the beginning of the motion parameter file name to specify the file name.

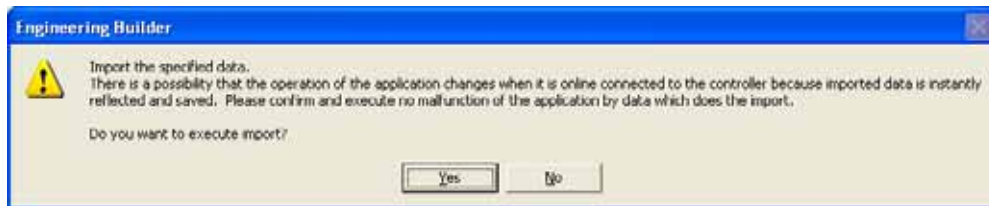
Example: Fixed parameter file name when MPE is specified: MPE_FixPrm_xxyy.csv

(k) **Check Box**

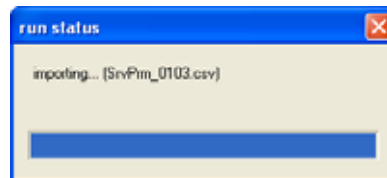
Click the box to select the file to be imported.

3. Click the Import Button.

The following message will appear asking for confirmation.



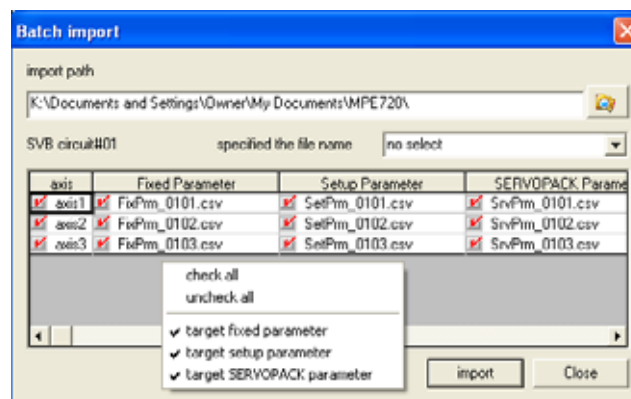
Click **Yes** to start a batch import. When the importing starts, the progress indicator will display the percentage of the process that has been completed.



- Limiting File Options for Import

Right-click the mouse in the **Batch import** Dialog Box to open the pop-up menu. Click to clear the check mark from the target fixed parameter, target setup parameter, and target SERVOPACK parameter. Then these three parameter types will be excluded from the files to be imported.

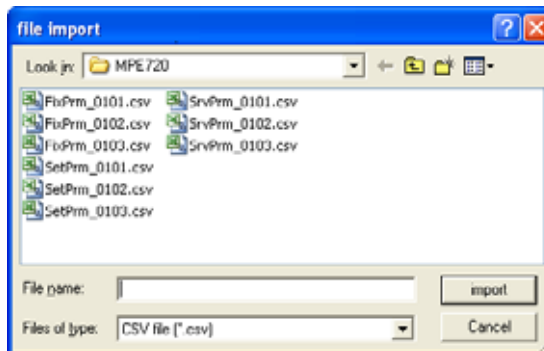
The import file options set by using the pop-up menu will be retained until the MPE720 version 6 is turned OFF and then ON again.



(2) Individual Import

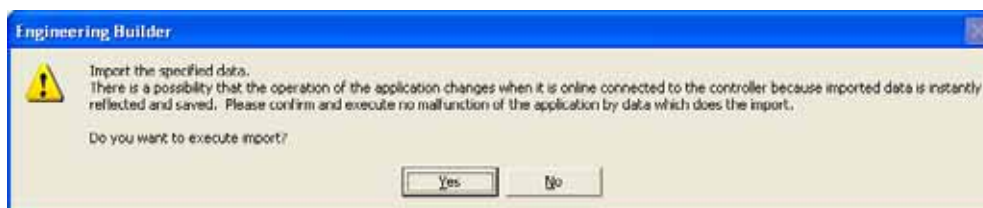
1. Select **File - Import** from the main menu and click the **Individual Import** Button in the **Import** Dialog Box.

The **file import** Dialog Box will appear. All the CSV files, including files whose names start with the specified character string, can be selected.

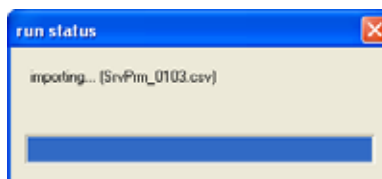


2. Select a CSV file to be imported, and then click **import**.

The following message will appear.



Click **Yes** to start importing the selected file. When importing starts, the progress indicator will display the percentage of the process that has been completed.



- The selected CSV file data will be imported to the parameter window displayed in the foreground of the currently opened window.

6.3 Variables

Variables can be exported from an open project file on the MPE720 version 6 to a CSV, CTF, or YST file, or imported from a CSV, CTF, or YST file to the MPE720 version 6.

Export means to save variables, comments, and structures in a CSV, CTF, or YST file. Only CSV files can be edited in Microsoft Excel.

Import means to save the CSV, CTF, or YST file in MPE720 version 6 again.

The variable data exported from a project file can be imported for use in another project file.

Data in a CSV file can be edited in Excel as required, and the edited CSV file data can be imported to a project file.

The results of export and import are output to the Output Subwindow.

- Import can be executed regardless of Machine Controller model.
- Refer to 6.2.1 *Exporting/Importing Motion Parameters* for information on exporting/importing motion parameters.

6.3.1 Exporting/Importing Global Variables, I/O Variables and Comments

(1) Outline

I/O variables, global variables, and I, O, M, and C register comments can be exported to CSV files. A desired file name can be set for each CSV file with a file extension “.CSV”.

If a CSV file with the same name already exists in the export destination, the data of CSV file in the export destination will be deleted, and new data will be written.

The editing of CSV files is described below.

When a CSV file is opened, the data is displayed from left to right, “Register”, “Comment”, “Variable”, and “Structure,” as shown below. When nothing is set for “Comment”, “Variable”, and/or “Structure”, the corresponding cell is left blank.

	A (Register) ^{*1}	B (Comment) ^{*2}	C (Variable) ^{*3}	D (Structure) ^{*4}
1	CW00001	Acceleration		
2	MB000001	RUN switch ^{*5}		
3	IF0007	I register	Ti	
4	MW00100		Data0 ^{*6}	
5	MA00200	PI parameter	PIParameter	PI_W
6	OL0687	Variable comments		

* 1. Enter a correct register.

* 2. Refer to the supplemental information given under step 2 of the structure assigning procedure in 5.3.1(1) [b] *Creating System Structures* for details on the Comment Column.

* 3. Refer to the supplemental information given under step 2 of the structure assigning procedure in 5.3.1(1) [b] *Creating System Structures* for information on how to assign variable names.

* 4. Displayed only when the register data type is ADDRESS.

Refer to the supplemental information given under step 2 of the structure assigning procedure in 5.3.1(1) [b] *Creating System Structures* for information on Member Name and Member Comments.

* 5. When only comments are set, the Variable column will be left blank.

* 6. When only variables are set, the Comment column will be left blank.

The edited CSV file can be imported to the MPE720 version 6. The data in the import destination file will be overwritten with the data in the import source.

- Axis variables can be neither exported nor imported.
- Exporting/importing only a specified register range is not possible.
- Right-click the corresponding folder in the Variable Subwindow and select **Export** or **Import** from the pop-up menu to execute export or import.

An example of importing a CSV file is described below.

(A: Register, B: Comments, C: Variable, D: Structure)

(Example) The CSV file A is imported to the data B in the Variable Subwindow of the opened project file.

A: Import source (Data saved in the CSV file)

	A	B	C	D
1	MA00200	PI parameter	Parameter	PI_W
2	MB000000	Test		
3	MF00070		Ti	
4	MW00100	RUN speed		

B: Import destination (Data in the Variable Subwindow of the project file)

	A	B	C	D
1	MA00200	Data process	PIParameter	PID_F
2	MB000000		TESTER	
3	MF00070	Integration time		
4	MW00100		Drive	

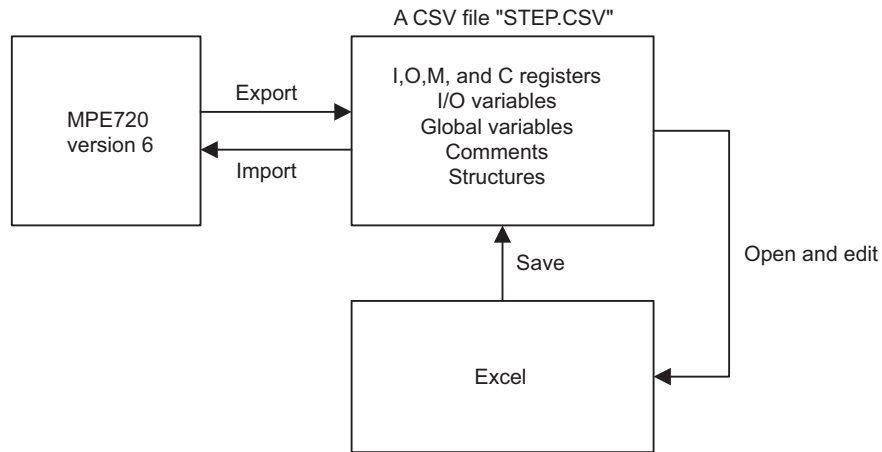
Data after A was imported to B (Data in the Variable Subwindow of the project file)

	A	B	C	D
1	MA00200	PI parameter	Parameter	PI_W
2	MB000000	Test	TESTER	
3	MF00070		Ti	
4	MW00100	RUN speed	Drive	



- If the Comment column for the register of the CSV file that is the import source is blank but a comment exists for the same register at the destination, the comment at the destination will be deleted.
- If the Variable Column of the register in the import source (CSV file) is blank but a variable is set for the same register in the project file of the import destination, the variable in the import destination will not be overwritten and will remain unchanged.

The following diagram illustrates the data export and import operation flow.

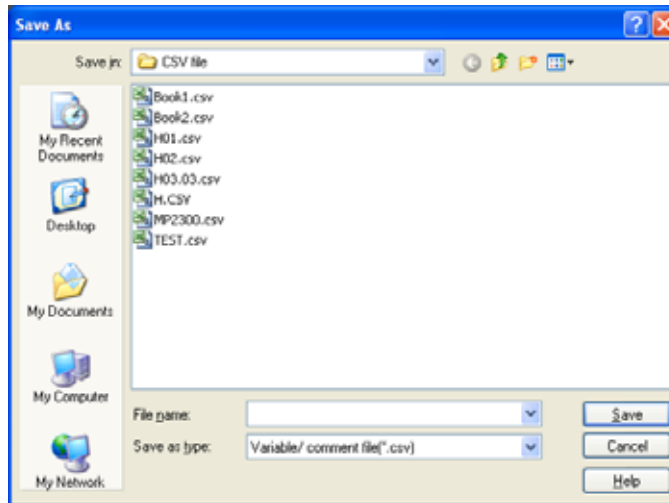


(2) Procedures to Export/Import Data

[a] Export

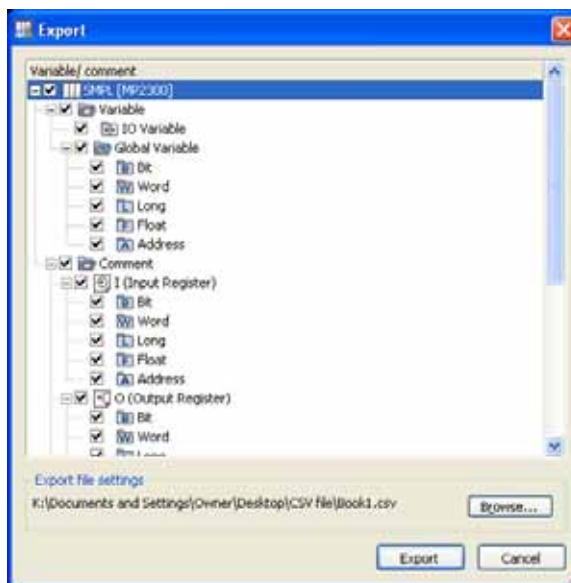
The assigned global variables and comments can be exported to a CSV file by using the following procedure.

1. Select **File - Export - Global variables and comments** from the main menu.
The **Save As** Dialog Box will appear.
2. Select a folder as the export destination, and enter a file name in the **File name** field. Then, click **Save**.



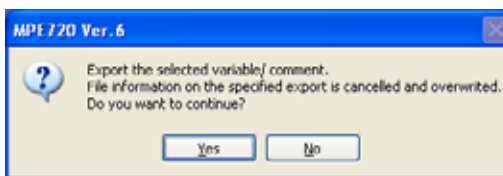
The **Export** Dialog Box will appear.

- All the check boxes of variables and comments in the CSV file specified in step 2 will be selected. Clear the check boxes of the items not to be exported, and then click **Export**.

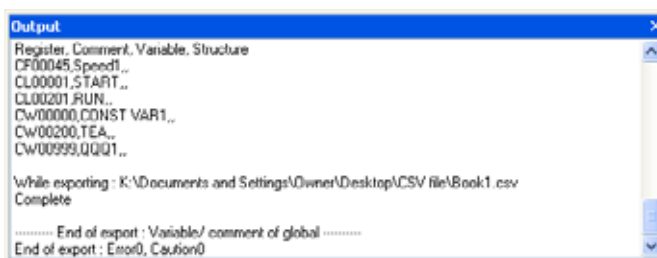


If **Browse** is clicked, the specified export destination (file name) or the **Save As** Dialog Box to create a file as the export destination will be displayed. To create a file, enter a file name and then click **Save** in the **Save As** Dialog Box.

The following message will appear asking for confirmation.



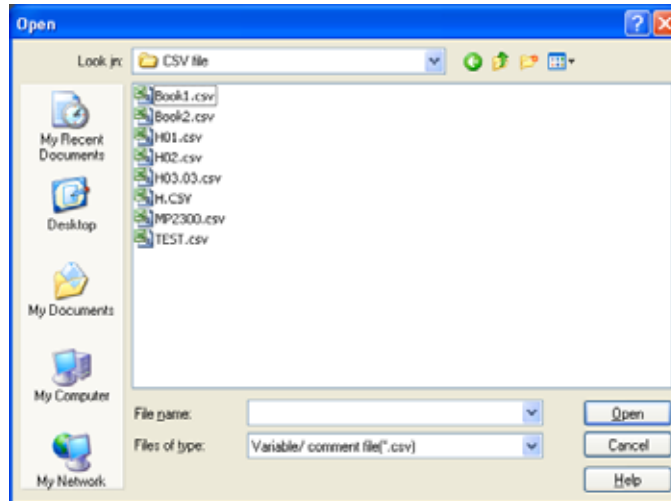
- Click **Yes**. Data export will start, and the results will be displayed in the Output Subwindow.



[b] Import

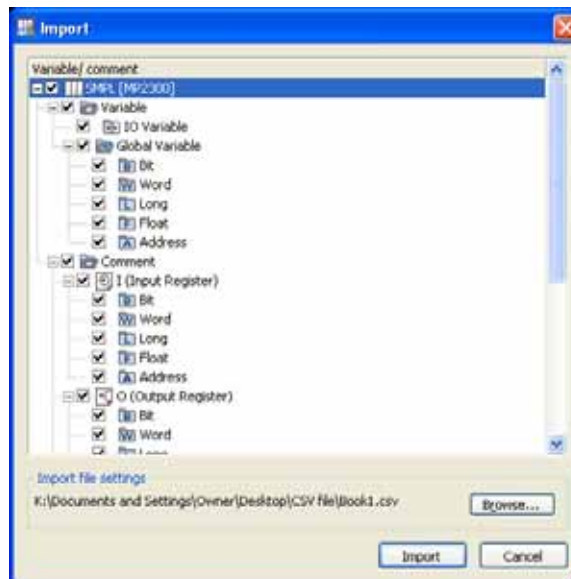
The global variables and comments in the CSV file can be imported to MPE720 version 6 using the following procedure.

1. Select **File - Import - Global variables and comments** from the main menu.
The **Open** Dialog Box will appear.
2. Select a CSV file to be imported, and then click **Open**.

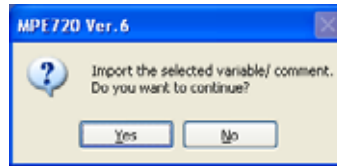


The **Import** Dialog Box will appear.

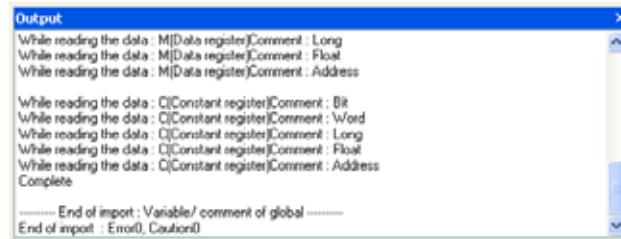
3. All the check boxes of variables and comments in the CSV file specified in step 2 will be selected. Clear the check boxes of the items not to be imported, and then click **Import**.
If you wish to reselect the CSV file to be imported, click **Browse**.



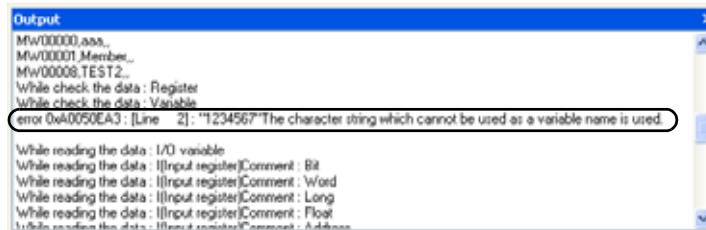
The following message will appear asking for confirmation.



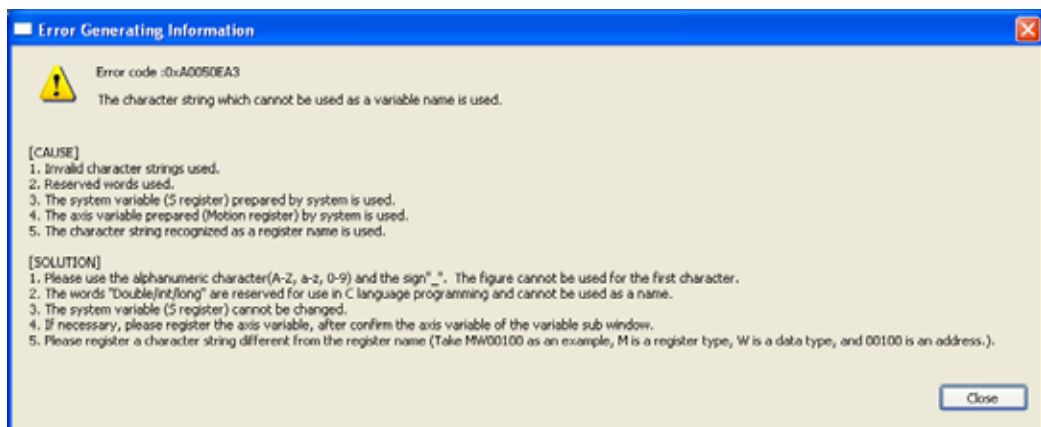
4. Click **Yes**. The selected data will start importing and the results will be displayed in the Output Subwindow.



An error code (0xAxxxxxx) may be displayed in the Output Subwindow as follows.



Select the error code (0xAxxxxxx) and then press the **F1** Key. The **Error Generating Information** Dialog Box will appear.



Check the error causes and take corrective action.

6.3.2 Exporting/Importing Local Variables and Comments

(1) Outline

Internal variables, variables outside functions, and D, #, X, Y, Z, and A register comments can be exported to a CSV file.

CSV files will be saved under the specified folder for each program.

MPE720 version 6 adds .csv to the program number, which is used as the file name. For the names of CSV files for three-level hierarchy programs, the period between levels will be omitted as shown below.

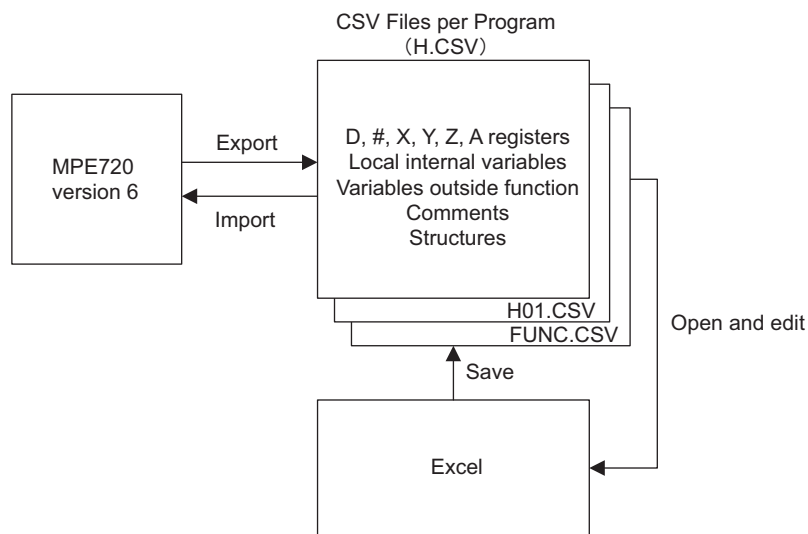
Example: CSV file name for H01: H01.csv

CSV file name for H02.03: H0203.csv

If a CSV file with the same name already exists in the export destination, the data of the CSV file in the export destination will be deleted and overwritten with the new data.

- The procedure to edit or display CSV files when exporting or importing is the same as for exporting or importing global variables and comments. Refer to 6.3.1 (1) *Outline* for details.
- Right-click a folder in the Variable Subwindow and select **Export** or **Import** from the pop-up menu to implement the exporting or importing of data.

The following illustration shows the data export/import operation flow.



(2) Procedures to Export/Import Data

[a] Export

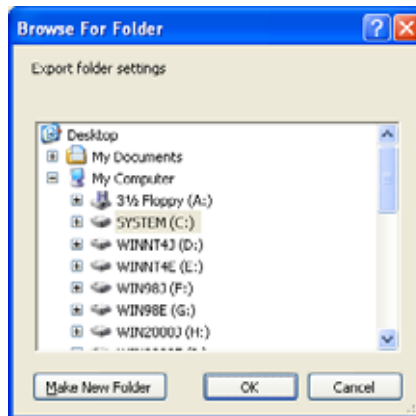
The local variables and comments assigned for each program can be exported to a CSV file by using the following procedure.

1. Select **File - Export - Local variables and comments** from the main menu.

The **Browse For Folder** Dialog Box will appear.

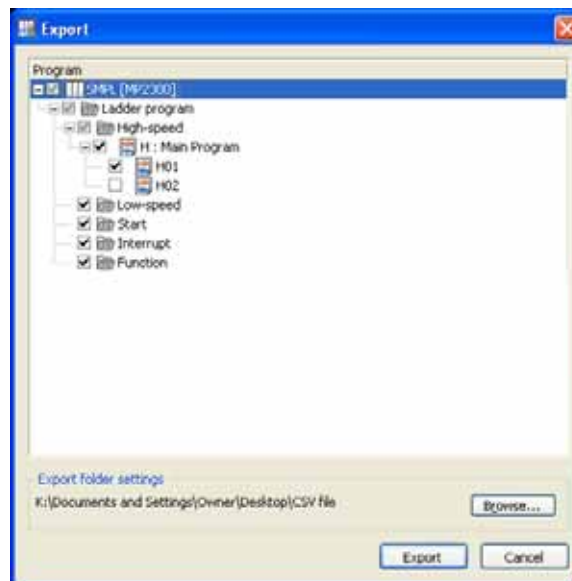
2. Select a folder as the export destination and then click **OK**.

To create a new folder, click **Make New Folder** to enter a folder name.

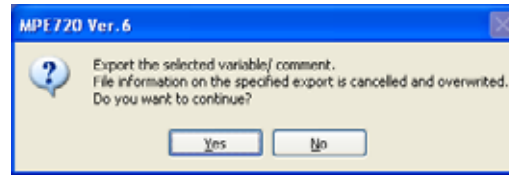


The **Export** Dialog Box will appear.

3. All the check boxes of ladder programs (CSV files) in the folder specified in step 2 will be selected. Clear the check boxes of ladder program data not to be exported, and then click the **Export** Button. If you wish to select a export destination program again, click **Browse**.



The following message will appear asking for confirmation.



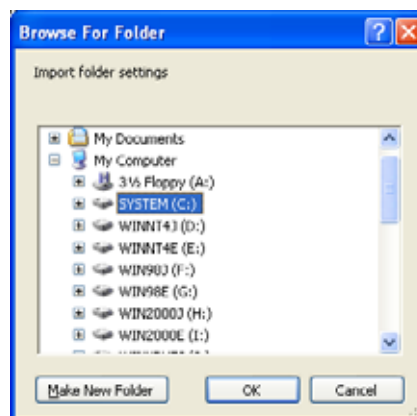
Click **Yes**. Data export will start, and the results will be displayed in the Output Subwindow.



[b] Import

The local variables and comments assigned for each program can be imported from the CSV file to the MPE720 version 6 by using the following procedure.

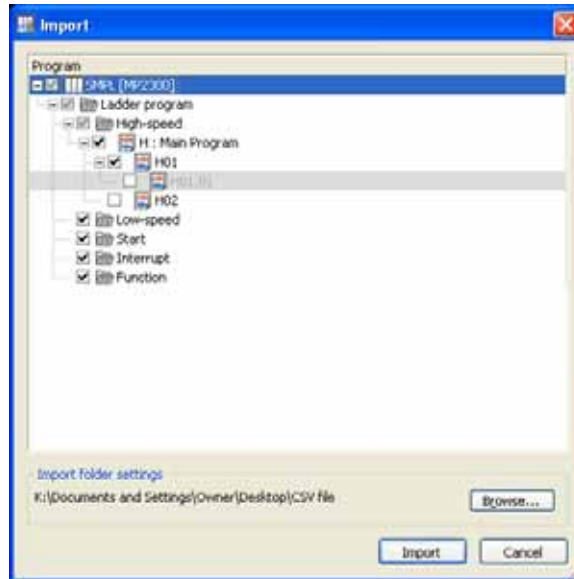
1. Select **File - Import - Local variables and comments** from the main menu.
The **Browse For Folder** Dialog Box will appear.
2. Select the folder in which the data to be imported is saved, and then click **OK**.



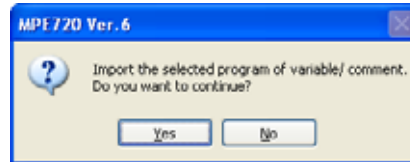
The **Import** Dialog Box will appear.

- All the check boxes of ladder programs (CSV files) in the folder specified in step 2 will be selected. Clear the check boxes of ladder programs not to be imported, and then click **Import**.

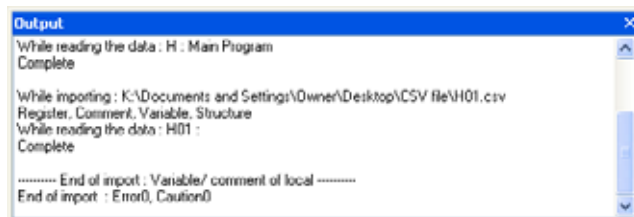
If you wish to change the import source folder, click **Browse**.



The following message will appear asking for confirmation.



- Click **Yes**. The selected files will start importing, and the results will be displayed in the Output Subwindow.



6.3.3 Exporting/Importing Constant Variables

(1) Outline

Constant variables, registers, comments, units, and values in a constant group variable can be exported.

The exported files will be saved in the specified folder for each constant group variable. The data will be exported with the constant group variable name with a CTF file extension.

If a CTF file with the same name already exists at the export destination, the data of CTF file in the export destination will be deleted and overwritten with the new data.

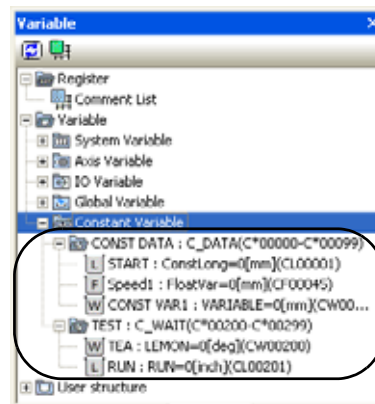
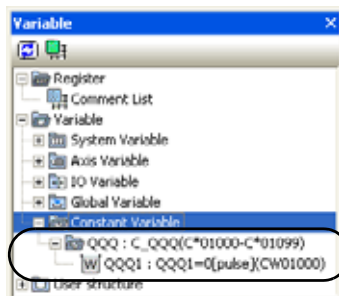
The data in the CTF files can be imported to the MPE720 version 6 as they are.

- CTF files cannot be edited.

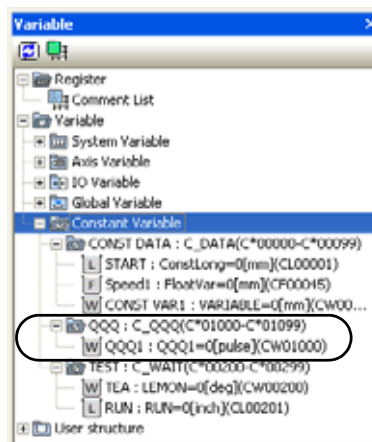
An example of a constant variable folder importing operation is shown below.

A: Constant Variable Import Source Folder

B: Constant Variable of Import Destination Folder

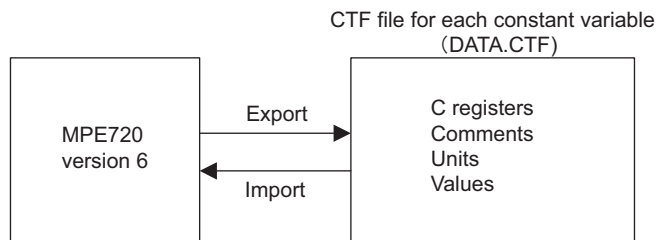


Constant Variable Folder after A is imported to B



- Right-click a folder in the Variable Subwindow and select **Export** or **Import** from the pop-up menu to export or import.

The following diagram outlines the export and import operation flow.

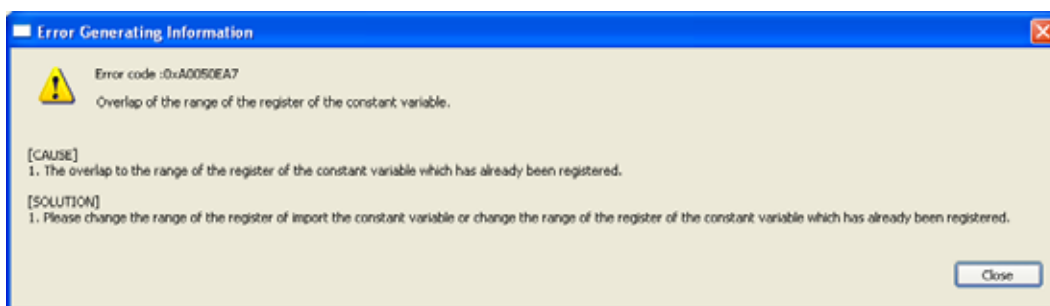


■ When the Register Ranges in Import Source and Destination Overlap

When some registers to be imported overlap with those in the import destination, the following error message will appear. Change the register range either in the import source or in the destination, as overlapping registers cannot be imported.

(Example) Register range specified in the import source: CW00000 to CW00099

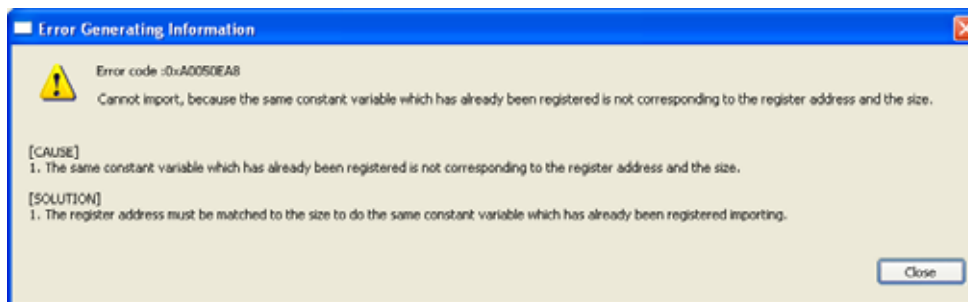
Register range specified in the import destination: CW00098 to CW00197



■ When the Register Ranges in the Import Source and Destination Overlap, and the Same Constant Variables Exist in the Import Destination

When the register range of the constant group variable overlaps with that of the import destination and the same constant variables exist in the import destination, the following error message will appear. Constant variables identical to those in the import destination cannot be imported.

- If the register range is not overlapping with that in the import destination, the error message will not appear, even if the constant variables are the same as those in the import destination.



(2) Procedures to Export/Import Data

[a] Export

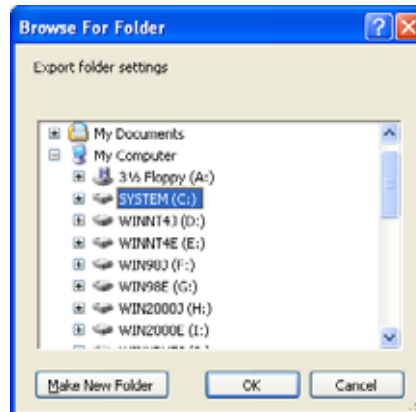
Data of constant variables can be exported group by group to CTF files in the selected folder by using the following procedure.

1. Select **File - Export - Constant variables** from the main menu.

The **Browse For Folder** Dialog Box will appear.

2. Select a folder for export destination, and then click **OK**.

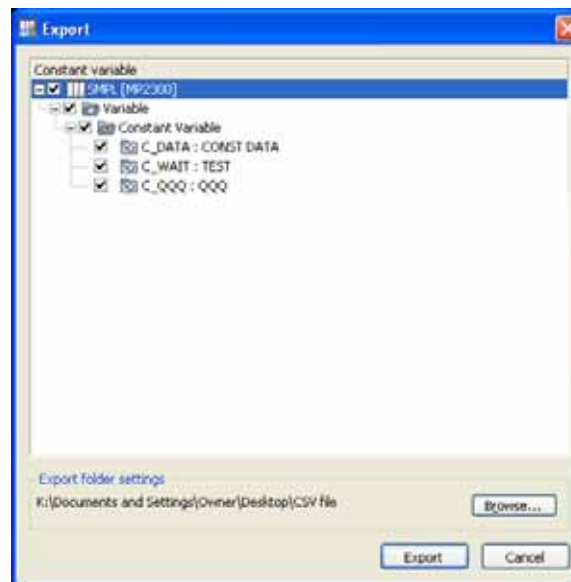
To create a new folder, click **Make New Folder** to enter a folder name.



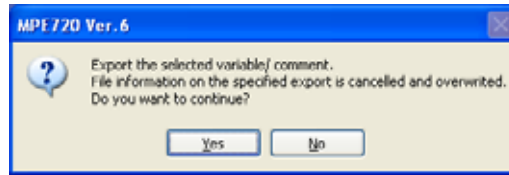
The **Export** Dialog Box will appear.

3. All the check boxes of constant variables (CTF files) in the folder specified in step 2 will be selected. Clear the check boxes of the items not to be exported and then click **Export**.

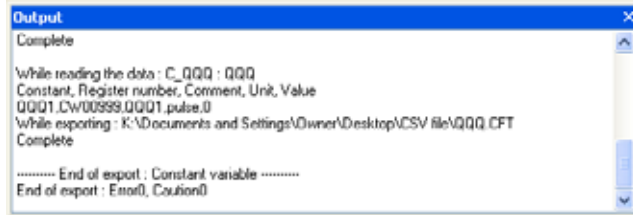
If you wish to change the export destination folder, click **Browse**.



The following message will appear asking for confirmation.



4. Click **Yes**. Data export will start and the results will appear in the Output Subwindow.



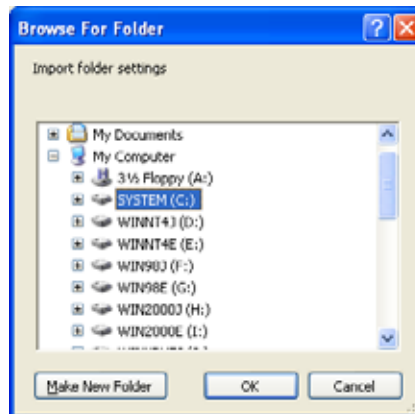
[b] Import

Data of constant variables can be imported group by group to MPE720 version 6 using the following procedure.

1. Select **File - Import - Constant variables** from the main menu.

The **Browse For Folder** Dialog Box will appear.

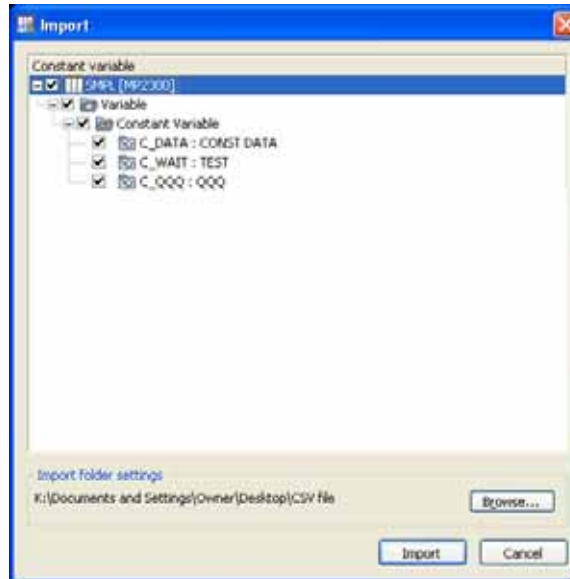
2. Select the folder in which the data to be imported is saved, and then click **OK**.



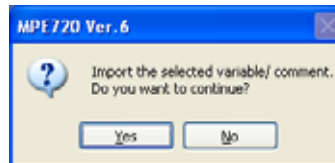
The **Import** Dialog Box will appear.

3. All the check boxes of constant variables (CTF files) in the folder specified in step 2 will be selected. Clear the check boxes of the items not to be imported, and then click **Import**.

If you wish to change the import source folder, click **Browse**.



The following message will appear asking for confirmation.



4. Click **Yes**. The selected files will start importing and the results will appear in the Output Subwindow.



6.3.4 Exporting/Importing User Structures

A user structure that contains data of the structure members can be exported to a YST file from the MPE720 version 6. A desired name can be set for a YST file with a file extension .YST.

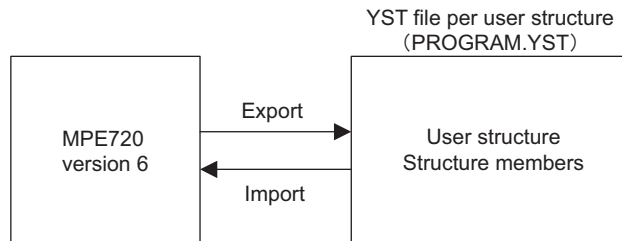
If a YST file with the same name already exists in the export destination, the data of the YST file in the export destination will be deleted and overwritten with the new data.

- YST files cannot be edited.

The exported data in a YST file can be imported to the MPE720 version 6 as is.

The data in the destination file will be overwritten with the data in the imported file.

The following diagram illustrates the export/import operation flow.



(1) Procedures to Export/Import Data

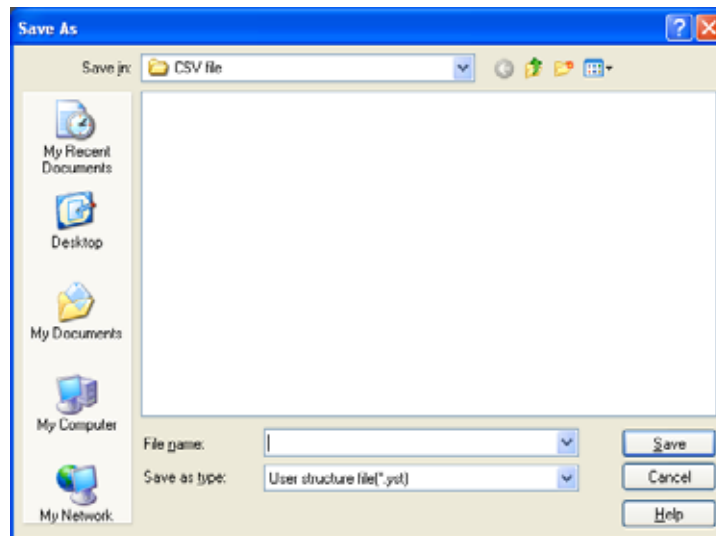
[a] Export

Data of a user structure can be exported to a YST file by using the following procedure.

1. Select **File - Export - User structure** from the main menu.

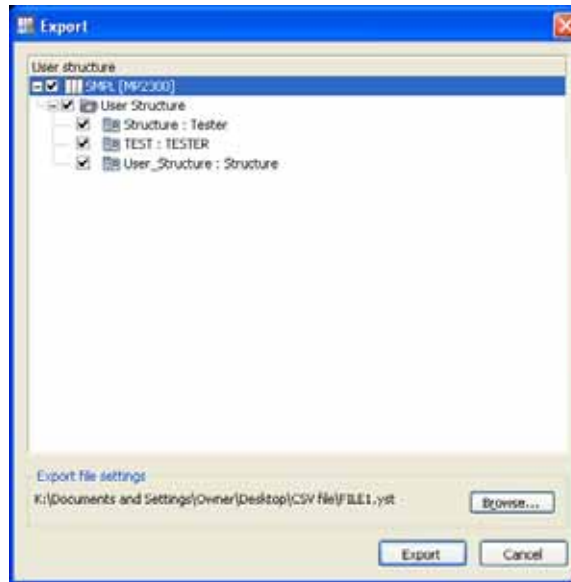
The **Save As** Dialog Box will appear.

2. Select a folder as the export destination and enter a file name in the **File name** Field. Then, click **Save**.



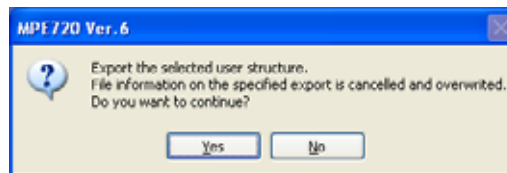
The **Export** Dialog Box will appear.

- All the check boxes of user structures in the YST file specified in step 2 will be selected. Clear the check boxes of user structures that are not to be exported, and then click **Export**.

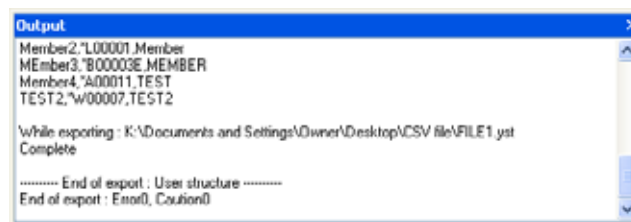


If **Browse** is clicked, the already specified export destination (file name) or the **Save As** Dialog Box to create a file for export destination will appear. To create a new file, enter a file name and click **Save** in the **Save As** Dialog Box.

The following message will appear asking for confirmation.



- Click **Yes**. Data export will start and the results will appear in the Output Subwindow.



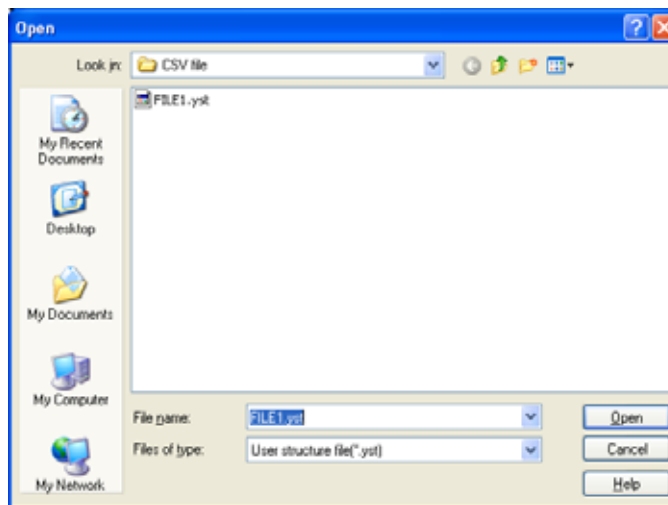
[b] Import

Data of user structures saved in a YST file can be imported to the MPE720 version 6 by using the following procedure.

1. Select **File - Import - User structure** from the main menu.

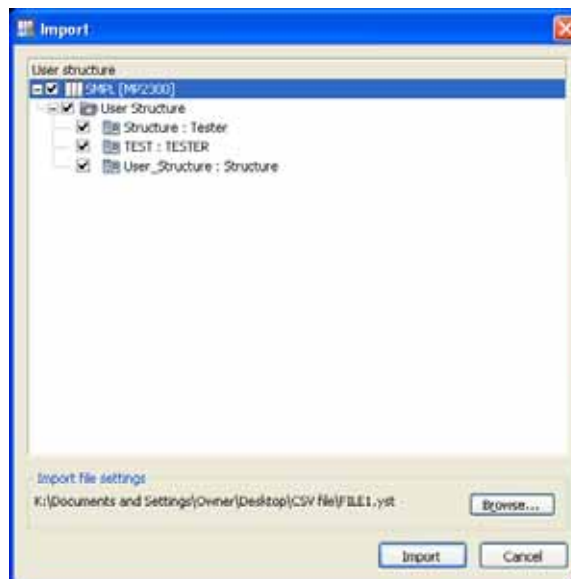
The **Open** Dialog Box will appear.

2. Select a YST file to be imported and then click **Open**.

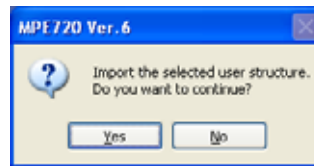


The **Import** Dialog Box will appear.

3. All the check boxes of user structures in the YST file specified in step 2 will be selected. Clear the check boxes of user structures not to be imported, and then click **Import**.



The following message will appear asking for confirmation.



4. Click **Yes**. The selected structures will start importing and the results will appear in the Output Subwindow.



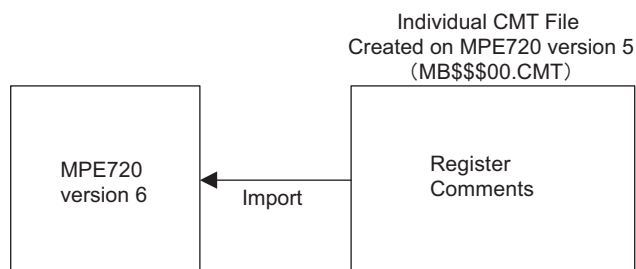
6.3.5 Importing MPE720 Version 5 CMT Files

The registers and comments used in the comment list of MPE720 version 5 can be imported to MPE720 version 6. The data of the file in the import destination will be overwritten with the data of the imported file.

The table below lists the comment files that can be imported.

- CMT files cannot be edited.
- CMT files cannot be exported from MPE720 version 6 to MPE720 version 5.

Comment File	Register	Data Type that Can be Imported
MB\$\$\$00.CMT	M register	BIT type comments
MW\$\$\$00.CMT	M register	WORD, LONG, FLOAT, and ADDRESS type comments
OB\$\$\$00.CMT	O register	BIT type comments
OW\$\$\$00.CMT	O register	WORD, LONG, FLOAT, and ADDRESS type comments
IB\$\$\$00.CMT	I register	BIT type comments
IW\$\$\$00.CMT	I register	WORD, LONG, FLOAT, and ADDRESS type comments
CB\$\$\$00.CMT	C register	BIT type comments
CW\$\$\$00.CMT	C register	WORD, LONG, FLOAT, and ADDRESS type comments
xxxxxxx.CMT	—	Local comments for each program



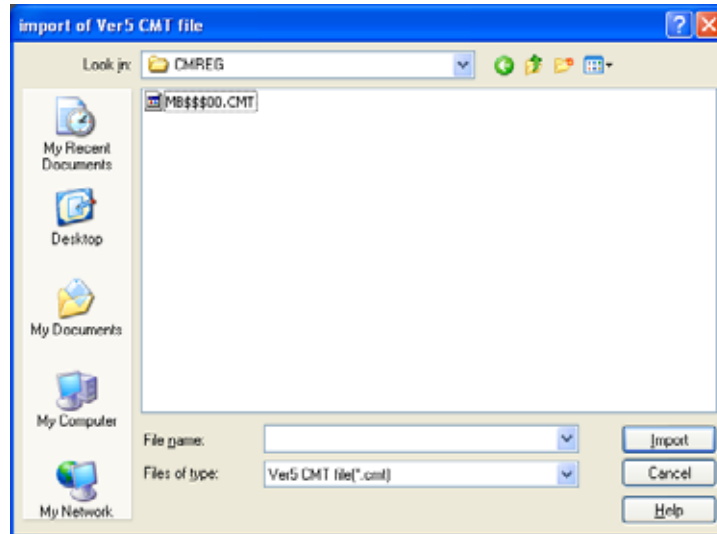
(1) Importing Comment Data Created on MPE720 Version 5

The local comment and register data created on the MPE720 version 5 for each program can be individually imported to the MPE720 version 6 by using the following procedure.

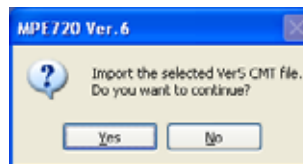
1. Select **File - Import - Ver5 CMT file** from the main menu.

The **import of Ver5 CMT file** Dialog Box will appear.

2. Select a CMT file to be imported, and then click **Import**.



The following message will appear asking for confirmation.



3. Click **Yes**. The CMT file will start importing and the results will appear in the Output Subwindow.



- The data that can be imported is limited to registers and comments. When you wish to use the symbols to which comments are assigned on the MPE720 version 5 for variables on the MPE720 version 6, use the following procedure to import the symbols to the MPE720 version 6.
 1. Select **File - Import - Global variables and comments** from the main menu. Alternatively, select **File - Import - Local variables and comments**. Then, create a CSV file.
 2. Open the CSV file to enter symbols in the variable column.
 3. Import the edited CSV file to the MPE720 version 6.

In this way, the symbols used in the MPE720 version 5 can be used as the variables in the MPE720 version 6.

6.4 Register Data

Register data can be exported to CSV files, and re-imported to MPE720 version 6. The CSV files can be edited in Microsoft Excel.

It is also possible to import the registers of cam data created with the Electronic Cam Data Tool from CDT files. The results of importing and exporting are output to the Output Subwindow.

Importing/exporting register data from/to CSV files: Refer to *6.4.1 Exporting/Importing the Register Data to/from CSV Files*.

Exporting registers of cam data created with the Electronic Cam Data Tool: Refer to *6.4.2 Importing Registers in Cam Data Created with the Electronic Cam Data Tool*.

6.4.1 Exporting/Importing the Register Data to/from CSV Files

(1) Outline of Exporting/Importing

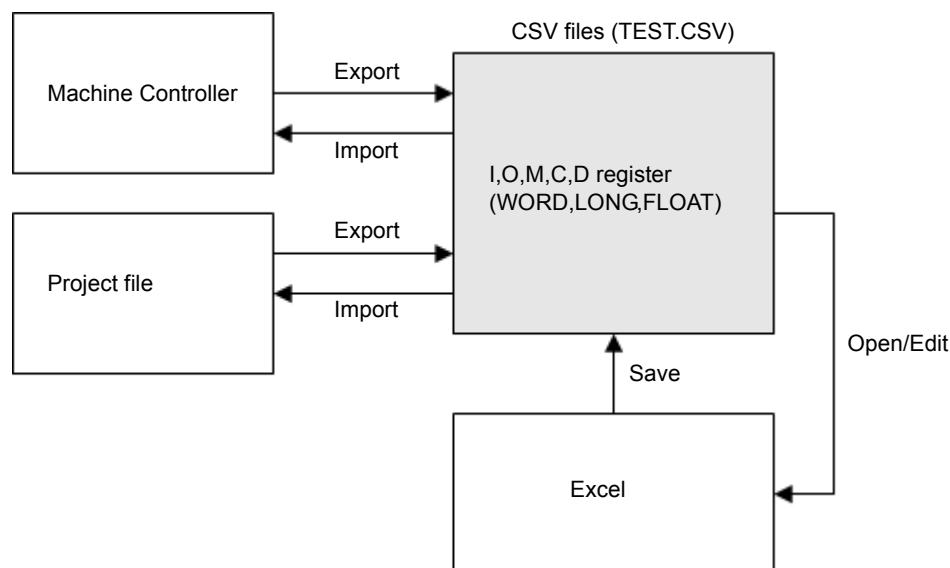
You can export register data to a CSV file, or import register data from a CSV file to MPE720 version 6.

If the exported register data is to be used in another project file or Machine Controller, importing the register data saved in a CSV file makes it possible to use the same data.

The data types that can be imported and exported are the Word, Long and Float data types of I, O, M, C and D registers. You can assign any name you like to a CSV file, and the extension is set as “.CSV.” Because CSV file data can be edited in Excel, you can edit the data as required before importing.

The results of importing and exporting are output to the Output Subwindow.

A schematic diagram for export/import data is shown below.



The following is an explanation of how to edit CSV files.

When a CSV file is opened, the data of each of the registers is shown in one column as shown by the rectangle in the figure below.

	A	B	C	
1	MW00000* ¹	*1	...	← Start register
2		H* ²		← Program name (local registers only)
3	30	98		
4	2	3		
5	86	706		← Register data
6	987	8641		Enter the correct data.
7	19873	0		

- * 1. Enter the correct register.
 - * 2. Enter this if a local register has been entered as the start register.
- You can import edited CSV files into MPE720 version 6.

■ Cautions on editing and importing CSV files

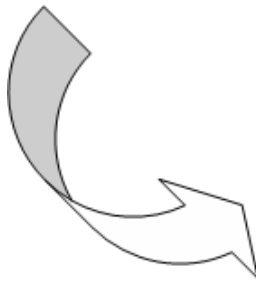
If the register data in a CSV file is illegal, the data from that illegal data onward will not be imported. Be sure to enter correct register data.

- Illegal data means blanks, non-data characters, and data that exceeds the register ranges.

Example: When the register data (third from top) of the start register IL0025 is set as a blank:

	A	B	C	D
1	MW00000	DF00010	IL0025	ML10
2		H		
3	100	25	14	10
4	101	67	97	11
5	102	36		12
6	103	1	564	13
7	104	68	235	14
8	105	8	23	15
9	106	18	11	16
10	107	17	223	17

One register data item is left blank.
Or illegal data is entered.



Register data import

Please select the imported register data.

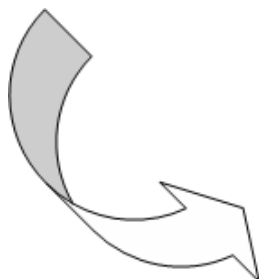
	A	B	C	D
Start register	<input checked="" type="checkbox"/> MW00000	<input checked="" type="checkbox"/> DF00010	<input checked="" type="checkbox"/> IL0025	<input checked="" type="checkbox"/> ML00010
Program name	H			
1	100	2.500000E+001	14	10
2	101	6.700000E+001	97	11
3	102	3.600000E+001		12
4	103	1.000000E+000		13
5	104	6.800000E+001		14
6	105	8.000000E+000		15
7	106	1.800000E+001		16
8	107	1.700000E+001		17

The third and subsequent register data of start register IL0025 are grayed out and cannot be imported.

Example: When all of the first line of the register data of the columns where the start register has been entered have been left blank:

	A	B	C	D
1	MW00100	DF00010	IL0025	ML10
2		H		
3				
4	101	67	97	11
5	102	36	67	12
6	103	1	98	13
7	104	68	564	14
8	105	8	235	15
9	106	18	23	16
10	107	17	11	17

All of the first line of register data is left blank.
Or illegal data has been entered.



Register data import

Please select the imported register data.

	A	B	C	D
Start register	<input checked="" type="checkbox"/> MW00100	<input checked="" type="checkbox"/> DF00010	<input checked="" type="checkbox"/> IL0025	<input checked="" type="checkbox"/> ML00010
Program name	H			
1	101	6.700000E+001	97	11
2	102	3.600000E+001	67	12
3	103	1.000000E+000	98	13
4	104	6.800000E+001	564	14
5	105	8.000000E+000	235	15
6	106	1.800000E+001	23	16
7	107	1.700000E+001	11	17

Import Cancel

When all of the first line of the register data is illegal, it is not recognized as register data and the data of the second and subsequent lines is shifted upward and displayed.

(2) Exporting/Importing Procedure

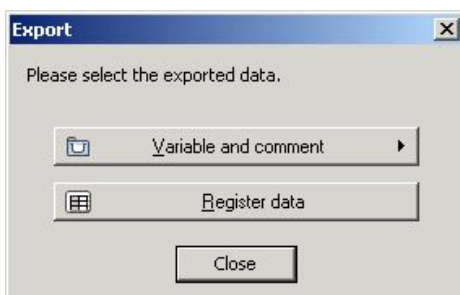
[a] Exporting

Register data that has been set in the Register List or Watch Tab Pages can be exported to a CSV file. The procedure for this is as follows.

1. Select **Program - Export** from the Main Menu.

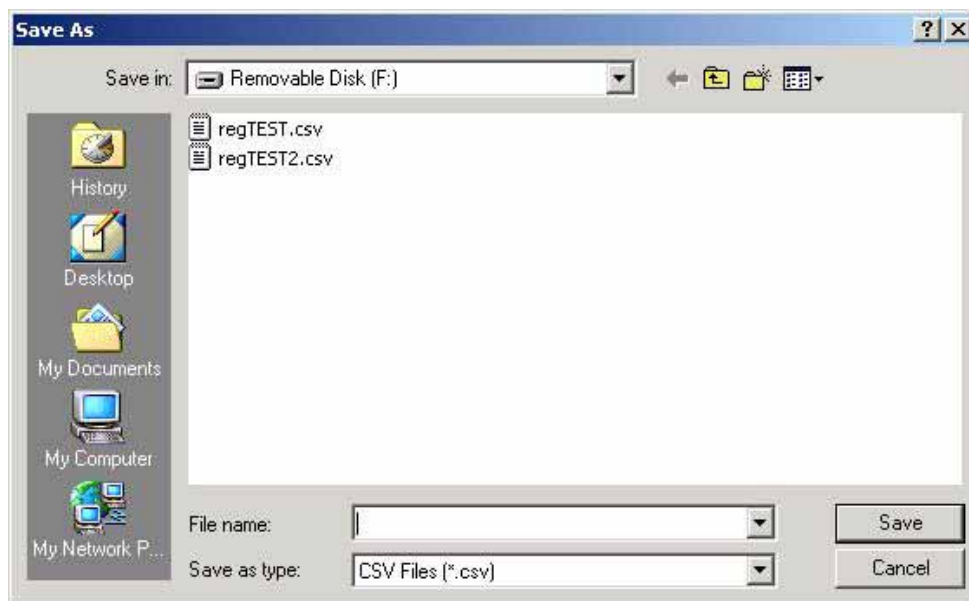
The **Export** Dialog Box will be displayed.

2. Click the **Register data** Button.



The **Save As** Dialog Box will be displayed.

3. Select the export destination folder and enter the file name, then click the **Save** Button.



The **Register data export** Dialog Box will be displayed.

- Enter the register data to be exported (**Start register**, **Program name**, **Number**), then click the **Export** Button.

	A	B	C	D	E	F
Start register						
Program name						
End register						
Number						

Start register: Enter the register from which the register data to be exported is to start.

Program name: When dealing with local registers, enter the program name of the program being used.

* If an entry is made here although dealing with registers other than local registers, an error message is displayed on executing export.

Number: Enter the number of data to be exported, counting from the start register.

Example: When exporting the data from MW00010 to MW00017, the setting to be made for **Number** is 18.

- Export of the register data starts, and the result is displayed in the Output Subwindow.

```

----- Register data Export start -----
export file : F:\reg3.csv
Register : MW00000 (20) Reading...
Register : MW00000 (20) Read completed
Register : MW09871 (1000) Reading...
Register : MW09871 (1000) Read completed
Register : OL6445 (32) Reading...
Register : OL6445 (32) Read completed
Creating export file...
Register data export completed.

```

[b] Importing

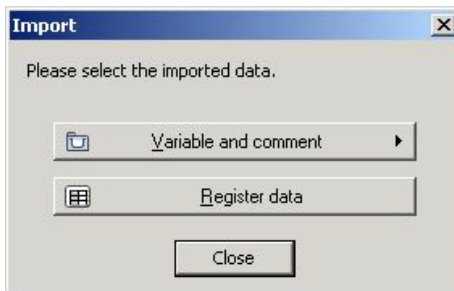
Register data saved in a CSV file can be imported to MPE720 version 6.

The procedure for this is as follows.

1. Select **File - Import** from the Main Menu. Alternatively, right-click the Register List Subwindow or Watch Subwindow and select **Import** from the pop-up menu that will be displayed.

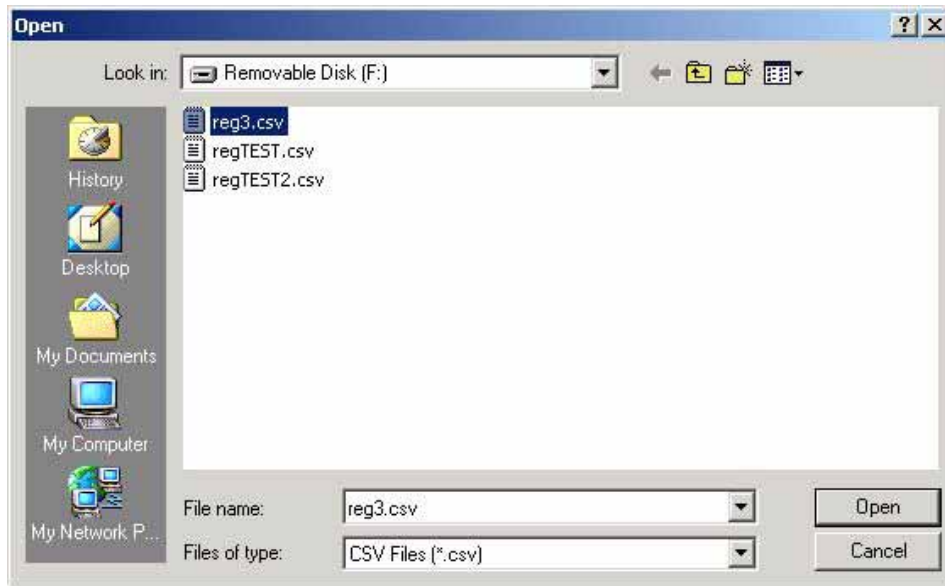
The **Import** Dialog Box will be displayed.

2. Click the **Register data** Button.



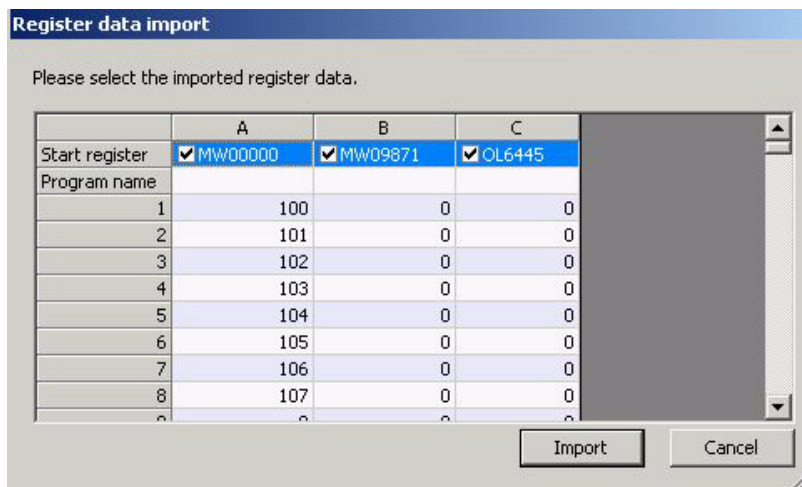
The **Open** Dialog Box will be displayed.

3. Select the CSV file from which to import data, and click the **Open** Button.



The **Register data import** Dialog Box will be displayed.

- The check boxes of all of the start registers in the CSV file selected in step 3 are checked. Uncheck the check boxes of the start registers that do not need to be imported, then click the **Import** Button.



Start register: The start registers of each of the register data in the CSV file are shown here.

Program name: If the start register is a local register, the program name is shown here.

- Import of the register data starts, and the result is displayed in the Output Subwindow.

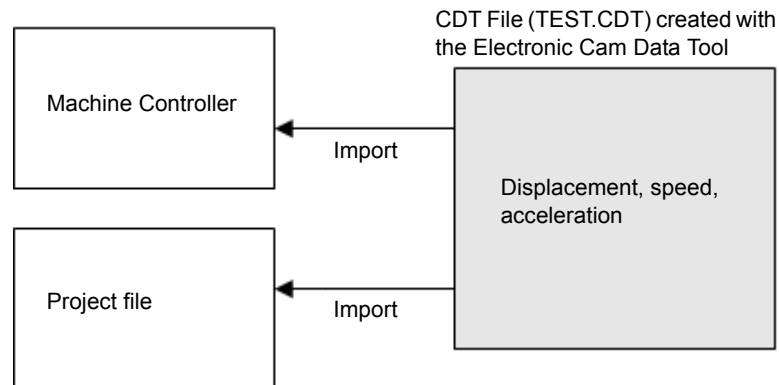
6.4.2 Importing Registers in Cam Data Created with the Electronic Cam Data Tool

Using MPE720 version 6, the registers in cam data created with the Electronic Cam Data Tool (CDT file) can be imported to a project file.

In addition, cam data can be transferred from a project file to the Machine Controller by using *Write to machine controller* in the *Transfer* menu.

The data to be imported can be selected based on the kinds of cam data (displacement, speed, acceleration).

A schematic diagram for importing data is shown below.

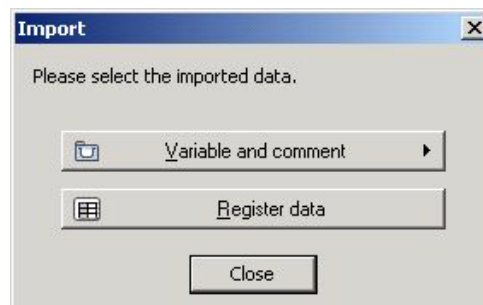


The procedure for importing cam data created with the Electronic Cam Data Tool to MPE720 version 6 is as follows.

1. Select **File - Import** from the Main Menu.

The **Import** Dialog Box will be displayed.

2. Click the **Register data** Button.



The **Open** Dialog Box will be displayed.

3. Select electronic cam file (*.cdt) as the file type. Select the CDT file to be imported and click the **Open** Button.

The **Cam data import** Dialog Box will be displayed.

4. The check boxes of all of the data kinds in the CDT file selected in step 3 are checked. Uncheck the check boxes of data types that are not to be imported.

5. Enter the start register of the register data to be imported for each data kind, then click the **Import** Button.

Cam data import

Please select the importing cam data and input the register.

	A	B	C
Data kind	<input checked="" type="checkbox"/> Displacement	<input checked="" type="checkbox"/> Speed	<input checked="" type="checkbox"/> Acceleration
Start register	MW00000	MW00100	ML01000
Program name			
End register	MW00074	MW00174	ML01148
Number	75	75	75

Data kind: Uncheck the check boxes of data other than that you want to import (*Displacement, Speed, Acceleration*).

Start register: Enter the start register of the registers you want to import.

Program name: If the entered start register is a local register, enter the program name here.

6. Import of the register data starts, and the result is displayed in the Output Subwindow.

Electronic Cam Data Preparation Tool

This chapter describes how to start the Electronic Cam Data Preparation Tool.

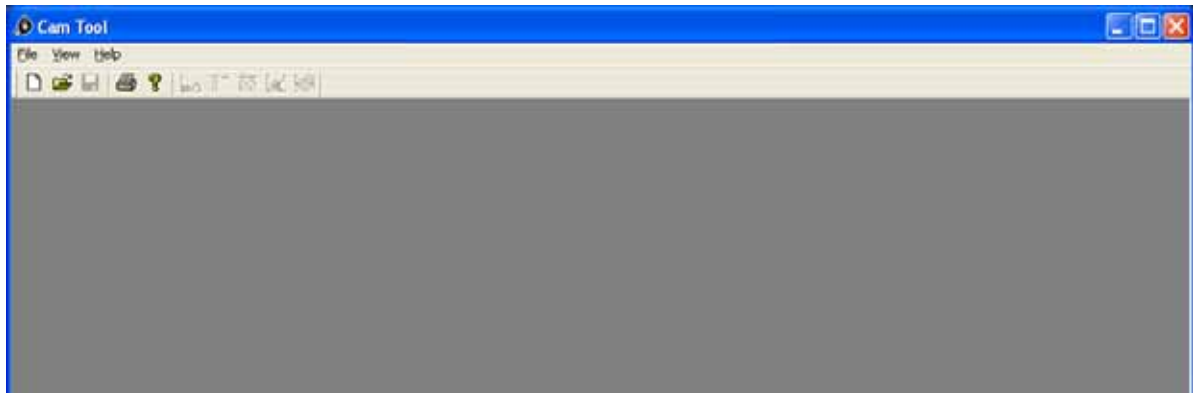
7.1 Overview of Electronic Cam Data	7-2
7.2 Starting and Operating the Electronic Cam Data Tool	7-2

7.1 Overview of Electronic Cam Data

The Electronic Cam Data Tool is a simulation and conversion tool that reads CSV-format files, tracks transition points, and converts the files to cam data files (.cdt). The converted data can then be transferred from the Cam Data Tool to the Controller.

7.2 Starting and Operating the Electronic Cam Data Tool

The Cam Tool Window is opened by selecting *Utility - Electronic Cam Tool* in the Launcher.



For details on operating the Electronic Cam Data Tool, refer to the *Machine Controller MP900/MP2000 Series Electronic Cam Data Preparation Tool Operation Manual (SIEP C880700 18)*.



Data Table Programs

This chapter describes how to start data table programs.

8.1 Overview of Data Table Programs	-----8-2
8.2 Starting and Using Data Table Programs	-----8-2

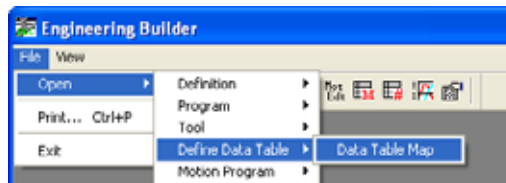
8.1 Overview of Data Table Programs

In data table programs, data used in the main ladder program can be prepared in table format.

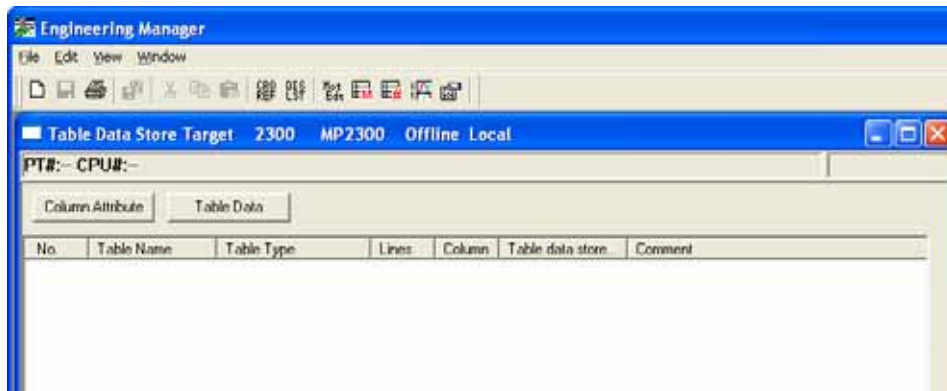
8.2 Starting and Using Data Table Programs

Use the following procedure to start the **Data Table Program** Window.

1. Select **Utility - Engineering builder** in the Launcher.
The Engineering Manager will be started.
2. Select **File - Open - Define Data Table - Data Table Map** from the Main Menu.



The **Table Data Store Target** Window will be displayed.



For details on preparing data tables, refer to *Chapter 11 Data Table Folders in the Machine Controller MP900/MP2000 Series MPE720 Software for Programming Device User's Manual (SIEP C880700 05)*.

Printing

This chapter describes how to print out ladder programs and other programs.

9.1 Printing Ladder Programs	9-2
9.1.1 Page Setup	9-2
9.1.2 Print Previews	9-3
9.1.3 Printing	9-5
9.1.4 Printing Cross-Reference Information	9-8
9.1.5 Printing Call Program Instructions (FUNC/SEE/MSEE)	9-9
9.2 Printing Other Programs	9-11

9.1 Printing Ladder Programs

A ladder program can be printed page by page. MPE720 version 6 contains various printing functions, such as print preview display, page setting, cross-reference information printing, closed scope printing, and circuit printing in reduced-size.

Current values displayed while online can not be displayed in print preview or printed.

- Refer to *9.2 Printing Other Programs* for information on printing CP ladder programs.

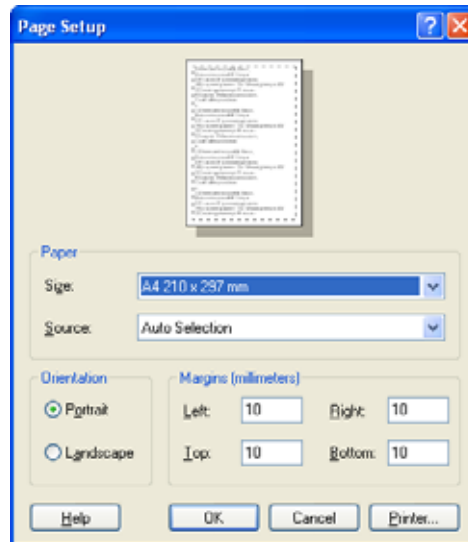


- With project link connection and direct connection to a Machine Controller, the project file will appear on screen. However, the ladder program saved in the Machine Controller RAM will be printed out.
 - Refer to *1.10.1 Connecting to Machine Controllers* for details on project link connection and direct connection.
-

9.1.1 Page Setup

Use the following procedure to display the **Page Setup** Dialog Box and make the page settings.

1. Open the program to be printed in the main window, and display it in the foreground of the window.
2. Select **File - Page Setup** from the Main Menu.
The **Page Setup** Dialog Box will appear.
3. Set each item, and then click **OK**.



9.1.2 Print Previews

(1) Displaying Print Previews

The following procedure can be used to display a print preview.

1. Open the ladder program for which the print preview is to be displayed in the main window, and display the program in the foreground of the window.
2. Select **File - Print Preview** from the Main Menu.

A print preview will be displayed for the selected ladder program.

(2) Print Preview Window Operations

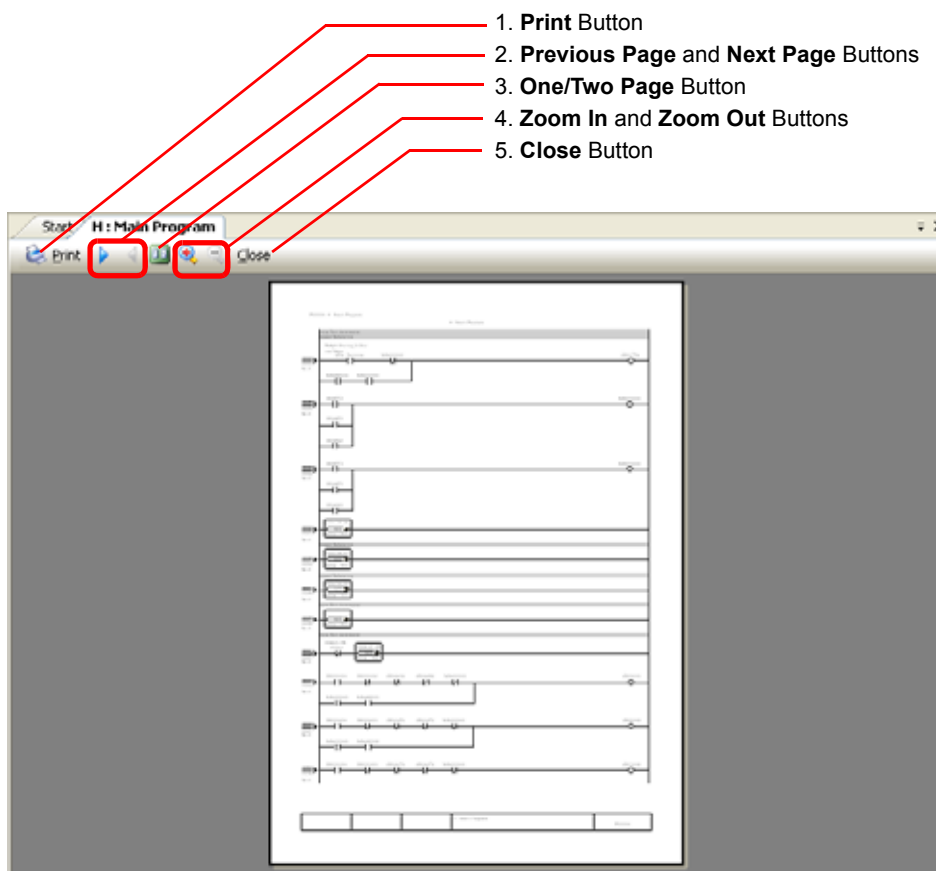


Fig. 9.1 One-page Display

The button operations are described below.

1. **Print Button**

The **Print** Dialog Box is displayed by clicking the **Print** Button. Pages can then be specified to be printed.

2. **Previous Page and Next Page Buttons**

When there are multiple pages in the print preview, these buttons can be used to change the page displayed.

3. One/Two Page Button

The **One/Two Page** Button changes the number of pages displayed in the main window. Displays of pages toggles between one and two pages by clicking this button.

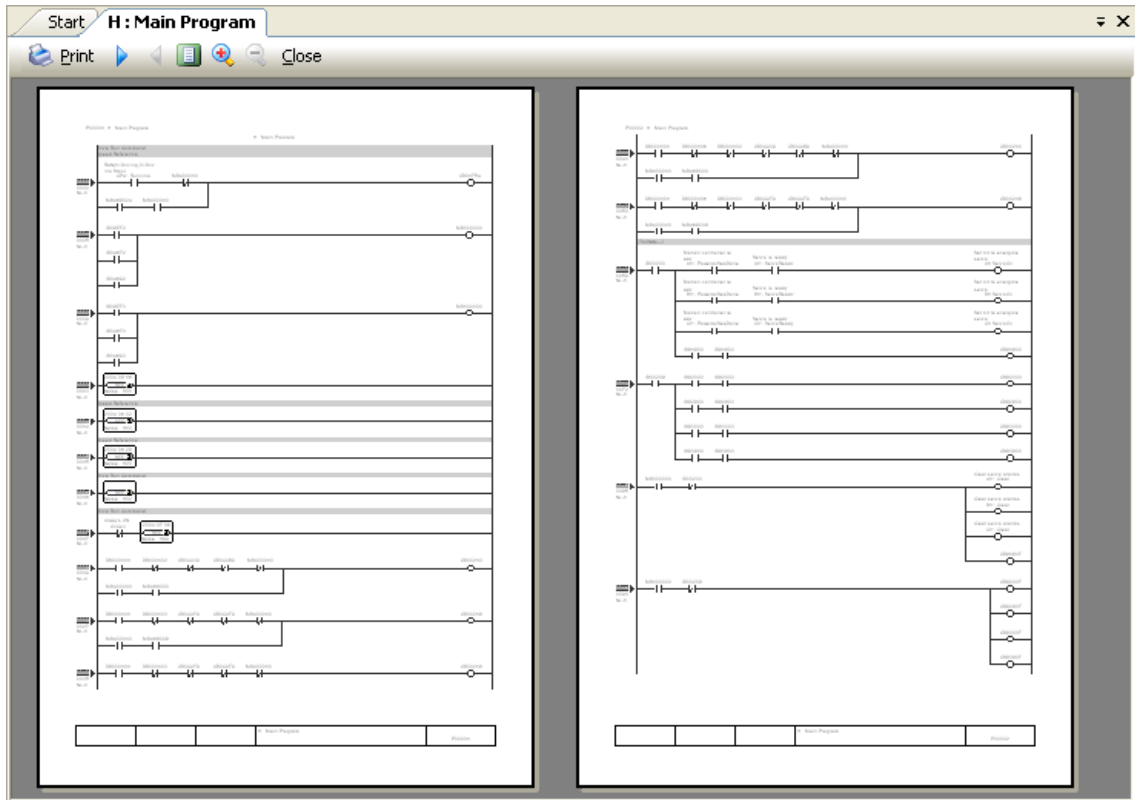


Fig. 9.2 Two-page Display

4. Zoom In and Zoom Out Buttons

These buttons toggle the display magnification between two levels.

5. Close Button

The **Print Preview** Window will be closed by clicking the **Close** Button.

- The display can be changed by clicking the tabs just as in other main windows until the **Print Preview** Window.

9.1.3 Printing

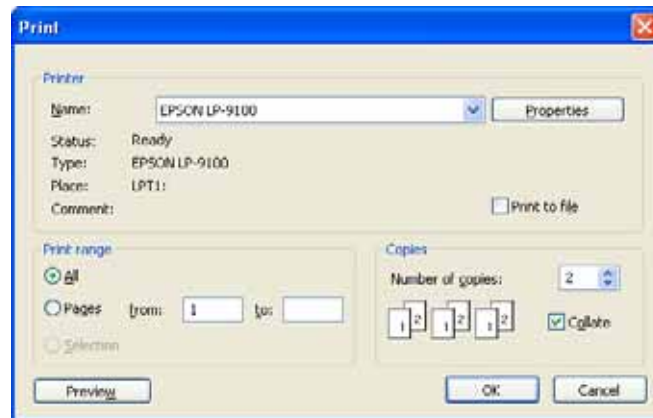
(1) Printing Each Ladder Program

The following two ways can be used to print the ladder program.

[a] Printing from Main Menu

The specified range of the Ladder Program that is displayed in the foreground in the main window can be printed from the main menu.

1. Open the program to be printed in the main window, and display it in the foreground of the window.
2. Select **File - Print** from the Main Menu.
The **Print** Dialog Box will be displayed.
3. Set each item, and then click the **OK** Button. The program will then be printed.



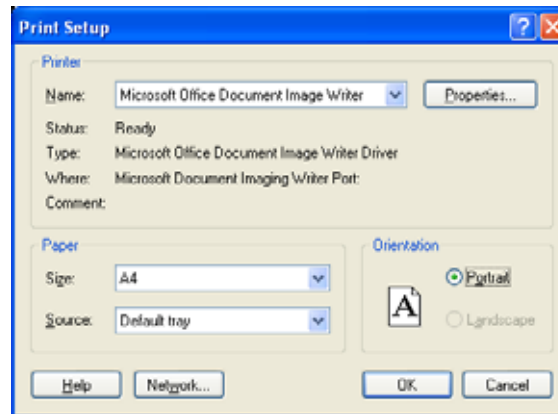
[b] Printing from Ladder Subwindow

Program printing can be directly implemented from the Ladder Subwindow.

When there is no hierarchy of elements under the selected ladder program or no hierarchy of elements is displayed, the **Print Setup** Dialog Box shown below will appear.

When there is a hierarchy of elements under the selected program, refer to *9.1.3 (2) Printing Programs as a Batch*.

1. Right-click the ladder program to be printed and select **Print** from the pop-up menu.
The **Print Setup** Dialog Box will appear.
2. Set each item, and then click **OK**. The selected ladder program will be printed.



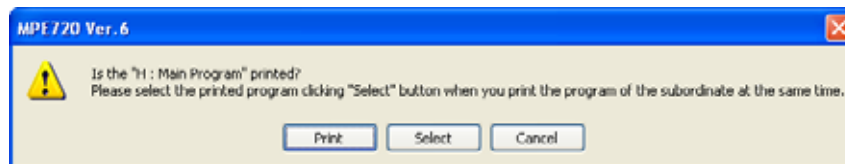
- Refer to *3.4.1 Changing Ladder Subwindow Displays* for display of hierarchy structure.

(2) Printing Programs as a Batch

Programs in a program folder (High-speed, Low-speed, Start, Interrupt, and Function) or a program containing lower hierarchical level programs can be selected for batch printing.

1. Select a program folder **High-speed**, **Low-speed**, **Start**, **Interrupt**, or **Function**, or select a program that contains programs of lower hierarchical levels from the Ladder Subwindow. Then, right-click the selected folder or program, and select **Print** from the pop-up menu.

When the selected program contains programs of lower hierarchical levels, the following message will appear.



- When a program folder is selected, the above message will not appear. Proceed to step 3.

2. Click one of three buttons:

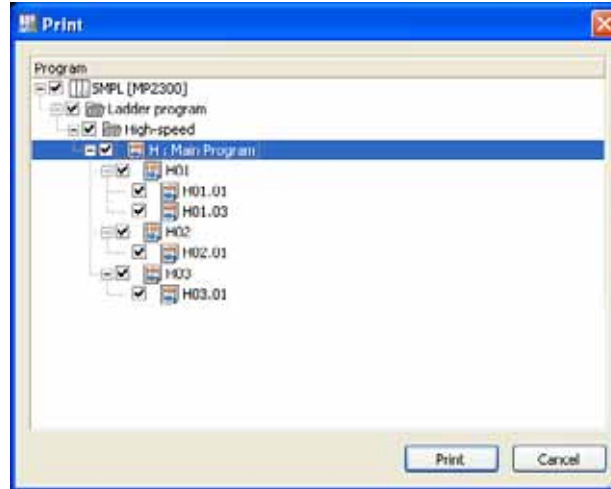
Print: Click this button to print only the selected program. The rest of the operation is the same as described in [b] Executing Print from Ladder Subwindow of *9.1.3 (1) Printing Each Ladder Program*

Select: Click this button to print the selected program together with the lower hierarchical level programs.

Cancel: Click this button to cancel printing.

When the **Select** Button is clicked, the **Print** Dialog Box will appear.

3. All the check boxes of the programs under the selected program folder will be selected.
Clear the check boxes of programs not to be printed.
 - When some check boxes are deselected in step 3, some check boxes of project files, ladder program folders, and High-speed, Low-speed, Start, Interrupt, and Function Drawing Folders may be shaded. This is because some of the check boxes of the files contained in the folder are selected or not selected.



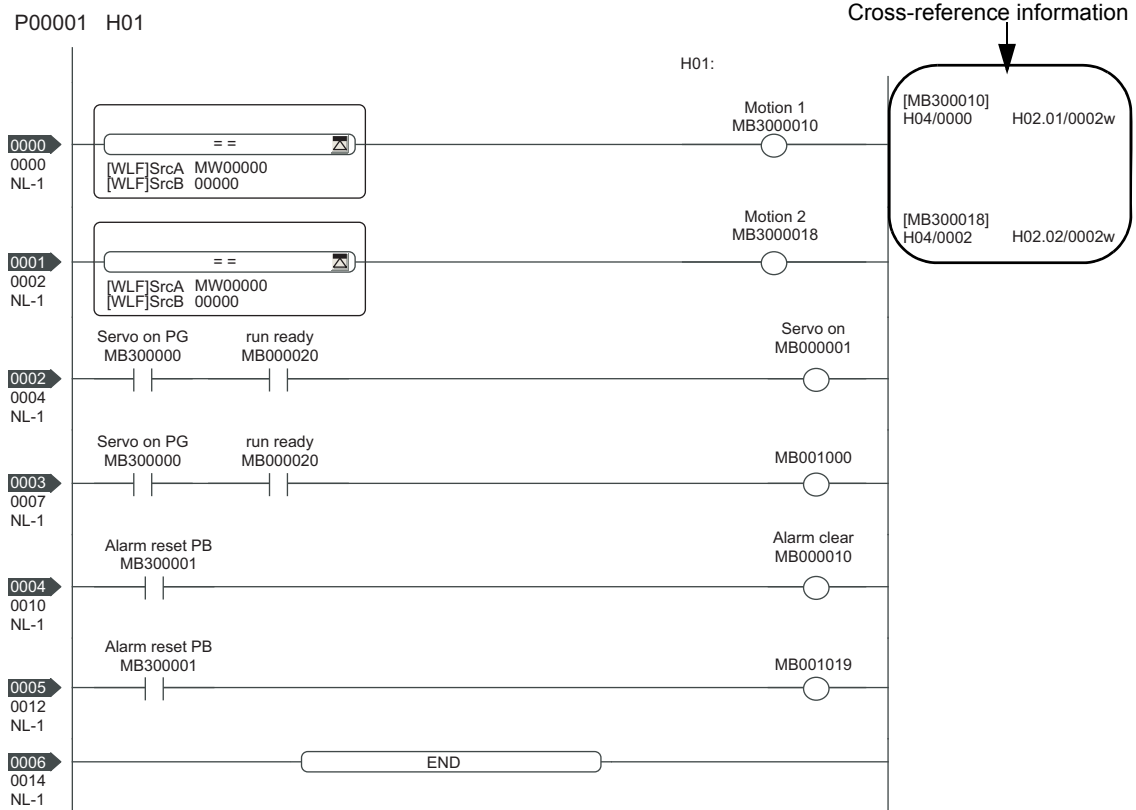
4. Click **Print**.
The **Print Setup** Dialog Box will appear.
5. Select each item and then click **OK**. All selected programs will be printed out as a batch.

9.1.4 Printing Cross-Reference Information

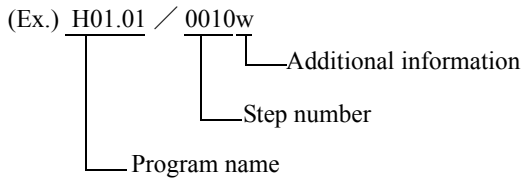
Cross-reference information is the information on the output registers (variables) used for coils and cross-referenced to another program. The cross-reference information will be printed on the right side of ladder program. The cross-reference information includes the program name and step number (execution step number) to which the output register is cross-referenced. The registers whose cross-reference information can be printed are M, I, O, D, Y, Z, and A registers. Cross-reference information can be printed only when the project file is open offline.

- Refer to 1.9.18 *Print: Ladder* for print setting.
- Refer to 3.5.4 *Cross Reference Searching* for cross reference.

The following illustration shows an example of printed program with cross-reference information.



Cross-reference information is given with Program name/Step number + Additional information in the same way as CP ladder programs.

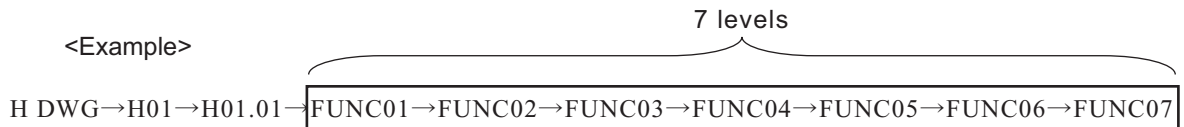


Display Items	Description	Display Example
Program Name	Only program numbers but not comments. In order from High-speed → Low-speed → Start → Interrupt → Function In order from First hierarchical level → Second hierarchical level → Third hierarchical level	H H01.01 FUNC01
Step Number	Step numbers are given with 4 digits in ascending order. For CP ladder programs, step numbers are given with 3 digits.	0001 1000
Additional Information	Subscript “i” or “j”	H01/0010i H01/0010j
	When being used as an output register, “w” is added. For CP ladder programs the indications are as follows. \$: Coil commands and store commands & : Transfer commands such as MOVW, XCHG, ROTL and ROTR @ : Pulse and count register commands	H01/0010w H01/0010@

9.1.5 Printing Call Program Instructions (FUNC/SEE/MSEE)

The programs that are called by the FUNC instructions, SEE instructions, and MSEE instructions can be displayed as a tree diagram and printed out.

The hierarchy of levels of call instructions for function programs consists of a maximum of seven levels. For motion programs, there is no limitation of levels.



- Call Instruction refers to the instruction to call and refer an instruction object in another program, such as FUNC, MSEE, and SEE.

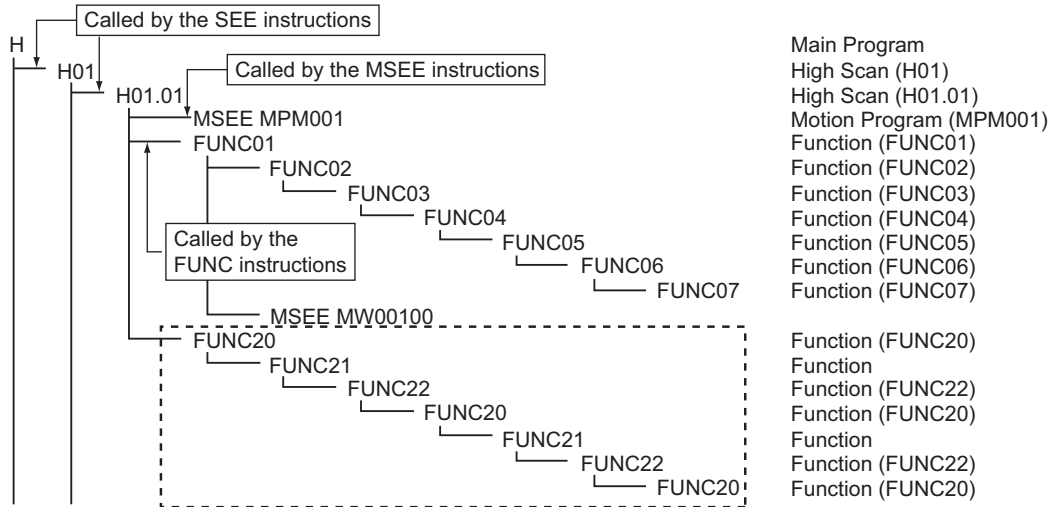
Use the following procedure to print out the program call instructions.

1. Select **Utility - Print Manager** from the Launcher and select the **Program** Tab in the **Print Manager** Window. Click **Details** on the DWG List in the **Program** Tab.
The **Print Object Setting** Dialog Box will appear.
2. Select the **Drawing Tree** check box, and then click **OK**.
3. Select **File - Execute print** from the Main Menu.
The **Execute print** Dialog Box will be displayed.
4. Check the **Program** check box and click the **Execute** Button.
The **Printers** Dialog Box will be displayed.
5. Make the necessary settings and then click the **OK** Button.
Call instruction printing completes.

■ Printing FUNC Instructions

The following illustration shows the FUNC instructions that are displayed in a tree diagram when printed.

PDATA1-962401 P00015 Drawing Tree (High Scan Drawings)



■ Printing SEE instructions

By entering the name of a second-level program in the SEE instruction of a first-level program, a program from the second level can now be displayed at the topmost level. In the same way, a third-level program can be displayed at the second level by entering the program name in SEE instruction for a second-level program.

■ Printing MSEE Instructions

MSEE instructions are displayed together with the variables set in the main program. The display of variables differ depending on whether constants or registers are assigned.

	Constant	Register
Display	MPM is added to a value. Example: --- MSEE MPM001	Register, as is Example: --- MSEE DW00001

9.2 Printing Other Programs

CP ladder programs, registers, definitions (system definition, scan time definition, module configuration, data trace), and motion programs can be printed.

There are two printing methods.

- ❗ • With project link connection, the data saved in the Machine Controller RAM will be printed for CP ladder programs, and the data saved in a project file will be printed for registers, definitions (system definition, scan time definition, module configuration, data trace), and motion programs.
- With direct connection, data other than CP ladder programs cannot be printed, as no project file was open when connecting the Machine Controller to the MPE720 version 6.

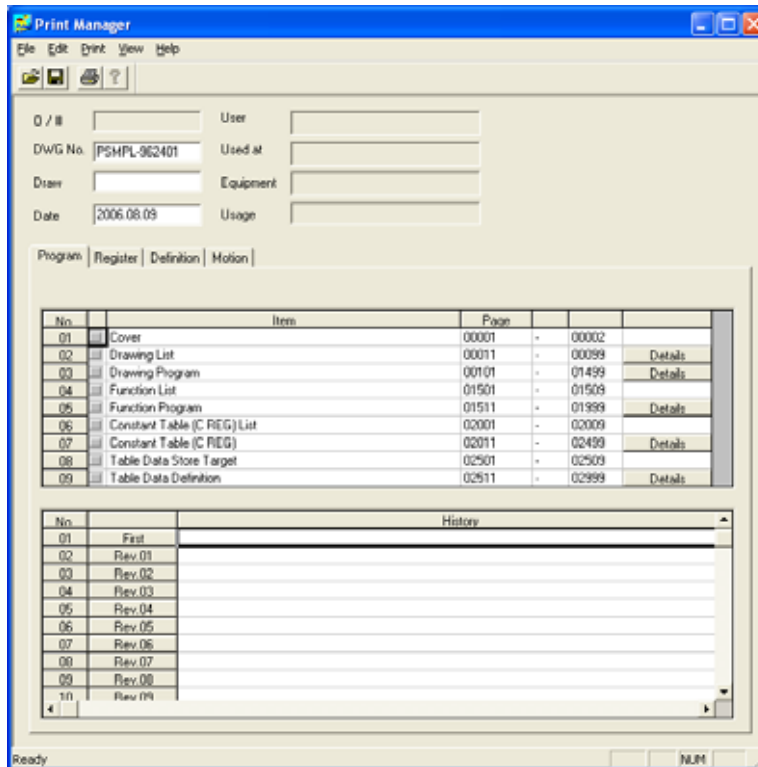
- Refer to 1.10.1 *Connecting to Machine Controllers* for details on project link connection and direct connection.

(1) Executing Printing from Launcher

Execute printing from the Launcher.

1. Select **Utility - Print Manager** from the Launcher.

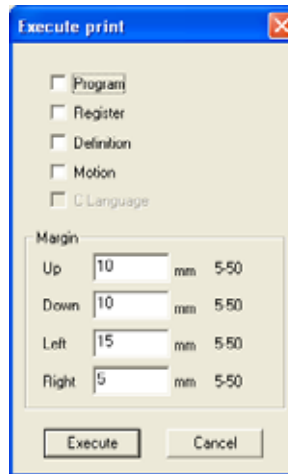
The Print Manager will open.



- Refer to 1.5.1 *Names and Descriptions of Window Components* for information on Launcher.

2. Select **Print - Execute print** from the main menu.

The **Execute print** Dialog Box will appear.



3. Select an object to be printed and set the page margins, and then click **Execute**.

The **Print** Dialog Box will appear.

- When printing is executed from the Print Manager for the first time, the **Printers** Dialog Box will appear. Set the printer type and then click **OK**.

4. Set each item, and then click **OK**. Printing will start.

Select **File - Print cancel** from the menu to hold or cancel the printing operation.

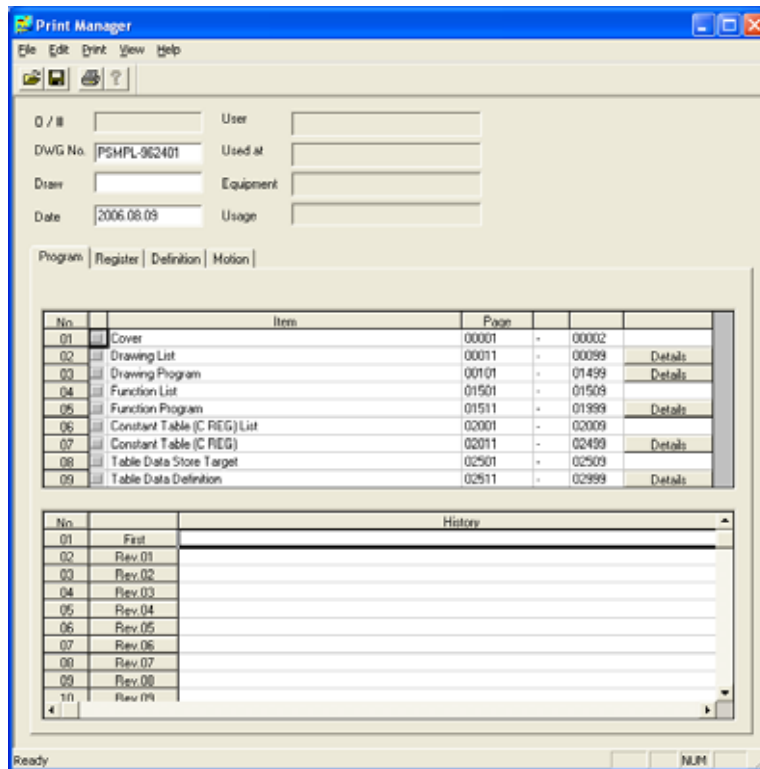
- The List Manager will open at the same time as the Print Manager, and indicate the progress of printing operation.

(2) Executing Printing from Engineering Manager

Execute printing from Engineering Manager.

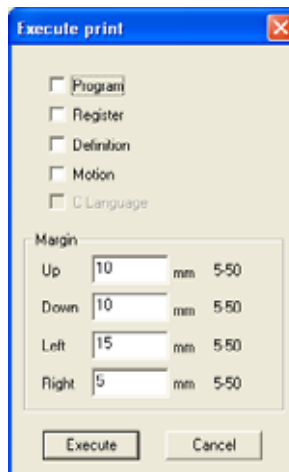
1. Select **File - Print** from the Engineering Manager main menu.

The **Print Manager** Window will open.



2. Select **Print - Execute print** from the main menu.

The **Execute print** Dialog Box will appear.



3. Select an object to be printed and set the page margins, then click **Execute**.

The **Print** Dialog Box will appear.

- ♦ When printing is executed from the Print Manager for the first time, the **Printers** Dialog Box will appear. Set the printer type and then click **OK**.

4. Set each item, and then click **OK**. Printing will start.

- ♦ The List Manager will open at the same time as the Print Manager, and indicate the progress of printing operation.

10

Transferring Data

This chapter describes the transfer functions in MPE720 version 6.

10.1 Outline of Data Transfers	10-2
10.2 Transferring Data	10-4
10.2.1 Writing to Machine Controllers	10-4
10.2.2 Program Disable Processing when a Write Error Occurs	10-8
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10.2.13 Detailed Comparison of Programs and Registers	10-24

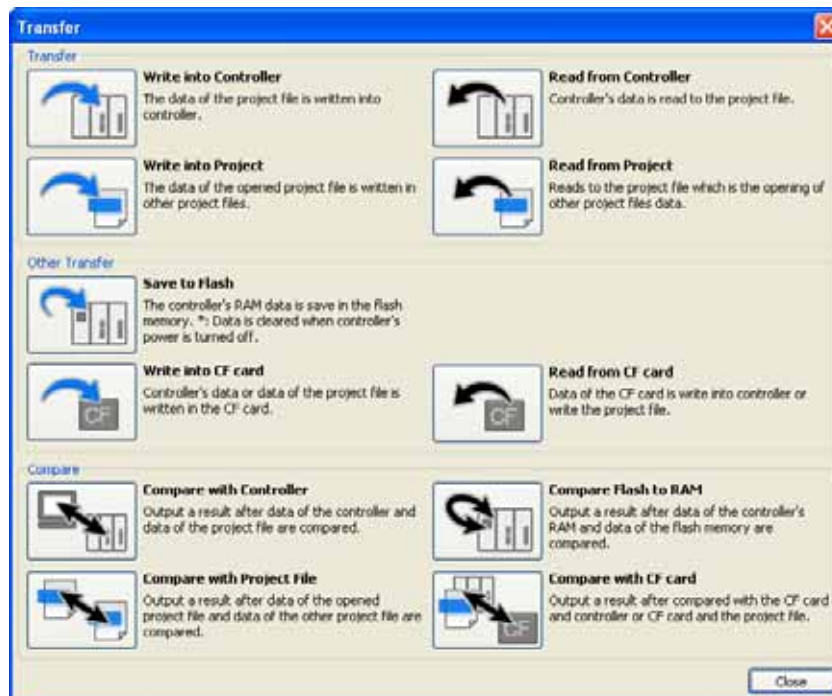
10.1 Outline of Data Transfers

A data transfer involves writing, reading, or comparing data between a computer running MPE720 version 6 and a Machine Controller, and saving the Machine Controller RAM data to flash memory.

The following types of data can be transferred.

- **System Configuration**
 - System Definitions
 - Scan Time Definitions
 - Module Configuration Definitions
 - Data Trace Data
- **Programs**
 - Ladder programs (High-speed, Low-speed, Start, Interrupt, Function)
 - Motion programs (Main, Sub, Group definitions)
 - Table data
 - Variables (Axis, I/O, Global, Constant, and User structure)
 - Comments (I/O, Global, and Constant)
- **Registers**
 - M (Data registers), D (Internal registers), C (Constant registers), S* (System registers), I* (Input registers), O* (Output registers)
 - * Registers marked by asterisks (*) cannot be written.

The type of data transfer can be specified by selecting **Online - Transfer** on the Main Menu, and then selecting the transfer type in the **Transfer** Dialog Box that will be displayed.

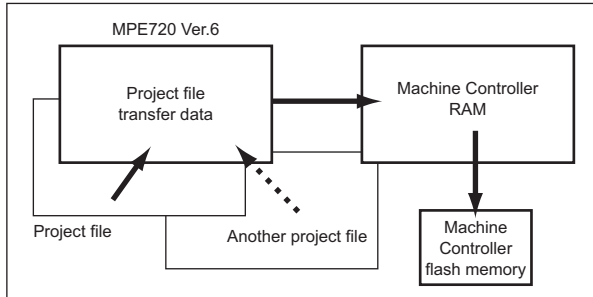


- For purposes of description, all of the icons in the above dialog box are shown as active.
- The transfer can also be executed by selecting **Online - Write into Controller**, **Read from Controller**, or **Save to Flash** from the Main Menu.
- The transfer can also be executed by selecting **Transfer** and then **Write into Controller**, **Read from Controller**, or **Save to Flash** from the Launcher.

The following diagrams illustrate the data transfer procedures using MPE720 version 6.

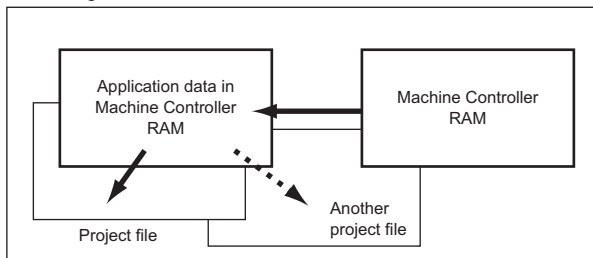
Data Transfers

1. Writing to the Machine Controller and Saving to Flash Memory



When *Write into Controller* is executed in the **Transfer** Dialog Box, data from the open project file (or another specified project file) is written to the Machine Controller RAM. When *Save to Flash* is executed, data in the Machine Controller RAM is written to the Machine Controller flash memory.

2. Reading from the Machine Controller



When *Read from Controller* is executed in the **Transfer** Dialog Box, data in the Machine Controller RAM is read to MPE720 version 6 and written to the open project file (or another specified project file).

The data transfer procedures are described in detail below.

10.2 Transferring Data

10.2.1 Writing to Machine Controllers

The procedure differs as described below, depending on whether a project file is currently open.

- When a project file is open: Offline
The current project file data is transferred to the Machine Controller. When offline, first connect to the Machine Controller before the transfer.
- When a MPE720 is connected to the Machine Controller with a project file open: Project Link Connection
If the **Write into Controller** Button in the **Transfer** Dialog Box is clicked, the **Open Project** Dialog Box will appear.
- When the connection is made without an open project file: Direct Connection
The project file that is to be the transfer source is first selected, and then the data is transferred to the Machine Controller.

These methods are described in detail below.

(1) Offline with an Open Project File

1. Select **Online - Transfer** from the Main Menu, and click the **Write into Controller** Button in the **Transfer** Dialog Box that will be displayed.

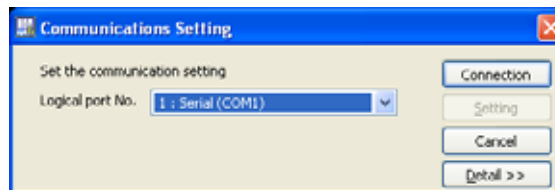
Alternatively, select **Online - Write into Controller** from the Main Menu.

A third method is to select **Transfer - Write into Controller** from the Launcher.

If the project file does not contain connection information, or if the **Write into Controller** Button is clicked in the **Transfer** Dialog Box, the **Communications Setting** Dialog Box will be displayed.

In all other cases, the **Transfer Program - Write into Controller** Dialog Box shown in step 3 will be displayed.

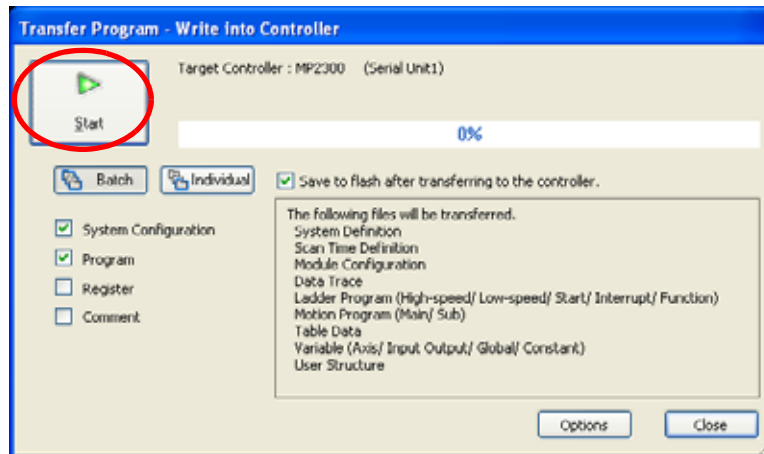
2. Select the port to be used for the transfer, and click the **Connection** Button.



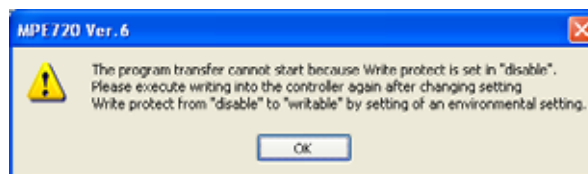
- With this procedure, connection information will not be written to the project file even when the **Connection** Button is clicked. To write connection information to the project file, select **Online - Communications Setting** from the Main Menu, and then make the settings in the **Communications Setting** Dialog Box that will be displayed.

The **Transfer Program - Write into Controller** Dialog Box will be displayed.

3. Select *Batch* or *Individual*, and then click the **Start** Button.



- ♦ If writing to the Machine Controller is prohibited in the system settings (under **Setup** in the Environment Setting Window), a write error will occur when the **Start** Button is clicked, and the following message will be displayed. For details on system settings, refer to 1.9.7 *Setup: System Setting*.



When selecting *Batch*, select the types of data to be transferred from among *System Configuration*, *Program*, *Register*, and *Comment*.

- ♦ With a batch transfer, the Machine Controller RAM will be cleared before the transfer, and it will be updated by the project file data being transferred.

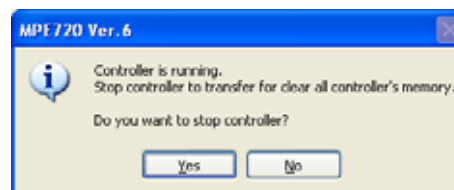
When *Individual* is selected, not only can *System Configuration*, *Program*, *Register* or *Comment* be specified, but also the particular data to be transferred.

- ♦ With an individual transfer, only the same file will be overwritten by the data being transferred.

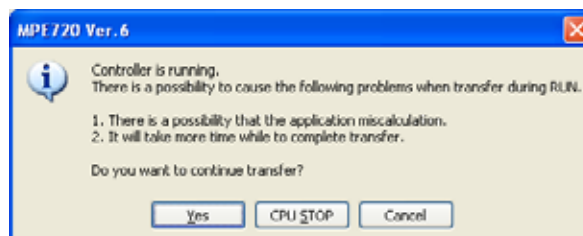
If *The flash saving is executed after transfer* is selected, the data will be saved to flash memory after being transferred to the Machine Controller RAM.

- ♦ For details on the data of the *System Configuration*, *Program*, *Register*, and *Comment* that is transferred, refer to .

If the CPU is in RUN status, one of the following messages will be displayed.



(a) When *Program* Is Selected for a Batch Transfer



(b) Anything Other than the Above

(a) The transfer will be started by clicking the **Yes** Button.

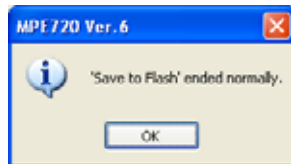
(b) **Yes**: The data will be transferred without stopping the CPU.

CPU STOP: The CPU will be stopped, and then the data will be transferred.

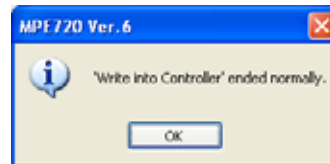
Cancel: The data will not be transferred.

Writing to the Machine Controller will begin.

- If a writing error occurs, refer to *10.2.4 Reading from Machine Controllers* on how to take a corrective action. When the transfer has been completed, one of the following messages will be displayed.



If Save to Flash Was Specified



If Save to Flash Was Not Specified

If the CPU was stopped, the following message will be displayed when the **OK** Button is clicked. Click the **Yes** Button to restart (RUN) the CPU and end the transfer, or click the **No** Button to end the transfer with the CPU stopped.



- After the transfer is complete, the data transfer log and results can be confirmed in the Transfer Subwindow.

(2) Connected Online with an Open Project File

1. Select **Online - Write into Controller** from the Main Menu.

Alternatively, select **Transfer - Write into Controller** from the Launcher.

The **Transfer Program - Write into Controller** Dialog Box will be displayed.

The subsequent operations are the same as from step 3 onwards in (1) *Offline with an Open Project File*.

- The **Open Project** Dialog Box will be displayed when **Write into Controller** is selected from the **Transfer** Dialog Box, even while connected online with a project file open.

(3) Connected Online without an Open Project File

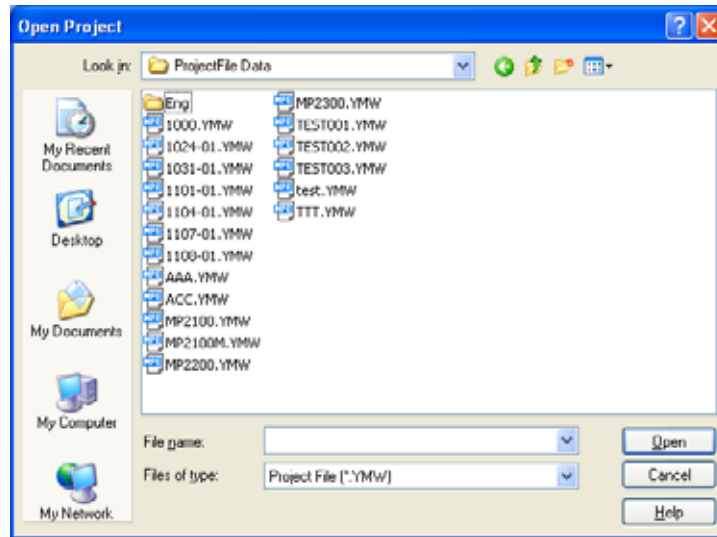
1. Select **Online - Transfer** from the Main Menu, and click the **Write into Controller** Button in the **Transfer** Dialog Box that will be displayed.

Alternatively, select **Online - Write into Controller** from the Main Menu.

A third method is to select **Transfer - Write into Controller** from the Launcher.

The **Open Project** Dialog Box will be displayed.

2. Select the project file that is to be transferred, and click the **Open** Button.



- Select a project file for which the Machine Controller type is the same as that of the currently connected Machine Controller.

The **Transfer Program - Write into Controller** Dialog Box will be displayed.

The subsequent operations are the same as from step 3 onwards in (1) *Offline with an Open Project File*.

10.2.2 Program Disable Processing when a Write Error Occurs

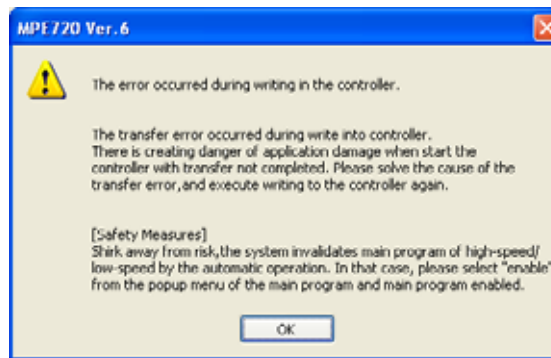
When data is transferred with the CPU stopped, a high-speed or low-speed main program can be invalid if the transfer fails (e.g., if there is an incompletely written program). When the CPU is restarted (RUN) after a transfer failure, there is a risk that an incompletely written program may be executed and the machinery may be damaged. This function can be set to eliminate this risk.

This function is valid only by selecting **File - Environment Setting - Transfer** from the Main Menu, and setting *Processing of invalid high/low main program* to *Disable*.

- For details on high-speed and low-speed main program disable processing, refer to 1.9.14 Variable: Variable.

(1) When Processing of Invalid High/Low Main Program Is Disabled

When *Processing of invalid high/low main program* is set to *Disable* in the Transfer Window, the following error message will be displayed if an error occurs during a data transfer with the CPU stopped.

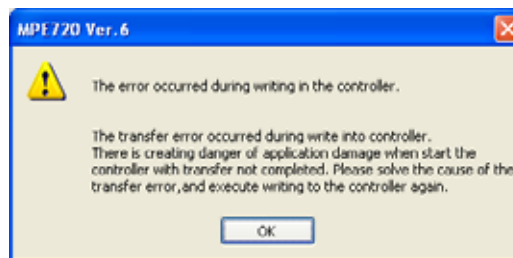


If this message is displayed, the main ladder program (high-speed or low-speed) is invalid in the Machine Controller and will not be executed even if the CPU is restarted (RUN).

- Even under the above conditions, if there is a communications timeout or if a write error occurs due to not being able to communicate with the Machine Controller, the message below in (2) will be displayed and disable processing will not be executed.

(2) When High Processing of Invalid/Low Main Program Is Not Disabled

When *Processing of invalid high/low main program* is set to *Not Disable* in the Transfer Window, the following error message will be displayed if an error occurs during a data transfer with the CPU stopped.



If this message is displayed, the program will be executed when the CPU is restarted (RUN) even if the program is incompletely written. Before restarting the CPU, be sure to execute the data transfer again to ensure that the program in the Machine Controller is complete.

10.2.3 Saving to Flash Memory

This section describes how to save data in the Machine Controller RAM to the Machine Controller flash memory. This function is valid only while connected online to the Machine Controller.

The procedure is as follows:

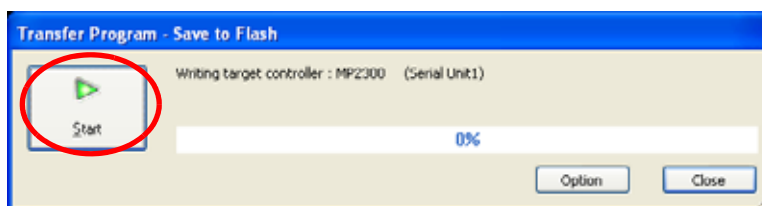
1. Select **Online - Transfer** from the main menu, and click the **Save to Flash** Button in the **Transfer** Dialog Box.

Alternatively, select **Online - Save to Flash** from the main menu.

A third method is to select **Transfer - Save to Flash** from the Launcher.

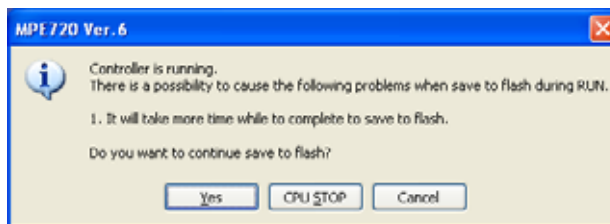
The **Transfer Program - Save to Flash** Dialog Box will appear.

2. Click the **Start** Button.



If the CPU is in RUN status, the following message will appear. Click either the **Yes** Button or the **CPU STOP** Button to start saving the data to flash memory.

- If the **Yes** Button is clicked, the operation will take more time.



When the save operation is completed, the following message will appear.



Click the **OK** Button. If the data was saved to flash memory with the CPU in RUN status, the operation will be finished.

If the data was saved to flash memory with the CPU stopped, the following message will appear.



If the **Yes** Button is clicked, the CPU will be restarted (RUN), and the save operation will be completed.

If the **No** Button is clicked, the save operation will complete with the CPU stopped.

10.2.4 Reading from Machine Controllers

The procedure differs as described below, depending on whether a project file is currently open.

- When a project file is open
Data in the Machine Controller RAM is transferred to the project file that is currently open. When offline, first connect to the Machine Controller before the transfer.
- When the connection is made without an open project file
After a project file is selected as the transfer destination, the data is then transferred from the Machine Controller.

These methods are described in detail below.

(1) Offline with an Open Project File

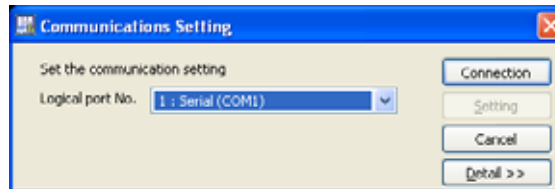
1. Select **Online - Transfer** from the Main Menu, and click the **Read from Controller** Button in the **Transfer** Dialog Box that will be displayed.

Alternatively, select **Online - Read from Controller** from the Main Menu.

If the project file does not contain connection information, or if the **Read from Controller** Button is clicked in the **Transfer** Dialog Box, the **Communications Setting** Dialog Box will be displayed.

In all other cases, the **Transfer Program - Read from Controller** Dialog Box shown in step 3 will be displayed.

2. Select the port to be used for the transfer, and click the **Connection** Button.



The **Transfer Program - Read from Controller** Dialog Box will be displayed.

3. Select **Batch** or **Individual**, and then click the **Start** Button.



When selecting **Batch**, select the types of data to be transferred from among *System Configuration*, *Program*, *Register*, and *Comment*.

When **Individual** is selected, not only can *System Configuration*, *Program*, *Register*, or *Comment* be specified, but also the particular data to be transferred.

- For details on the data of the *System Configuration*, *Program*, *Register*, and *Comment* that is transferred, refer to .

Reading from the Machine Controller will be started.

When the transfer has been completed, the following message will be displayed. Click the **OK** Button to end the read operation.



- After the transfer is complete, the data transfer log and results can be confirmed in the Transfer Subwindow.

(2) Online with an Open Project File

- Select **Online - Read from Controller** from the Main Menu.

Alternatively, select **Transfer - Read from Controller** from the Launcher.

The **Transfer Program - Read from Controller** Dialog Box will be displayed.

The subsequent operations are the same as from step 3 onwards in (1) *Offline with an Open Project File*.

- The **Open Project** Dialog Box will be displayed when *Read from Controller* is selected from the **Transfer** Dialog Box, even while connected online with an open project file.

(3) Connected Online without an Open Project File

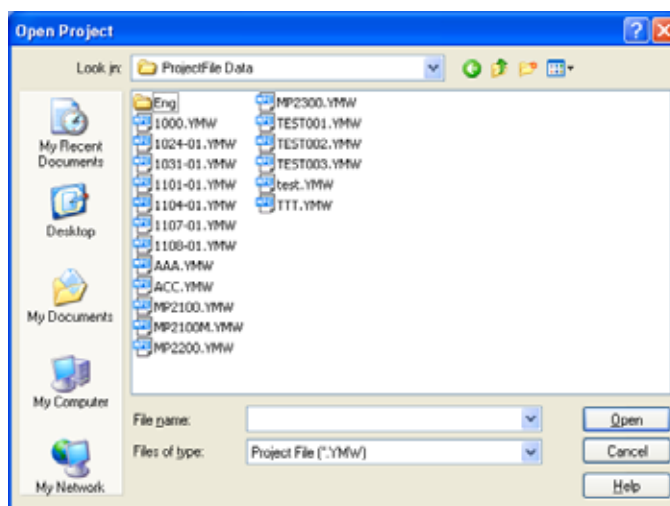
- Select **Online - Transfer** from the Main Menu, and click the **Read from Controller** Button in the **Transfer** Dialog Box that will be displayed.

Alternatively, select **Online - Read from Controller** from the Main Menu.

A third method is to select **Transfer - Read from Controller** from the Launcher.

The **Open Project** Dialog Box will be displayed.

- Either select the project file in which the data read from the Machine Controller is to be saved or enter the name of a new project file to be created, and then click the **Open** Button.



- If a new project file is being created, the class of the currently connected Machine Controller will be set for that project file.

The **Transfer Program - Read from Controller** Dialog Box will be displayed.

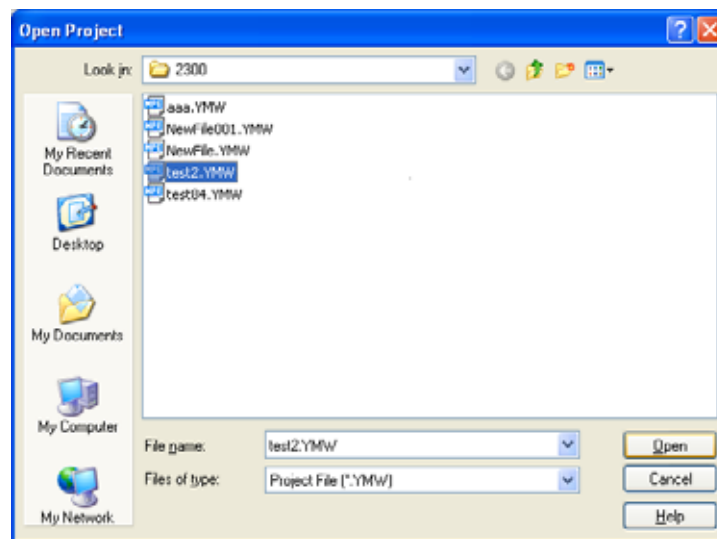
The subsequent operations are the same as from step 3 onwards in (1) *Offline with an Open Project File*.

10.2.5 Writing into a Project File

Write the data in the open project file into another project file. This function is enabled when the MPE720 version 6 is not connected to the Machine Controller. This status is regarded as offline.

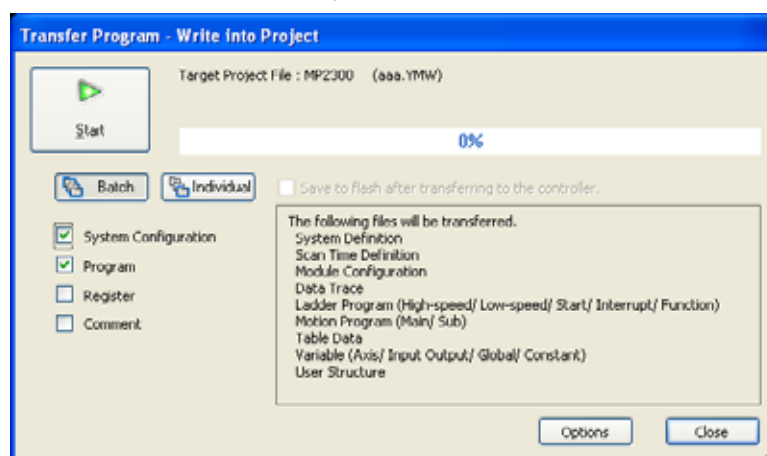
The procedure is as follows:

1. Select **Online - Transfer** from the main menu, and click the **Write into Project** Button in the **Transfer** Dialog Box.
The **Open Project** Dialog Box will appear.
2. Select the project file to be overwritten, and click **Open**.



The **Transfer Program - Write into Project** Dialog Box will appear.

3. Click either the **Batch** or **Individual** Button, and then click the **Start** Button.



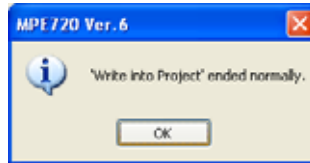
When selecting the **Batch** or **Individual** Button, the types of data to be transferred (**System Configuration**, **Program**, **Register**, and **Comment**) can be selected.

When selecting the **Individual** Button, the particular data to be transferred can also be designated.

- For details on the data of the **System Configuration**, **Program**, **Register**, and **Comment** that is transferred, refer to .

After clicking **Start**, the data will begin writing into the project file.

When the writing is complete, the following message will appear. Click **OK**.



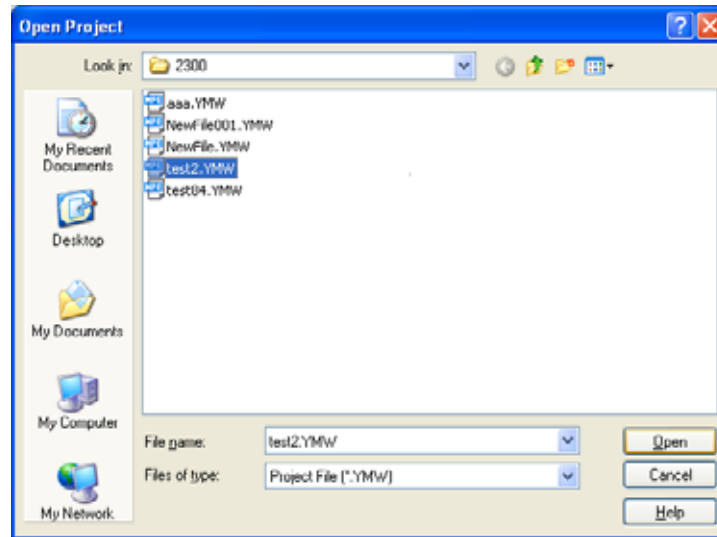
- After the transfer is complete, the data transfer log and results can be confirmed in the Transfer Subwindow.

10.2.6 Reading from a Project File

The data will be read from the selected project file and written into the currently open project file. This function is enabled when the MPE720 version 6 is not connected to the Machine Controller (offline).

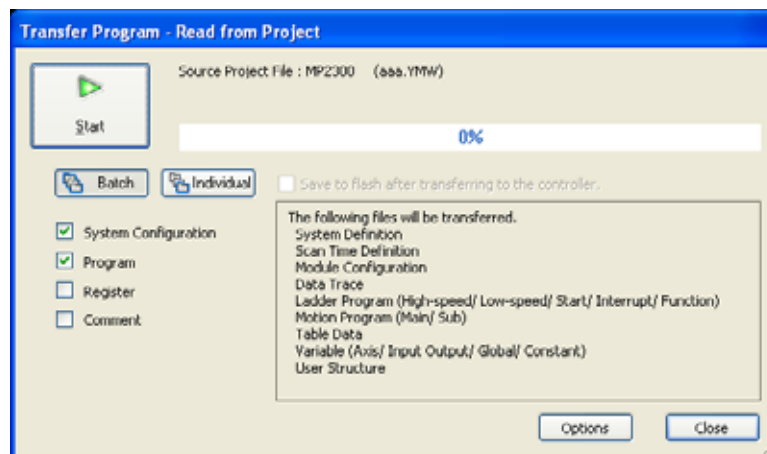
The procedure is as follows:

1. Select **Online - Transfer** from the main menu, and click the **Read from Project** Button in the **Transfer** Dialog Box.
The **Read from Project** Dialog Box will appear.
2. Select a project file from which a data is to be read and then click the **Open** Button.



The **Transfer Program - Read from Project** Dialog Box will appear.

3. Click either the **Batch** or **Individual** Button, and then click the **Start** Button.



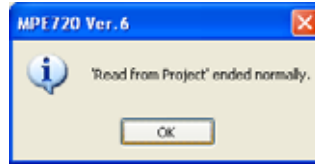
When selecting the **Batch** or **Individual** Button, the types of data to be transferred (**System Configuration**, **Program**, **Register**, and **Comment**) can be selected.

When selecting the **Individual** Button, the particular data to be transferred can also be designated.

- For details on the data of the **System Configuration**, **Program**, **Register**, and **Comment** that is transferred, refer to .

After clicking **Start**, the data will begin reading from the project file.

When reading is complete, the following message will appear. Click **OK**.



- After the transfer is complete, the data transfer log and results can be confirmed in the Transfer Subwindow.

10.2.7 Writing into the CF Card

The data can be written into the CF card. The operation of this function differs depending on whether a project file is open or not.

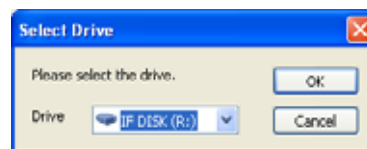
- When a project file is open
The data in the open project file that needs to be saved in a CF card is transferred to the CF card.
- When the connection is made without an open project file
The data in the RAM of the Machine Controller (MP2200 CPU-02) is transferred to the CF card installed in the computer.

Use the following procedure to save data in the CF card.

1. Select **Online - Transfer** from the main menu, and click the **Write into CF Card** Button in the **Transfer** Dialog Box.

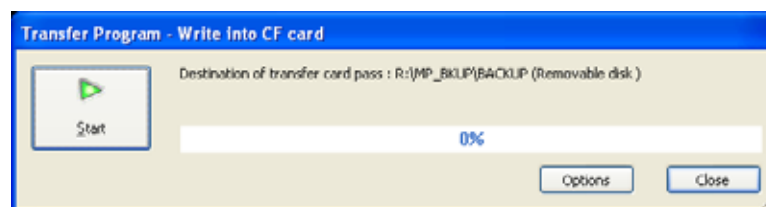
The **Select Drive** Dialog Box will appear.

2. Select a drive to be used, and then click **OK**.



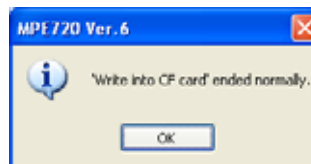
The **Transfer Program - Write into CF Card** Dialog Box will appear.

3. Click the **Start** Button.



Writing to the CF card will begin.

When the writing is complete, the following message will appear. Click **OK** to end the transfer operation.



- After the transfer is complete, the data transfer log and results can be confirmed in the Transfer Subwindow.

10.2.8 Reading from CF Card

The data can be read from the CF card.

The operation of this function differs depending on whether a project file is open or not.

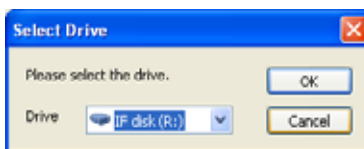
- When a project file is open
Data will be transferred from the CF card to the open project file. When offline, a connection is made to the Machine Controller (MP2200 CPU-02) before starting transfer.
- When the connection is made without an open project file
Data will be transferred from the CF card to the Machine Controller (MP2200 CPU-02).

The procedure is as follows:

1. Select **Online - Transfer** from the main menu, and click the **Read from CF Card** Button in the **Transfer** Dialog Box.

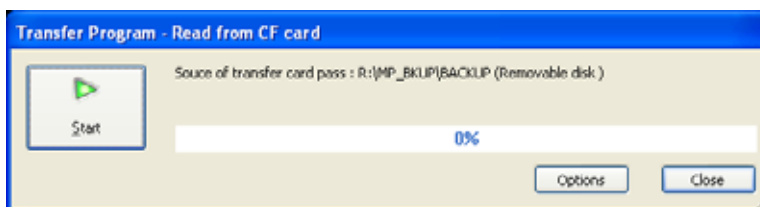
The **Select Drive** Dialog Box will appear.

2. Select a drive to be used, and then click the **OK** Button.



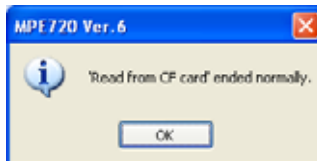
The **Transfer Program - Read from CF Card** Dialog Box will appear.

3. Click the **Start** Button.



Reading from the CF card will begin.

When the reading is complete, the following message will appear. Click **OK** to end the transfer operation.



- After the transfer is complete, the data transfer log and results can be confirmed in the Transfer Subwindow.

10.2.9 Comparison with the Machine Controller

This function differs, as described below, depending on whether a project file on the computer is open (when offline) and whether a Machine Controller is connected (when online).

- Offline

After a connection is made to the Machine Controller, the data in the currently open project file and the data in the Machine Controller RAM are compared and the results are output to the Transfer Subwindow.

- Online

When the project file for the data comparison is specified (or a new file is created), the data in the specified project file and the data in the Machine Controller RAM are compared and the results are output to the Transfer Subwindow.

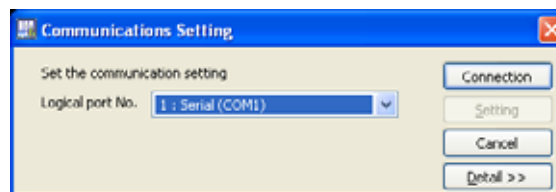
These methods are described in detail below.

(1) Offline

1. Select **Online - Transfer** from the main menu, and click the **Compare with Controller** Button in the **Transfer** Dialog Box.

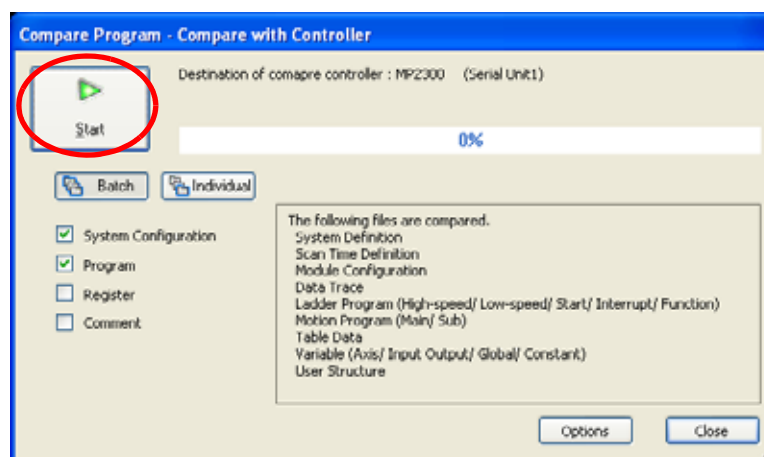
The **Communications Setting** Dialog Box will appear.

2. Select the port to be used for the transfer, and click the **Connection** Button.



The **Compare Program - Compare with Controller** Dialog Box will appear.

3. Select **Batch** or **Individual**, and then click the **Start** Button.



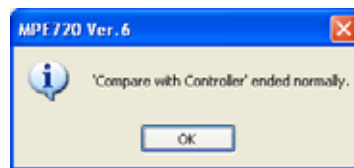
When selecting the **Batch** or **Individual** Button, the types of data to be compared (**System Configuration**, **Program**, **Register**, and **Comment**) can be selected.

When selecting the **Individual** Button, the particular data to be compared can also be designated.

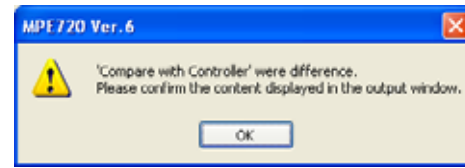
- For details on the data of the **System Configuration**, **Program**, **Register**, and **Comment** that is compared, refer to .

After clicking **Start**, the data will begin comparison.

When the comparison has been completed, the following message will be displayed. Click **OK** to end the compare operation.



No Difference Found



Differences Found

- After the comparison is complete, the data comparison log and result can be confirmed in the Transfer Subwindow.

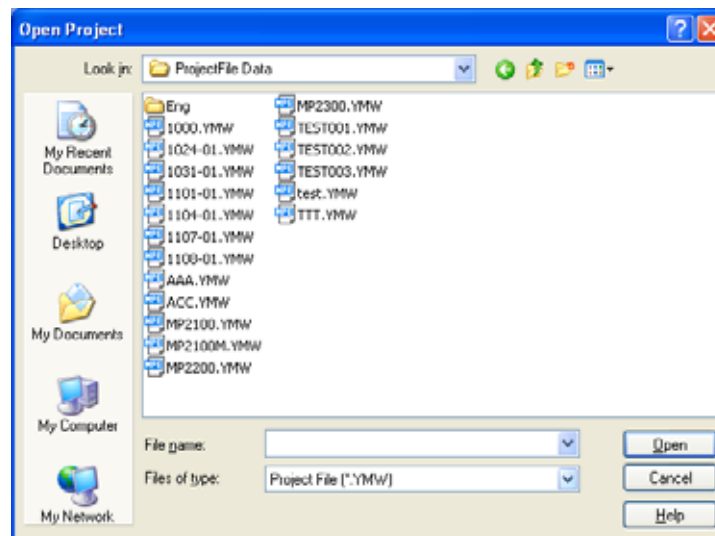
(2) Online

1. Select **Online - Transfer** from the main menu, and click the **Compare with Controller** Button in the **Transfer** Dialog Box.

The **Open Project** Dialog Box will appear.

2. Select the project file to be compared with the Machine Controller Data, and click the **Open** Button.

- When a connection is made to the Machine Controller after the project file has been opened, the file name of the open project file will be displayed in the *File name* Field as the default.



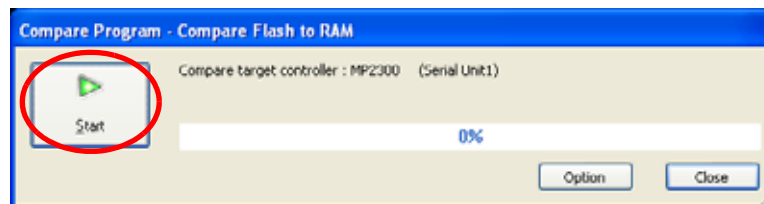
The **Compare Program - Compare with Controller** Dialog Box will appear.

The subsequent operations are the same as from step 3 onwards in *10.2.9 (1) Offline*.

10.2.10 Comparing Flash Memory and RAM

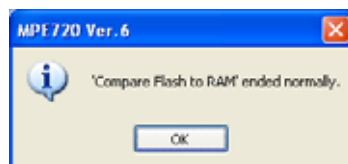
This function compares the data in the Machine Controller RAM with the data in the flash memory, and outputs the results to the Transfer Subwindow. The function is valid only while connected online to the Machine Controller. The procedure is as follows:

1. Select **Online - Transfer** from the main menu, and click the **Compare Flash to RAM** Button in the **Transfer** Dialog Box.
The **Compare Program - Compare Flash to RAM** Dialog Box will appear.
2. Click the **Start** Button.



The comparison between the data in flash memory and the data in RAM will begin.

When the comparison has been completed, one of the following messages will be displayed. Click **OK** to end the compare operation.



No Differences Found



Differences Found

- After the comparison is complete, the data comparison log and results can be confirmed in the Transfer Subwindow.

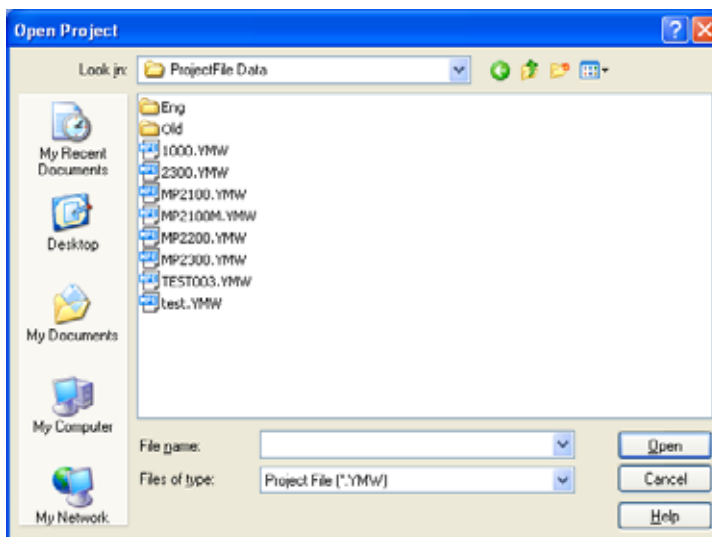
10.2.11 Comparing Project Files

This function compares the data in an open project file with the data in another project file, and outputs the results to the Transfer Subwindow. The function is valid only when not connected to the Machine Controller (i.e., when offline). The procedure is as follows:

1. Select **Online - Transfer** from the main menu, and click the **Compare with Project File** Button in the **Transfer** Dialog Box.

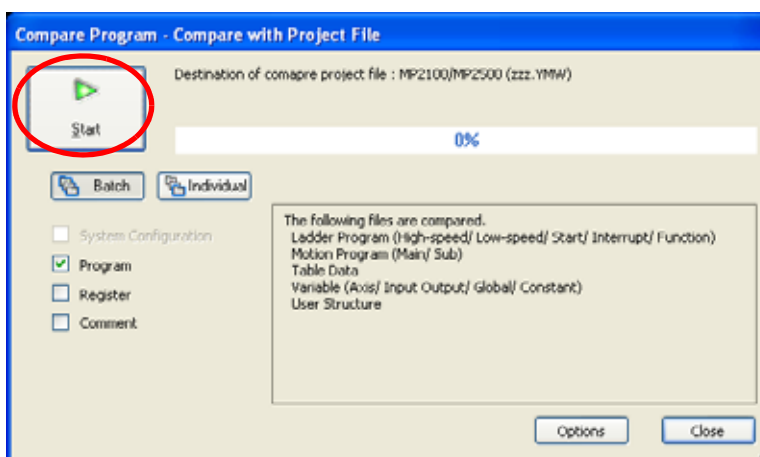
The **Open Project** Dialog Box will appear.

2. Select the project file to be compared and click the **Open** Button.



The **Compare Program - Compare with Project File** Dialog Box will appear.

3. Select **Batch** or **Individual**, and then click the **Start** Button.



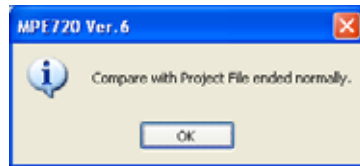
When selecting the **Batch** or **Individual** Button, the types of data to be compared (**System Configuration**, **Program**, **Register**, and **Comment**) can be selected.

When selecting the **Individual** Button, the particular data to be compared can also be designated.

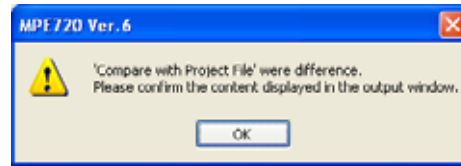
- ◆ For details on the data of the **System Configuration**, **Program**, **Register**, and **Comment** that is compared, refer to .

The comparison with the project file will begin.

When the comparison has been completed, the following message will be displayed. Click **OK** to end the compare operation.



No Difference Found



Differences Found

- After the comparison is complete, the data comparison log and result can be confirmed in the Transfer Subwindow.

10.2.12 Comparing with CF Card Data

The data in the CF card will be compared with the data in a Machine Controller or a project file. The operation differs depending on whether a project file on the computer is open (when offline) and whether a Machine Controller is connected (when online).

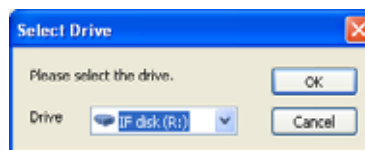
- When a project file is open
The data in the open project file and the data in the CF card are compared, and the results are output to the Transfer Subwindow.
- When the Machine Controller (MP2200 CPU-02) is connected
The data in the Machine Controller (MP2200 CPU-02) RAM and the data in the CF card are compared and the results are output to the Transfer Subwindow.

Use the following procedure to compare data.

1. Select **Online - Transfer** from the main menu, and click the **Compare with CF Card** Button in the Transfer Dialog Box.

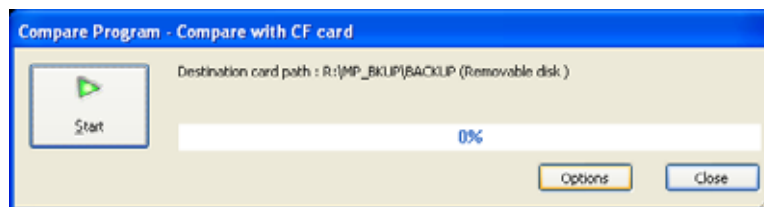
The **Select Drive** Dialog Box will appear.

2. Select a drive, and then click **OK**.



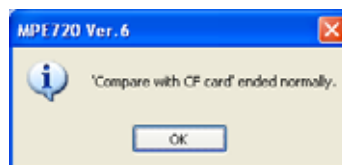
The **Compare Program - Compare with CF Card** Dialog Box will appear.

3. Click the **Start** Button.



Comparison will begin.

When the comparison is complete, the following message will appear. Click **OK** to end the comparison operation.



No Difference Found



Differences Found

- ♦ After the comparison is complete, the comparison data log and results can be confirmed in the Transfer Subwindow.

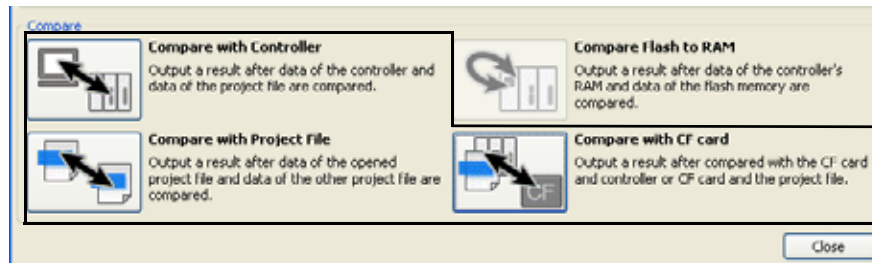
10.2.13 Detailed Comparison of Programs and Registers

Data in the programs saved to two memories can be compared in detail. Differences between the two sets of data are output to the Transfer Subwindow. With the Compare Flash to RAM function, the detailed comparison of programs is not possible.

- ♦ You can go to the corresponding program by double-clicking the output comparison result.
- ♦ The detailed comparison for programs is applicable only for ladder programs, motion programs, and registers.

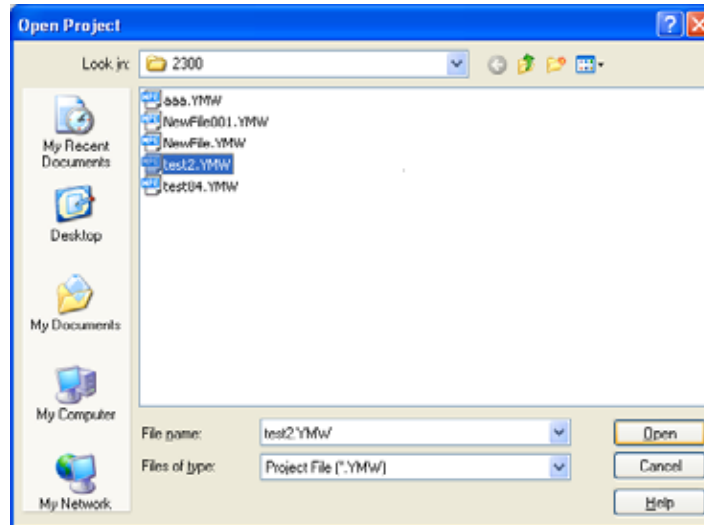
Use the following procedure to compare programs.

1. Select **Online - Transfer** from the main menu, and select a program to be compared in the **Transfer** Dialog Box.



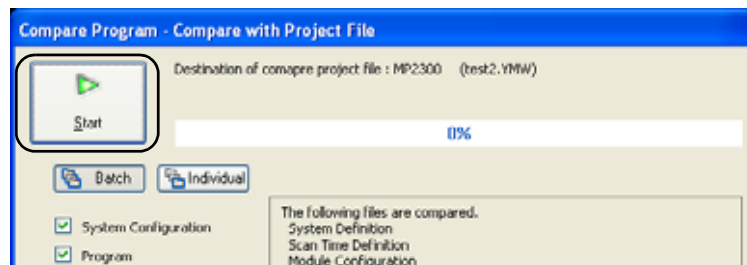
The **Open Project** Dialog Box will appear.

2. Select a data of project file, CF card, or Machine Controller to be compared, and then click the **Open** Button. This explanation will use the selection of **Compare with Project File** as an example.



The **Compare Program - Compare with Project File** Dialog Box will appear.

3. Click either the **Batch** or **Individual** Button, and then click the **Start** Button.



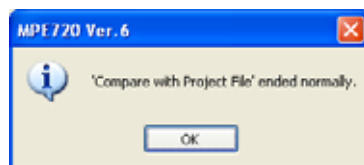
When selecting the **Batch** or **Individual** Button, the types of data to be compared (**System Configuration**, **Program**, **Register**, and **Comment**) can be selected.

When selecting the **Individual** Button, the particular data to be compared can also be designated.

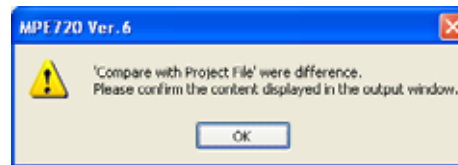
- For details on the data of the **System Configuration**, **Program**, **Register**, and **Comment** that is transferred, refer to .

After clicking **Start**, the data will begin comparison.

When the comparison is complete, the following message will appear. Click **OK** to end the comparison operation.



No difference Found



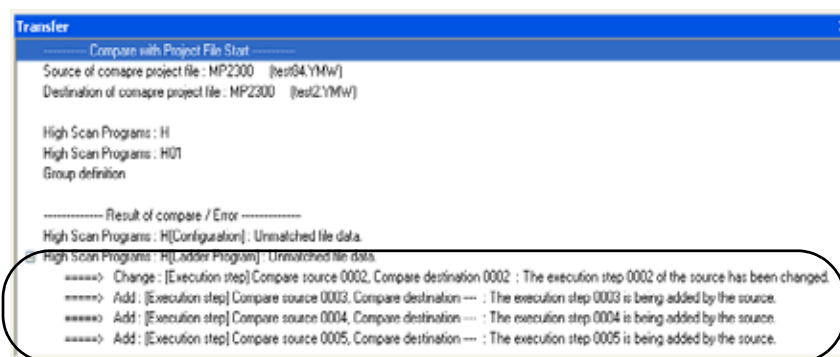
Differences Found

- After the comparison is complete, the data comparison log and results can be confirmed in the Transfer Subwindow.

(1) Jump Function from Transfer (Comparison Result) Subwindow

If unmatched data is found during comparison of program data, the unmatched data will be displayed in the Transfer Subwindow as follows. Double-click the unmatched data and you can go to the execution step or line where the unmatched data is found.

However, if unmatched data is found during comparison of CP ladder programs, the corresponding CP ladder program will open. If unmatched data is found during comparison with motion programs, you will go to the motion program line where the unmatched data is found.



- Multiple differences were found though only one element in the program was modified
This contradiction may appear in the results because ladder programs are compared on the base of execution codes (executable data after compilation) and one instruction is converted into multiple execution codes (instruction numbers). This will not cause any problems in the operation.
- Differences were found though the same data were compared.
 - (a) This contradiction may appear due to differences between two types of compilations (normal compilation and version 5 compatible compilation). For a version 5 compatible compiler, the information on the version 5 compatible compilation is written on 0 to 4 steps of the program. However, for a normal compiler, such information is not given.
 - (b) When comparing programs in which conditional instructions* are used, this contradiction may appear due to differences between two types of compilations (normal compilation and version 5 compatible compilation): the work registers used by MPE720 version 6 are optimized. To obtain perfectly matched results, execute compilation in the same compile mode.

* Indicate the instructions displayed in the Ladder Subwindow. Refer to *Machine Controller MP900/MP2000 series New Ladder Editor User's Manual* (manual number: SIE-C887-13.1) for details.

11

Axes

This chapter describes the functions that relate to axis operations.

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11.1 Axis Setup Wizard

11.1.1 Overview of the Axis Setup Wizard

(1) What is the Axis Setup Wizard?

This is a function that makes it easy to set up SERVOPACKs that are connected in a MECHATROLINK network. It enables everything from setup of SERVOPACK parameters to tuning, to setting the Machine Controller in accordance with the machine specifications, to backing up of data, enabling easy setup of axes.

(2) Conditions of Use

The following conditions must be established in order to use the Axis Setup Wizard.

- The communication port used must be Ethernet or Ethernet (LP).
- Communication with the Machine Controller must be established (online status).
- The SERVOPACK must be a Σ -V series for use with MECHATROLINK.
- SigmaWin+ Ver. 5.11 or later must be installed.
If SigmaWin+ Ver. 5.11 or later is not installed, you can download it free of charge from the e-mechatronics site (product/technology information site).
Access this site with the following URL: <http://www.e-mechatronics.com/support/tool/>
- The SERVOPACK version must be 0011 or later.
- The built-in SVB with CPU of the Machine Controller must be Ver. 2.60 or later, and an optional SVB must be Ver. 1.25 or later.

11.1.2 Starting the Axis Setup Wizard

Open the **Axis Setup Wizard** Window.

1. Opening from the System Subwindow

Double-click *Axis configuration - Axis Setup Wizard*.

Right-click *Axis configuration - Axis Setup Wizard*, then select **Open** in the pop-up menu that will be displayed.

2. Opening from the **My Tool** Window

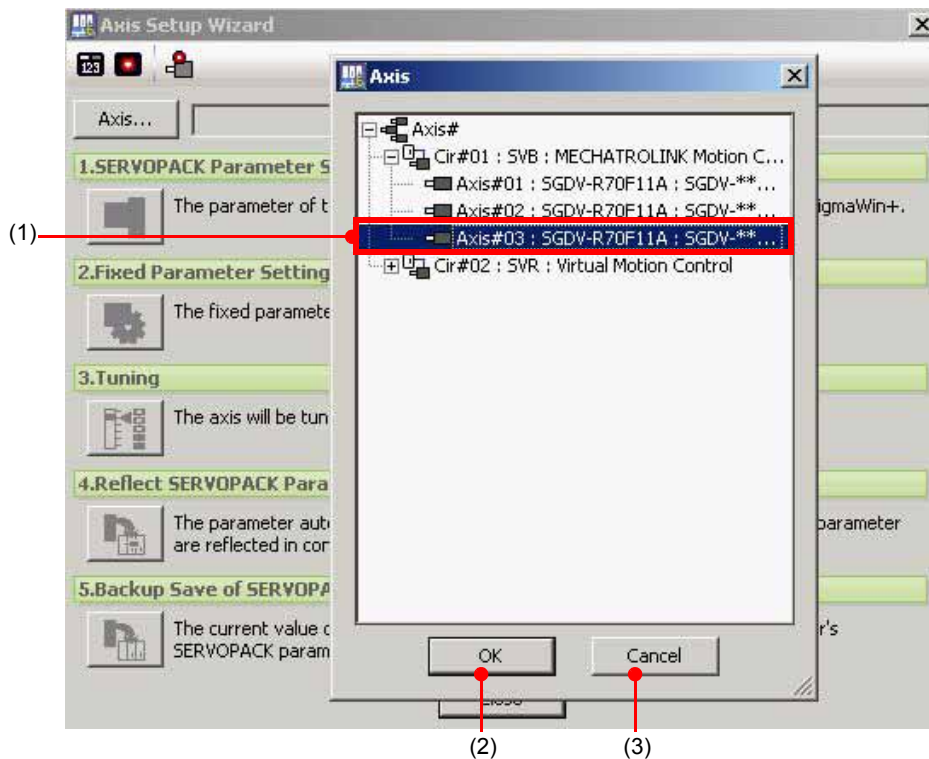
Click the **Axis Setup Wizard** Button registered in the **My Tool** Window.



11.1.3 Names and Descriptions of Components of the Axis Setup Wizard

(1) Axis Dialog Box

Select the axis to be set up.

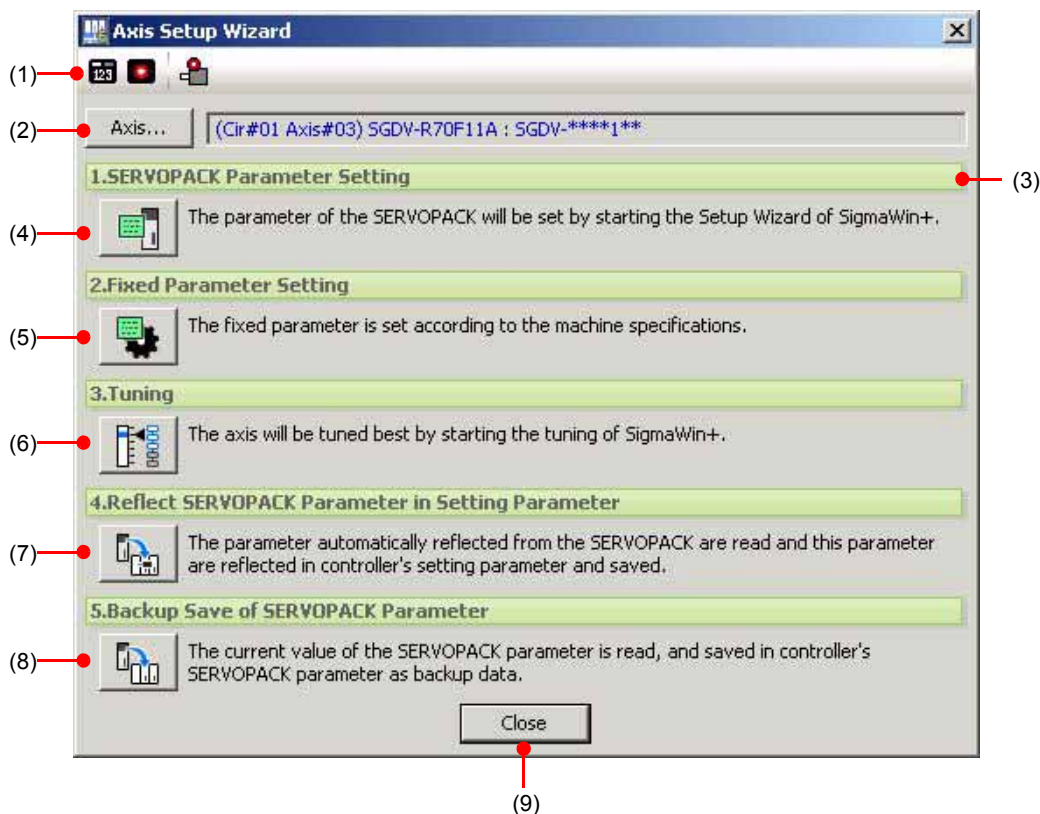


No.	Component	Description
(1)	Axis	Displays the information allocated to the module configuration definition. Select the axis to be set up.
(2)	OK	Selects the axis and returns you to the Axis Setup Wizard Window.
(3)	Cancel	Returns you to the Axis Setup Wizard Window without selecting an axis.

- The only axis that can be used with the **Axis Setup Wizard** is the selected axis. To use another axis, click the **Axis** Button to display the **Axis** Dialog Box, then make another axis selection.

(2) Axis Setup Wizard

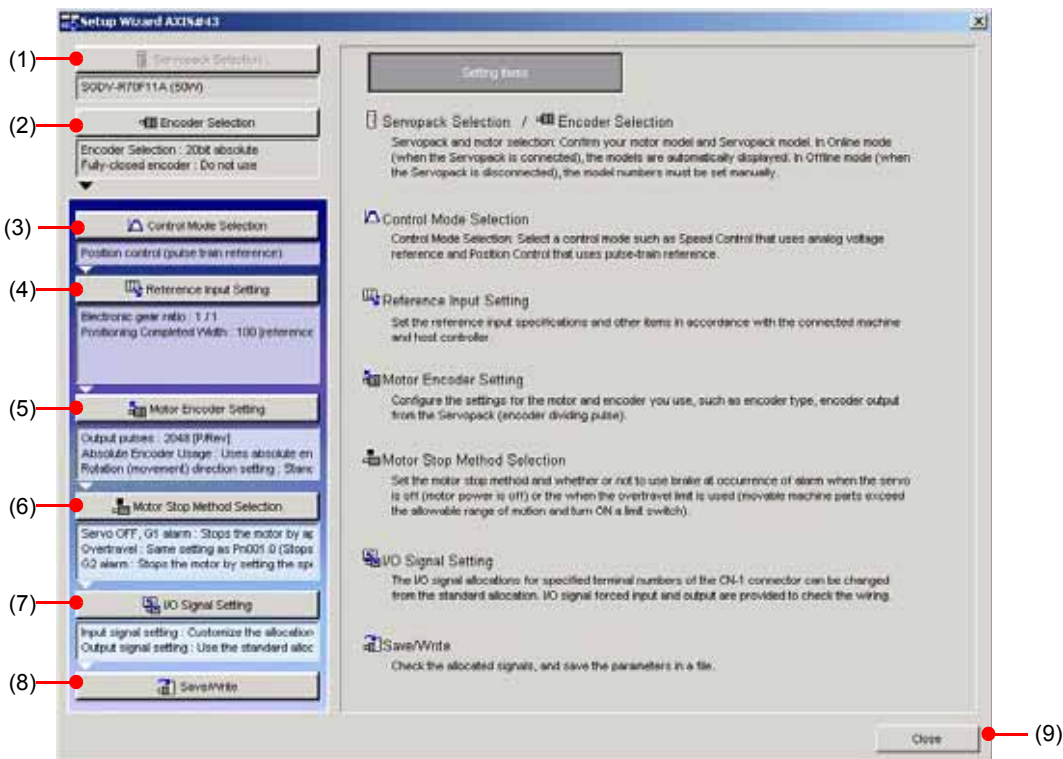
Set up one axis at a time of a SERVOPACK connected to the MECHATROLINK network.



No.	Component		Description
(1)	Toolbar	Axis Monitor	Displays the Axis Monitor Window.
		Alarm Monitor	Displays the Alarm Monitor Window.
		Alarm/Warning	Displays the Alarm/Warning Window.
(2)	Axis...		Displays the Axis Dialog Box to select the axis to be set up.
(3)	Axis indication		The selected axis is shown here.
(4)	SERVOPACK Parameter Setting		Starts the SigmaWin+ setup wizard to set the SERVOPACK parameters.
(5)	Fixed Parameter Setting		Displays the Fixed Parameter Setting Window to set the fixed parameters in accordance with the machine specifications.
(6)	Tuning		Starts SigmaWin+ tuning and tunes the axis optimally.
(7)	Reflect SERVOPACK Parameter in Setting Parameter		Reads the parameters to be automatically reflected from the SERVOPACK, reflects them in the setting parameters of the Machine Controller, and saves them.
(8)	Backup Save of SERVOPACK Parameter		Reads the current values of the SERVOPACK parameters and saves them as backup data of the SERVOPACK parameters in the Machine Controller.
(9)	Close		Closes the Axis Setup Wizard Window.

(3) SERVOPACK Parameter Setting

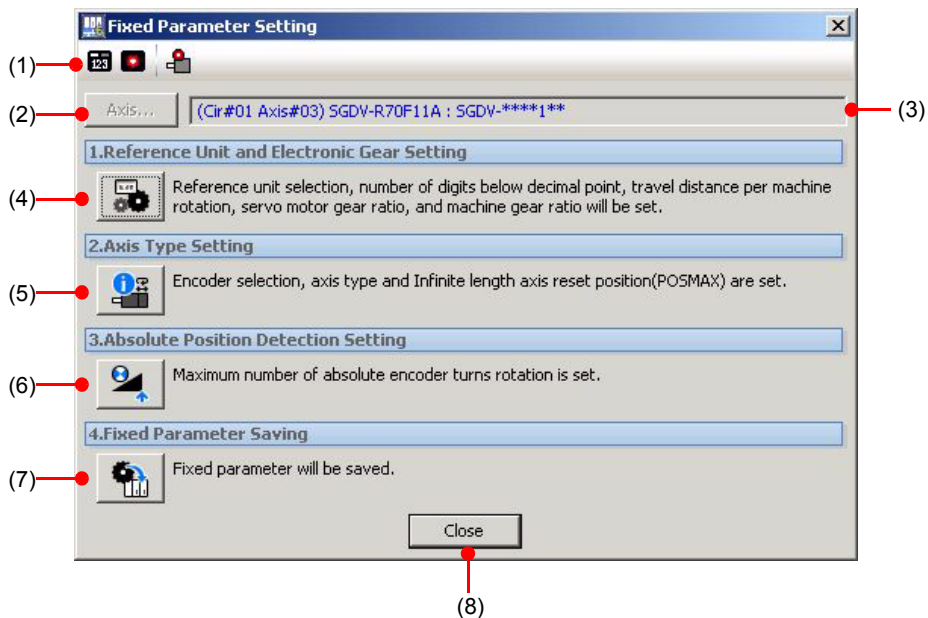
The SERVOPACK parameters can be set using the SigmaWin+ setup wizard.



No.	Component	Description
(1)	SERVOPACK Selection	Selects the SERVOPACK.
(2)	Encoder Selection	Selects the encoder.
(3)	Control Mode Selection	Selects the control mode.
(4)	Reference Input Setting	Sets the reference input specifications and other settings in accordance with the machine to be operated and host controller.
(5)	Motor Encoder Setting	Sets the motor and encoder to be used.
(6)	Motor Stop Method Selection	Sets the stop method and brake setting for when the servo goes off, at overtravel, and when an alarm occurs.
(7)	I/O Signal Setting	Changes the meanings of specific terminal numbers among the I/O signals of the SERVOPACK's CN-1 connector.
(8)	Save/Write	Confirms the set signals and saves the parameters to file.
(9)	Close	Closes the Setup Wizard Window.

(4) Fixed Parameter Setting

The fixed parameters of the Machine Controller can be set in accordance with the machine specifications.



No.	Component	Description
(1)	Toolbar	Refer to (1) Toolbar in 11.1.3 Names and Descriptions of Components of the Axis Setup Wizard.
(2)	Axis...	This button is disabled.
(3)	Axis indication	Displays the selected axis.
(4)	Reference Unit and Electronic Gear Setting	Displays the Reference Unit/Electronic Gear Window to set the reference unit and electronic gears.
(5)	Axis Type Setting	Displays the Axis Type Setting Window to set the motor type and axis type.
(6)	Absolute Position Detection Setting	Displays the Absolute Position Detection Setting Window to set the simple ABS rotary position mode and the maximum number of absolute encoder rotations.
(7)	Fixed Parameter Saving	Displays the Fixed Parameter Saving Window to save the changed fixed parameter values.
(8)	Close	Closes the Fixed Parameter Setting Window.

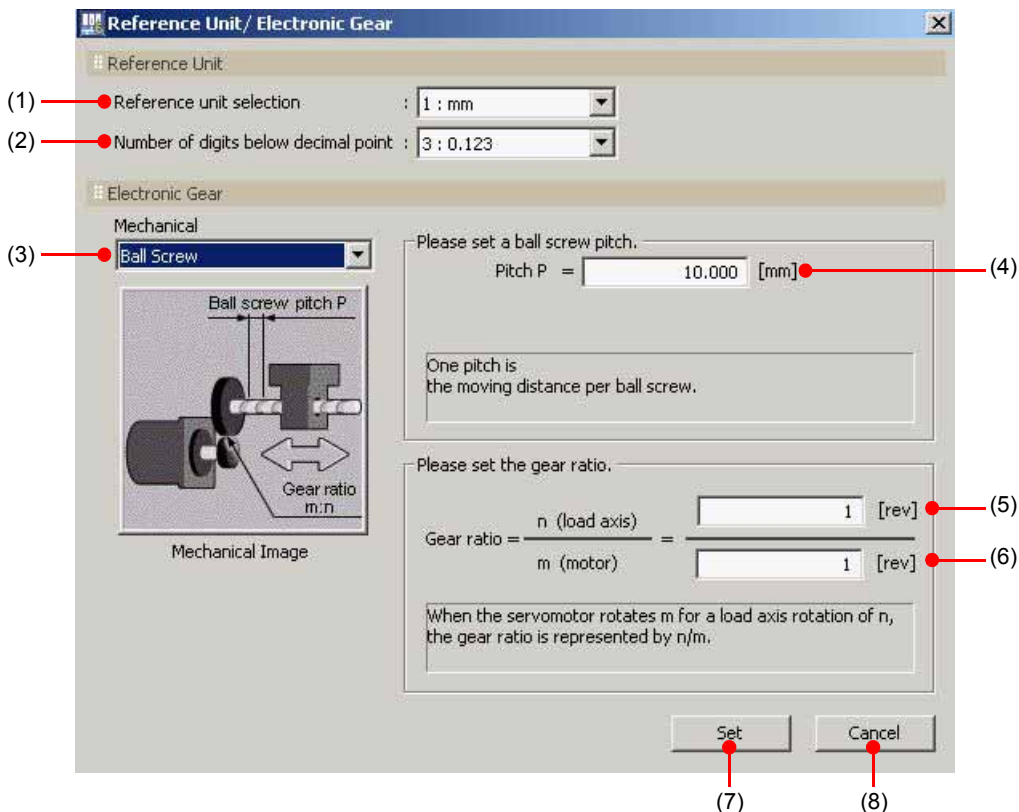
[a] Reference Unit and Electronic Gear Setting

Sets the reference unit, the number of decimal places, the pitch of the electronic gear (pulley diameter) and the reduction gear ratio.

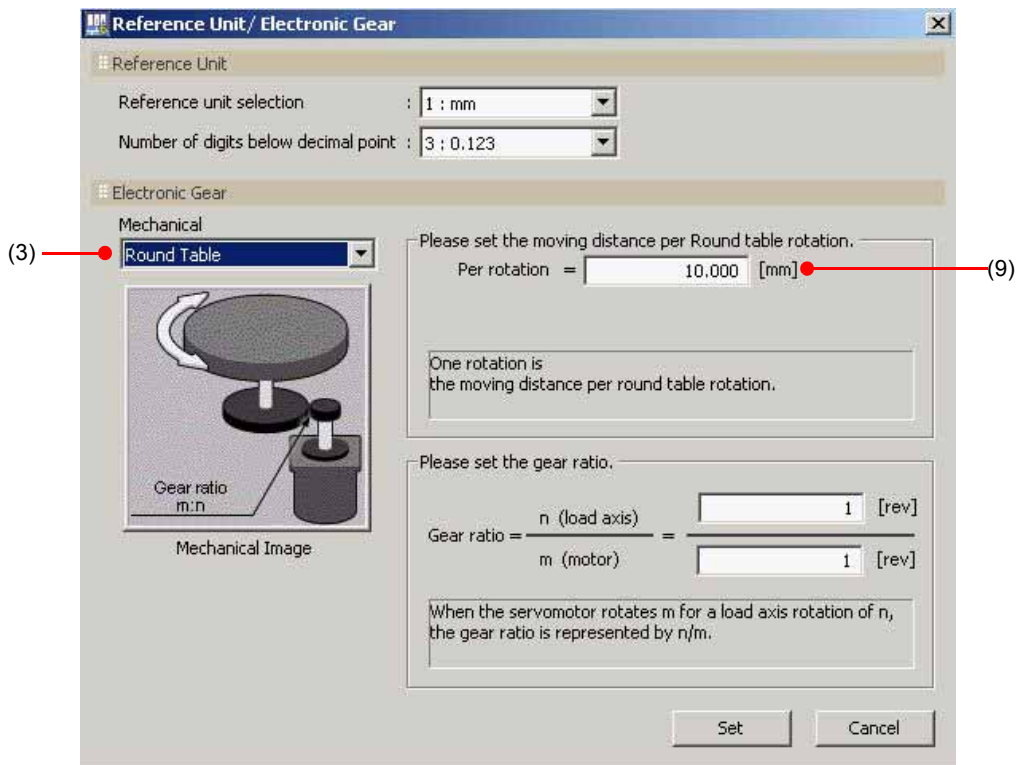
Setting the reference unit and electronic gear settings enables you to set the following fixed parameters.

No.	Fixed parameter
No. 4	Reference unit selection
No. 5	Number of decimal places
No. 6	Travel distance per machine rotation
No. 8	Servo motor gear ratio
No. 9	Machine gear ratio

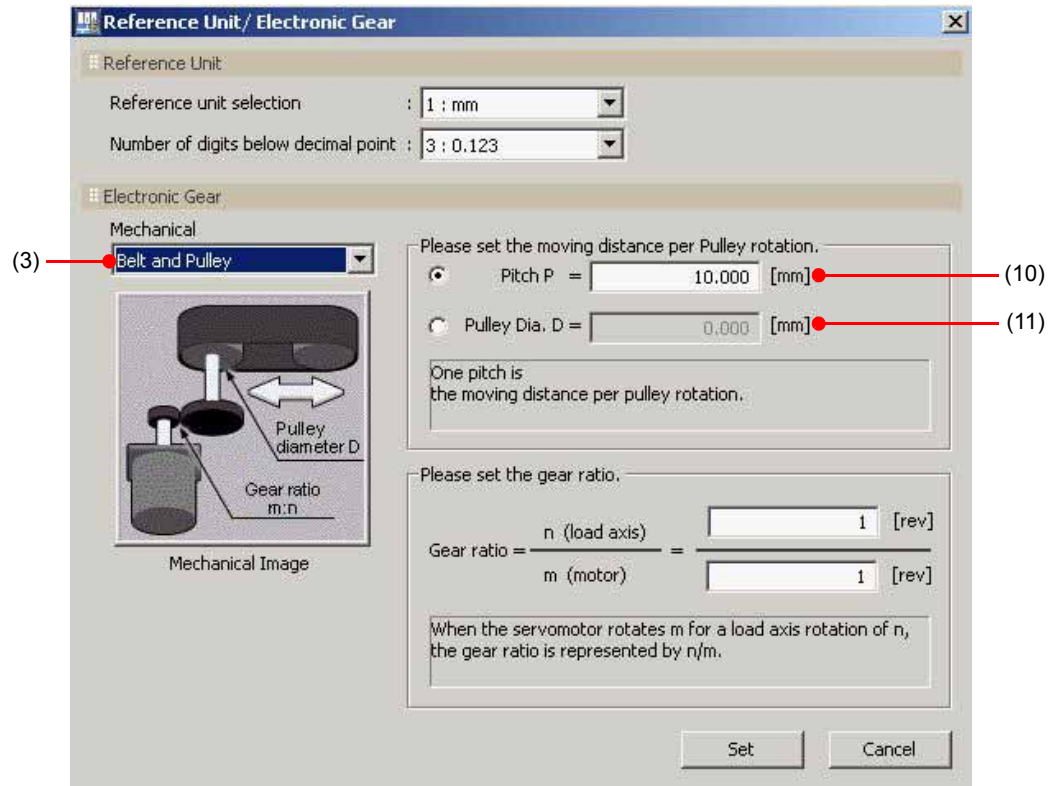
■ Ball screw



■ Rotary table



■ Belt and pulley



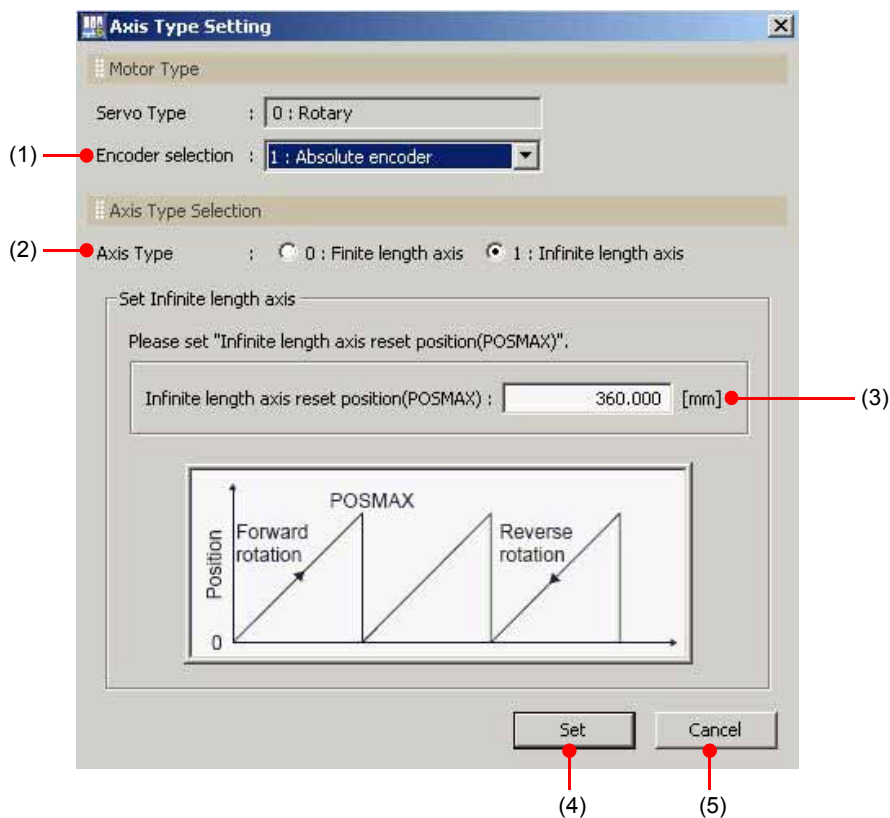
No.	Component	Description
(1)	Reference unit selection	Select the reference unit from the following five options. 0: pulse, 1: mm, 2: deg, 3: inch, 4: μm <ul style="list-style-type: none"> When "0: pulse" has been selected for Reference unit selection, the settings from (2) onward are disabled.
(2)	Number of digits below decimal point	Select the number of decimal places from among the following six options. 0: None, 1: 0.1, 2: 0.12, 3: 0.123, 4: 0.1234, 5: 0.12345
(3)	Mechanical	Select the mechanical construction from among the following three options. [a] Ball Screw [b] Round Table [c] Belt and Pulley
(4)	Pitch P	Set the travel per rotation of the ball screw.
(5)	Load axis	Set the number of rotations of the load axis for the reduction gear ratio.
(6)	Motor	Set the number of rotations of the motor for the reduction gear ratio.
(7)	Set	Sets the reference unit/electronic gear settings and returns you to the Fixed Parameter Setting Window.
(8)	Cancel	Returns you to the Fixed Parameter Setting Window without setting the reference unit/electronic gear settings.
(9)	Per rotation	Set the travel per rotation of the rotary table.
(10)	Pitch P	Set the travel per rotation of the pulley.
(11)	Pulley Dia.	Set the diameter of the pulley.

[b] Axis Type Setting

Sets the motor type and the axis type.

Setting the axis type enables you to set the following parameters.

No.	Fixed Parameter
No. 1 Bit 0	Axis type selection
No. 10	Infinite length axis reset position (POSMAX)
No. 30	Encoder selection



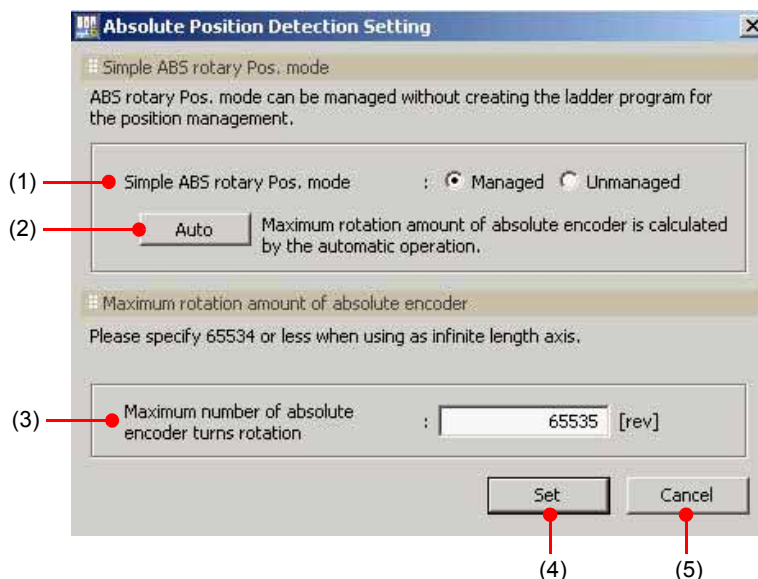
No.	Component	Description
(1)	Encoder selection	Select the encoder from among the following three options. 0: Incremental encoder 1: Absolute encoder 2: Absolute encoder (for incremental use)
(2)	Axis Type	Select the axis type from the following two options. 0: Finite length axis, 1: Infinite length axis
(3)	Set infinite length axis	Set the reset position for an infinite length axis. • This setting can be made if "Infinite length axis" has been selected at (2) Axis Type .
(4)	Set	Sets the axis type and returns you to the Fixed Parameter Setting Window.
(5)	Cancel	Returns you to the Fixed Parameter Setting Window without setting the axis type.

[c] Absolute Position Detection Setting

Sets the simple ABS rotary position mode and the maximum number of absolute encoder rotations. Setting absolute position detection enables you to set the following parameters.

No.	Fixed Parameter
No. 1 Bit 9	Simple ABS rotary position mode selection
No. 38	Maximum number of absolute encoder rotations

- The values set here are also reflected in Pn205, the Multiturn Limit Setting parameter, upon saving.



No.	Component	Description
(1)	Simple ABS rotary Pos. mode	Select the simple ABS rotary position mode. <ul style="list-style-type: none"> Enabled if “Infinite length axis” has been selected at (2) Axis Type in [b] Axis Type Setting.
(2)	Auto*	Automatically calculates the maximum number of absolute encoder rotations. <ul style="list-style-type: none"> Enabled if Managed was selected at (1).
(3)	Maximum number of absolute encoder turns rotation	Set the maximum number of absolute encoder rotations. If “Finite length axis” has been set for Axis Type in [b] Axis Type Setting a value of 65535 or lower can be set, and if “Infinite length axis” has been set, a value of 65534 or lower can be set.
(4)	Set	Sets absolute position detection and returns you to the Fixed Parameter Setting Window.
(5)	Cancel	Returns you to the Fixed Parameter Setting Window without setting absolute position detection.

- * The method used for automatic calculation is as follows.

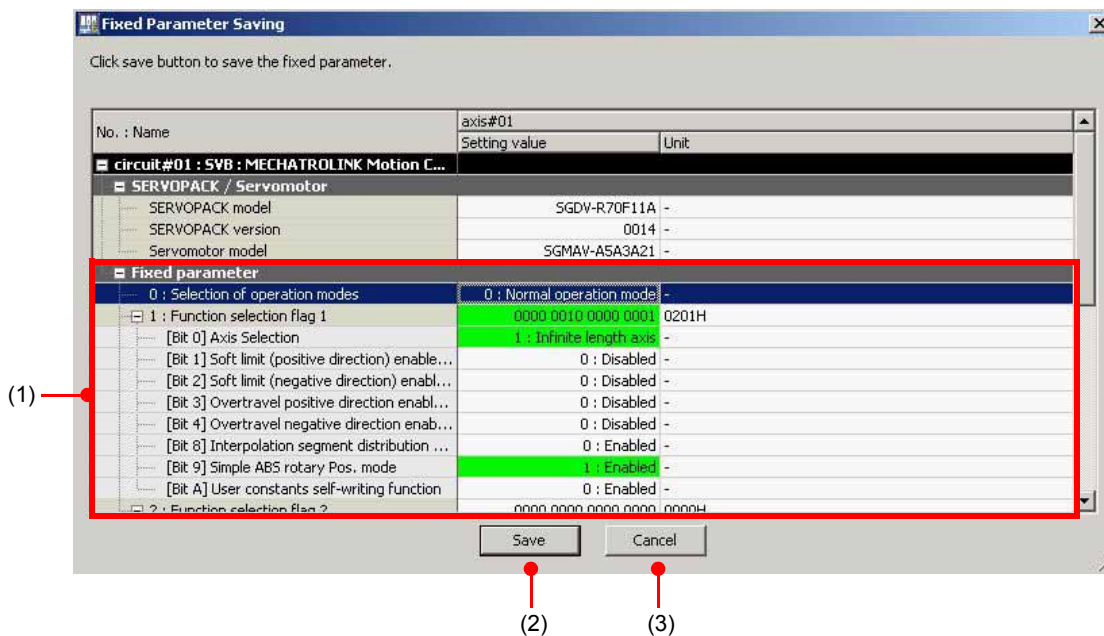
$$\frac{(\text{“Fixed parameter No. 38: Maximum number of absolute encoder rotations”} + 1)}{\text{Reset rotation amount}} = \text{Integral value (remainder} = 0)$$

The “reset rotation amount” differs as shown below depending on whether the reference unit is “pulse” or “mm/deg/inch.”

“No. 10: Reset position of infinite length axis” “No. 36: Number of pulses per motor rotation”	“No. 10: Reset position of infinite length axis” × “No. 8: Motor gear ratio” “No. 6: Travel distance per machine rotation” × “No. 9: Machine gear ratio”
When the reference unit is “pulse”	When the reference unit is “mm/deg/inch”

[d] Fixed Parameter Saving

Saves the parameters set in [a] to [c].

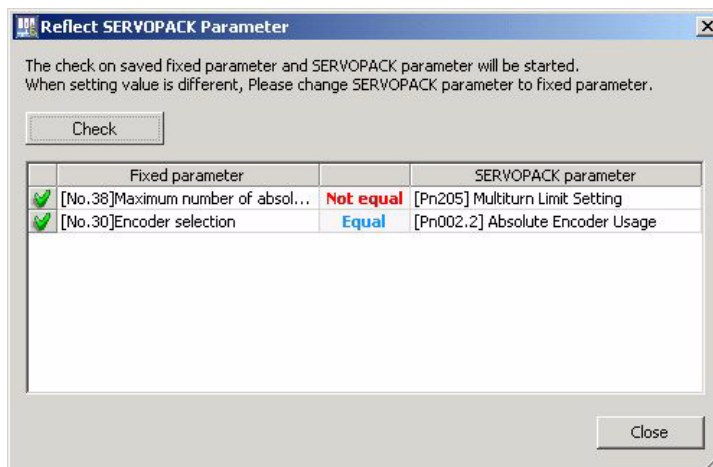


No.	Component	Description
(1)	Fixed parameter	Displays the fixed parameters set in [a] to [c].
(2)	Save	Saves the fixed parameters and returns you to the Fixed Parameter Setting Window.
(3)	Cancel	Returns you to the Fixed Parameter Setting Window without saving the fixed parameters.

- If “1: Absolute encoder” has been selected at (1) Encoder selection in [b] *Axis Type Setting*, the fixed parameters and SERVOPACK parameters are compared after saving the fixed parameters.

1. The **Reflect SERVOPACK Parameter** Dialog Box will be displayed.

Click the **Check** Button to check for differences in the set values of the saved fixed parameters and SERVOPACK parameters.



Fixed Parameter	SERVOPACK Parameter
No. 38 Maximum number of absolute encoder rotations	Pn205 Multiturn Limit Setting
No. 30 Encoder selection	Pn002.2 Absolute Encoder Usage

2. Parameters that have been checked are marked with ✓, and the results of checks are indicated.

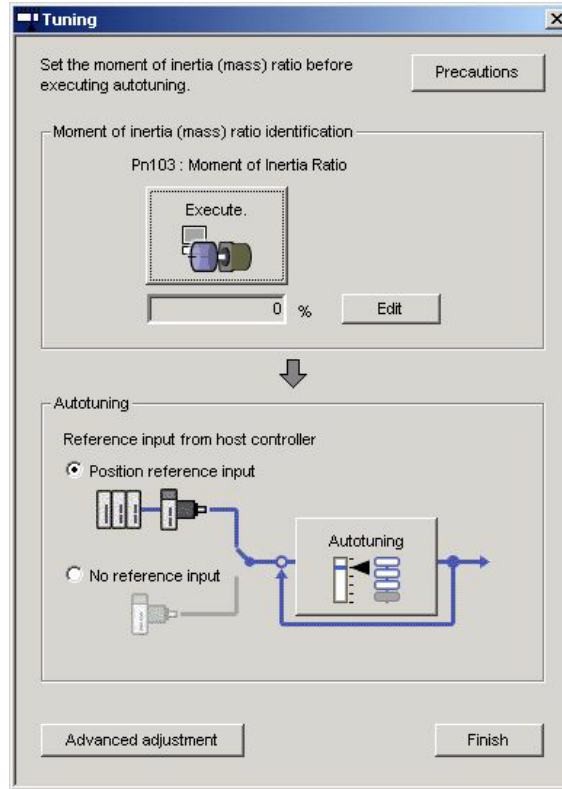
If the fixed parameters and the SERVOPACK parameters match: Equal

If the fixed parameters and SERVOPACK parameters do not match: Not equal

(5) Tuning

SigmaWin+ tuning can be started to adjust the axes optimally.

- For details on setting tuning, refer to 4.6 Tuning in AC Servo Drives Engineering Tool SigmaWin+ Online Manual Σ -V Component (manual No.: SIEP S800000 73).



■ When tuning has been started after initializing the SERVOPACK

Changes the setting of Pn170 (tuningless switch), then initiates a software reset.

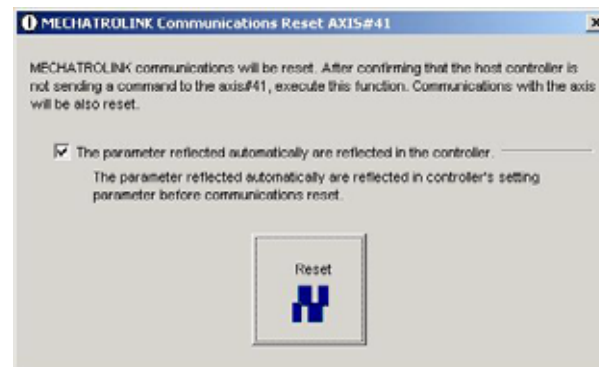
Check the **Reset MECHATROLINK communication** check box and click the **Execute** Button.

(With SigmaWin+ Σ -V, a reset is automatically applied after setting changes.)



■ About automatic adjustment

If tuning is performed with *No reference input* set for *Reference input from host controller* the connection with the machine controller is broken, so the **MECHATROLINK Communications Reset** Dialog Box will be displayed to reconnect after tuning.



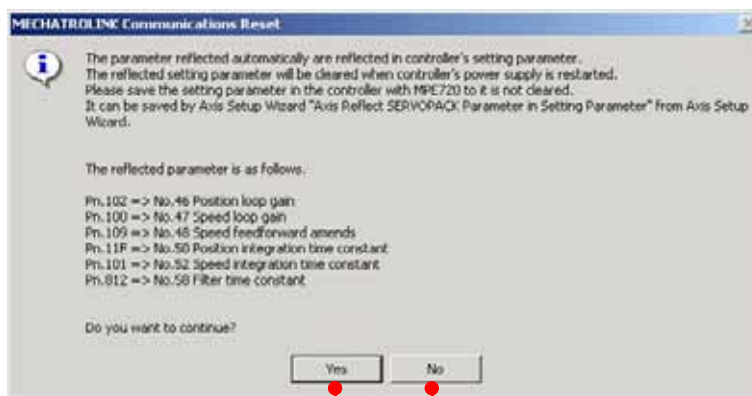
(6) Reflection of the SERVOPACK Parameters in the Setting Parameters

The SERVOPACK parameters can be automatically reflected in the setting parameters of the Machine Controller.

- If the fixed parameter “No.1 BitA: Servo user constant automatic write function” is enabled, on turning the power to the Machine Controller off and back on, the SERVOPACK parameters are written with the values of the setting parameters. For this reason, if the SERVOPACK parameters are changed after tuning, reflect these changes in the setting parameters before turning the power to the Machine Controller off and back on.

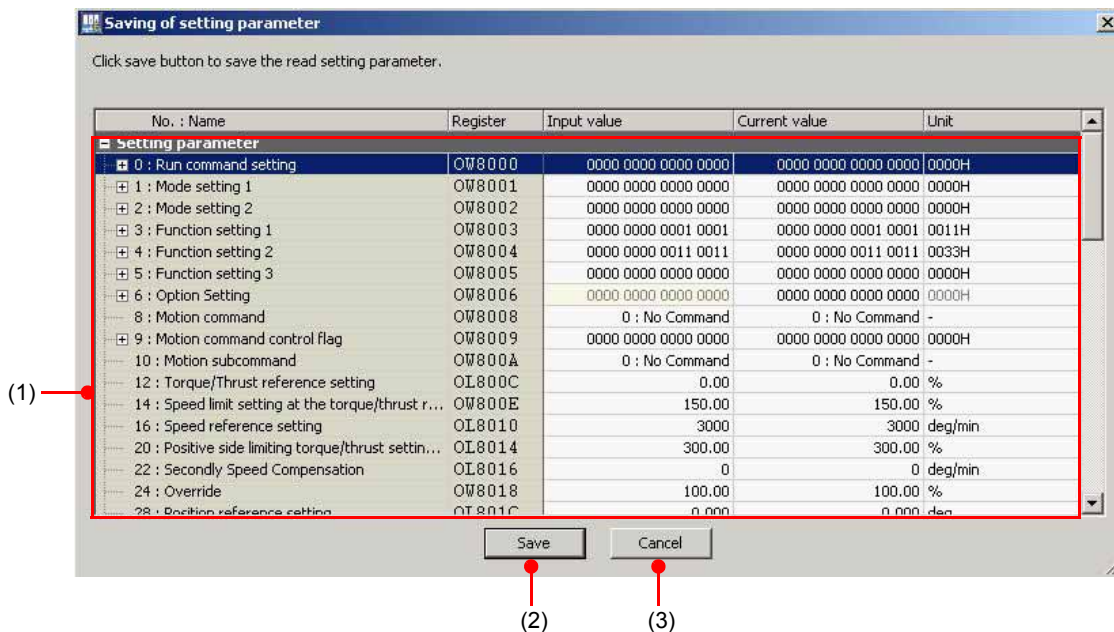
The parameters that are reflected from the SERVOPACK to the Machine Controller are as follows.

SERVOPACK	⇒	Machine Controller
Pn102: Position loop gain		OWxx2E: Position loop gain
Pn100: Speed loop gain		OWxx2F: Speed loop gain
Pn109: Feed forward		OWxx30: Speed feed forward compensation
Pn11F: Position integral time constant		OWxx32: Position loop integral time constant
Pn101: Speed loop integral time constant		OWxx34: Speed loop integral time constant
Pn812: Movement average time		OWxx3A: Filter time constant



(1) (2)

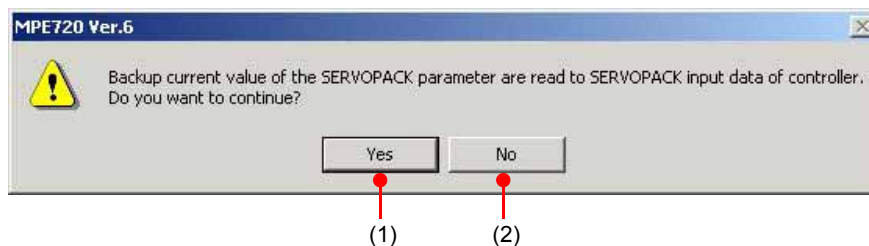
No.	Component	Description
(1)	Yes	Reads the SERVOPACK parameters and displays the Saving of setting parameter Window.
(2)	No	Returns you to the Axis Setup Wizard Window without reading the SERVOPACK parameters.



No.	Component	Description
(1)	Setting parameter	The read setting parameters are shown here.
(2)	Save	Saves the setting parameters and returns you to the Axis Setup Wizard Window.
(3)	Cancel	Returns you to the Axis Setup Wizard Window without saving the setting parameters.

(7) Backup Saving of the SERVOPACK Parameters

The current values of the SERVOPACK parameters can be read and saved as backup data in the SERVOPACK setting data of the Machine Controller.



No.	Component	Description
(1)	Yes	Saves a backup copy of the SERVOPACK parameters and returns you to the Axis Setup Wizard Window.
(2)	No	Returns you to the Axis Setup Wizard Window without saving a backup copy of the SERVOPACK parameters.

11.2 Test Run

11.2.1 Overview of Test Running

(1) What is Test Running?

This is a function that checks that the SERVOPACK axes operate in response to machine controller commands. The test run function allows you to perform the following operations by using the **Test run** Dialog Box.

- Axis servo enable and servo disable: The specified SERVOPACK axis can be turned ON and OFF.
- Jog operation: The specified SERVOPACK axis can be rotated in one direction at a constant speed.
- Step operation: The specified SERVOPACK axis can be rotated from the current position to a specified position.

The following two functions are also provided as means of monitoring test runs.

- Axis Monitor: Monitors the operating status of the axes.
- Alarm Monitor: Monitors the alarm information of all the axes in one window.
- Test operation can be used when the motion controller (SVB-01, SVB-01 inverter, SVA-01, SVR, PO-01) of the target axes are in the state indicated in the table below. If they are in a different state, the test run function cannot be operated.

Operating Axis		“Ready for Operation” Status	“Servo ready” Status	Motion Command Response Code
SVB (built-in CPU) SVB-01	Servo	ON	ON	No command
	Inverter	–	ON	No command
SVA-01		ON	ON	No command
SVR		ON	–	No command
PO-01		ON	–	No command

- * For inverters, the “ready for operation” status is the operation permitted status, and the “servo ready” status is the inverter ready status.



A precondition for carrying out a test run correctly is that no ladder program, motion program or sequence program is running.

11.2.2 Starting a Test Run

Open the **Test run** Dialog Box and specify the SERVOPACK axis for which test run is to be carried out. The procedure for setting the axis is as follows.

1. Double-click **Axis configuration - Test run** in the System Subwindow. Alternatively, click the **Test Run** Button registered in the **My Tool** Window.



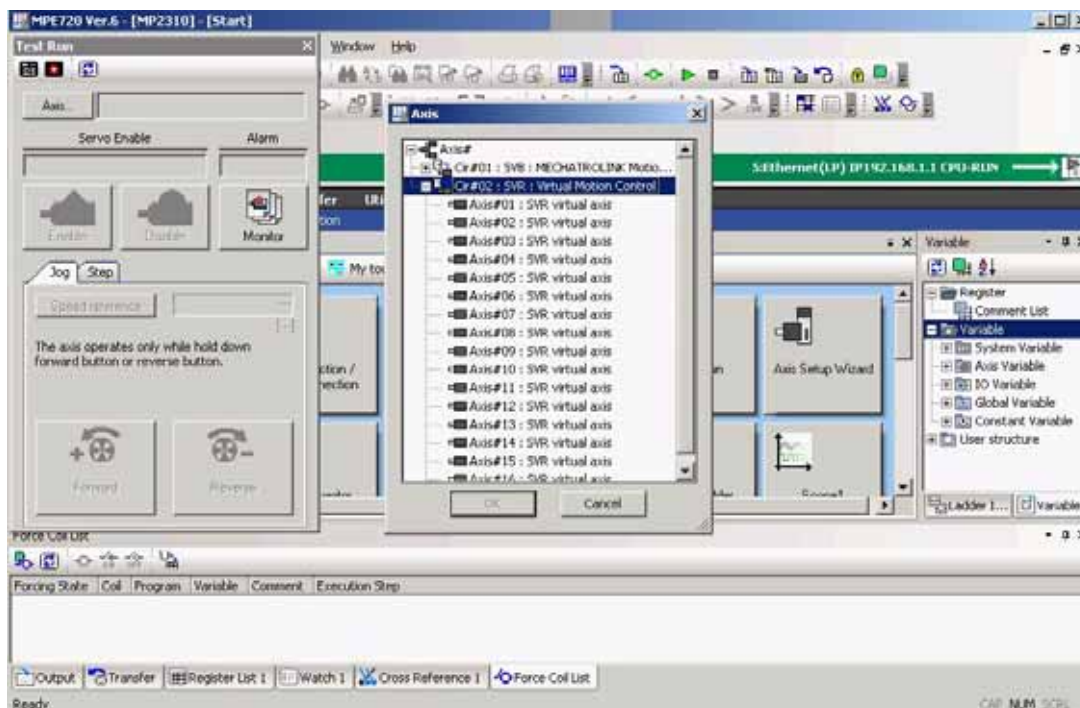
The **Test run Warning** Dialog Box will be displayed.

2. Read the cautions and click the **Agree** Button.

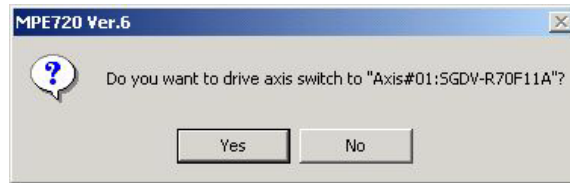


The **Test run** Window and the **Axis** Dialog Box will be displayed.

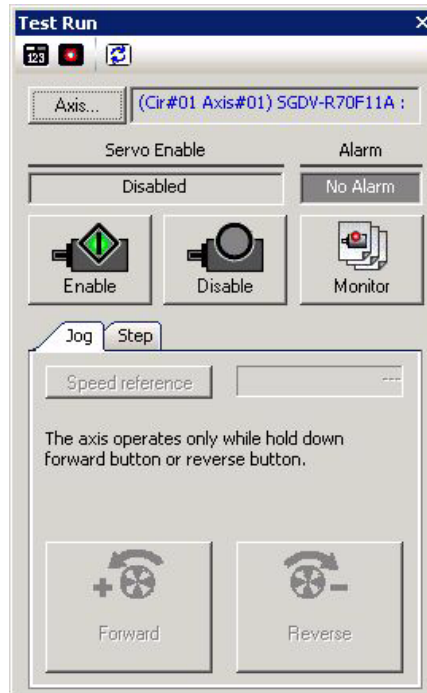
3. Select the axis on which the test run is to be carried out from the axis configuration tree in the **Axis** Dialog Box, then click the **OK** Button.



The following message is displayed.



4. On clicking the **Yes** Button, the selected axis name will appear in the display field to the right of the **Axis** Button in the **Test Run** Window.

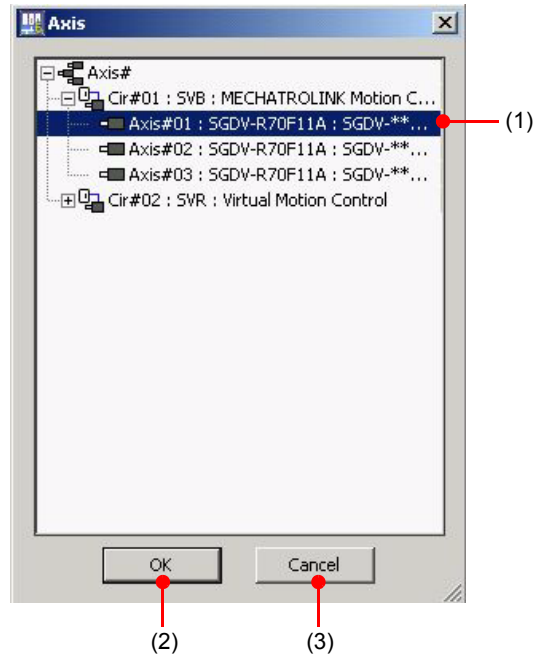


- The axis on which the test run can be performed is restricted to the single selected axis. To use another axis, click the **Axis** Button to display the **Axis** Dialog Box, then make another axis selection.

11.2.3 Names and Descriptions of Components of Test Run

(1) Axis Dialog Box

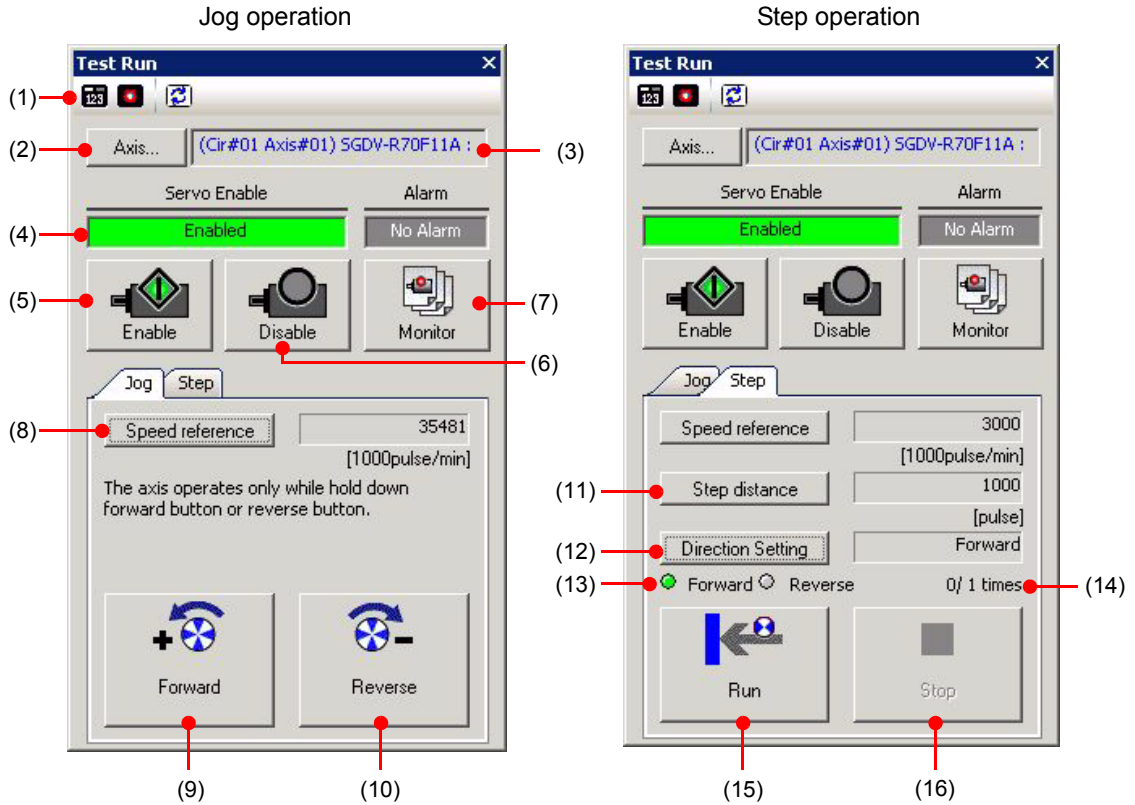
The axis on which the test run is to be carried out can be selected here.




No.	Component	Function
(1)	Axis	Displays the information allocated to the module configuration definition. Select the axis on which the test run is to be carried out.
(2)	OK	Selects the axis and displays the Test Run Window.
(3)	Cancel	Ends the test run without selecting an axis.

(2) Test Run

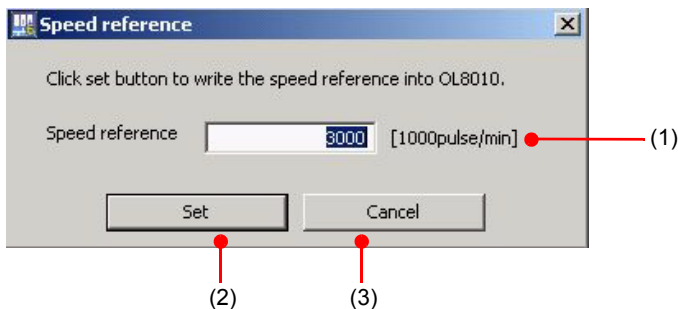
Test runs can be carried out from this window.



No.	Component		Function
(1)	Toolbar	Axis Monitor	Displays the Axis Monitor Window in the main window.
		Alarm Monitor	Displays the Alarm Monitor Window in the main window.
		Update with latest information	Updates the test run indication with the latest information.
(2)	Axis	Displays the Axis Dialog Box.	
(3)	Axis indication	Displays the selected axis.	
(4)	Status	Displays the axis operating status, and alarm occurrence information.	
(5)	Enable	Sets the axis in the servo enable status.	
(6)	Disable	Sets the axis in the servo disable state.	
(7)	Monitor	Displays the Alarm/Warning Dialog Box.	
(8)	Speed reference	Displays the Speed reference Dialog Box. Set the speed at which the axis rotates (speed reference).	
(9)	Forward	Rotates the axis in the forward direction while held down.	
(10)	Reverse	Rotates the axis in the reverse direction while held down.	
(11)	Step distance	Displays the Step distance Dialog Box. Set the step distance of the axis.	
(12)	Direction Setting	Displays the Direction Setting Dialog Box. Set the direction in which the axis starts step operation and the number of times step operation is performed.	
(13)	Forward/reverse status	Indicates the current direction of rotation in step operation with  .	
(14)	Number of repetitions status	Displays the “current number of iterations/set number of iterations.”	
(15)	Run	Runs step operation in the direction of operation set at Direction Setting .	
(16)	Stop	Stops step operation.	

(3) Setting the Speed Reference Value

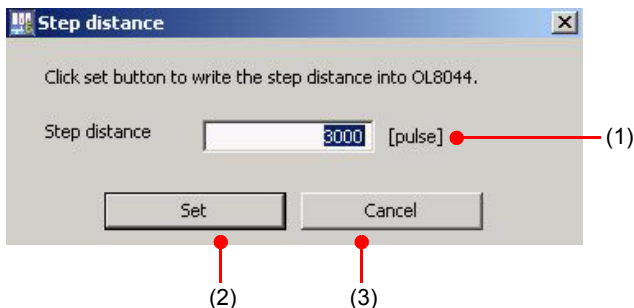
The speed reference value can be set here.



No.	Component	Function
(1)	Speed reference	Set the speed of operation in jog operation or step operation here.
(2)	Set	Sets the speed reference value and returns you to the Test Run Window.
(3)	Cancel	Returns you to the Test Run Window without setting a speed reference value.

(4) Setting the Step Distance

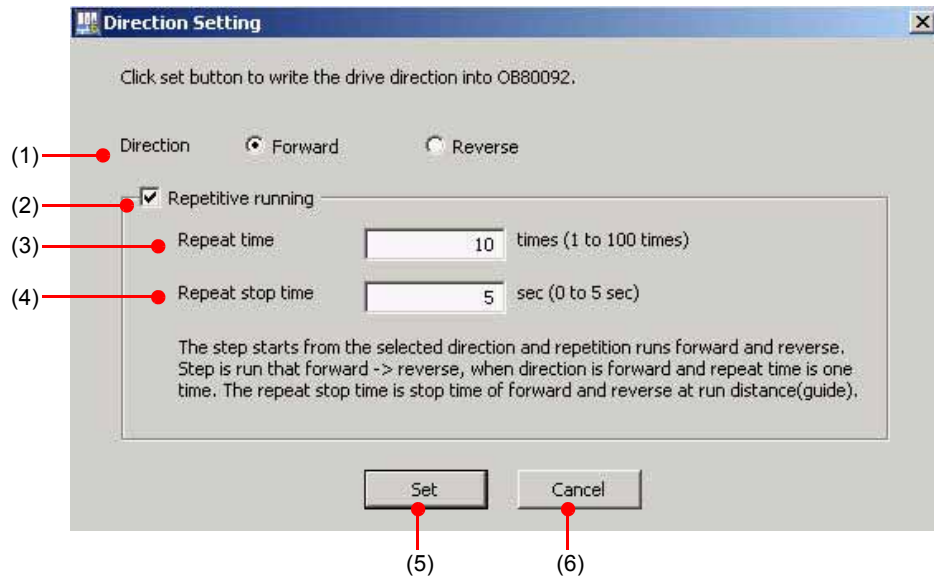
The step difference can be set here.



No.	Component	Function
(1)	Step distance	Set the step distance for step operation.
(2)	Set	Sets the step difference and returns you to the Test Run Window.
(3)	Cancel	Returns you to the Test Run Window without setting a step distance.

(5) Setting the Direction of Operation

The direction of operation can be set here.



No.	Component	Function
(1)	Direction	Set the direction in which step operation is to be started.
(2)	Repetitive running	When this check box is checked, repetitive operations are enabled.
(3)	Repeat time	Set the number of times that forward and reverse operation is to be repeated. Example: When Reverse is selected and Repeat time is set to 2, the axis rotates as follows: "reverse → forward → reverse → forward." (Each occurrence of "forward → reverse" or "reverse → forward" is counted as one repetition.)
(4)	Repeat stop time	Set the stop time between repetitive operations.
(5)	Set	Sets the direction of operation and returns you to the Test Run Window.
(6)	Cancel	Returns you to the Test Run Window without setting the direction of operation.

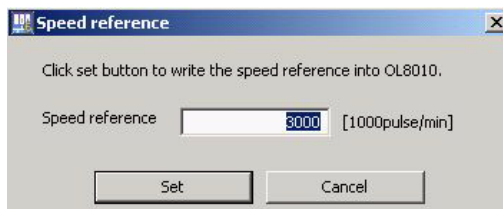
11.2.4 Setting the Speed, Step Distance, and Direction

(1) Setting the Speed Reference Value

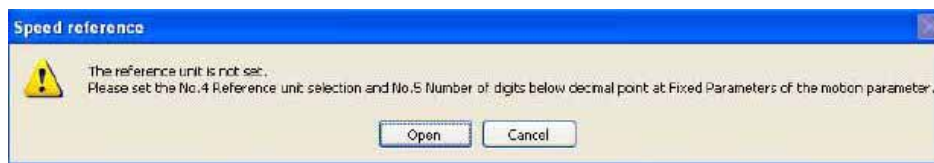
Set the speed for performing step operation as follows.

1. Click the **Speed reference** Button on the **Jog** Tab Page.

Alternatively, click the **Speed reference** Button on the **Step** Tab Page.
The **Speed reference** Dialog Box will be displayed.



- If the units for specifying the speed reference value have not been set, the following message dialog box will be displayed. Click the **Open** Button and set the speed reference unit.



2. Enter the operating speed and click the **Set** Button.

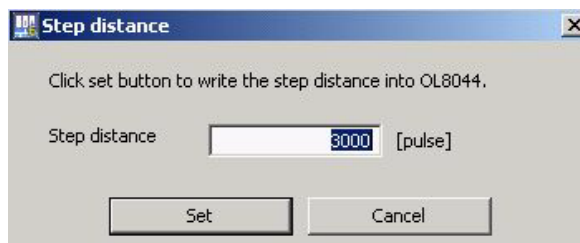
The entered value (speed reference value) is written to the setting parameter, completing setting.

(2) Setting the Step Distance

Set the extent of the step motion as follows.

1. Click the **Step distance** Button on the **Step** Tab Page.

The **Step distance** Dialog Box will be displayed.



2. Enter the value for the step motion, then click the **Set** Button.

The entered value (step distance) is written to the setting parameter, completing setting.

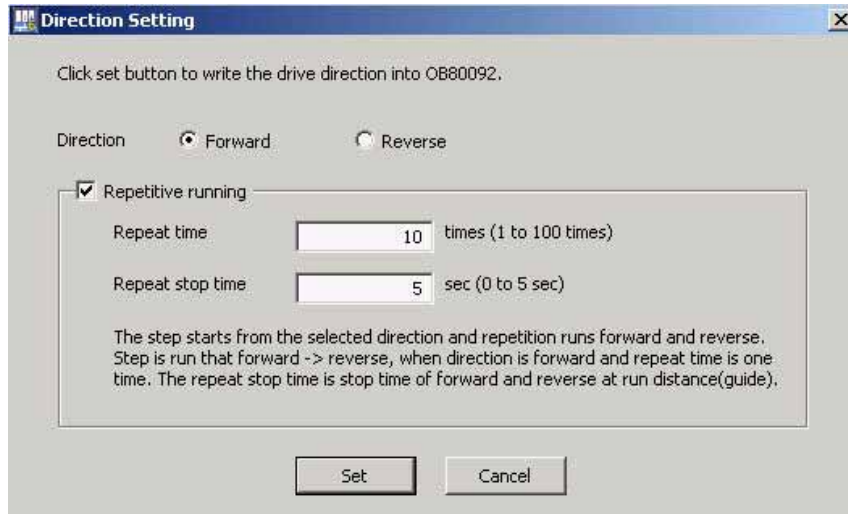
(3) Setting the Direction of Operation

Set the direction in which step operation is to start, and repeated operation, as follows.

By setting the number of repetitions in the **Direction Setting** Dialog Box, you can repeat forward/reverse operation this number of times.

1. Click the **Direction Setting** Button on the **Step** Tab Page.

The **Direction Setting** Dialog Box will be displayed.



2. Set the direction of operation and whether repetitive operation is to be performed or not, then click the **Set** Button.

When operation is started, these settings are reflected as the current values of the setting parameters.

11.2.5 Servo Enable and Servo Disable Status of Axes

The specified SERVOPACK axis can be enabled (servo enable) or disabled (servo disable).

In the following explanation, enabling an axis is called “setting the servo enable status” and disabling an axis is called “setting the servo disable status.”

The servo enable and servo disable statuses can be switched by clicking the **enable** and **disable** Buttons. The operating status of SERVOPACK axes can be checked in the **Test run** Dialog Box.

(1) Setting the Servo Enable Status

This means enabling the SERVOPACK. The status of the axis changes from **Disable** to **Enable** and it becomes possible to use the Jog and Step Tab Pages.

If an alarm occurs while the servo enable status is set, it will become impossible to use the Jog and Step Tab Pages.

The alarm status changes to **Alarm** or **Warning**.

- For details on alarms, refer to 11.4 Alarm Monitor.

1. Click the **Enable** Button.

The axis is set in the servo enable status.

The axis status changes from **Disable** to **Enable**.

(2) Setting the Servo Disable Status

This means that the axis that has been in the servo Enable status is stopped. The status of the axis changes from **Enable** to **Disable**, and it becomes impossible to use the **Jog** or **Step** Tab Pages.

1. Click the **Disable** Button.

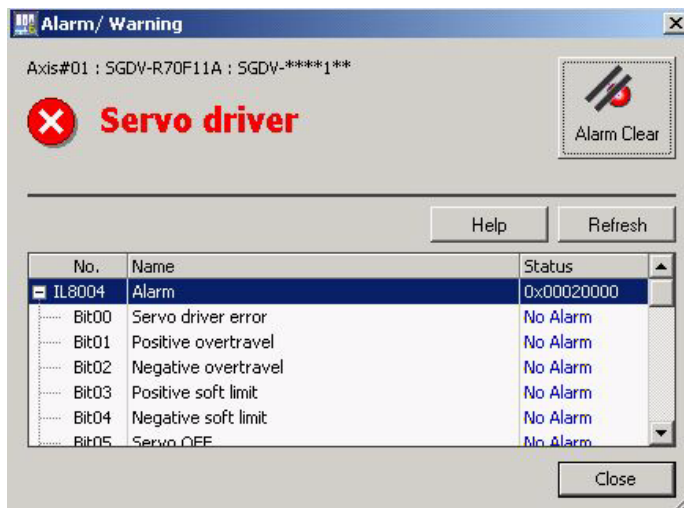
The axis is set in the servo disable status.

The status of the axis changes from **Enable** to **Disable**.

The Jog and Step Tab Pages are disabled (grayed out).

(3) Display of Alarm Information

On clicking the **Monitor** Button, the **Alarm/Warning** Dialog Box will be displayed. It shows the alarm and warning information.



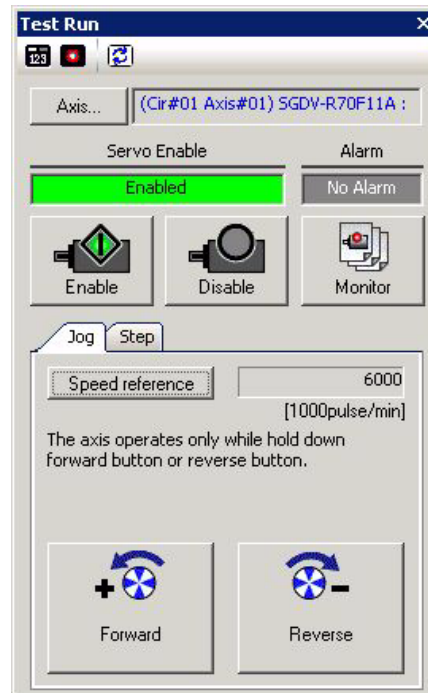
11.2.6 Axis Jog Operation

In jog operation, a SERVOPACK axis is rotated in one direction.

The axis can be rotated in this direction while it is in the servo enable status.



- Jog operation can be performed while the axis is in the servo enable status.
- When you switch from the **Jog** Tab Page to the **Step** Tab Page, the values set in jog operation are not saved.



(1) Axis Forward Rotation

The axis rotates in the forward direction at the speed set in *11.2.4 Setting the Speed, Step Distance, and Direction*. It continues rotating as long as the button remains pressed.

1. Set the speed reference value.
2. Press and hold down the **Forward** Button with the mouse.

The axis rotates in the forward direction.

3. Release the **Forward** Button.

Axis rotation stops.

(2) Axis Reverse Rotation

The axis rotates in the forward direction at the speed set in *11.2.4 Setting the Speed, Step Distance, and Direction*. It continues rotating as long as the button remains pressed.

- 1.** Set the speed reference value.
- 2.** Press and hold down the **Reverse** Button with the mouse.
- 3.** Release the **Reverse** Button.

The axis rotates in the reverse direction.

Axis rotation stops.

11.2.7 Axis Step Operation

In step operation, a SERVOPACK axis is rotated from its current position to a specified position. Forward and reverse rotation of the axis can be repeated while it is in the servo enable status.



- Step operation can be performed while the axis is in the servo enable status.
- On switching from the **Step** Tab Page to the **Jog** Tab Page, the values set in step operation are not saved.

(1) Starting Step Operation

The axis will perform step operation based on the data set in *11.2.4 Setting the Speed, Step Distance, and Direction*. On reaching the set operation count, step operation stops.

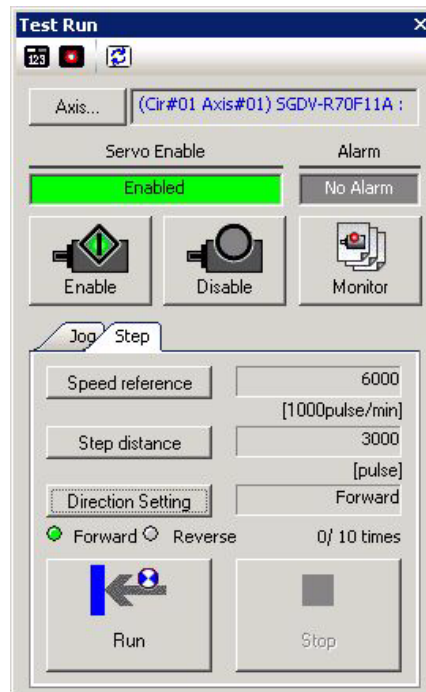
1. Make the following settings in order to perform step operation.

Speed reference: Set the speed at which the axis is to rotate.

Step distance: Set the travel when the axis rotates.

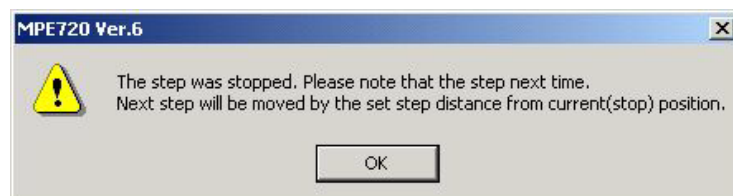
Direction Setting: Set the direction in which the axis is to rotate.

2. Click the **Run** Button on the **Step** Tab Page.



Step operation of the axis starts with the speed, step distance and direction of operation set in step 1. On reaching the set count, step operation stops.

- If operation is stopped while step operation is in progress, the message below is displayed.



11.3 Axis Monitor

11.3.1 Outline of Axis Monitor

(1) What is Axis Monitor?

This is a function for monitoring the operating status of each of the axes connected to the Machine Controller. The operating status of the axes (*Ready/Servo Enable*, *Alarm/Warning*, *Prof. Comp/In Position*, *Motion Command*), and the monitor data of any desired monitor parameters can be displayed.



11.3.2 Starting Axis Monitor

Open the **Axis Monitor** Window.

1. Opening from the System Subwindow

Double-click *Axis configuration - Axis monitor*.

2. Opening from the **My Tool** Window

Click the Axis Monitor Button registered in the **My Tool** Window.

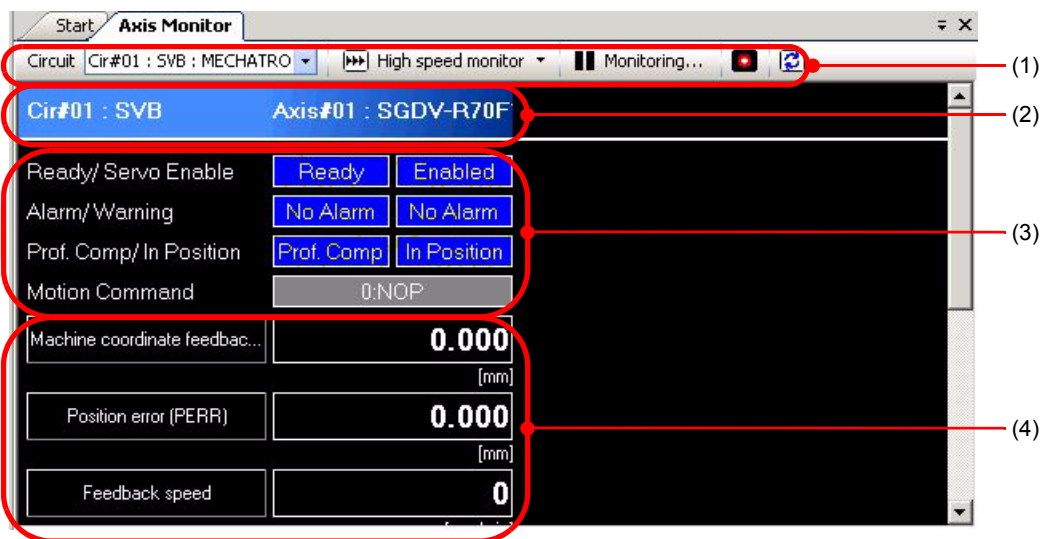


11.3.3 Names and Descriptions of Components of Axis Monitor

(1) Axis Monitor

In the **Axis Monitor** Tab Page, only the axes displayed in the main window can be monitored. To monitor a hidden axis, scroll the window to display it.

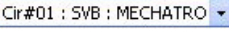



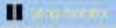



- The axes that can be displayed for each module are as follows.
 - SVB Module:** Axes connected to the MECHATROLINK network
 - SVA-01:** 2 axes
 - SVR:** 16 axes
 - PO-01:** 4 axes



No.	Component	Function
(1)	Toolbar	Updates the window display and stops monitoring.
(2)	Circuit and axis indication	Displays the circuit number and axis name.
(3)	Axis operating status indication	Displays the operating status of the axis.
(4)	Monitor parameter display	Displays the monitor parameter names and their current values.

[a] Toolbar

The toolbar includes icons relating to monitoring, e.g. for circuit selection and speed changes to be monitored.

Icon	Name	Function
	Circuit selection	Select the circuit to be monitored.
 High speed monitor  Normal speed monitor  Low speed monitor	Monitor type	Select the monitoring cycle from the following three options. High speed monitor Normal speed monitor Low speed monitor
 Stop monitoring  Monitoring...	Stop monitoring Start monitoring	Stop monitor: Temporarily stops monitoring. Monitoring: Starts monitoring.
	Alarm monitor	Displays the Alarm Monitor Window.
	Update with latest information	Updates the Axis Monitor Window with the latest information.

[b] Circuit and Axis Indication

The circuit numbers of the modules connected to the Machine Controller, the motion module (SVB, SVA, PO-01, SVR) names, and the names of the axes connected to the motion module are displayed.

It is possible to display the Axis Monitor Windows of other modules using the combo box.

[c] Axis Indication


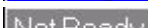


The axis number, axis type name, and comment (if there is a comment) for each axis are displayed.

[d] Axis Operating Status Indication

The axis operating status are displayed. The following operating statuses can be checked: *Ready/Servo Enable, Alarm/Warning, Prof. Comp/In Position, Motion Command*.



■ Ready/Servo Enable

The Ready and Servo Enable operating statuses are displayed.

Icon	Name	Function
 	Ready	Ready: Indicates the status in which the preparations for operation of the axis have been completed. Not Ready: Indicates the status in which the preparations for operation of the axis have not been completed.
 	Enable	Enabled: Indicates the servo enable status. Disabled: Indicates the servo disable status.

■ Alarm/Warning


When they have occurred, alarms and warnings are displayed.

Icon	Name	Function
	Alarm	Indicates that an alarm has occurred.
	Warning	Indicates that a warning has occurred.

Clicking the status displays the **Alarm/Warning** Dialog Box, enabling you to check the detailed information on the alarm or warning.





- For details on alarms/warnings, see *11.3 Axis Monitor*.

When an alarm or warning is remedied, the status changes to that shown below.

Icon	Name	Function
	Normal status	Indicates that no alarm or warning is in effect.

■ Prof. Comp/In Position

The position control statuses **Prof. Comp** and **In Position** are displayed. When these statuses are in effect, their backgrounds are shown in blue.

Icon	Name	Function
 	Distribution completed	Indicates the status that the distribution is completed.
 	In position	Indicates the status that positioning is completed.

■ Motion Command

The status of the motion command response code is displayed. The background for statuses other than **0:NOP** is shown in blue.

[e] Monitor Parameter Display

The monitor data of the monitor parameters is displayed. For details, refer to *11.3 Axis Monitor*.

11.3.4 Setting and Displaying Monitor Parameters

Set the parameters to be monitored, and display their data, as follows.

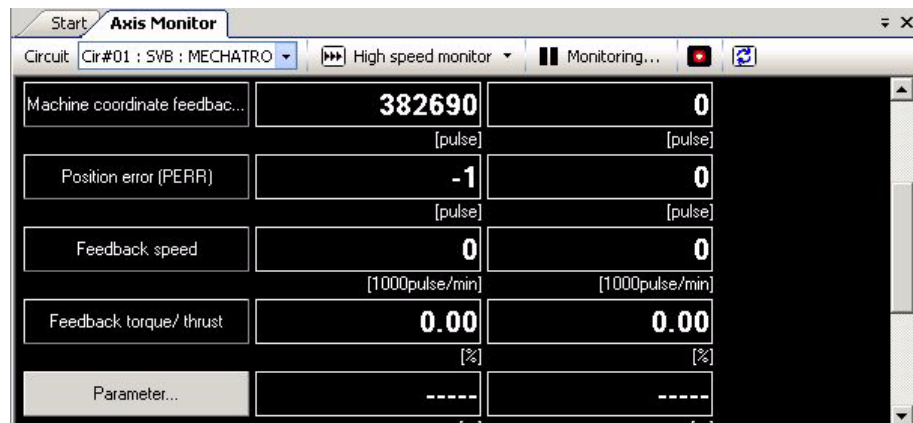
The monitor data of the monitor parameters indicated in the module configuration definitions can be checked.

Select the monitor parameters to be monitored from a list and set them. Alternatively, enter the motion register (I/O registers only) directly.

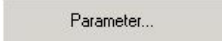
A maximum of 8 monitor parameter data can be monitored at one time.

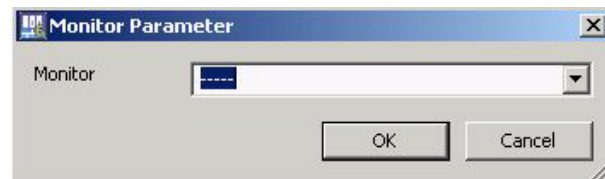
- It is also possible to change monitor parameters that have already been set.

Since the monitor parameters that have been set are saved as setting information, they can be displayed when the **Axis Monitor** Tab Page is opened again.



Use the following procedure to select monitor parameters.

- Click a monitor parameter that is already displayed, or the **Parameter** Button ().
The **Monitor Parameter** Dialog Box will be displayed.
- Click the ▼ Button to drop down the combo box, then select the monitor parameter. Alternatively, enter the motion register (I/O registers only) directly.



The monitor parameters displayed in the combo box are as follows.

Monitor Parameter	Register	Unit
Target position in machine coordinate system (TPOS)	ILxx0E	Reference unit
Calculated position in machine coordinate system (CPOS)	ILxx10	Reference unit
Reference position in machine coordinate system (MPOS)	ILxx12	Reference unit
Feedback position in machine coordinate system (APOS)	ILxx16	Reference unit
Latch position in machine coordinate system (LPOS)	ILxx18	Reference unit
Position error (PERR)	ILxx1A	Reference unit
POSMAX number of turns	ILxx1E	[rev]
Speed reference output value monitor	ILxx20	[pulse/sec]
Feedback speed	ILxx40	Selected speed unit
Torque/thrust reference monitor	ILxx42	Selected torque unit

3. Click the **OK** Button.

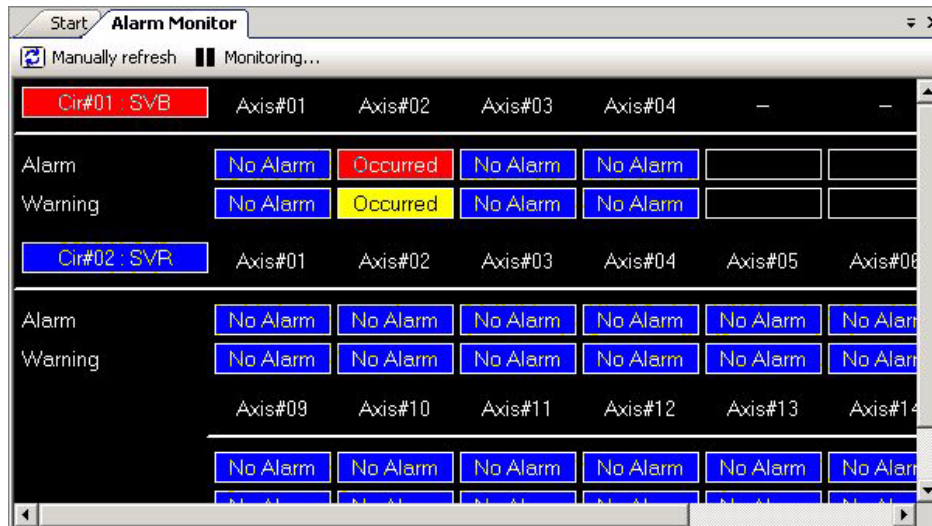
The monitor parameter is displayed in the **Axis Monitor** Window and monitoring is started.

11.4 Alarm Monitor

11.4.1 Overview of Alarm Monitor

(1) What is Alarm Monitor?

This is a function that monitors the alarm information of all of the axes that are connected to the Machine Controller. The alarm/warning occurrence status for each axis is displayed to enable monitoring of the alarm and warning information.



11.4.2 Starting Alarm Monitor

Open the **Alarm Monitor** Window.

1. Opening from the System Subwindow

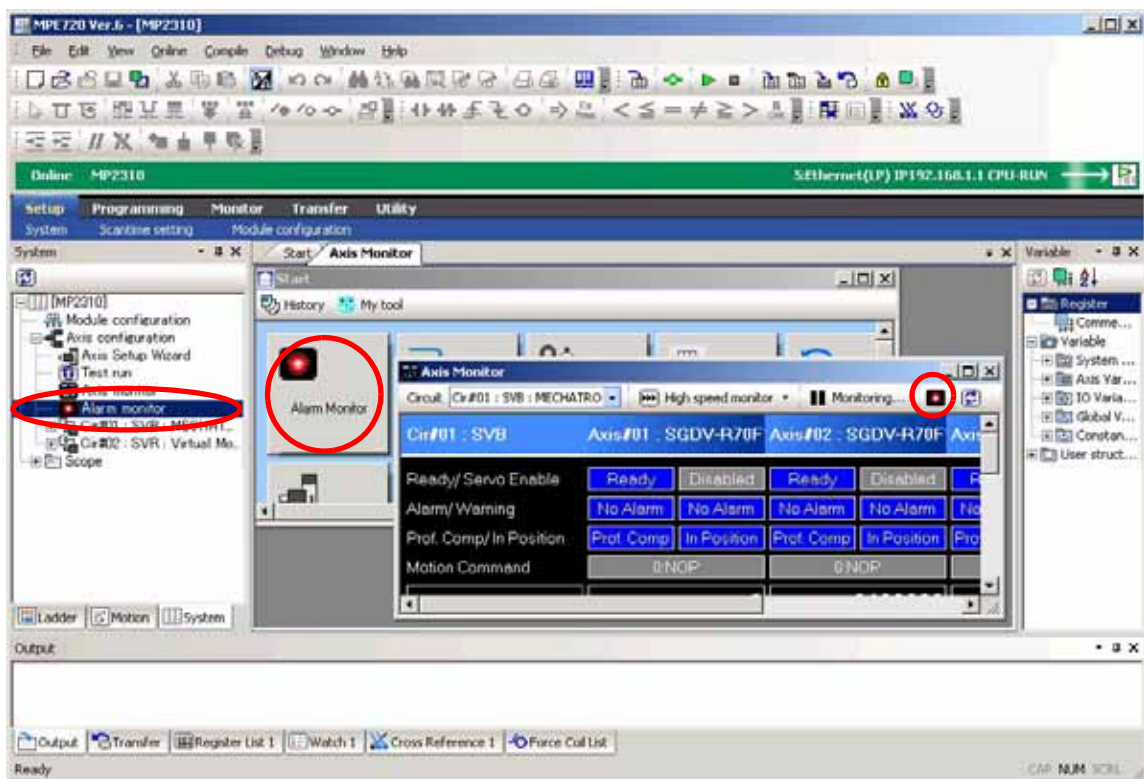
Double-click *Axis configuration - Alarm monitor*.

2. Opening from the **My Tool** Window

Click the **Alarm Monitor** Button registered in the **My Tool** Window.

3. Opening from the **Axis Monitor** Window

In the **Axis Monitor** Window, click the **Alarm Monitor** Icon.

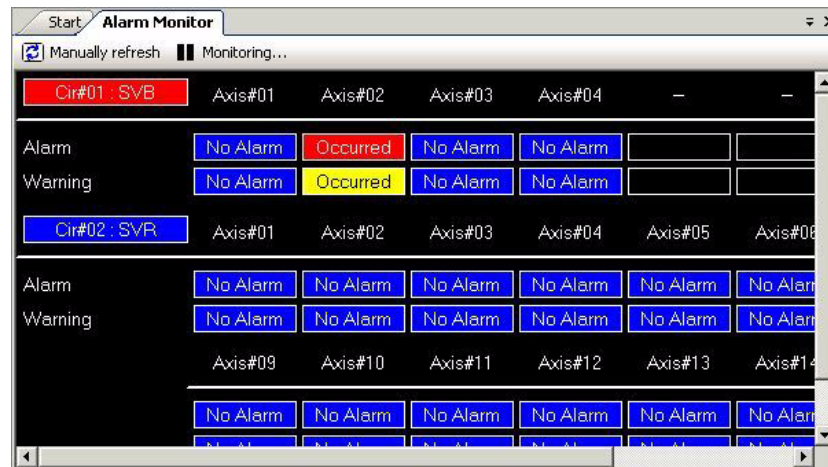


11.4.3 Names and Descriptions of Components of Alarm Monitor

(1) Alarm Monitor

The **Alarm Monitor** Tab Page shows the warning and alarm occurrence statuses for each circuit. A maximum of 8 axes can be displayed in a single row, in the **Axis Monitor** Tab Page.




- When offline, all monitor data is displayed as “-----”.



No.	Component	Function
(1)	Toolbar	Refreshes the display and stops monitoring.
(2)	Circuit number/module name	Displays the circuit number and module name.
(3)	Axis No.	Displays the axis numbers set for the motion module.
(4)	Status indication	Displays the statuses of alarms and warnings.

[a] Toolbar

Icons for manually refreshing and for temporarily stopping or starting monitoring are provided.

Icon	Name	Function
 Manually refresh	Manual refresh	Manually refreshes the alarm and warning information of the Alarm Monitor Tab Page. The Alarm Monitor Tab Page is not automatically refreshed.
 Stop monitor  Monitoring...	Stop monitoring Start monitoring	Stop monitor: Temporarily stops monitoring. Monitoring: Starts monitoring.

[b] Circuit Number/Module Name

The circuit numbers and motion module names are displayed.

By clicking a circuit number, the monitor data for each circuit can be shown/hidden. This makes it possible to show only the data of the required axes.

When a circuit is shown: The monitor data of alarms and warnings is shown.



When a circuit is hidden: The monitor data of alarms and warnings is hidden.



[c] Statuses

When an alarm or warning occurs, the alarm/warning statuses are displayed.

Icon	Name	Function
	Normal status	Indicates that no alarm or warning is in effect.
	Alarm in effect	Indicates that an alarm has occurred.
	Warning in effect	Indicates that a warning has occurred.

(2) Displaying alarms/warnings

Double-click the axis on which the alarm or warning occurred to display the **Alarm/Warning** Dialog Box.



No.	Component	Function
(1)	Axis name	Displays the axis name. The sequence of indications is: axis allocation number - comment - type.
(2)	Alarm/warning name	Displays the name of the alarm or warning.
(3)	Alarm Clear	Clears alarms that have occurred.
(4)	Help	Displays information on the alarm that has occurred from the manual: User's manual on the Motion Module for MP2200 and MP2300 Machine Controllers.
(5)	Refresh	Refreshes the information in the Alarm/Warning Dialog Box
(6)	Alarm/Warning display	Displays the bit numbers, parameter names and statuses. The alarms and the warnings are the bit-wise information that can be displayed at each of the motion modules.
(7)	Close	Closes the Alarm/Warning Dialog Box.

11.4.4 When an Alarm/Warning Occurs

Check the details of the alarm/warning, and the corrective action. Check that it can be corrected, and then clear the alarm.

When an alarm or warning occurs, the status changes to **Occurred** or **Occurred**.

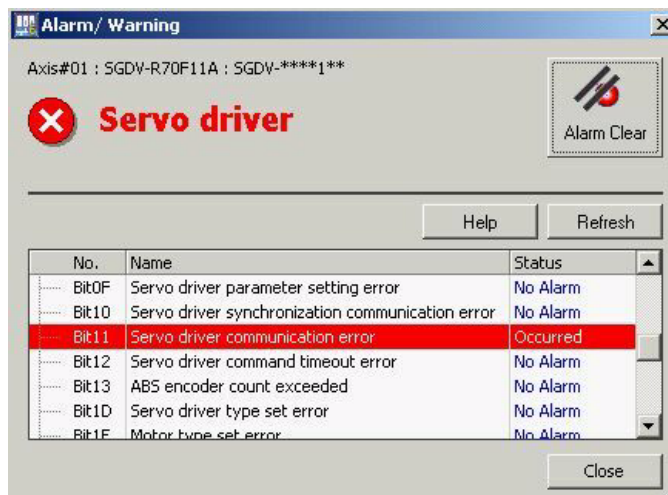
Clicking the status displays the **Alarm/Warning** Dialog Box, allowing you to check the detailed information on the alarm or warning.

Here, the procedure when an alarm or warning occurs is explained by taking a servo driver communication error as an example.

1. Click the status in the **Alarm Monitor** Tab Page.

The **Alarm/Warning** Dialog Box will be displayed.

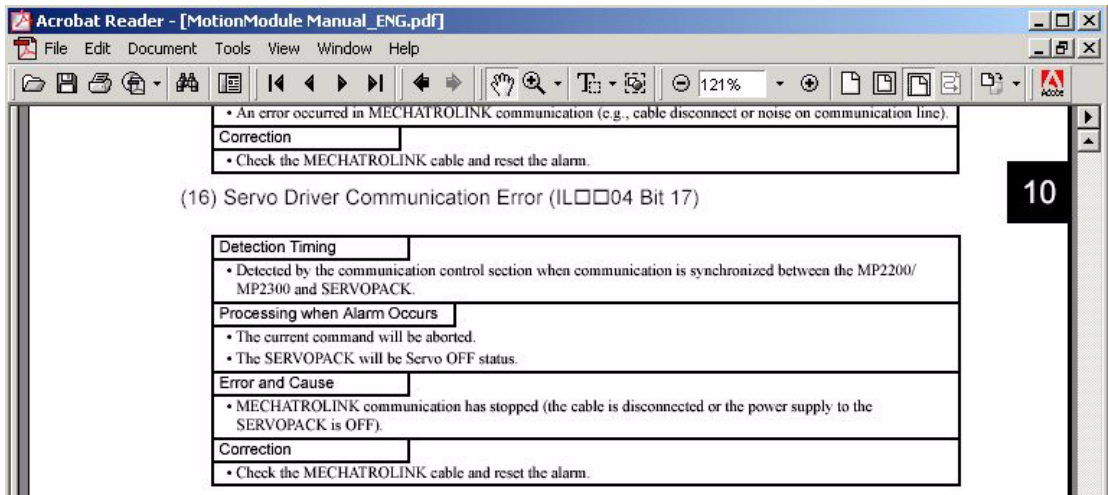
2. Select the name of the alarm or warning that has occurred, and click the **Help** Button.



The user's manual on the Motion Module for MP2200 and MP2300 Machine Controllers opens, and the details on the selected alarm or warning are displayed.

- When an alarm and warning have occurred, the details for the alarm are displayed.

3. Read the detailed information on the alarm that has occurred and take corrective action in accordance with the manual.



4. Click the **Alarm Clear** Button.

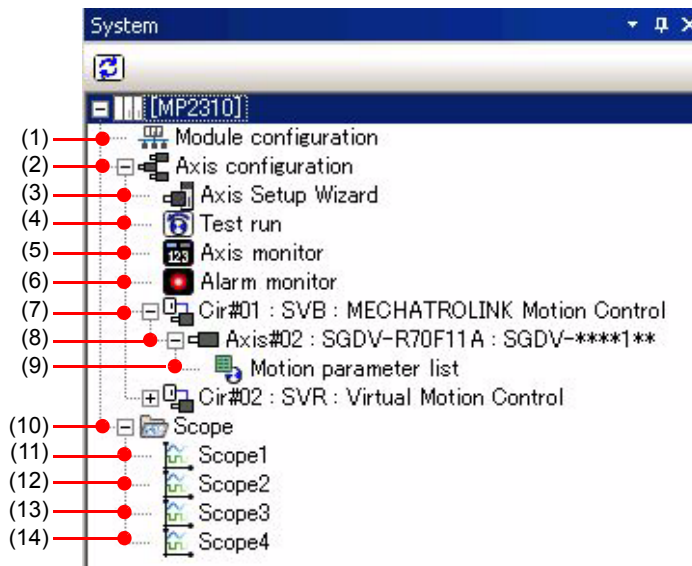
If no other alarm or warning has occurred, the status becomes **No Alarm**.

- If there is still an alarm or warning in effect, repeat the procedure from step 1.

11.5 Axis Management in the System Subwindow

The System Subwindow is used to manage the module configuration and axis configuration, and the trace function. In the axis configuration, the axis allocation statuses can be checked.

It is also possible to directly display utilities such as module configuration definitions and the motion parameter list.



No.	Component	Description
(1)	Module configuration	Double-clicking here displays the module configuration definition.
(2)	Axis configuration	The tree items relating to axis operations are presented as child nodes.
(3)	Axis Setup Wizard	Double-clicking here displays the Axis Dialog Box of the Axis Setup Wizard .
(4)	Test run	Double-clicking here displays the cautions prior to starting a test run. Click the I Agree Button to display the Test Run Window . <ul style="list-style-type: none"> The test run function can only be used when connected to the Machine Controller.
(5)	Axis monitor	Double-clicking here displays the Axis Monitor Tab Page in the main window.
(6)	Alarm monitor	Double-clicking here displays the Alarm Monitor Tab Page in the main window.
(7)	Cir#xx	Displays the information on the motion module of the circuit number set in the module configuration definition. The sequence of the information from left to right is: circuit number - module name - comment.
(8)	Axis#xx	Displays the information on the axis allocated to the motion module. The sequence of the information from left to right is: allocation number of the axis - comment - type. The type is only shown for SVB modules, and the type of the device set in the MECHATROLINK Allocation Window is shown.
(9)	Motion parameter list	Double-clicking here displays the Motion Parameter Window for the specified axis.
(10)	Scope	(Refer to <i>13 Tracing</i> .)
(11)	Scope1	Displays the Scope1 Tab Page in the main window.
(12)	Scope2	Displays the Scope2 Tab Page in the main window.
(13)	Scope3	Displays the Scope3 Tab Page in the main window.
(14)	Scope4	Displays the Scope4 Tab Page in the main window.

12

Monitoring

This chapter describes how to monitor items such as register status and the operating status of connected Machine Controllers.

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12.1 Types of Monitoring

The following seven monitoring functions are supported by MPE720 version 6.

- **Trace Monitoring**
Trace monitoring is used to monitor and trace the values of specified variables (registers) at specific time intervals in a graphical or chart format.
For details, refer to *Chapter 13 Tracing*.
- **Register Lists**
A register list displays the values (memory map) of registers in consecutive areas. This enables real-time monitoring when a Machine Controller is connected. The values can be edited. For details, refer to *12.2 Register Lists*.
- **Watch**
The watch function displays the values of specified registers in a list. This enables real-time monitoring when a Machine Controller is connected. The values can be edited. For details, refer to *12.3 Watch Function*.
- **Online Current Value Display**
While online, the values of registers are displayed in the ladder program. For details, refer to *12.4 Online Current Value*.
- **Offline Current Value Display**
While offline, the values of registers are displayed in the ladder program. For details, refer to *12.5 Offline Current Value*.
- **System Monitor**
The system monitor is used to monitor Machine Controller status while a Machine Controller is connected (i.e., while online). For details, refer to *12.6 System Monitor*.
- **Troubleshooting**
The troubleshooting function is used to detect and analyze errors that occur when a Machine Controller is connected. For details, refer to *12.7 Troubleshooting*.

These functions are described in detail on the following pages.

12.2 Register Lists

12.2.1 Outline

With the register list function, the current values of registers in consecutive areas (memory map) can be monitored in a Register List Subwindow (1, 2, or 3). This enables real-time monitoring when a Machine Controller is connected. The current data can be edited.

- The register map displays the data of the project file even during a direct connection. When a project link connection is established the data of the Machine Controller is used, so the register map may display data that does not match the project file for which the project link is established. When displaying a register map with a project link connection, data must be transferred to the project file in advance by **Read from Controller**.

The S, I, O, M, C, and D registers are supported. However, C registers can only be referenced since C registers are read only.

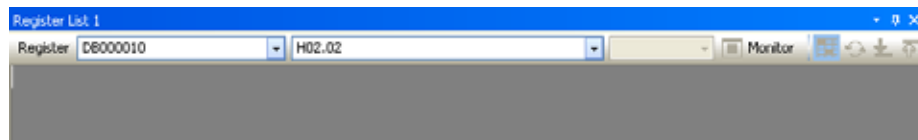
12.2.2 Displaying Memory Maps

- Click a tab to select one of the Register List Subwindows (1, 2, or 3).

Select **Monitor - Register List** from the Launcher. The Register List 1 Subwindow will automatically be displayed.

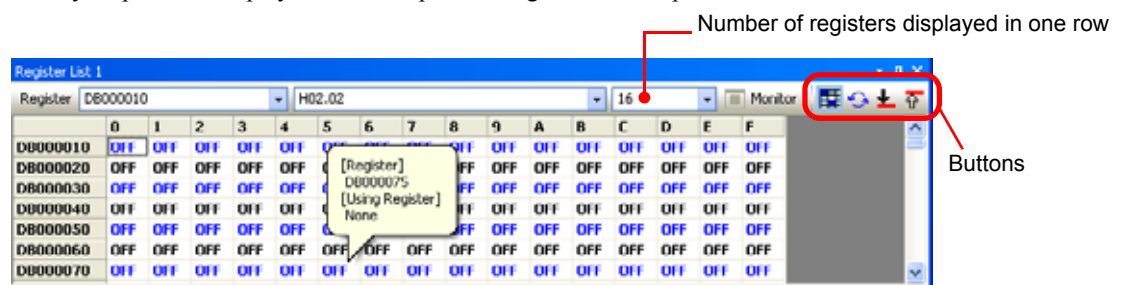
- The display of the Register List Subwindow can be switched ON and OFF by selecting **Display - Register List - Register List 1** (or 2 or 3) from the Main Menu.

- In the *Register* Field, Enter the register address to be displayed in the memory map. To display a D register list, also enter the program number as shown below.

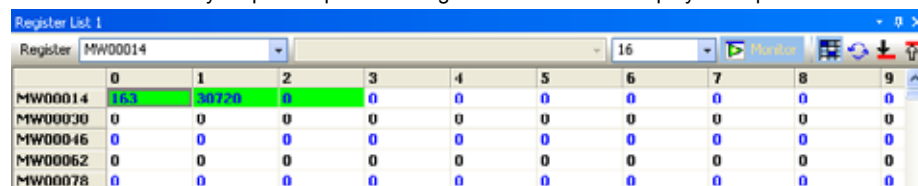


- Press the **Enter** Key.

A memory map will be displayed with the specified register in the top row.




Memory Map Example for D Registers and Balloon Display Example



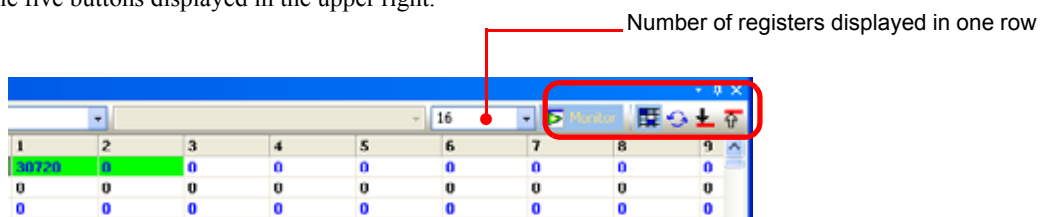
Memory Map Example for M Registers

- The scroll bar can be moved to change the register range that is being displayed.
- When the cursor is moved on the memory map, the register at the cursor position will be shown with the usage status in a balloon display.

- The number of registers displayed in one row can be changed. The display can also be changed using the five buttons at the upper right of the list.
- Right-click the register list, and select decimal, hexadecimal, binary, or ASCII from the pop-up menu to change the data type in the *Value* Fields. The type cannot be changed, however, for data types B and F.
- Characters are displayed in blue and black in alternating rows.
- The **Monitor** Icon is valid while a Machine Controller is connected (while online).
- In the screen shown in step 3 on the previous page, a green background indicates that the register is used in a ladder program. A red background indicates that the register is used for more than one data type. This color-coded display is enabled when the **Memory Map Display** Button is ON .
- For details on the number of registers displayed in one row and on using the five buttons, refer to 12.2.3 *Changing Memory Map Displays*, below.

12.2.3 Changing Memory Map Displays

The number of registers displayed in one row can be changed. In addition, the memory map display can be changed using the five buttons displayed in the upper right.



■ Number of Registers Displayed in One Row

The number of registers displayed in one row can be changed between 1 and 16 by entering a number directly or by selecting from a list (always 16 for BIT type). When *Automatic* is selected, the number of registers displayed will automatically be set to match the display size of the Register List Subwindow.

■ Monitor Button: ON OFF

This button is valid only while online. It toggles between ON and OFF each time it is clicked.

When monitoring is set to ON, register data is continually refreshed and displayed. When monitoring is set to OFF, the data is not refreshed.

■ Memory Map Display Button: Display ON Display OFF


This button toggles the display between ON and OFF each time it is clicked.

When the display is ON, registers used in the ladder program are displayed with a green background and registers used for more than one data type are displayed with a red background.

When the display is OFF, all registers are displayed with a white background.


■ Memory Map Refresh Button

Click this button to refresh the register map display.

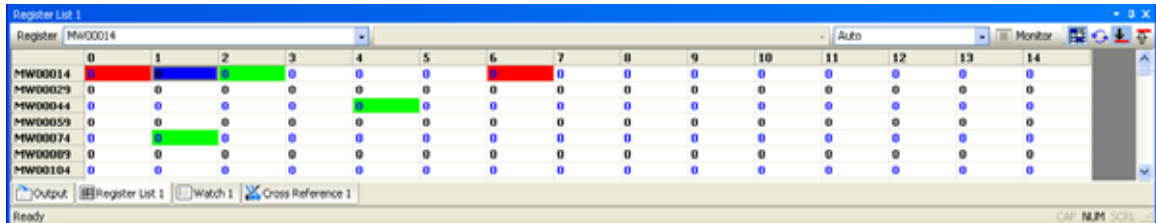
- The **Memory Map Refresh** Button is invalid when the display is turned OFF  by the **Memory Map Display** Button.

■ Duplicated Register Search (Up/Down) Buttons /

These buttons are used to find and display registers that are used for more than one data type. The buttons with the up and down arrows are used to search up and down.

- These buttons are invalid when the display is turned OFF  by the **Memory Map Display** Button.

The search results are displayed in the Output Subwindow. Registers used for more than one data type are displayed with a blue background.



Register	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
MW00014	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW00029	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW00044	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW00059	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW00074	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW00089	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW00104	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

12.2.4 Editing Data

With a memory map, double-clicking a data cell or pressing the **F2** Key will display the text cursor and enable the following editing operations.

- Entering data directly
- Deleting (setting to 0)
- Copying and pasting

Press the **Enter** Key to save the edited data. While online, the changes in the data will be directly reflected in Machine Controller operations.

12.3 Watch Function

12.3.1 Outline

With the watch function, values and comments for specified registers (S, I, O, M, C, or D) can be monitored in the Watch Subwindow (1, 2, or 3). This enables real-time monitoring when a Machine Controller is connected. The values can be edited.

- When Project Link Connection is used, the data registered in the Watch Subwindow will be saved only in the Machine Controller. To write the data in the project file, transfer the data from the Machine Controller by executing the **Read from Controller** command and selecting the **Batch** Button. (Refer to 10.2.4 Reading from Machine Controllers.)

12.3.2 Displaying Watch Data

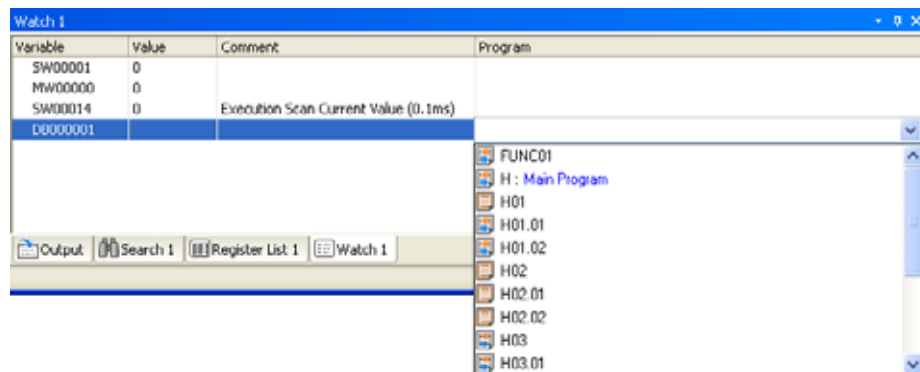
1. Click a tab to select one of the Watch Subwindows (1, 2, or 3).

Select **Monitor - Watch** from the Launcher. The Watch 1 Subwindow will automatically be displayed.

- To display or hide a Watch Subwindow (1, 2, or 3), select **Display - Watch - Watch 1 (or 2 or 3)** from the Main Menu. The display will be toggled ON and OFF.

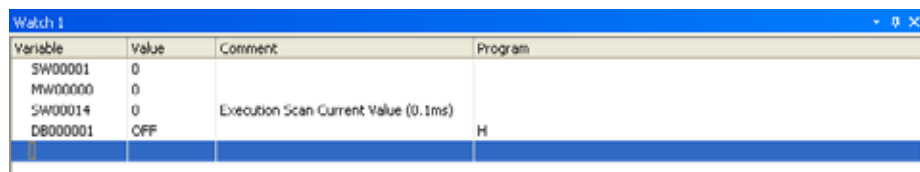
2. Display the text cursor by either double-clicking the *Variable* Field or pressing the **F2** Key, and then enter the register or variable that is to be watched. The register or variable can be entered by dragging and dropping, or copying and pasting from a ladder program or the Variable Subwindow.

To watch a D register, also enter the program number as shown below.



3. Press the **Enter** Key.

The contents of the specified register will be displayed.



Right-click the row, and select decimal, hexadecimal, binary, or ASCII from the pop-up menu to change the data type in the *Value* Field.

12.3.3 Editing Values

With the watch function, double-clicking the *Value* Field or pressing the **F2** Key will display the text cursor in the *Value* Field and enable the following editing operations.

- Entering data directly
- Copying and pasting

Press the **Enter** Key to save the edited data. While online, the changes in the data will be directly reflected in Machine Controller operations.

- Comments cannot be edited.

12.4 Online Current Value

12.4.1 Outline

While online, register values can be monitored on the ladder program screen.

12.4.2 Displaying Online Current Value

While connected to the Machine Controller (while online), the status of the following items can be monitored on the ladder program screen.

- The current values for each object are displayed in blue characters.
- Constant and coil instructions are highlighted when the register value is 1.
- IF and ELSE instructions are highlighted when the condition is satisfied.

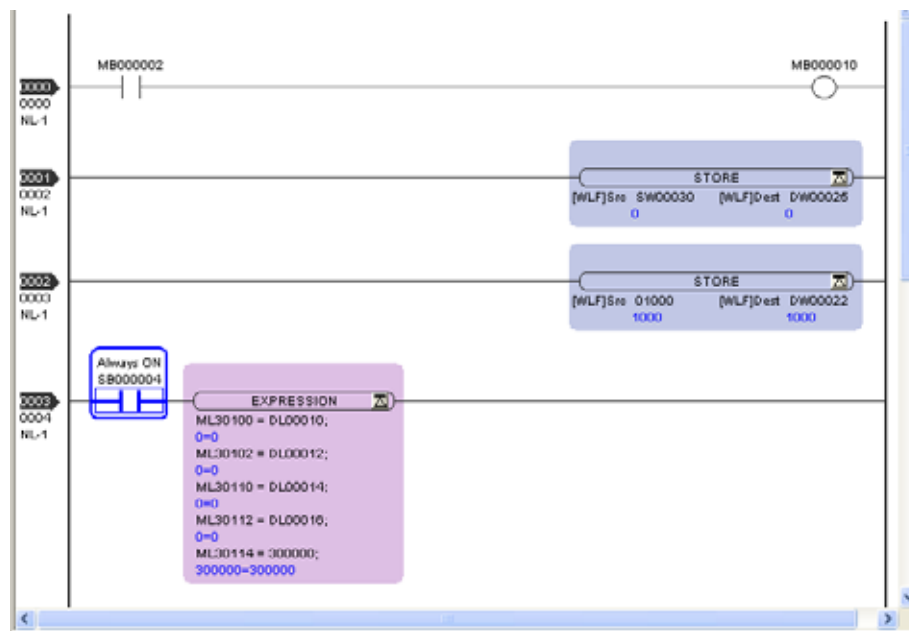


Fig. 12.1 Display Example of Register Current Value



- If "!=" is used in an EXPRESSION instruction, the operation item on the right side of the equation may display an inverted current value. If this happens, 1 will be displayed in place of 0, so online current value display may be inconsistent, as shown below.



12.5 Offline Current Value

12.5.1 Outline

While offline, register values can be monitored on the ladder program screen.

12.5.2 Displaying Offline Current Value

While a Machine Controller is not connected (while offline), the current values of the registers can be viewed in blue characters by selecting **Display - Offline Current Value** from the main menu.

- The offline current value function is not supported for the IF/ELSE, WHILE, and EXPRESSION instructions.
- When register data is read using data transfer from the Machine Controller (i.e., when the *Register Check Box* is selected for reading from the Controller), the register data that is read will be displayed.
- When register values are changed by a means such as a register list, the data for the applicable register will be refreshed but simulation will not be executed (i.e., data will not be written due to a program condition turning ON). Therefore, no other register data will be refreshed.

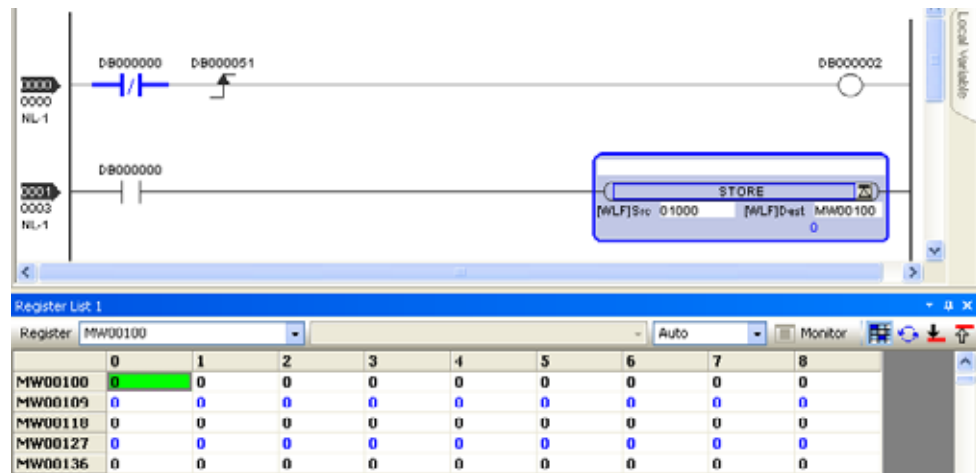


Fig. 12.2 Display Example of Offline Current Value

12.6 System Monitor

12.6.1 Outline

The system monitor is used to monitor Machine Controller status while a Machine Controller is connected (i.e., while online).

Machine Controller status (LED indicators, CPU status, scan time values) can be monitored in the System Monitor Subwindow. The CPU can be toggled between STOP and RUN, the memory cleared, and errors reset.

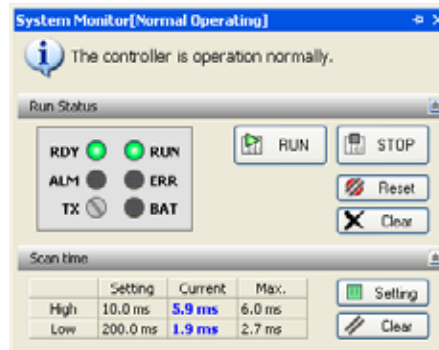
The System Monitor Subwindow is automatically displayed as a pop-up when an error is detected.


12.6.2 Using the System Monitor Subwindow

1. Select **Monitor - System Monitor** from the Launcher.

The System Monitor Subwindow title bar will be displayed.

2. Move the mouse pointer to the title bar to display the System Monitor Subwindow.



- The default setting is Automatically Hide Mode. Click the **Automatically Hide** Button  in the title bar to convert to a floating window that will not be hidden.

RUN Status Display

This display shows the status of the LED indicators for the Machine Controller.

LED	Contents	Color and Status	Monitor Register
RDY	Machine Controller operating status	Green: Normal Gray: Error	SB000400 ON: Normal OFF: Error
RUN	Machine Controller RUN status	Green: Operating Gray: Stopped	SB000401 ON: Operating OFF: Stopped
ALM	Alarm status	Red: Alarm Gray: Normal	SB000402 ON: Alarm OFF: Normal
ERR	Error status	Red: Error Gray: Normal	SB000403 ON: Error OFF: Normal
TX	MECHATROLINK-I/ MECHATROLINK-II data transmission status	Always gray. (Always not communicating.)	---
BAT	Battery alarm status	Red: Battery alarm Gray: Normal	SB000487 ON: Alarm OFF: Normal

RUN and STOP Buttons

These buttons change the Machine Controller's CPU status. Their functions are the same as **CPU RUN** and **CPU STOP** in the Online Menu.

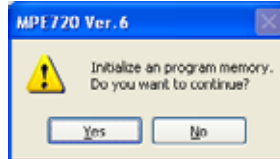
- Refer to 1.11 Stopping (STOP) and Restarting (RUN) the Machine Controller CPU.

Reset Button

Click the **Reset** Button to clear the Machine Controller error log.

Clear Button

This button clears the contents of the Machine Controller's RAM. When it is clicked, the following message will be displayed for confirmation.



- If program write protection is set to *Write Disable* in the Setup Folder of the **Environment Setting** Dialog Box, connection may not be possible the next time it is attempted. If this occurs, turn the power supply to the Machine Controller OFF and then back ON.

Scan Time Display

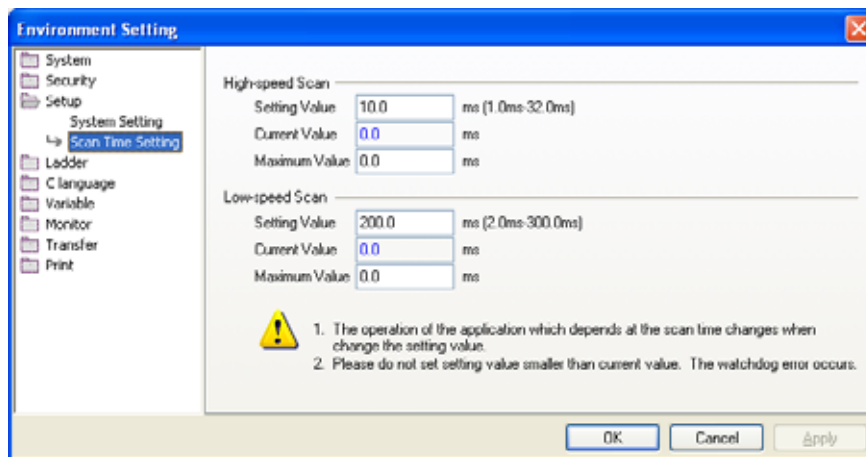
This display shows scan time values. If the current value or maximum value exceeds the set value, it will be displayed in red characters.

Scan Time Over is an error that occurs if the current value or maximum value exceeds the set value.

LED	Setting Value	Current Value	Maximum Value
High Speed	Indicator color: Black Monitor register: SW00004	Blue: Within the set range Red: Over the set value Monitor register: SW00005	Black: Within the set range Red: Over the set value Monitor register: SW00006
Low Speed	Indicator color: Black Monitor register: SW00010	Blue: Within the set range Red: Over the set value Monitor register: SW00011	Black: Within the set range Red: Over the set value Monitor register: SW00012

Setting Button

When this button is clicked, the Scan Time Setting screen in the **Environment Setting** Dialog Box is displayed and the scan time can be changed.

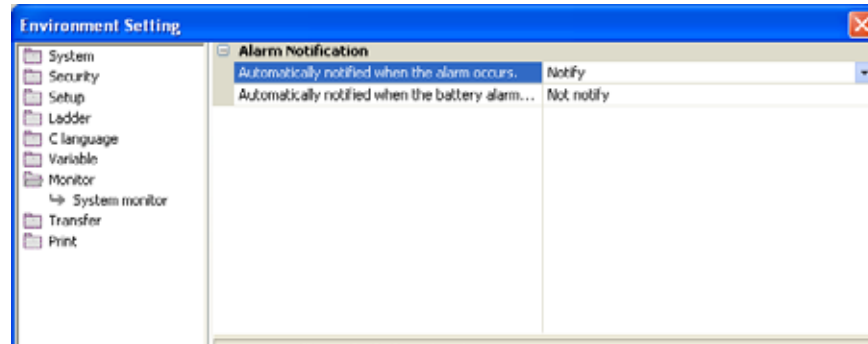


Clear Button

When this button is clicked, the maximum value for the high-speed or low-speed scan is cleared.

12.6.3 Pop-up Display When an Error Is Detected

When automatic notification of alarms is set in the System Monitor screen of the **Environment Setting** Dialog Box (select **File - Environment Setting** from the main menu), the System Monitor Subwindow will be displayed automatically when an alarm occurs.



- For details on measures to take when errors are detected, refer to [12.7 Troubleshooting](#).

12.7 Troubleshooting

12.7.1 Overview of Troubleshooting

(1) What is Troubleshooting?

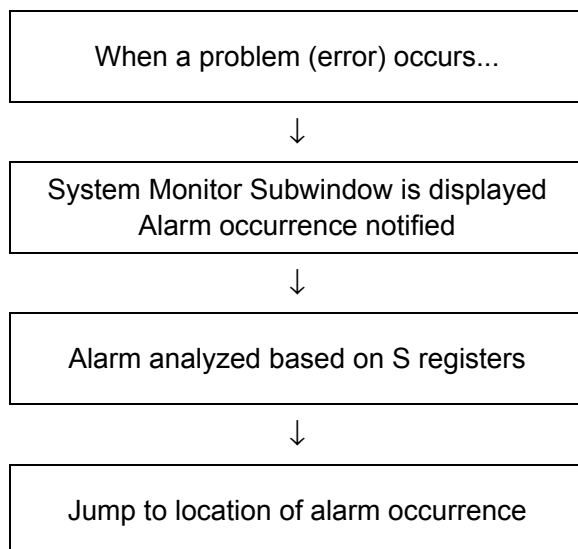
The troubleshooting function is used to detect and analyze errors that occur when a Machine Controller is connected. When an error occurs, a message is displayed in the status area of the System Monitor Subwindow to notify the occurrence of the error.

Troubleshooting can be performed in relation to the following errors.

- Critical failures
- Operation errors (occurring in ladder programs, motion programs, and sequence programs)
- Battery alarm
- Scan time exceeded errors
- I/O errors (occurring at I/O modules)

(2) Flow of Troubleshooting

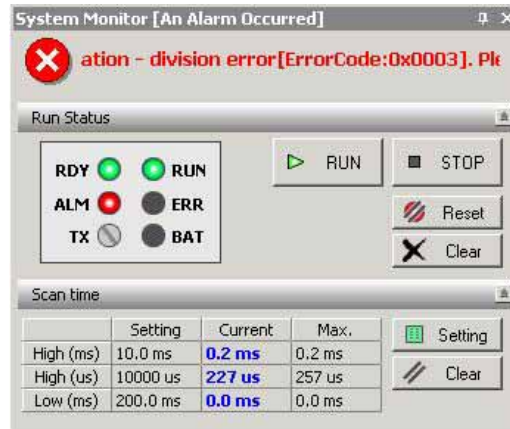
Clicking the part where “An alarm has occurred.” is displayed in red starts the troubleshooting to analyze the error.



12.7.2 Starting Troubleshooting

The rough flow, applicable to both operation errors and I/O errors, is described below.

1. When an error occurs the System Monitor Subwindow automatically pops up and an alarm is displayed in the status area.



Troubleshooting starts.

- A setting in the **Environment Settings** Dialog Box specifies whether the pop-up appears. For details, see *12.6.3 Pop-up Display When an Error Is Detected*.
2. Click the area where the following message is displayed in red: "An alarm has occurred. Troubleshooting is started by clicking here."
 3. An error message indicating the details of the alarm is displayed.
 - The content of the error message and the operating procedure from step 3 onward vary depending on the nature of the error.

If an operation error has occurred, refer to *12.7.3 (1) When an Operation Error Has Occurred in a Program*.
 If an I/O error has occurred, refer to *12.7.3 (2) When an I/O Error Has Occurred*.

12.7.3 Analysis in Troubleshooting

The following is an explanation of the method of analysis from step 3 onward in *12.7.2 Starting Troubleshooting*. The method of analysis is different for operation errors that occur in ladder programs, motion programs or sequence programs and I/O errors that occur at I/O modules.

If an operation error has occurred, refer to *12.7.3 (1) When an Operation Error Has Occurred in a Program*. And if an I/O error has occurred, refer to *12.7.3 (2) When an I/O Error Has Occurred*.

(1) When an Operation Error Has Occurred in a Program

The following explains the method of analysis of operation errors that occur in ladder programs, motion programs, or sequence programs.

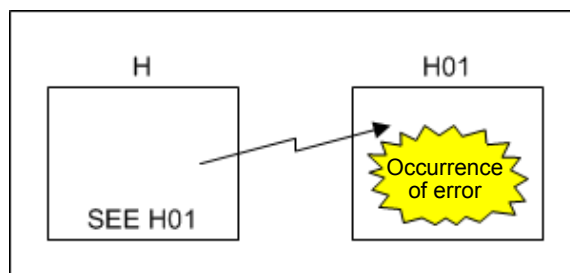
The procedure for analyzing operation errors differs depending on where they occurred.

There are the following four types of analytical procedure.

(The procedures take the occurrence of an operation error in a ladder program as an example.)

- [a] When an Operation Error Has Occurred in a Program Other than a Function Program
- [b] When an Operation Error Has Occurred in a Function Program Called from a Program Other than a Function Program
- [c] When an Operation Error Has Occurred in a Function Program Called from a Function Program
- [d] When an Operation Error Has Occurred in an Unknown Program
- If operation errors have occurred in multiple programs at the same time, the error information will not be cleared even if the points indicated in the System Monitor Subwindow are corrected. For this reason, the error information may be incorrect in some cases. Click the **Reset** Button to clear the previous error information.

[a] When an Operation Error Has Occurred in a Program Other than a Function Program

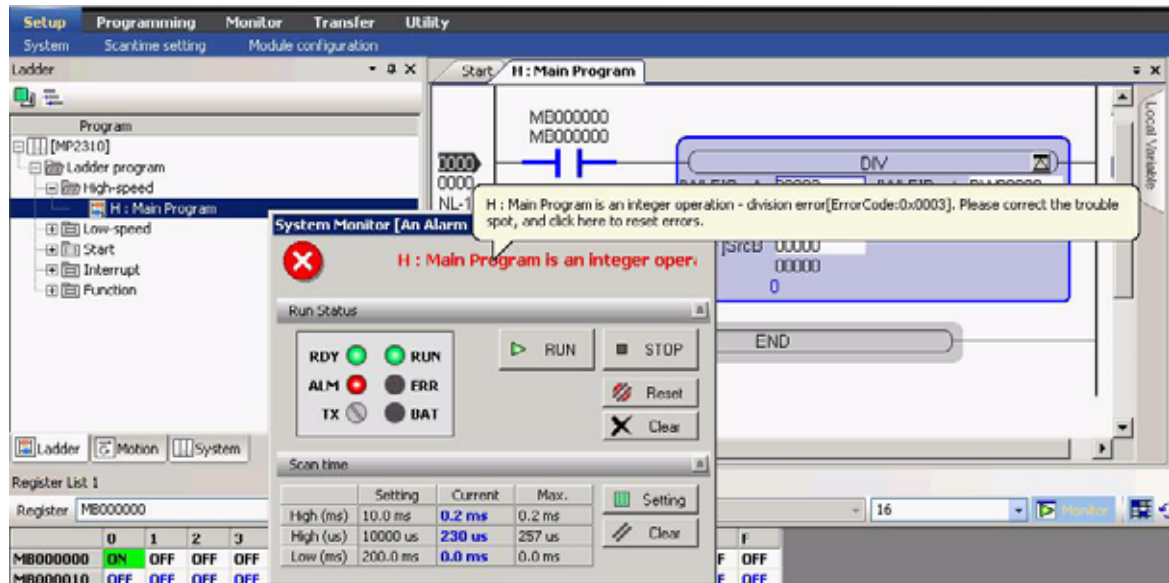


1. When an error has occurred in a program other than a function program (ladder program, motion program, sequence program), the following error message is displayed.
 - The same applies when an operation error occurs in a program called by an SEE command, MSEE command or SSEE command.



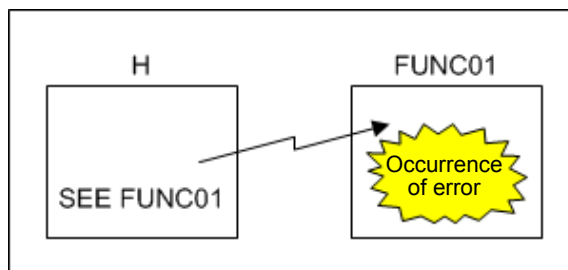
2. Read the error message and click the **OK** Button.

The program in which the error occurred will open.



- On moving the mouse pointer to the status area a pop-up help message will be displayed to enable checking of the error information of the status area at a glance.
3. Identify the command where the error occurred based on the error message and information in the status area, and correct the program.
 4. When dealing with a ladder program compile the program, and when dealing with a motion program or sequence program save the program.

- [b] When an Operation Error Has Occurred in a Function Program Called from a Program Other than a Function Program



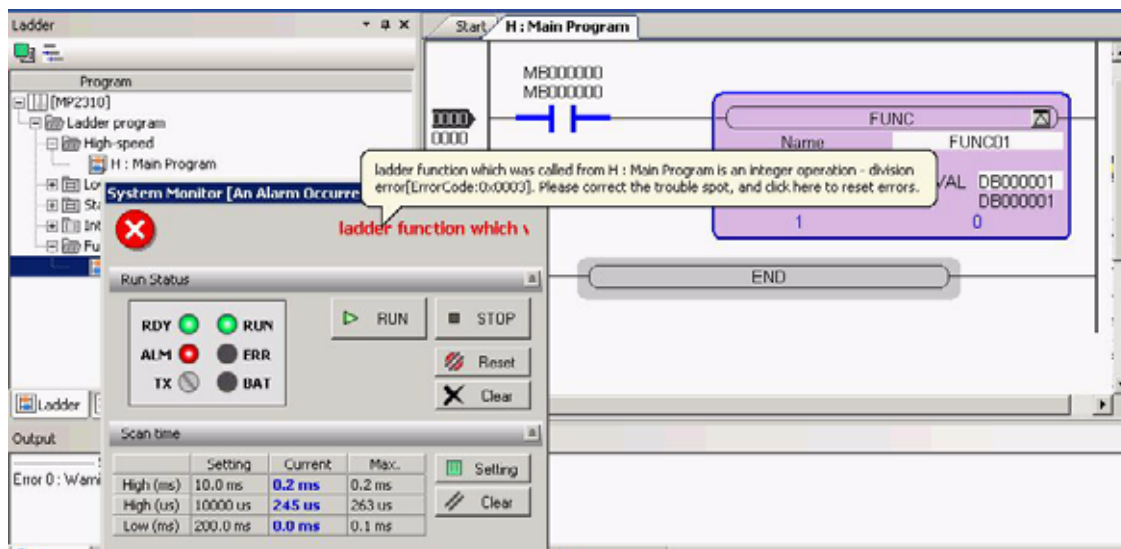
1. The following error message is displayed.



2. Read the error message and click the **OK** Button.

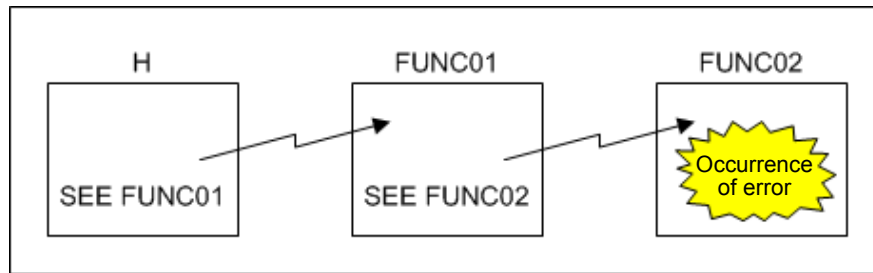
The program in which the error occurred will open.

The name of the program that calls the function program in which the error occurred, and the step number of the FUNC instruction object where the function program was called, are displayed in the status area of the System Monitor Subwindow.



- On moving the mouse pointer to the status area a pop-up help message will be displayed to enable checking of the error information of the status area at a glance.
3. Identify the command where the error occurred based on the error message and information in the status area, and correct the program.
 4. Compile the ladder program.

[c] When an Operation Error Has Occurred in a Function Program Called from a Function Program



1. When an operation error has occurred in a function program called from a function program, the following error message is displayed.

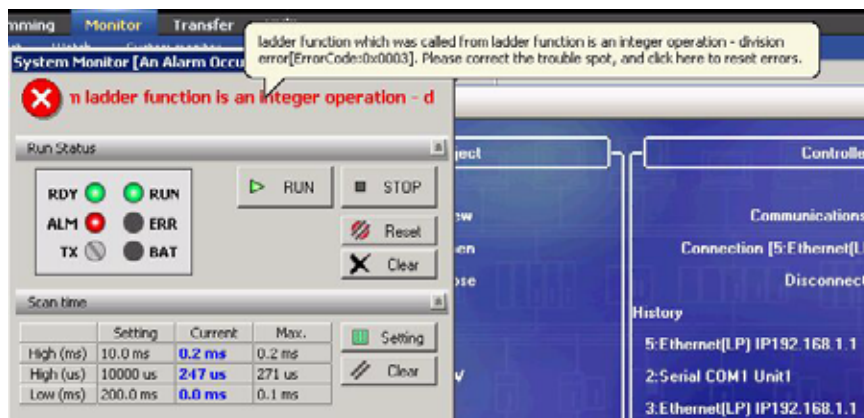


2. Read the error message and click the **OK** Button.

The error information is displayed in the status area of the System Monitor Subwindow.

Since it is not possible to identify the location where the error occurred, the program cannot be opened.

3. Search for the function program from which the function program was called, and search within it for the FUNC instruction object where the function program was called.



4. Open the function program that is called up by the FUNC instruction object, and correct the program. Search for the instruction where the error occurred based on the error information, and identify the command.
5. Compile the ladder program.

[d] When an Operation Error Has Occurred in an Unknown Program



1. If MPE720 version 6 judges that it is not the latest error information, for example when the program in which the error occurred has been deleted, the following error message is displayed.
2. Read the error message and click the **OK** Button.

Old error information is displayed in the status area of the System Monitor Subwindow.



3. Click the status area to clear the error information.
The error information is updated to the latest status.

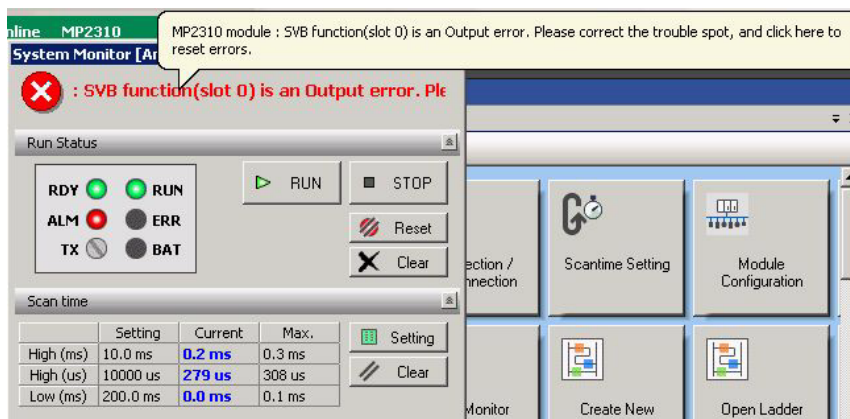
(2) When an I/O Error Has Occurred

The following explains the method for analyzing errors of an I/O module connected to the Machine Controller.

1. When an error occurs in an I/O module connected to the Machine Controller, the following error message is displayed.

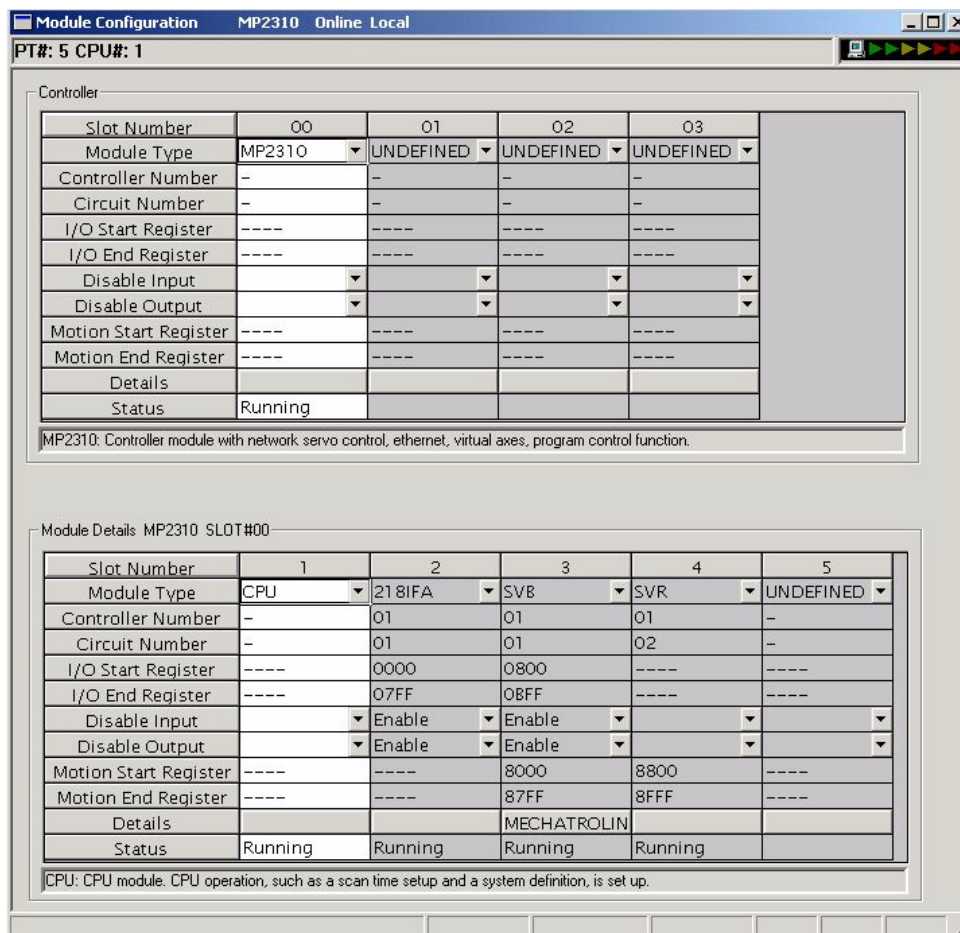


2. Read the error message and click the **OK** Button.

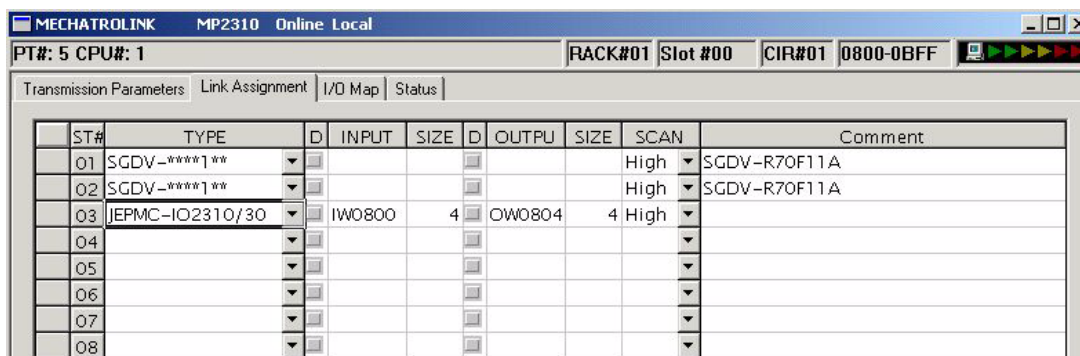


The information on the I/O module in which the error occurred is displayed in the status area of the System Monitor Subwindow.

- After checking the module information, open the **Module Configuration** Window.

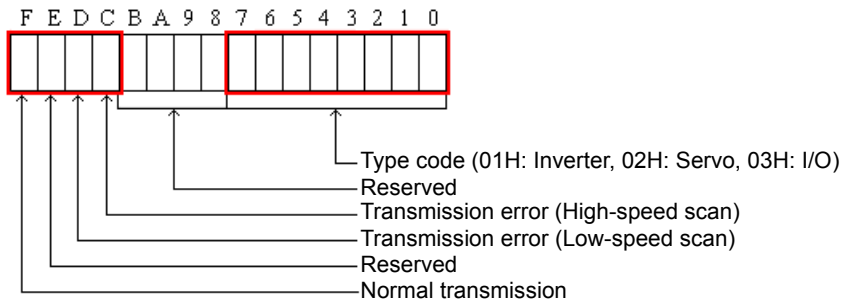


- From this window, open the I/O module in which the error occurred.



5. Check the status (STS) of the I/O module, and analyze the location where the I/O error occurred.

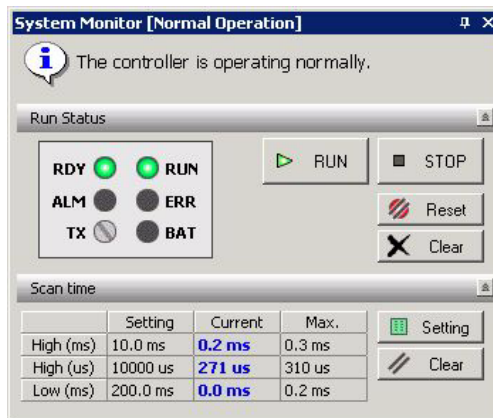
- Since the status is shown in hexadecimal, convert the first and fourth digits to binary by referring to the figure below.



6. Save the module configuration.

12.7.4 Display after Correcting an Error

Correct the error by referring to 12.7.3 (1) *When an Operation Error Has Occurred in a Program* or 12.7.3 (2) *When an I/O Error Has Occurred*. If no other error has occurred, the indication in the System Monitor Subwindow goes back to Normal Operation.



- If the program has not been corrected properly, or if multiple errors have occurred, the display changes to that shown in step 1 of 12.7.2 *Starting Troubleshooting*. Analyze the error again.

12.7.5 Error Codes

The following table lists the error codes that can be detected by the System Monitor.

Error Code	Error Classification
0x01	Integer operation: Underflow
0x02	Integer operation: Overflow
0x03	Integer operation: Division error
0x09	Double integer operation: Underflow
0x0A	Double integer operation: Overflow
0x0B	Double integer operation: Division error
0x10	Integer storage: Non-numeric error
0x11	Integer storage: Underflow
0x12	Integer storage: Overflow
0x21	Real number storage: Underflow
0x22	Real number storage: Overflow
0x23	Real number operation: Division by zero
0x30	Real number operation: Invalid operation
0x31	Real number operation: Exponential underflow
0x32	Real number operation: Exponential overflow
0x33	Real number operation: Division error
0x34	Real number storage: Exponential underflow
0x35	Real number operation: Stack error
0x40	SQRT error
0x41	SIN error
0x42	COS error
0x43	TAN error
0x44	ASIN error
0x45	ACOS error
0x46	ATAN error
0x47	EXP error
0x48	LN error
0x49	LOG error
0x4A	DZA error
0x4B	DZB error
0x4C	LIMIT error
0x4D	PI error
0x4E	PD error
0x4F	PID error
0x50	LAG error
0x51	LLAG error
0x52	FGN error
0x53	IFGN error
0x54	LAU error
0x55	SLAU error
0x56	REM error
0x57	RCHK error
0x58	BSRCH error
0x59	SORT error
0x6D	PI error
0x6E	PD error

Error Code	Error Classification
0x6F	PID error
0x70	LAG error
0x71	LLAG error
0x72	FGN error
0x73	IFGN error
0x74	LAU error
0x75	SLAU error
0x76	FGN error
0x77	IFGN error
0x7E	SLAU error
0x80	BIN error
0x81	BIN error
0x82	BCD error
0x83	BCD error
0x84	PARITY error
0x85	PARITY error
0x86	SQRT error
0x87	SIN error
0x88	COS error
0x89	ATAN error
0x8A	IN error
0x8B	OUT error
0x8C	INR error
0x8D	OUTR error
0x8E	INS error
0x8F	OUTS error
0x90	ROTL error
0x91	ROTR error
0x92	MOVB error
0x93	MOVW error
0x94	SETW error
0x95	XCHG error
0x96	LIMIT error
0x97	LIMIT error
0x98	DZA error
0x99	DZA error
0x9A	DZB error
0x9B	DZB error
0x9C	PWM error
0x9D	SFC error
0x9E	SHFTL error
0x9F	SHFTR error
0xA0	BEXTD error
0xA1	BPRESS error
0xA2	SORT error
0xA3	QSORT error
0xA4	SORT error

(cont'd)

Error Code	Error Classification
0xA5	QSORT error
0xA6	RCHK error
0xA7	RCHK error
0xA8	COPYW error
0xA9	ASCII error
0xAA	BINASC error
0xAB	ASCBIN error
0xAC	BRCH error
0xAD	BSRCH error
0xAE	TMADD error
0xAF	TMSUB error
0xB1	SPEND error
0xC0	TBLBR error
0xC1	TBLBW error
0xC2	TBLSRL error
0xC3	TBLSRC error
0xC4	TBLCL error
0xC5	TBLMV error
0xC6	QTBLR error
0xC7	QTBLRI error
0xC8	QTBLW error
0xC9	QTBLWI error
0xCA	QTBLCL error
0xE0	MSEE error

13

Tracing

This chapter describes tracing, one of the monitoring functions.

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13.1 Types of Tracing

MPE720 version 6 has the following three tracing functions.

- Data tracing

Data tracing is a function to monitor and trace the values of specified variables (registers) at specific time intervals in a graphical or chart format. (Refer to *13.3 Data Tracing*.)

- XY tracing

XY tracing is a function to enable visual analysis of the locus of two axes by obtaining the position data (target positions, feedback positions) of the X- and Y-axis at every scan and plotting them on a two dimensional planar graph. (Refer to *13.4 XY Tracing*.)

13.2 Real-Time Tracing

13.2.1 Overview of Real-Time Tracing

(1) What is Real-Time Tracing?

Real-time tracing is a function to enable analysis of the data transitions and timings at every scan by obtaining register data from the Machine Controller and plotting them on a graph. Register data such as speed, torque, and bit data can be obtained.

13.2.2 Starting Real-Time Trace

The **Real-Time Trace** Tab Page can be displayed in the main window by using any of the following methods.

1. Opening from the System Subwindow

Double-click **Scope1**, **Scope2**, **Scope3**, or **Scope4** and click the **Real-Time Trace** Button in the **Trace Type** Window.

Select **Scope1**, **Scope2**, **Scope3**, or **Scope4**, right-click the selected icon and select *Open in Real-Time Trace* from the pop-up menu that will be displayed.

2. Opening from the **My Tool** Window

Click the **Scope1**, **Scope2**, **Scope3**, or **Scope4** Button registered in the **My Tool** Window and click the **Real-Time Trace** Button in the **Trace Type** Window.

3. Opening from the Launcher

Select *Monitor - Trace* in the Launcher and click the **Real-Time Trace** Button in the **Trace Type** Window.

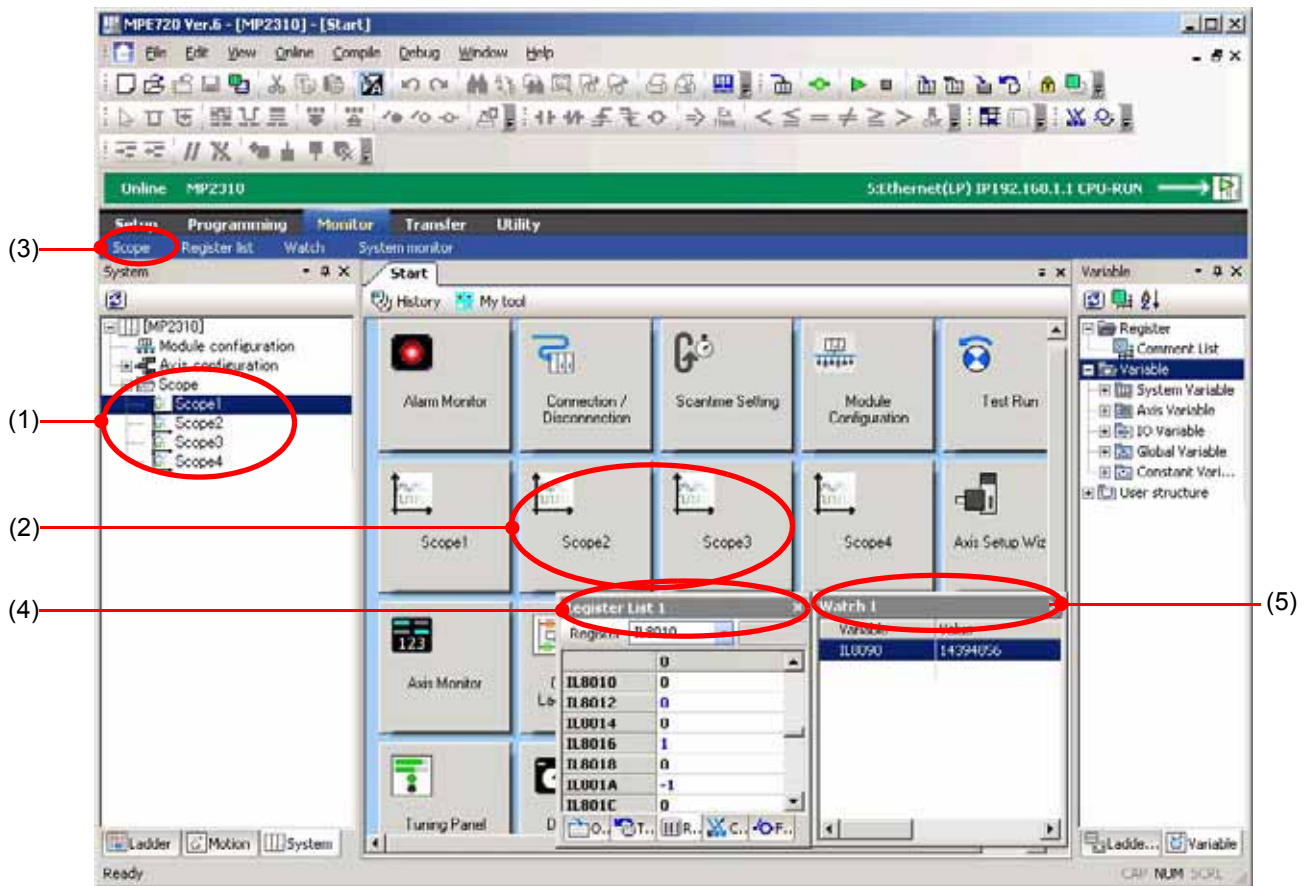
4. Opening from the Register List Subwindow

Select a row in the Register List Subwindow, right-click the selected row and select *Add to Trace* from the pop-up menu that will be displayed.

5. Opening from the Watch Subwindow

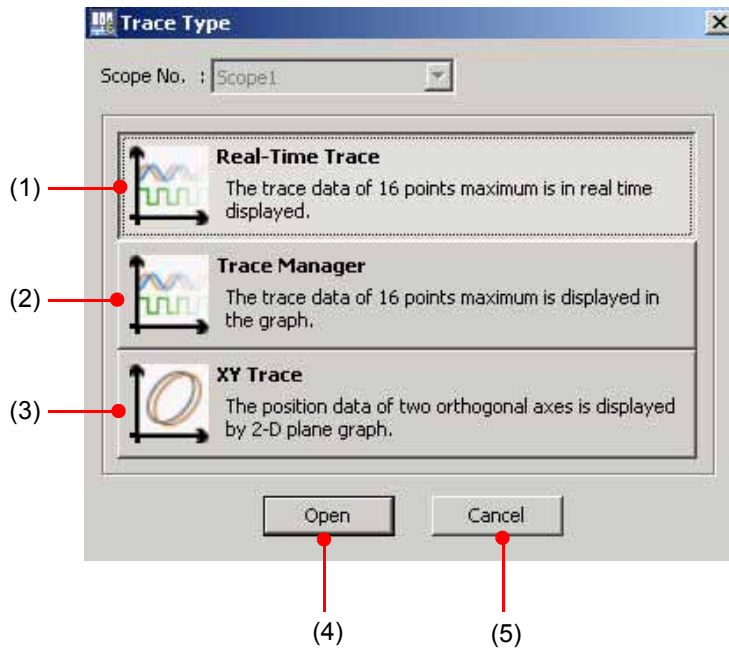
Select a row in the Watch Subwindow, right-click the selected row and select *Add to Trace* from the pop-up menu that will be displayed.

13.2.2 Starting Real-Time Trace



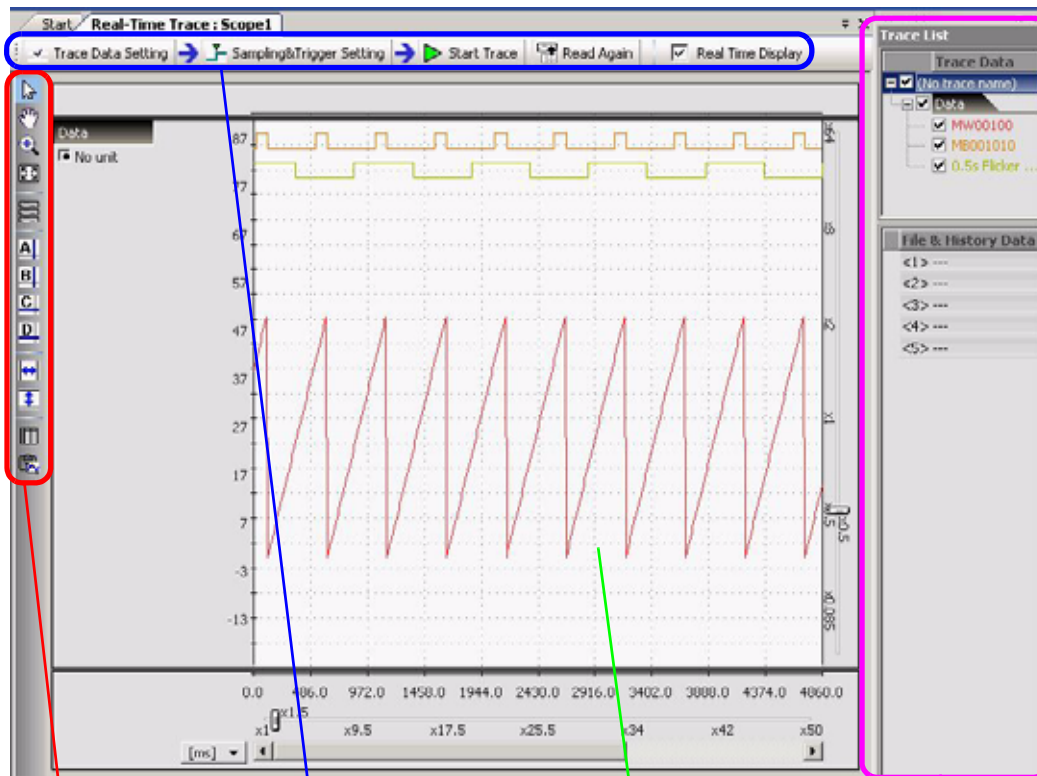
13.2.3 Names and Descriptions of Components of Real-Time Tracing

(1) Trace Type Window



No.	Component	Description
(1)	Real-Time Trace	Displays up to 16 trace data points in real-time.
(2)	Trace Manager	Plots up to 16 trace data points on a graph.
(3)	XY Trace	Plots the position data of two orthogonal axes on a two dimensional planar graph.
(4)	Open	Starts tracing of the selected trace type.
(5)	Cancel	Returns you to the main window without starting tracing of the selected trace type.

(2) Overall View
















Graph Toolbar
Contains the buttons to be used for the analysis of trace data.

Trend Graphs
Displays the trace data. Analysis can be performed in the **Real-Time Trace** Tab Page using the graph toolbar, slider, and cursor.

Tracing Toolbar
Selects axes, sets conditions for obtaining trace data, and starts tracing, in this order.

Tracing Targets
Displays the tracing targets, trace files and tracing history.

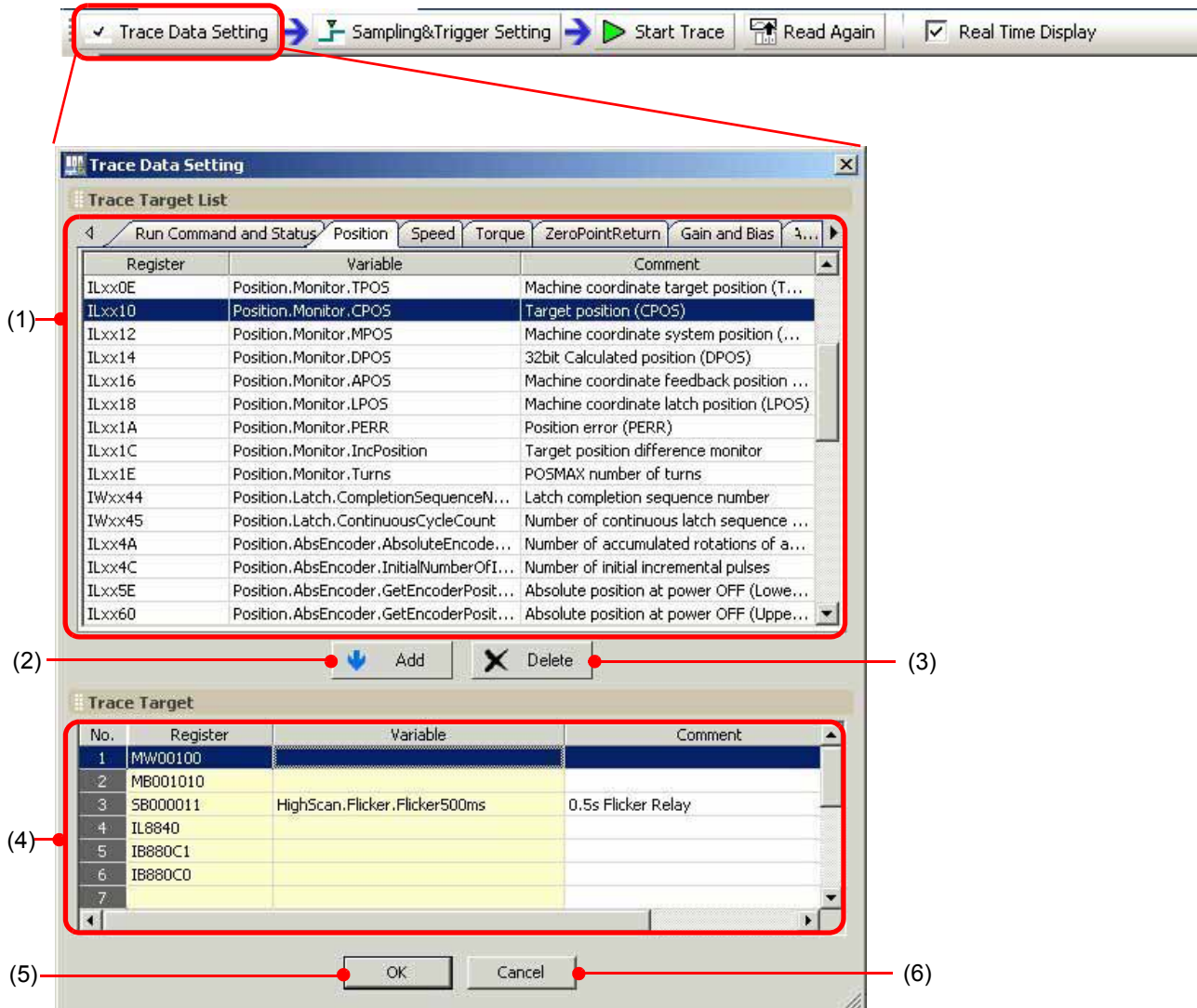
(3) Graph Toolbar

Icon	Function
	Selection Icon: Enlarges the view on double-clicking at the desired position.
	Scroll Icon: Moves the display position. Double-clicking at the desired position enlarges the view.
	Enlarge Icon: Enlarges the view on selecting the desired position by dragging or double-clicking.
	Reset Icon: Returns the view to the original magnification.
	Split Graph Icon: Splits the graph views.
	Cursor A: Displays cursor A and shows the values at the intersections of the graphs.
	Cursor B: Displays cursor B and shows the values at the intersections of the graphs.
	Cursor C: Displays cursor C and shows the values at the intersections of the graphs.
	Cursor D: Displays cursor D and shows the values at the intersections of the graphs.
	Coordinate Cursor A/B Icon: Coordinates the movement of cursors A and B, separated by a fixed distance.
	Coordinate Cursor C/D Icon: Coordinates the movement of cursors C and D, separated by a fixed distance.
	List View Icon: Displays the data in the list format.
	Copy Graph Icon: Copies the graph display image to the clipboard.

(4) Tracing Toolbar

[a] Trace Data Setting

The tracing targets can be set here.

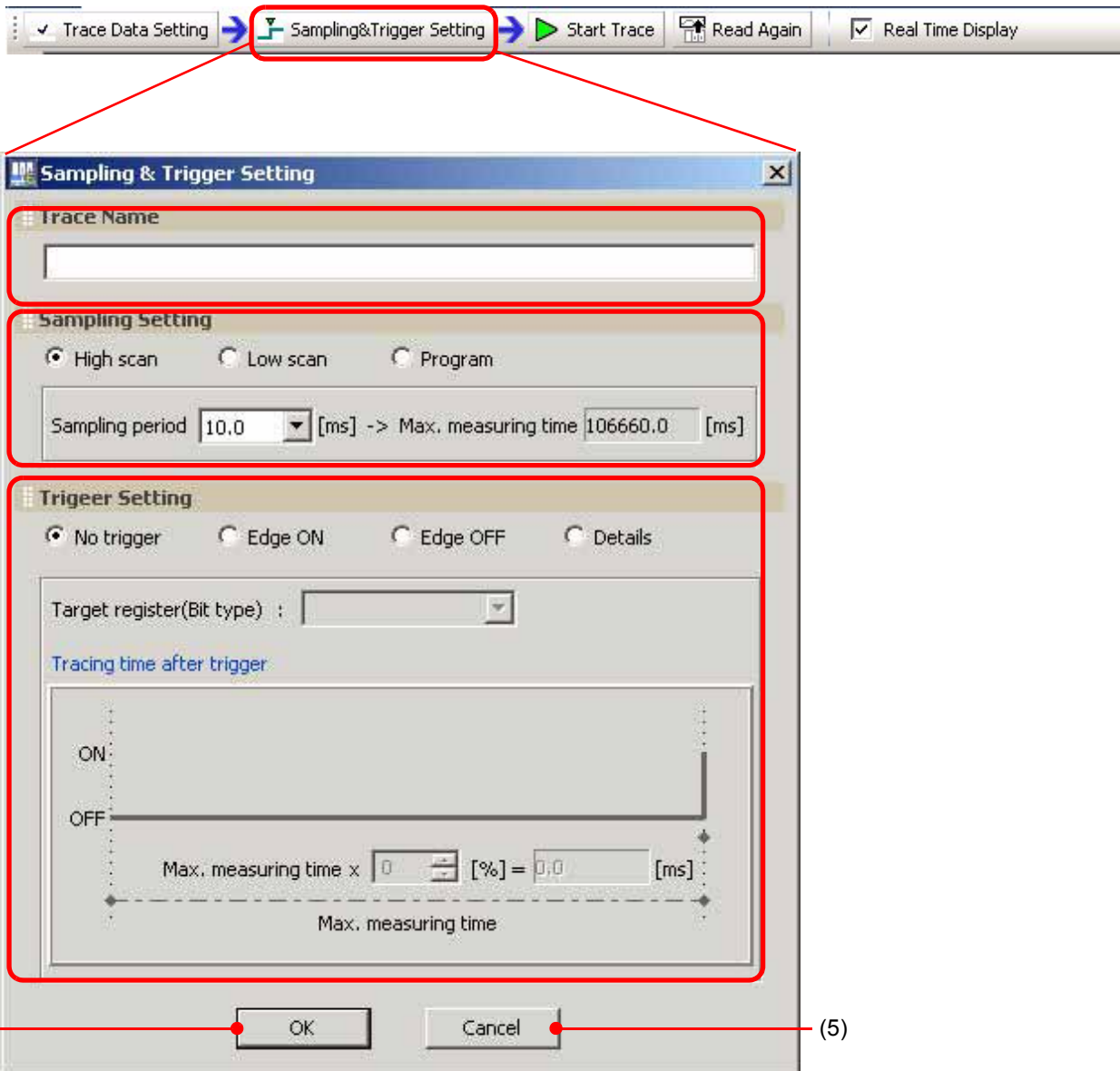


No.	Component	Description
(1)	Trace Target List	Displays the list of the registers that can be set as the tracing target. <ul style="list-style-type: none"> Right-clicking on Trace Target List will display the pop-up menu that enables selection or deselection of registers. <ul style="list-style-type: none"> Add to Trace: Adds the selection to the tracing targets. Clear: Deselects the selection when multiple registers have been selected using the Shift or Ctrl Key. Select All: Selects all registers displayed on the tab page.
(2)	Add	Sets the selected registers as the tracing targets.
(3)	Delete	Removes the selected registers from the tracing targets.

(4)	Trace Target	Displays the registers that have been set as the tracing target. It is also possible to directly enter registers rather than selecting them in the <i>Trace Target List</i> . <ul style="list-style-type: none">• Right-clicking on Trace Target will display the pop-up menu that enables editing of the tracing targets. Insert Row: Inserts an empty row. Delete Row: Deletes the selected rows. If a tracing target is set in the selected row, the tracing target is removed.
(5)	OK	Sets the tracing targets and enables the Sampling & Trigger Setting Button.
(6)	Cancel	Returns to the Real-Time Trace Tab Page without setting the tracing targets.

[b] Sampling & Trigger Setting

The trace name can be set and sampling and trigger settings can be made here.



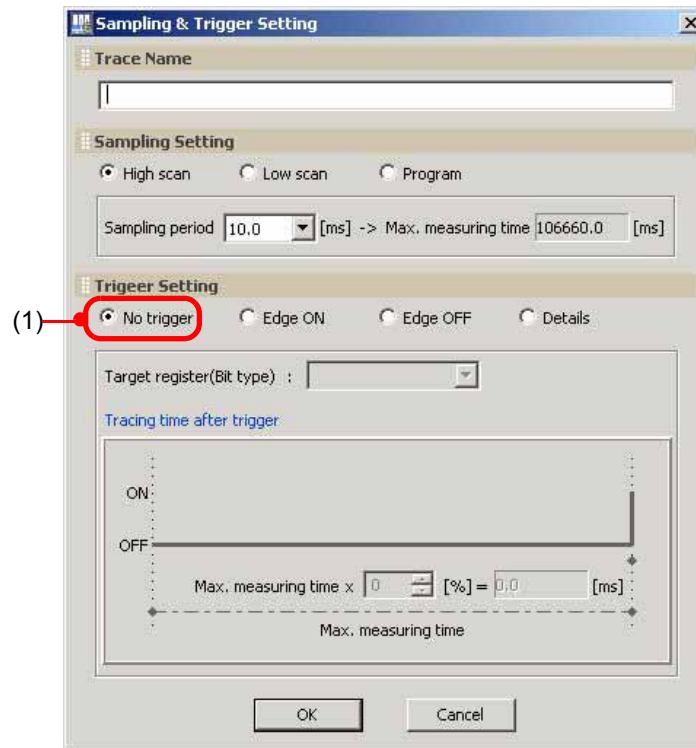
No.	Component	Description
(1)	Trace Name	Register a name of up to 32 characters as the comment.
(2)	Sampling Setting	Specify the conditions for sampling data. [a] High scan/Low scan/Program [b] Sampling period Displays a guide for the maximum measurement time.
(3)	Trigger Setting	Set the method for obtaining trace data. [a] No trigger [b] Edge ON/OFF [c] Details • For details on the trigger setting method, refer to ■ <i>Trigger Setting</i> .
(4)	OK	Sets the sampling and trigger settings and enables the Start Trace Button.
(5)	Cancel	Returns you to the Real-Time Trace Tab Page without setting the sampling and trigger settings.

■ Trigger Setting

There are four settings available as the condition for executing tracing.

[No trigger]

Executes tracing with no condition.

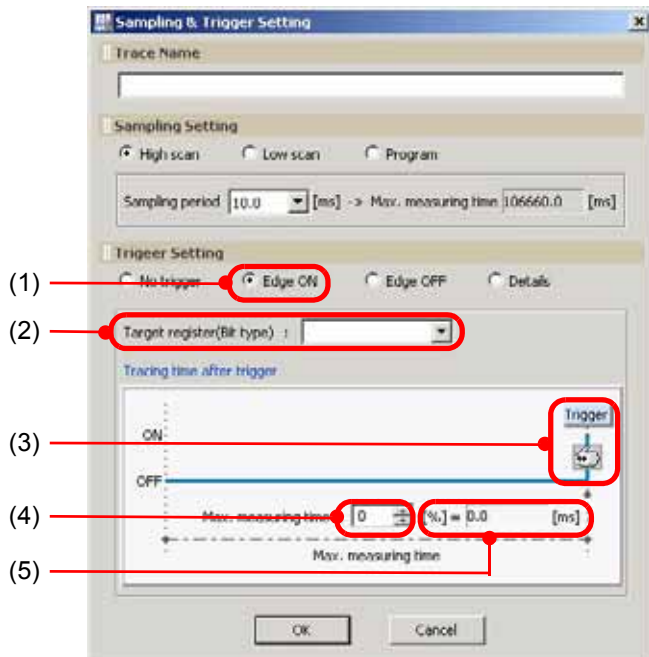


No.	Component	Description
(1)	No trigger	Allows you to start or stop tracing manually.

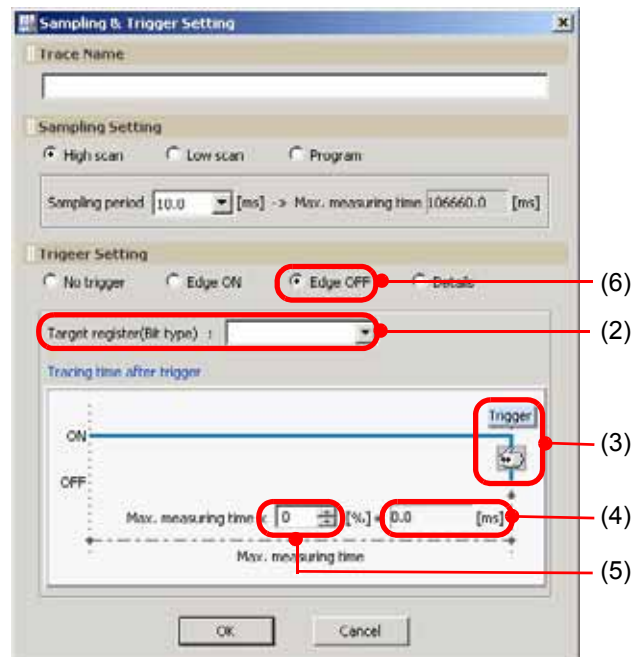
[Edge ON/OFF]


Obtains data before and after a specific bit changes from OFF to ON or ON to OFF.

Edge ON:



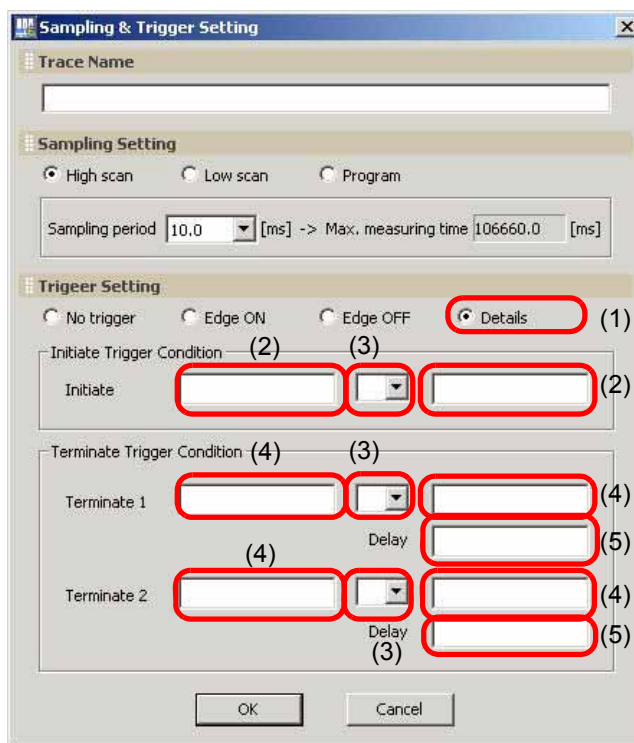
Edge OFF:



No.	Component	Description
(1)	Edge ON	Obtains data before and after a specific bit changes from OFF to ON.
(2)	Target register (Bit type)	Enter the target register.
(3)		Set the trigger position by dragging.
(4)	[%]	Set the trigger position by selecting a value.
(5)	[ms]	Displays the maximum measurement time for tracing after the trigger is turned ON.
(6)	Edge OFF	Obtains data before and after a specific bit changes from ON to OFF.

[Details]

Enables tracing by using any register as the trigger.



No.	Component	Description	
(1)	Details	Set tracing using any register (of the Bit, Word, Float, or Long type) as the trigger. It is possible to control tracing by combining the initiate and terminate triggers as necessary.	
(2)	Initiate	Set the initiate trigger by entering the desired register and value. If no initiate trigger is specified, tracing will start at the same time as sampling starts.	
(3)	Condition	Set the trigger condition by selecting one of the following operators.	
		Operator	Trigger condition
		>	The trigger turns ON when the register value is larger than the comparison value.
		<	The trigger turns ON when the register value is smaller than the comparison value.
		=	The trigger turns ON when the register value is equivalent to the comparison value.
		<>	The trigger turns ON when the register value is different from the comparison value.
>=	The trigger turns ON when the register value is equivalent to or larger than the comparison value.		
<=	The trigger turns ON when the register value is equivalent to or smaller than the comparison value.		
(4)	Terminate	Set the terminate trigger by entering the desired register and value. If no terminate trigger is specified, tracing will continue until sampling is stopped.	
(5)	Delay	Specify the number of samplings to be performed after the establishment of the stop condition before stopping tracing.	

[c] Start/Stop Trace



Function	Description
Start Trace	Starts tracing. The trace data are obtained and displayed in real time. <ul style="list-style-type: none"> • If Program is selected in the Sampling & Trigger Setting Window, tracing cannot be started. Only the Read Again Button is available.
Real Time Display	The transition of the data during tracing is displayed in real time if this check box is checked. <ul style="list-style-type: none"> * The data transition is displayed only on one Trace Tab Page when multiple Trace Tab Pages are open.
Stop Trace	Stops tracing. All the buffer trace data are obtained and displayed on stopping.

[d] Read Again



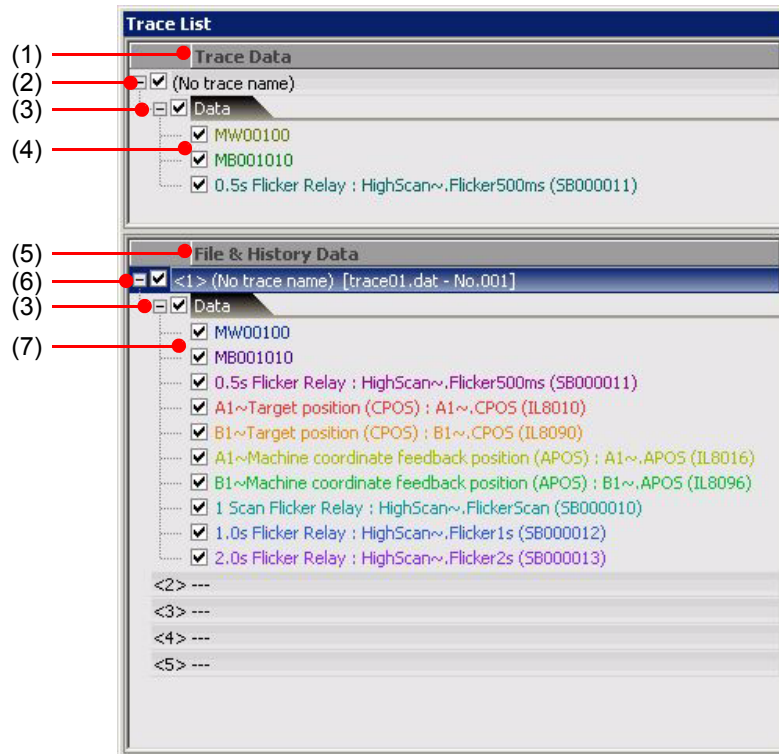
Function	Description
Read Again	Reads the trace data from the Machine Controller again.

(5) Tracing Targets

The tracing targets that were measured, read from external files, or from history data are displayed in an easy-to-understand manner.

The waveform, graph and details of each tracing target can be checked.

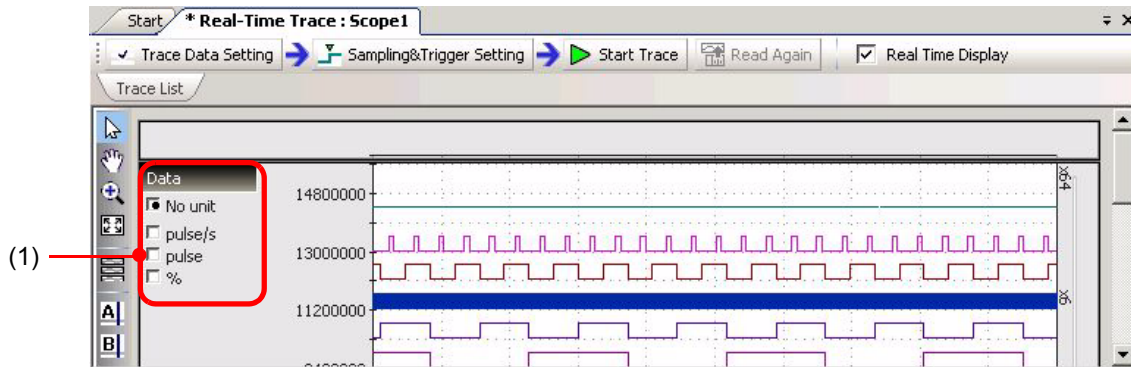
The waveform can be shown/hidden on the graph by checking/unchecking the corresponding check box.



No.	Indication	Function
(1)	Trace Data	Displays the trace data of the measured tracing targets.
(2)	Trace Name	Displays the trace name.
(3)	Trace Group Name	Classifies the trace data by groups. <ul style="list-style-type: none"> The trace data are classified into the groups corresponding to each tab page in the Trace Data Setting Window and the Data group that contains all other data.
(4)	Register	Displays the registers that have been measured as the tracing targets. <ul style="list-style-type: none"> The registers are displayed in the same color as in the graph.
(5)	File & History Data	Displays the trace data of the tracing targets registered from the monitor data or read from external files.
(6)	Trace Name	Displays the trace names of the tracing targets registered from the monitor data or read from external files. <ul style="list-style-type: none"> Up to five data items can be backed up in the files and history data.
(7)	Register	Displays the registers that have been registered from the monitor data or read from external files as the tracing targets. <ul style="list-style-type: none"> The registers are displayed in the same color as in the graph.

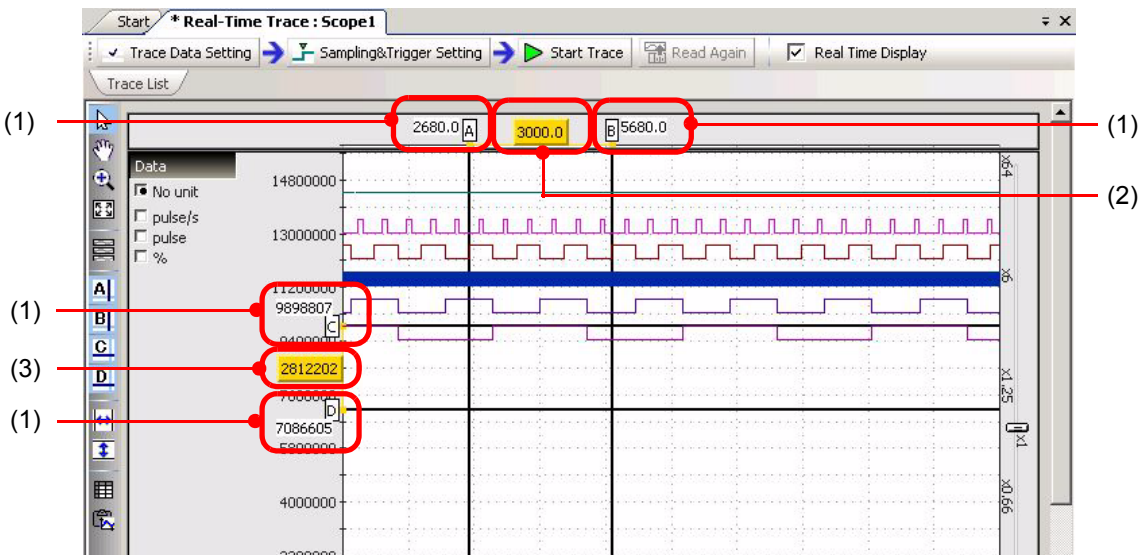
(6) Trend Graphs

[a] Unit of the Graph



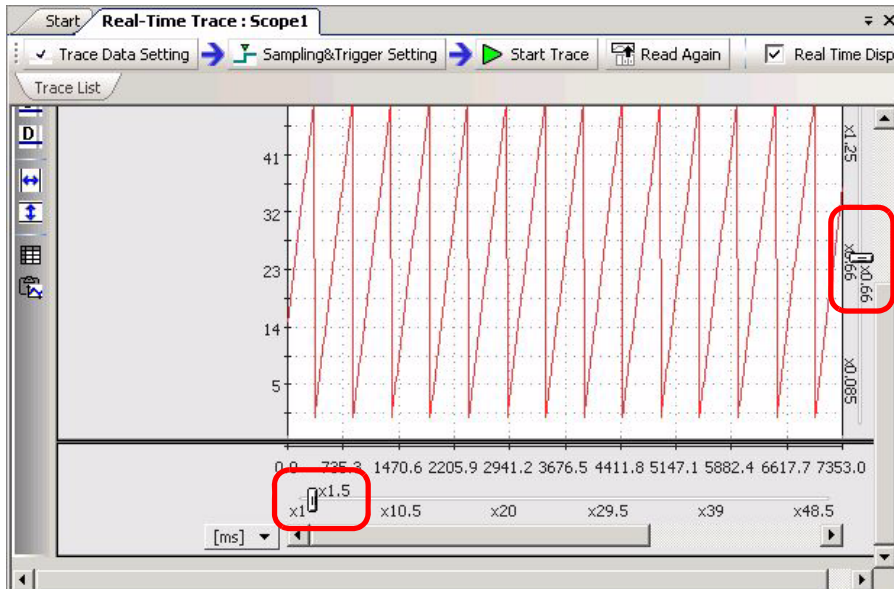
No.	Indication	Function
(1)	-	Displays the units of the parameters selected for tracing targets.

[b] Cursors



No.	Indication	Function
(1)		Displays the value at the cursor position.
(2)	-	Displays the difference value between cursors A and B.
(3)	-	Displays the difference value between cursors C and D.

[c] Slider



No.	Indication	Function
-		Reduces/enlarges the view on dragging the Scale Factor Sliders up/down or left/right. The vertical and horizontal scale factors can be changed in the following ranges. Vertical scale factor: 0.085 to 64 times Horizontal scale factor: 1 to 48.5 times

[d] Scrolling



No.	Indication	Function
-		Scrolls the graph left/right.

[e] Split Graph View

It is possible to classify trace data waveforms on the graph into groups according to the tracing target classification and split the graph so that an individual graph is displayed for each group.

The tracing targets are classified into the groups corresponding to each tab page in the **Trace Data Setting** Window and the group that contains all other registers.

You can switch between the split view and the collective view of the graphs.

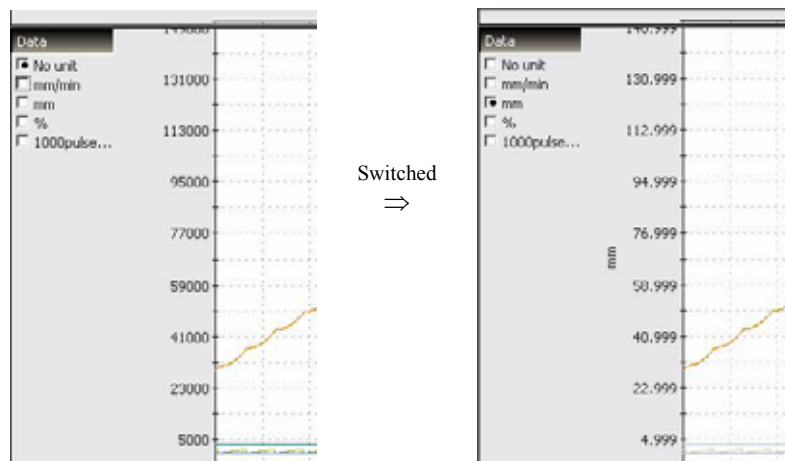


[f] Switching the Unit of the Graph

When there is more than one unit system for the trace data being displayed, the unit for the vertical axis of the graph can be switched.

On switching the unit, the scale on the axis is changed according to the attributes of the axis (unit and number of decimal places) and the waveforms are displayed.

- The selectable units may vary depending on the attributes of the axis.
- The unit can be switched regardless of the view (collective view or split view) of the graph. When the unit is switched, the tracing targets that cannot be represented in the selected unit are shown with a line of the same color, but paler.



[g] Displaying Measurement Data

It is possible to refer to the trace definition information (sampling and trigger setting information) of the monitor data and history data.

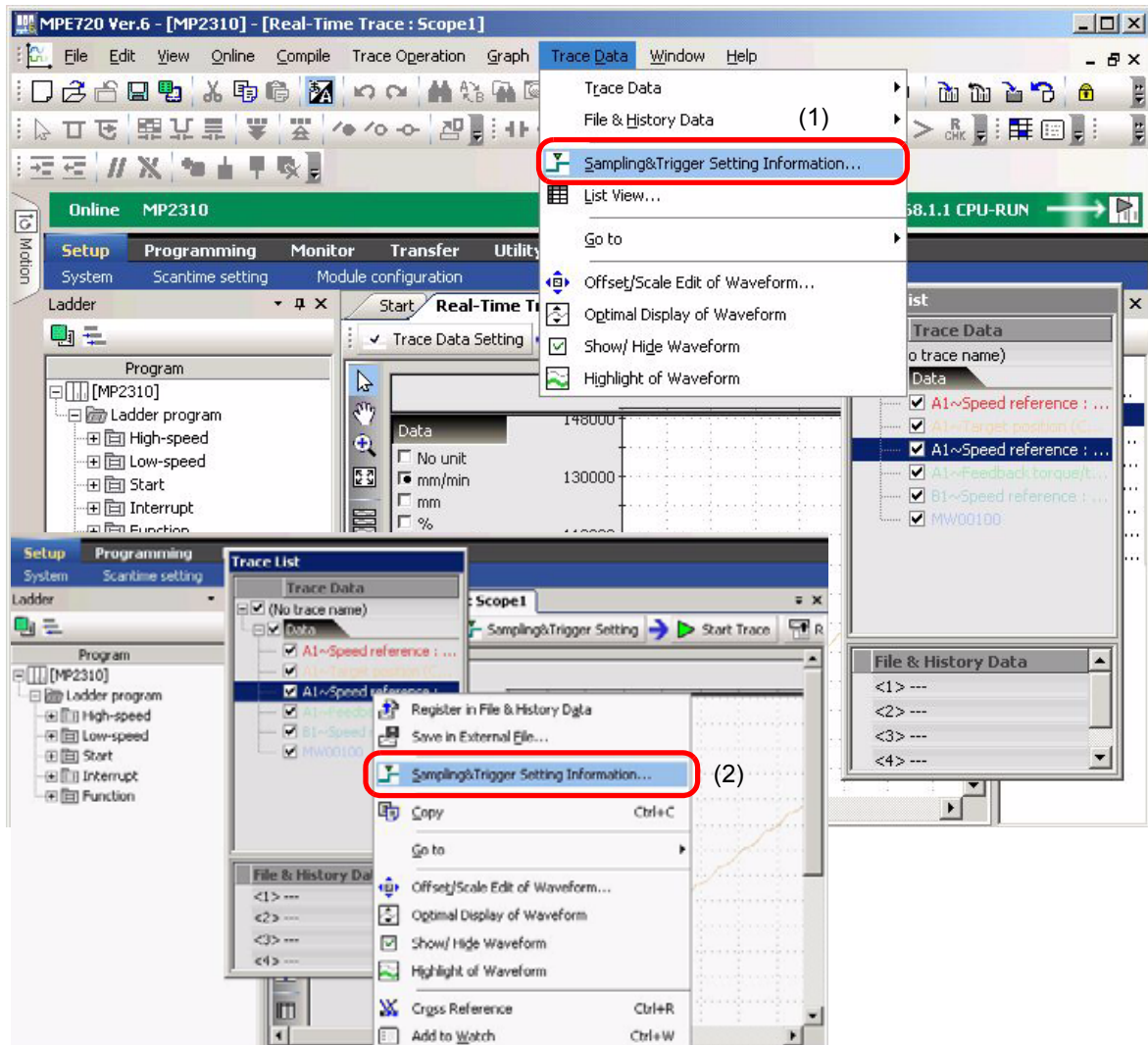
This helps you to refer to the trace definition used in past measurement or to reuse past trace definitions for measurement.

1. Opening from the Main Menu

Select *Trace Data - Sampling & Trigger Setting Information* from the Main Menu. The **Sampling & Trigger Setting** Window will be displayed.

2. Opening from the pop-up menu

Right-click on *Monitor Data* or *File & History Data* in the Trace List Subwindow, and select *Sampling & Trigger Setting Information* from the pop-up menu that will be displayed.



(7) Editing Trace Data

It is possible to enlarge/reduce or shift the waveform of trace data. Editing the size and position of the waveform facilitates comparison with other waveforms and enables analysis of the trace data.

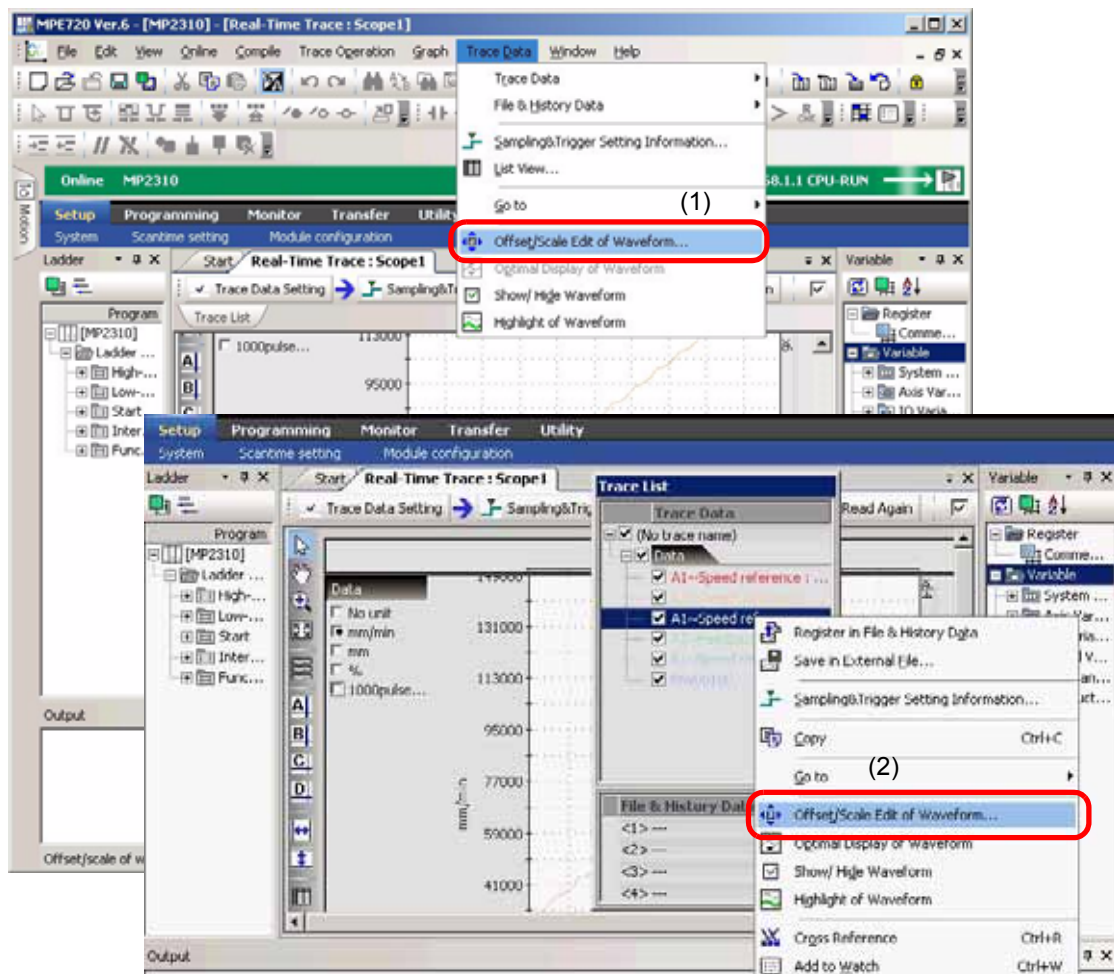
- When the monitor data is updated, the contents of the edit will be reset.

1. Opening from the Main Menu

Select **Trace Data - Offset/Scale Edit of Waveform** from the Main Menu.

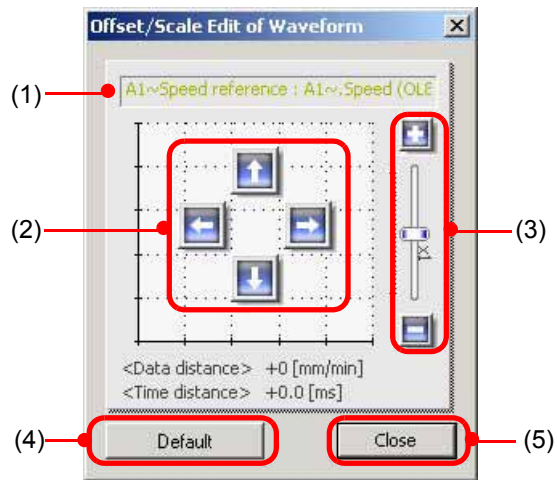
2. Opening from the pop-up menu

Right-click the register to be edited in **Monitor Data** or **File & History Data** in the Trace List Subwindow, and select **Offset/Scale Edit of Waveform** from the pop-up menu that will be displayed.



13.2.3 Names and Descriptions of Components of Real-Time Tracing

- Right-clicking the trace group name enables editing of all waveforms in the group collectively.



No.	Indication	Function
(1)	Trace Name	Displays the trace name or file name.
(2)	Offset Shift Button	Shifts the waveform of the specified tracing target up/down/left/right.
(3)	Scale Adjustment Slider	Enlarges/reduces the amplitude of the trace data of the specified tracing target.
(4)	Default	Restores the default setting for the edited trace data.
(5)	Close	Closes the Edit Trace Data Window.

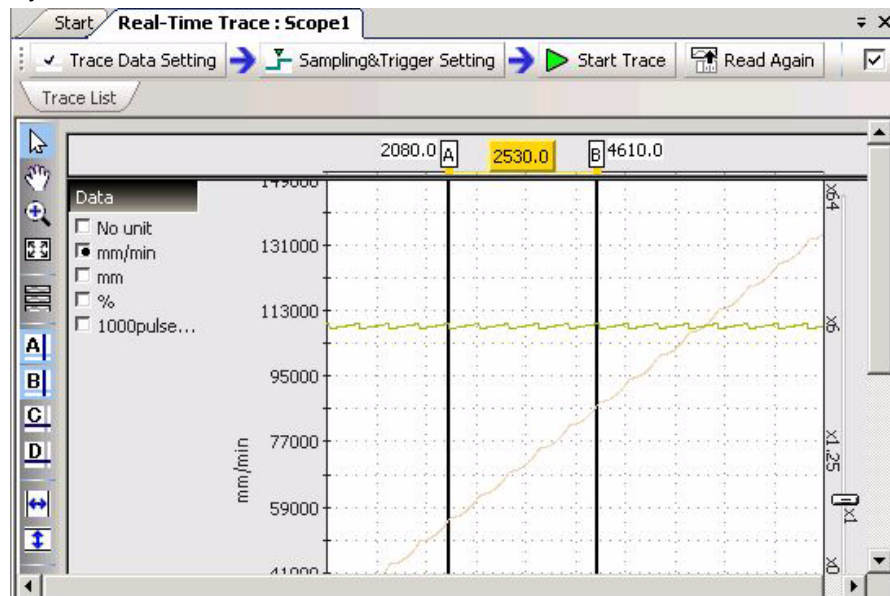
13.2.4 Analyzing Trace Data

It is possible to analyze trace data with editing trace data or enlarge/reduce waveforms.

(1) Analyzing I/O Registers and M Registers

The difference between the set values and the actual values can be analyzed as follows.

1. Display the trace data to be analyzed on the graph.
2. Select **Trace Data - Edit Trace Data** from the Main Menu. Alternatively, right-click on **File & History Data** in the Trace List Subwindow, and select **Edit Trace Data** from the pop-up menu that will be displayed.
3. Shift the waveform to a desired position using the arrow buttons in the **Edit Trace Data** Window.
4. Click the Cursor A/B or Cursor C/D Icon in the Graph Toolbar and set the cursor at the register to be analyzed.

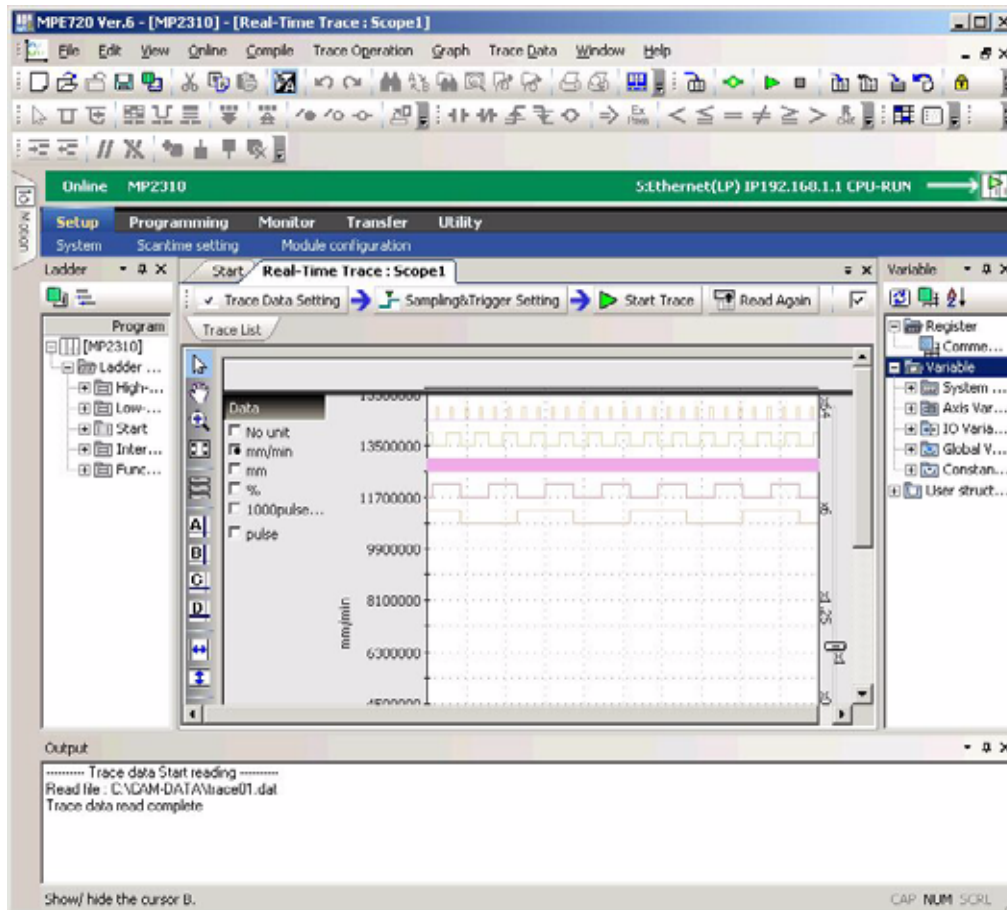


5. Analyze the difference between the set register waveform and the actually output register waveform.

(2) Comparing Trace Data with History Data

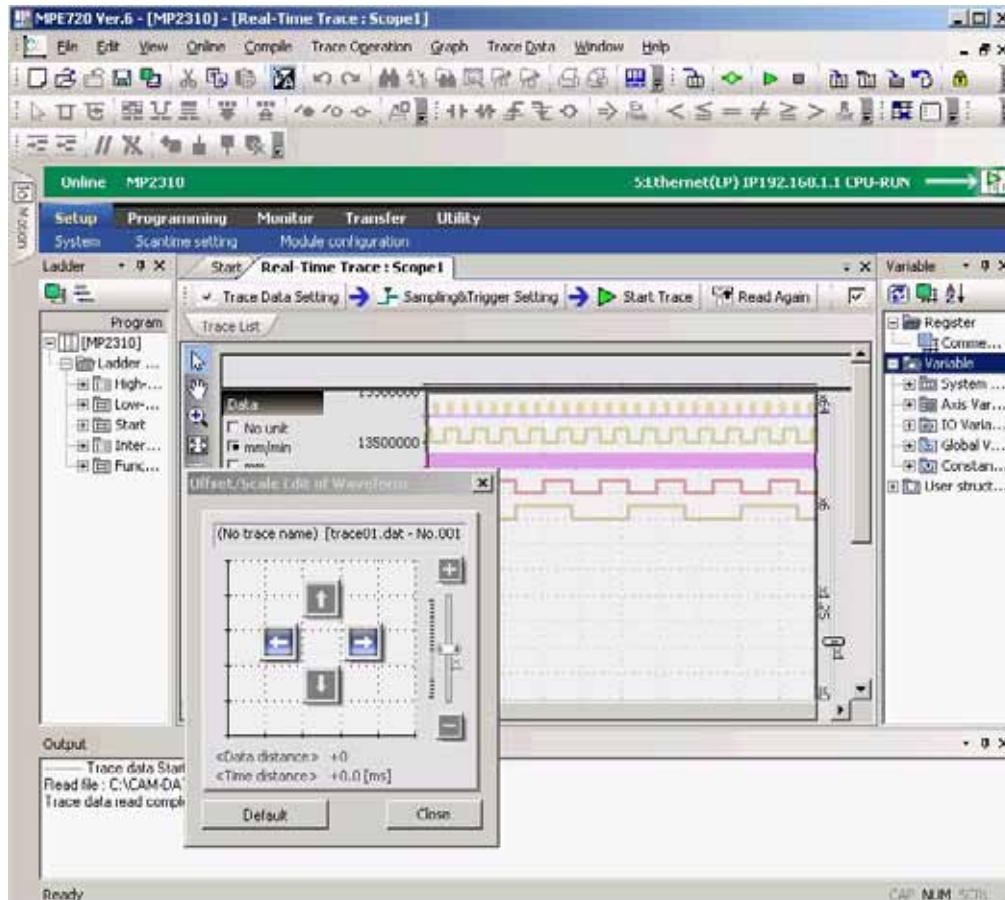
The trace data read from the Machine Controller can be compared to the trace data obtained in the past as follows.

1. Read trace data from an external file to **File & History Data** in the Trace List Subwindow.
 - If the trace data has already been read, check the check box of the trace definition to be used.
The waveform of the trace data will be plotted on the graph.



2. Select **Trace Data - Offset/Scale Edit of Waveform** from the Main Menu. Alternatively, right-click on **File & History Data** in the Trace List Subwindow, and select **Offset/Scale Edit of Waveform** from the pop-up menu that will be displayed.

The **Edit Trace Data** Window will be displayed.



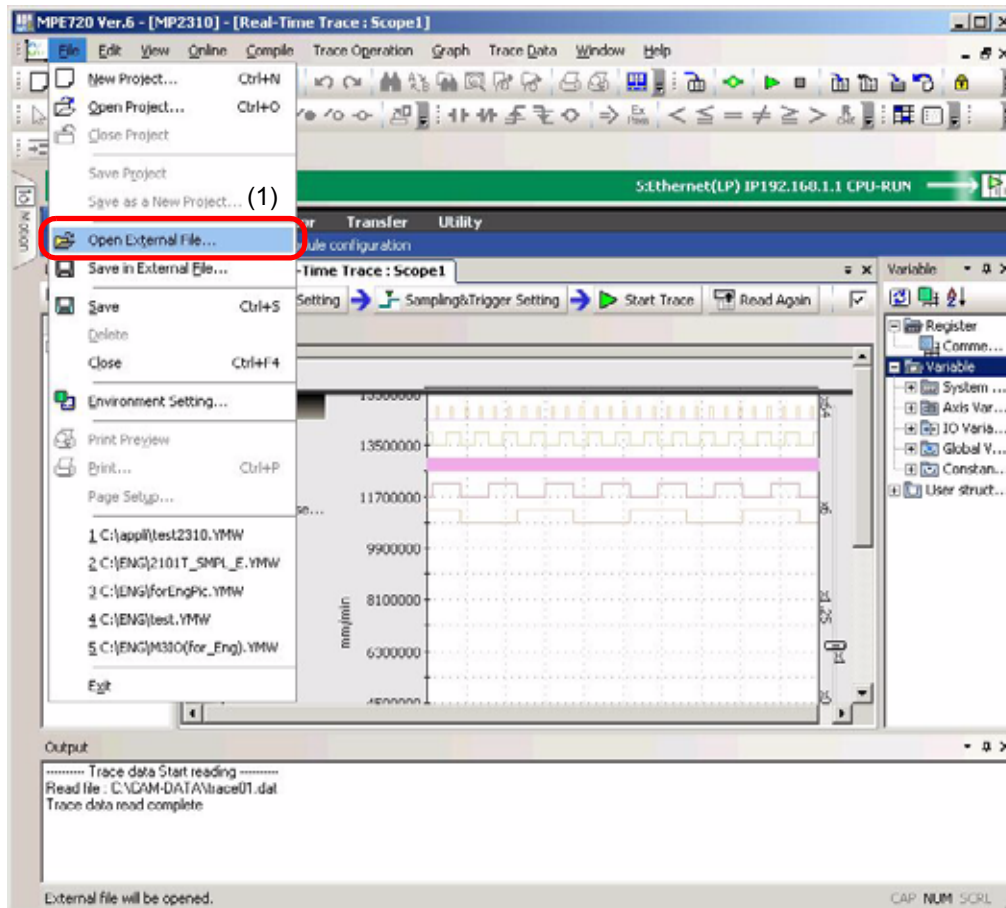
3. Shift the start position of the data to the desired position using the arrow buttons in the **Edit Trace Data** Window.
4. Compare the trace data with the past trace data using the edit functions (enlarge/reduce, slider, etc.).

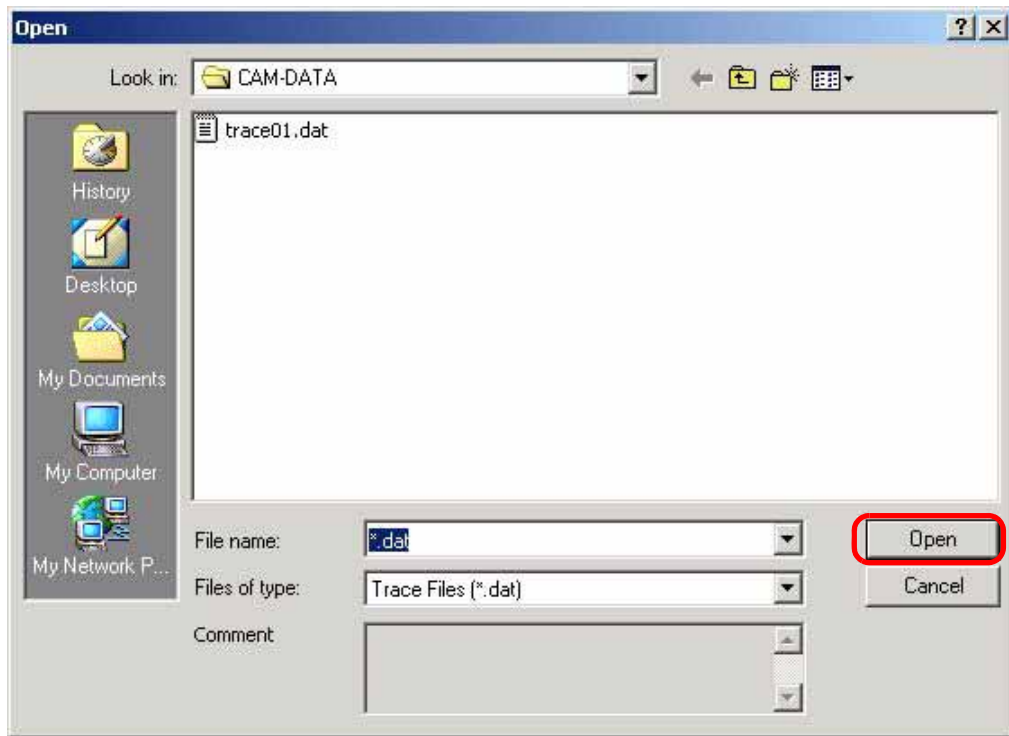
13.2.5 Reading Trace Data

Saved trace data can be read from trace definition files (.dat) or CSV files (.csv).

1. Reading from the Main Menu

Select **File - Open External File** from the Main Menu and open a CSV file or a trace definition file in which trace data are saved.





13.2.6 Saving Trace Data

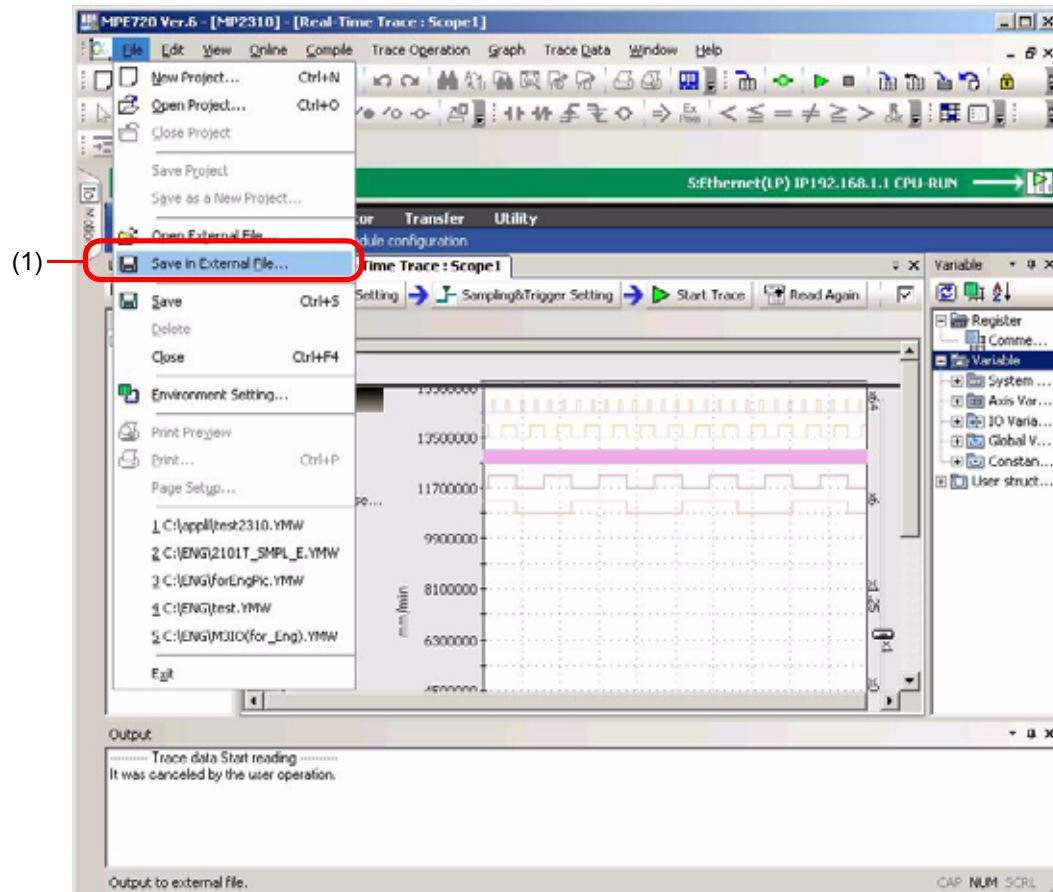
Trace data can be saved to a CSV file or a trace definition file.

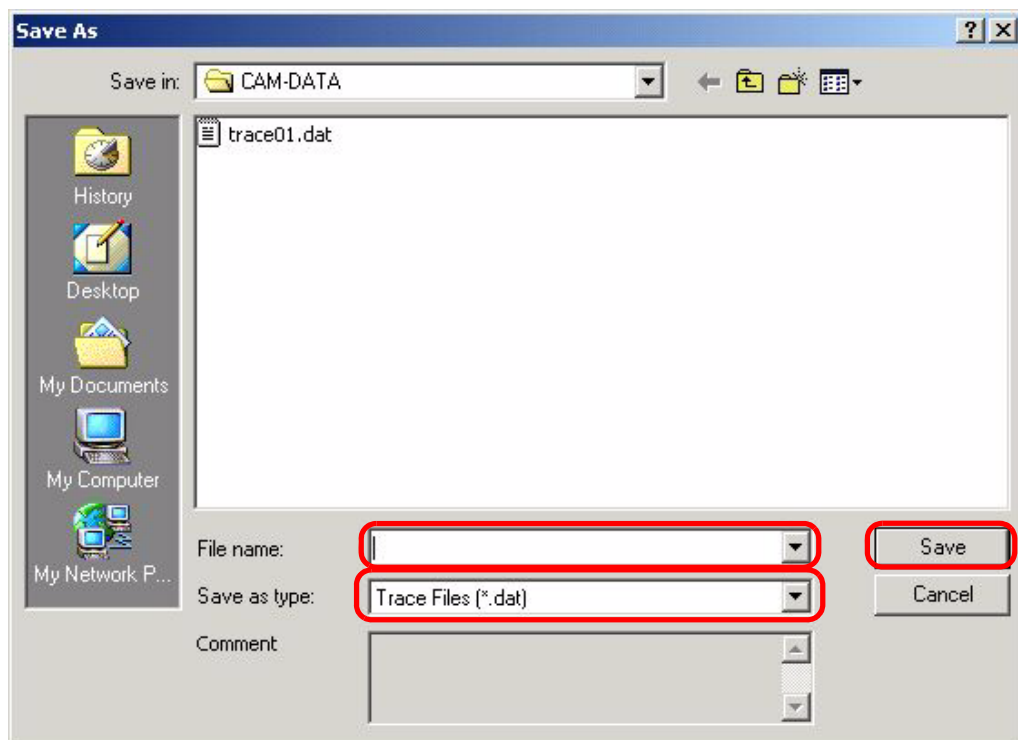
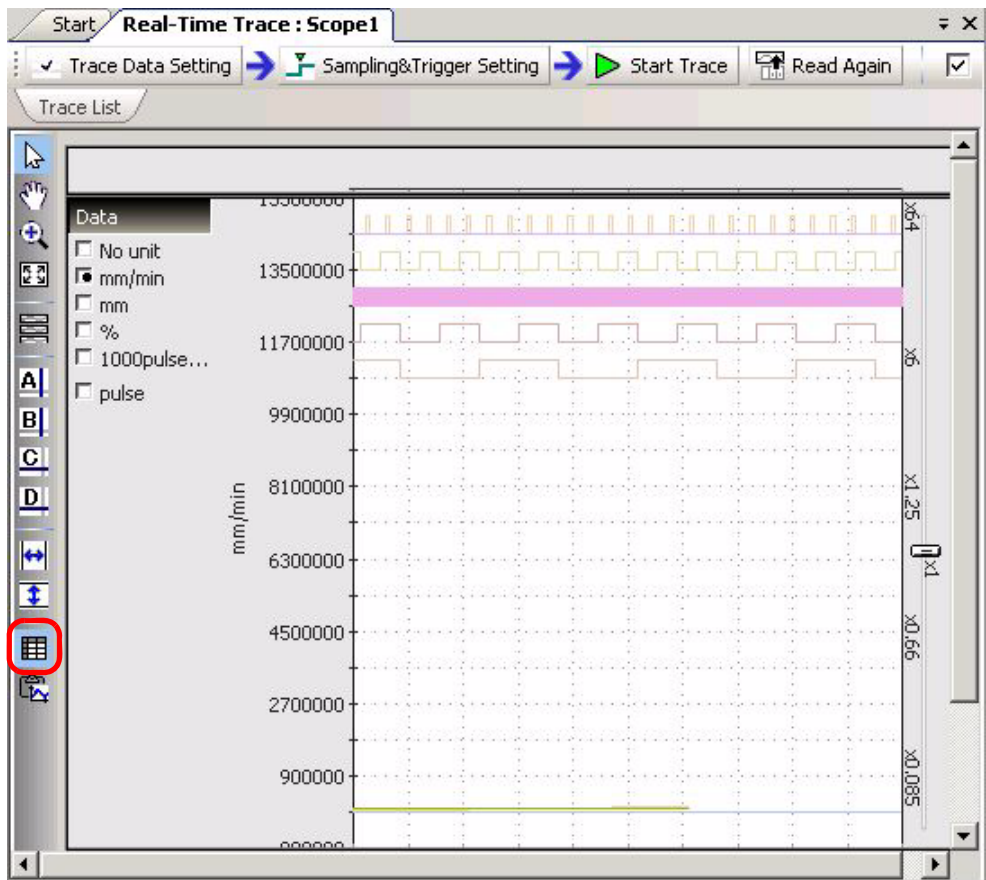
Saving trace data to a CSV file or a trace definition file enables analysis.

1. Saving from the Main Menu.

Select **File - Save in External File** from the Main Menu. Select either CSV file or trace definition file as the file type and specify the file name to save the trace data.

- It is also possible to display the data in the list format and paste the list to an Excel file.





13.2.7 Displaying in List Format

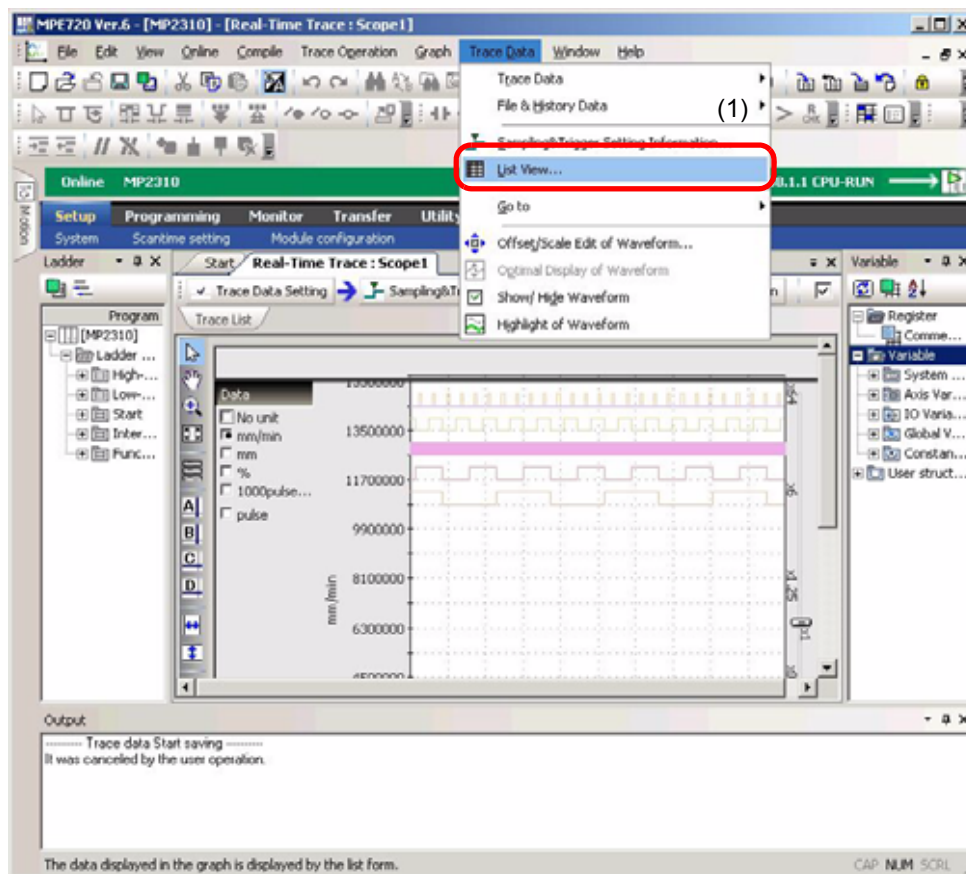
The monitor data and history data displayed on the graph can be displayed in the list format.

1. Displaying from the Main Menu

Select **Trace Data - List View** from the Main Menu. The trace data displayed in the graph will be displayed in the list format.

2. Displaying from the toolbar

Click the **List View Icon**. The trace data displayed in the graph will be displayed in the list format.





	Monitor-01	Monitor-02	Monitor-03	Monitor-04	Monitor-05	Monitor-06
Variable	OL8010	IL8010	OL8010	IL8042	OL8090	MW00100
Time[ms]	[mm/min]	[0.001mm]	[mm/min]	[0.01%]	[1000pul...]	[---]
0.0	1380	29108	1380	119	3000	46
10.0	1410	29332	1410	124	3000	47
20.0	1440	29560	1440	155	3000	48
30.0	1470	29793	1470	202	3000	49
40.0	1500	30031	1500	210	3000	50
50.0	0	30275	0	190	3000	0
60.0	30	30523	30	119	3000	1
70.0	60	30610	60	-97	3000	2
80.0	90	30614	90	-144	3000	3
90.0	120	30622	120	-31	3000	4
100.0	150	30635	150	28	3000	5
110.0	180	30653	180	59	3000	6
120.0	210	30677	210	91	3000	7
130.0	240	30705	240	115	3000	8
140.0	270	30738	270	133	3000	9
150.0	300	30776	300	150	3000	10
160.0	330	30820	330	162	3000	11

13.2.8 Copying the Graph

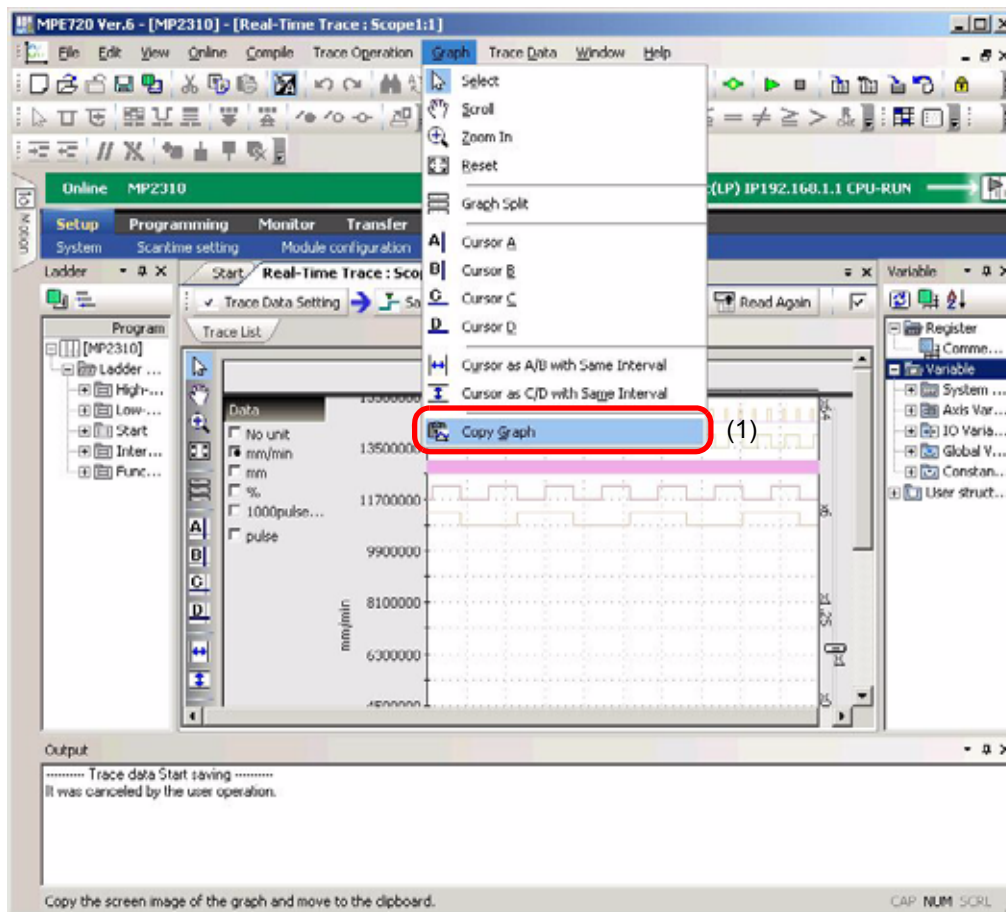
The image of the graph display can be copied to the clipboard.

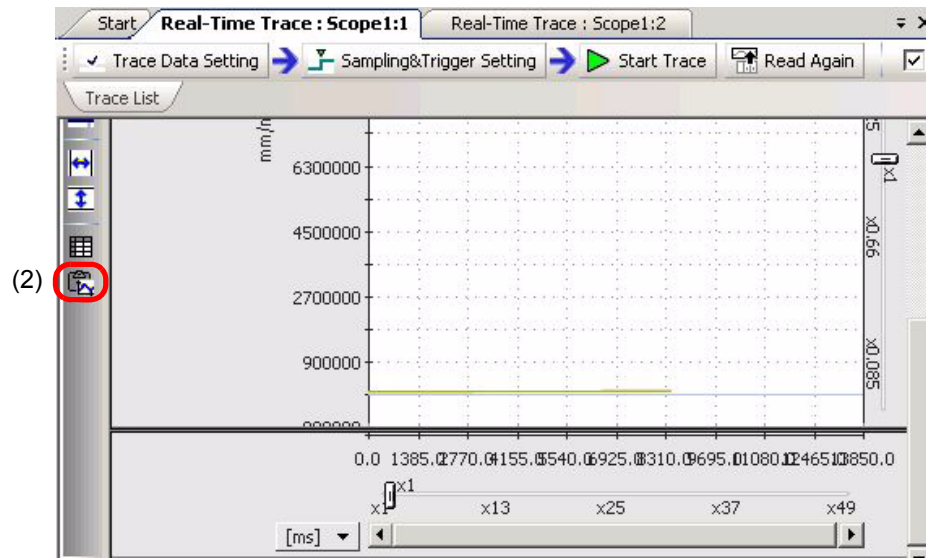
1. Copying from the Main Menu

Select **Graph - Copy Graph** from the Main Menu. The image of the graph display will be copied to the clipboard.

2. Copying from the toolbar

Click the **Copy Graph** Icon. The image of the graph display will be copied to the clipboard.





13.3 Data Tracing

13.3.1 Outline

Data tracing is one of the MPE720 version 6 monitoring functions. While connected to the Machine Controller (i.e., while online), data tracing can be used to collect Machine Controller I/O data, process it, and display it in graph format. This function can be used for monitoring the operating status of a program or for debugging.

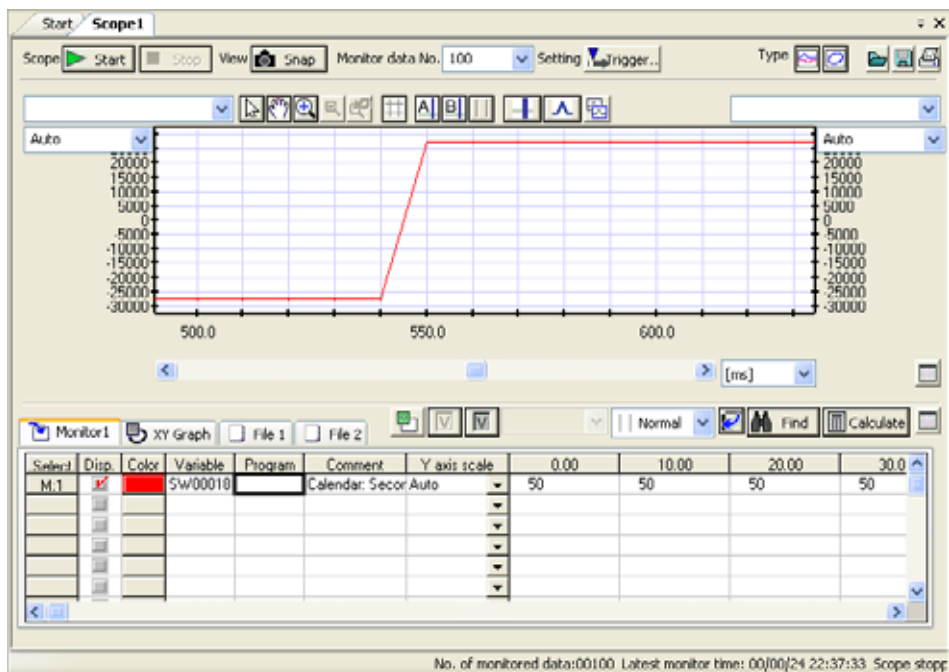


Fig. 13.1 Example of a Graph

13.3.2 Starting a Data Trace Window

Select **Monitor - Scope** from the Launcher. A **Data Trace** Window will be displayed in the main window. With MPE720 version 6, a maximum of four Data Trace Windows can be displayed.

- For details on displaying multiple Data Trace Windows, refer to 13.3.7 (4) *Select Monitor Setting Dialog Box*.

13.3.3 Data Trace Window Configuration

A **Data Trace Window** is configured as shown below.

Operation Panel Area
(Refer to 13.3.5 Operation Panel.)

Graph Area
(Refer to 13.3.6 Graph Area Operations.)

List Area
(Refer to 13.3.7 List Area Operations.)

Selected	Disp	Color	Variable	Program	Comment	Y axis scale	0.00	10.00	20.00
M:1	<input checked="" type="checkbox"/>		SW00010		Calendar: Seconds	Auto	52	52	52
M:2	<input checked="" type="checkbox"/>		SW00017		Calendar: Hours Minu	Auto	1046	1046	1046

No. of monitored data:00020 Latest monitor time: 00/00/20 04:16:35 Scoping Not

- For description purposes, all of the above icons are shown as active.

- **Operation Panel Area**

This area is used for general data trace operations, such as starting and stopping a scope, trigger settings, etc. It is always displayed, regardless of the graph or list display mode. (Refer to 13.3.5 Operation Panel.)

- **Graph Area**

This area displays trace data. Either a trend graph or an X-Y graph can be selected. The Graph Area is not displayed when the List Area display is maximized. (Refer to 13.3.6 Graph Area Operations.)

- **List Area**

This area is used for operations such as assigning and deleting Monitor Variables. Monitor Variables are displayed in list format. The List Area is not displayed when the Graph Area display is maximized. (Refer to 13.3.7 List Area Operations.)

■ Terminology: Monitor Variables

Variables (registers) that being monitored in graphs or data monitor displays are called Monitor Variables. For a variable (register) to be treated as a Monitor Variable, it must be assigned as one.

- For details on assigning monitor variables, refer to 13.3.7 (4) *Select Monitor Setting Dialog Box*.

13.3.4 Displaying Graphs

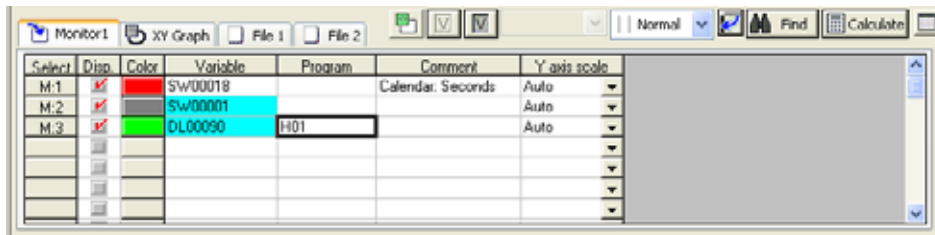
Use the following procedure to display a trend graph or an X-Y graph using the data trace function.

1. Double-click the *Variable* Field in the List Area to display the text cursor, and then enter the register or variable name to be monitored and press the **Enter** Key.

For a D register, enter the name of the program to be monitored in the *Program* Field.

- Variables can be entered by dragging and dropping from the Variable Subwindow.
- A maximum of 16 registers or variables can be entered.

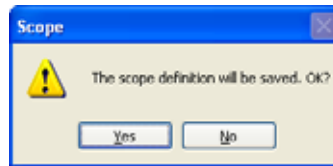
If a comment has been set for a variable that is entered, then the comment will be displayed by entering the variable.






- A blue background for a setting in the *Variable* Field indicates that the setting has not been saved.

2. Select **File - Save Setting** from the Main Menu.

A message asking for confirmation will be displayed.



Click the **Yes** Button. The setting will be saved and the background in the *Variable* Field will return to white.

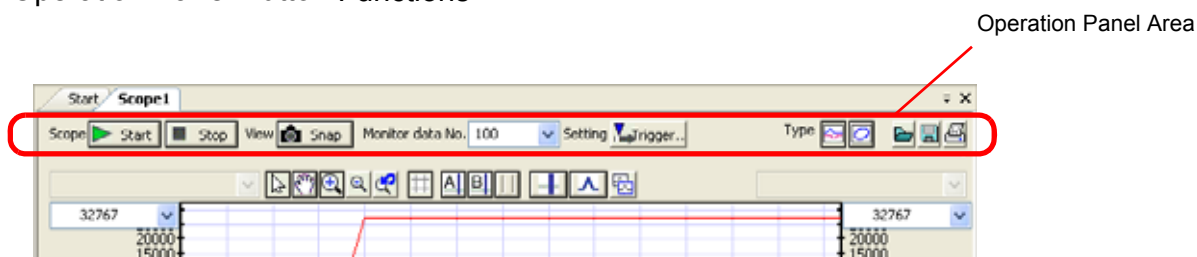
3. Click the **Start** Button () in the Operation Panel to start tracing, and click the **Stop** Button () to stop. Alternatively, click the **Snap** Button () to upload the current contents of the trace memory.

A message will be displayed while the data is being obtained, and the graph will be displayed in the Graph Area. The graphs can be toggled between a trend graph and an X-Y graph.

- Detailed settings can be made in the List Area for relevant variables, including not only setting the variables but setting the display colors for graphs and displaying or hiding graphs. For details, refer to *13.3.7 List Area Operations*.
- The method for displaying graphs can be set in detail in the Graph Area. For details, refer to *13.3.6 Graph Area Operations*.
- A wide range of data trace operations can be executed using the buttons in the operation panel. For details, refer to *13.3.5 Operation Panel*.

13.3.5 Operation Panel

(1) Operation Panel Button Functions




- For description purposes, all of the above icons are shown as active.

The buttons on the operation panel have the following functions.

Start Button ()/**Stop Button** (): The **Start** Button and the **Stop** Button are valid only while online.

These buttons start and stop trace operations that record register values with each scan. When one of the buttons is turned ON, the other is automatically turned OFF.

 -  Tracing is being executed. (May be waiting for trigger condition)

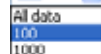
 -  Tracing is stopped.

Tracing is started simultaneously when the **Scope** Window is opened, so the **Stop** Button is turned ON when the window is opened.

Snap Button (): The **Snap** Button is valid only while online.

When this button is clicked, a one-time snapshot of the trace data memory is captured and displayed.

Monitor data No. ()



A maximum value can be set for the trace data to be captured when the **Stop** Button or **Snap** Button is clicked. Either select *All data*, *100*, or *1,000*, or click in the cell and directly enter the number.

- The maximum value that can be directly entered is 32,158.

Trigger and Configuration Button ()

When this button is clicked, the **Trigger and Configuration** Dialog Box is displayed.

- For details on the **Trigger and Configuration** Dialog Box, refer to 13.3.5 (2) *Trigger and Configuration Dialog Box*.

Trend Graph Button ()

When this button is clicked, a trend graph is displayed.

- For details on the contents of the display and the setting method, refer to 13.3.6 (6) *Trend Graphs*.

X-Y Graph Button ()

When this button is clicked, an XY graph is displayed.

- For details on the contents of the display and the setting method, refer to 13.3.6 (7) *X-Y Graphs*.

Import Button ()

When this button is clicked, the **Select File** Dialog Box is displayed and trace data and data trace definitions can be read from selected files to the **Data Trace** Window.


Export Button ()

When this button is clicked, the **Select File** Dialog Box is displayed and trace data and data trace definitions can be written from the **Data Trace** Window to specified files.

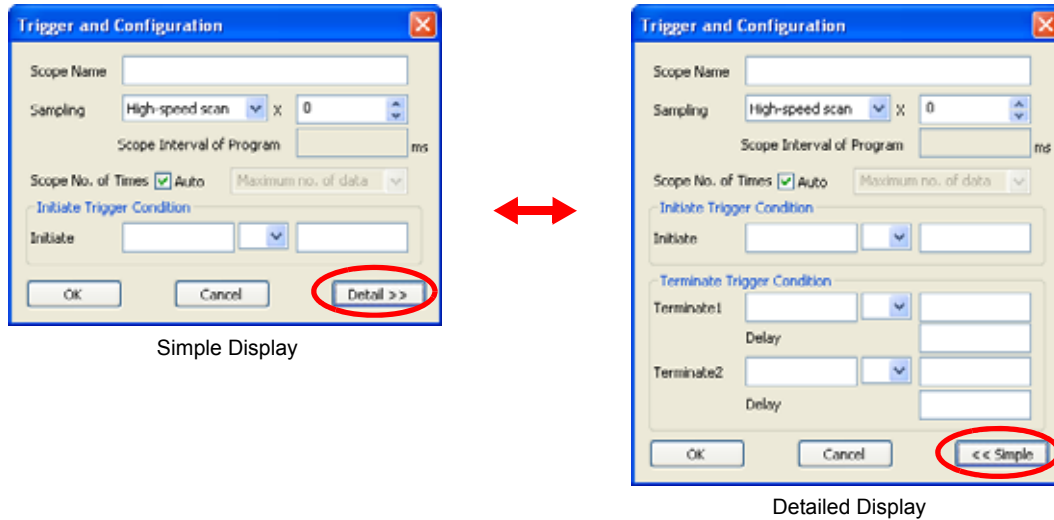
Print Button ()

When this button is clicked, the **Select File** Dialog Box is displayed and trace data and data trace definitions can be saved to selected files.

(2) Trigger and Configuration Dialog Box

The **Trigger and Configuration** Dialog Box is displayed by clicking the **Trigger and Configuration** Button () on the operation panel.

To toggle between a simple display and a detailed display, click the **Simple** Button or the **Detail** Button.



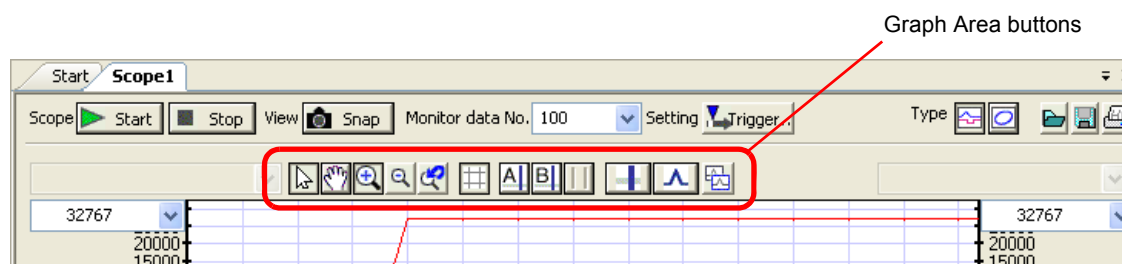
The following table shows each item in the detailed display.

Item	Contents	Set Value
Scope Name	Specifies the name of the condition set that is set in the dialog box. The user can name the scope event.	A maximum of 32 characters can be used.
Sampling	Specifies the data sampling condition. Samples will be taken in line with the selected program.	High-speed scan Low-speed scan Specification by program
Sampling Interval	Specifies the data sampling interval. *When set to 0, tracing is executed each time.	0 to 32,767
Scope Interval of Program	Specifies the time in ms. The value set here is used for the time axis. This setting is valid only when the sampling condition is for specification by program.	0.1 to 999.9
Scope No. of Times	Specifies the number of data traces. When <i>Auto</i> is selected, data tracing continues until the stop trigger condition is met or until the Stop Button is clicked.	No specification Max. data, 100, 1000 1 to 999,999
Initiate Trigger Condition	Specifies the register number, logical operator, and number to serve as the trigger for initiating the trace operation. If nothing is specified, tracing will start at the same time as sampling starts.	Register number > / < / = / < > / > = / < = Number
Terminate Trigger Conditions 1 and 2 (Not shown for simple display.)	Specifies the register number, logical operator, and number to serve as the trigger for terminating the trace operation. One or two terminate triggers can be set. If nothing is specified, tracing will be executed until sampling stops.	Register number > / < / = / < > / > = / < = Number
Number of Terminate Delays (Not shown for simple display.)	Specifies how many times sampling is to be executed and tracing terminated after the termination condition is met.	0 to 65,534

13.3.6 Graph Area Operations

(1) Functions of Buttons in Graph Area

The Graph Area buttons are used for common functions in the Trend Graph Mode and the X-Y Graph Mode.



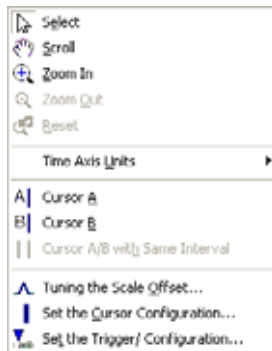
- For description purposes, all of the above icons are shown as active.

The following table shows the functions of the Graph Area buttons.

	Icon	Name	Contents
Cursor settings		Select	When this icon is clicked, the cursor turns into an offset adjustment cursor for the Graph Area and the graph can be scrolled vertically by dragging. <ul style="list-style-type: none"> • Graph Areas for which <i>Auto</i> is selected from the list as the maximum vertical axis value cannot be moved.
		Scroll	Turns the cursor into a graph scroll cursor so that the graph can be scrolled horizontally by dragging.
		Zoom In	Turns the cursor into the graph zoom-in cursor to enable enlarging areas by selecting them with the cursor.
		Zoom Out	After using zoom-in to get a close up view, gradually reduces the size of the image being displayed. <ul style="list-style-type: none"> • This icon is available.
		Reset	Returns the graph to its original scale. <ul style="list-style-type: none"> • This icon is available.
		Grid	Toggles between displaying and hiding the grid.
Cursor operations		Cursor A	Toggles between displaying and hiding cursor A, one of the two cursor types (A and B).
		Cursor B	Toggles between displaying and hiding cursor B, one of the two cursor types (A and B).
		Cursor A/B with Same Interval	Links cursors A and B to operate at a fixed interval. <ul style="list-style-type: none"> • This icon is active when both cursors A and B are displayed.
		Cursor Setting	Displays the Cursor Setting Dialog Box. <ul style="list-style-type: none"> • Refer to 13.3.6 (4) <i>Cursor Setting Dialog Box</i>.
		Adjust Scale/Offset	Displays the Scale Offset Adjust Dialog Box. <ul style="list-style-type: none"> • Refer to 13.3.6 (5) <i>Scale Offset Adjust Dialog Box</i>.
		Copy Graph	Copies the graph to the clipboard. <ul style="list-style-type: none"> • Copied images of graphs can be pasted in other Windows applications.
		Maximum Graph Display	Hides the list and maximizes the graph display. <ul style="list-style-type: none"> • This icon is active only during normal graph display.
		Normal Graph Display	Displays the list and returns the graph to its normal display. <ul style="list-style-type: none"> • This icon is active only during maximum graph display.

(2) Graph Area Pop-up Menu

The following pop-up menu is displayed by right-clicking in the Graph Area.



The items in the pop-up menu can perform the same operations as the buttons in the Graph Area. For details, refer to *13.3.6 (1) Functions of Buttons in Graph Area*.

(3) Using Mouse Cursors

There are two types of cursor (A and B) in the Graph Area. They can be used either individually or together.


- For details on displaying, hiding, and linking cursors A and B, refer to *13.3.6 (1) Functions of Buttons in Graph Area*.

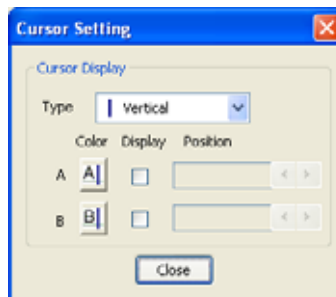
Left-clicking within a graph will cause the cursor to move as described below, depending on the circumstances.

- When Only Cursor A (or Cursor B) Is Displayed
Cursor A (or cursor B) will move to the location that was clicked.
- When Cursors A and B Are Both Displayed and Linked
Cursor A will move to the location that was clicked and cursor B will move with it at a fixed interval.
- When Cursors A and B Are Both Displayed but Not Linked (See note.)
When the cursor mode in the List Area is set to either *Normal* or *Cursor A*, cursor A will move to the location that was clicked. Cursor B will not move.
When the cursor mode in the List Area is set to *Cursor B*, cursor B will move to the location that was clicked. Cursor A will not move.

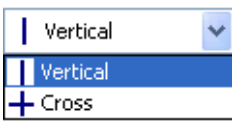



Note: When *Cursor A/B with Same Interval* is not selected, *Normal* cannot be selected as the cursor mode in the List Area. Conversely, when *Cursor A/B with Same Interval* is selected, neither *Cursor A* nor *Cursor B* can be selected as the cursor mode in the List Area.

(4) Cursor Setting Dialog Box


When the **Cursor Setting** Button () in the Graph Area is clicked, the **Cursor Setting** Dialog Box will be displayed as shown below.

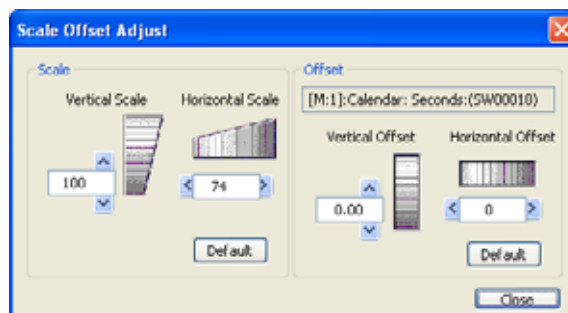


The following table shows the items to be set in the **Cursor Setting** Dialog Box.

Icon	Name	Contents	Remarks
	Type	Used to select either <i>Vertical</i> () or <i>Cross</i> (+) cursor shape.	The cross cursor is displayed when a Monitor Variable is activated in the <i>Select Field</i> of the list display. The center of the cross cursor will move over the selected Monitor Variable.
	Color	Used to select the cursor A and B colors.	When the icon is clicked, the Color Setting Window will be displayed.
	Display	Used to toggle between displaying and hiding the A and B cursors.	The cursors are displayed by selecting their respective check boxes.
	Position	Used to adjust the cursor display position. Enter a value directly or use the spin buttons.	When a number is entered directly, it is adjusted to the nearest grid position.

(5) Scale Offset Adjust Dialog Box

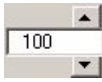






When the **Adjust Scale/Offset** Button () in the Graph Area is clicked, the **Scale Offset Adjust** Dialog Box will be displayed as shown below. This dialog box can be used to adjust the scale (maximum value) for each axis of the graph and to adjust the offset (deviation from the center).



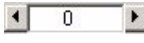

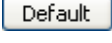

There is no need to select the object for scale adjustment. Offset adjustment is valid when an offset adjustment object is selected in the *Select* Field of the list. (See note.) Offset adjustment cannot be used without selecting an object. It also cannot be used if the selection is cleared after the dialog box is displayed. If that occurs, it can be used by selecting an offset adjustment object from the list to activate it.

Note: Use the *Select* Field in the list to select the offset adjustment object. On Monitor Pages and File Pages, the selected object will be a Monitor Variable. The offset adjustment horizontal axis will be the sampling time, and the vertical axis will be the data value of the selected Monitor Variable. On an X-Y Display Page, the Monitor Variables set for the vertical and horizontal axes become the objects. The offset adjustment horizontal and vertical axes will be the data values for the variables that are set. For details on pages, refer to 13.3.7 (1) *Changing Pages*.


The following table shows the items to be set in the **Scale Object Adjust** Dialog Box.

Icon	Name	Contents	Remarks
	Vertical Scale Set Value	Used to set the vertical scale. Enter a value directly or use the spin buttons.	Input range: 100 to 1,000
	Vertical Scale Adjustment Bar	Used to adjust the vertical scale. Drag up and down using the mouse.	–
	Horizontal Scale Set Value	Used to set the horizontal scale. Enter a value directly or use the spin buttons.	Input range: 10 to 1,000
	Horizontal Scale Adjustment Bar	Used to adjust the horizontal scale. Drag up and down using the mouse.	–
	Offset Adjustment Variable	The variable name for the offset adjustment object is displayed.	–
	Vertical Offset Position Set Value	Used to set the vertical offset position. Enter a value directly or use the spin buttons.	Input range: -100.00 to 100.00
	Vertical Offset Adjustment Bar	Used to adjust the vertical offset position. Drag up and down using the mouse.	–

(cont'd)

Icon	Name	Contents	Remarks
	Horizontal Offset Position Set Value	Used to set the horizontal offset position. Enter a value directly or use the spin buttons.	Input range: When the object (sampling time) is selected at a Monitor Page or File Page: -99 to 99 When the object (variable value) is selected at an X-Y Display Page: -100.00 to 100.00
	Horizontal Offset Adjustment Bar	Used to adjust the horizontal offset position. Drag up and down using the mouse.	–
	Default	Used to return the scale or offset to their default values. Vertical scale: 100 Horizontal scale: 100 Vertical offset: 0.00 Horizontal offset: 0	The default value for the horizontal offset is 0.00 when an object is selected at an X-Y Display Page.
	Close	Used to close the Scale Offset Adjust Window.	–

(6) Trend Graphs

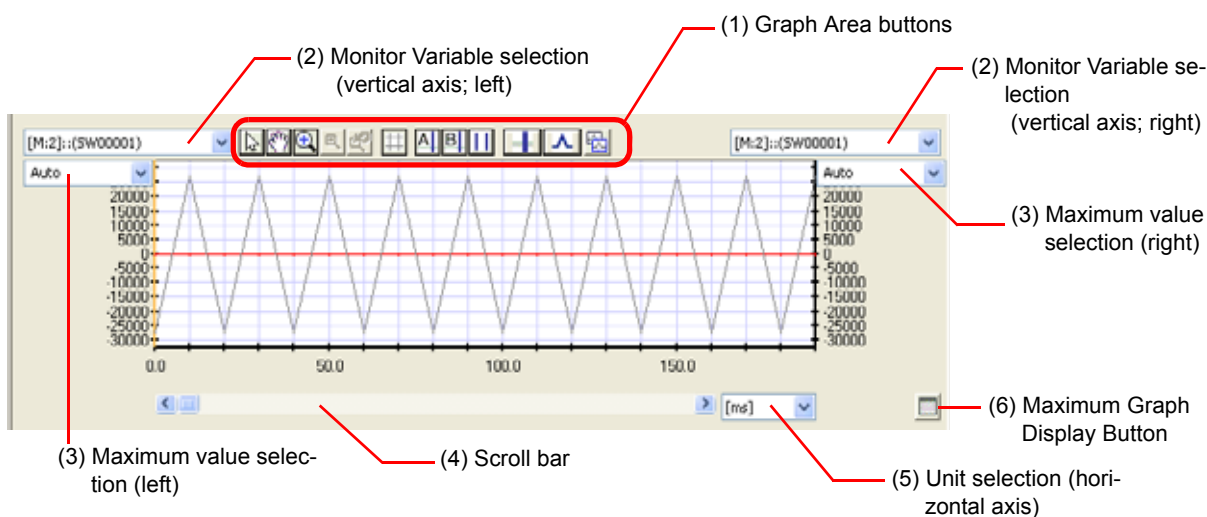
When the Trend Graph Button () in the operation panel is clicked, the Graph Area will change to the Trend Graph Mode.

In Trend Graph Mode, Monitor Variables (register values) that have been set are displayed in graph format in a time sequence.

Operations such as pointer settings, cursor settings, scale adjustments, and graph copying can be performed in this mode. Operations in Trend Graph Mode are described in detail below.

[a] Operations in Trend Graph Mode

The configuration elements of the graph in Trend Graph Mode are described below.



(1) Graph Area Buttons

The Graph Area buttons are used in both the Trend Graph Mode and the X-Y Graph Mode. They can be used for operations such as setting or changing pointers and cursors or switching the graph display.

- For details on the Graph Area buttons, refer to 13.3.6 (1) *Functions of Buttons in Graph Area*.

(2) Monitor Variable Selection (Left, Right)

Variable names and maximum values (units) can be set separately for the left and right vertical axes in a trend graph.

Clicking the drop-down arrow will display in a list all of the variables for which the display is set to ON in the List Area. Select the variables to be set for the left and right vertical axes.

(3) Maximum Value Selection (Left, Right)

The Maximum Value Selection is used to set the maximum values for the left and right vertical axes (Monitor Variables). The values can be directly entered by double-clicking the cells. When **Auto** is selected, maximum values are adjusted so that all of the trace data that is obtained will be displayed in the Graph Area.

(4) Scroll Bar

The section to be monitored can be moved by either dragging the slide bar or clicking the right or left arrows.

(5) Unit Selection

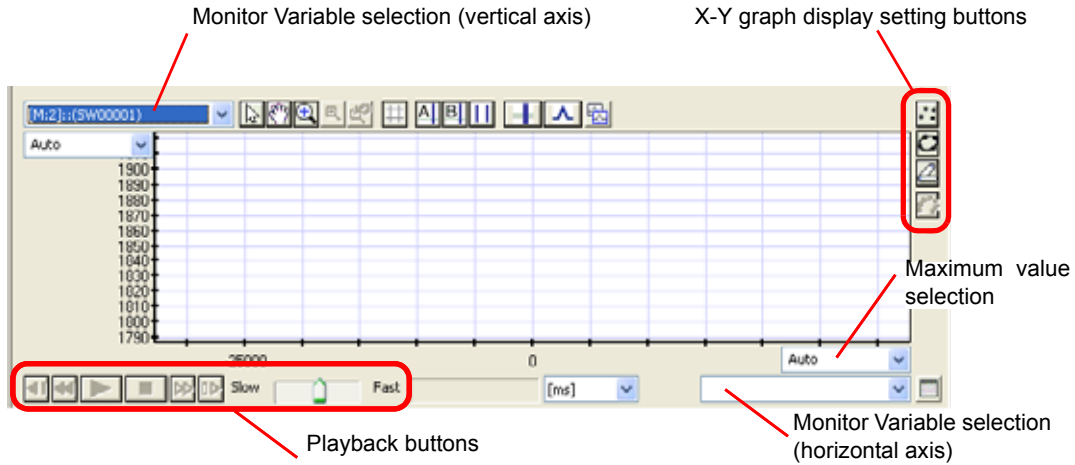
The display unit for the horizontal axis (time axis) can be set to data, ms, sec, or min.

(6) Maximum Display Button () and Normal Display Button ()

When the **Maximum Display** Button is clicked, the List Area is hidden, the Graph Area is maximized, and the **Normal Display** Button is displayed. When the **Normal Display** Button is clicked, the Graph Area is returned to its original size and the List Area is displayed.

(7) X-Y Graphs

An X-Y graph takes two specified Monitor Variables (variable X and variable Y) in the horizontal and vertical axes, and shows their relationship over a given time.



Variable names and maximum values can be set for the horizontal and vertical axes of X-Y graphs in the same way as for the vertical axes of trend graphs. While an X-Y graph is displayed, display settings and playback operations are enabled in addition to all of the operations for a trend graph.

[a] X-Y Graph Display Setting Buttons







The display settings for an X-Y graph can be changed.

Icon	Name	Contents
	Point Display	Used to display coordinates as points.
	Line Display	Used to display coordinates connected by lines.
	Model Display	Used to display coordinates connected by lines according to connected-point data. <ul style="list-style-type: none"> For details on connected points, refer to <i>Connection Point</i> in 13.3.7 (6) <i>Changing Pages</i>.
	Tracks	Used to select whether or not to leave tracks. <ul style="list-style-type: none"> Active for point display only.

[b] Playback Operations

The playback function reproduces displays of data captured before tracing is stopped, or data captured for snapshots. Operations such as playback, stop, forward, return, slow-motion forward, and slow-motion return can be performed. Playback can be executed when an X-Y graph is displayed. There is no time information included in an X-Y graph, so this function is provided to display changes in data with the elapsed time.

The following table shows the playback-related buttons.

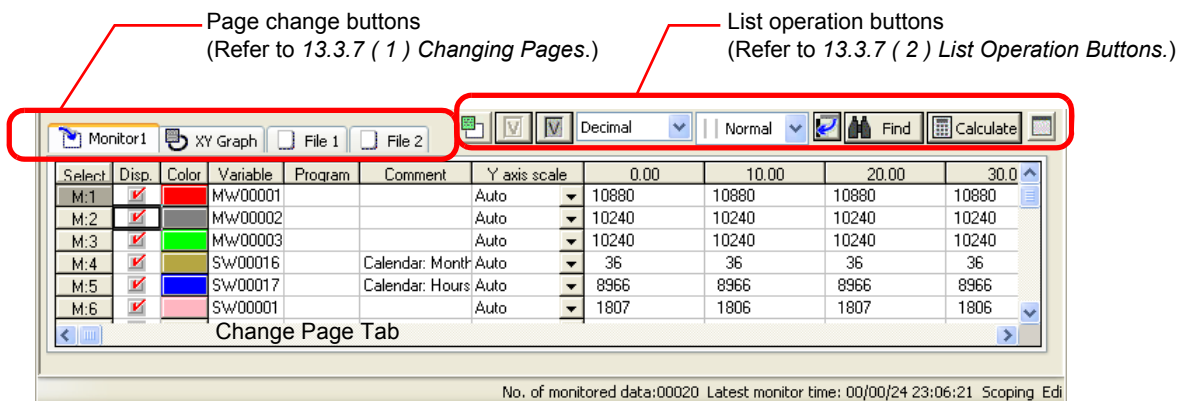
Icon	Name	Contents
	Playback	Replays an X-Y graph from the beginning of the traced data.
	Stop	The replaying of an X-Y graph is stopped at the point where this button is clicked.
	Fast Forward/Return	Executes fast forward or return at the specified rate. When these buttons are cleared, playback is automatically resumed. • Can be used only during playback.
	Slow-motion Forward/ Slow-motion Return	Executes slow-motion forward or return.
–	Return to Beginning	Select <i>XY Graph - Return to Beginning</i> from the Main Menu. The beginning of the traced data will be returned to.
–	Forward to End	Select <i>XY Graph - Forward to End</i> from the Main Menu. The end of the traced data will be forward to.
	Rate Setting	Sets the forward and return rate.
	Execution Time	Displays the execution time for the playback display. The unit can be set to ms, sec, min, or data.

13.3.7 List Area Operations

The following operations can be executed in the List Area: monitor setting, variable selection, object variable setting, data display setting, cursor mode, list vertical/horizontal display switching, searching, calculations, and maximum list display. These operations can be executed in any mode, regardless of the list display mode (page).

- For details on assigning Monitor Variables, refer to 13.3.7 (8) *Assigning Monitor Variables*.

An example of List Area display and configuration is shown below.



(1) Changing Pages



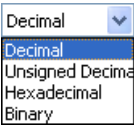
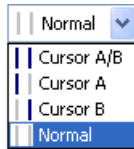

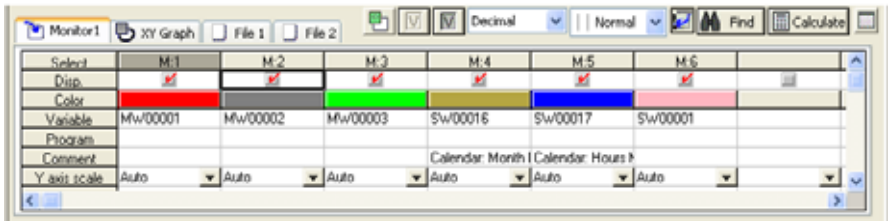

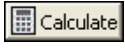


Click the **Change Page** Tab to change the page.

The following three types of pages are displayed in the List Area.

- Monitor Pages (Refer to 13.3.7 (5) *Monitor Pages*.)
- X-Y Display Pages (Refer to 13.3.7 (6) *X-Y Display Page*.)
- File Pages (Refer to 13.3.7 (7) *File Pages*.)

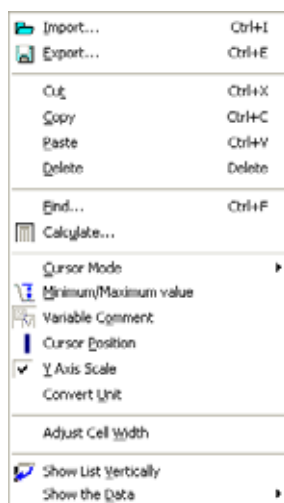
(2) List Operation Buttons

The following table provides details on the list operation buttons.

Icon	Name	Contents
	Monitor Setting	Displays the Select Monitor Setting Dialog Box so that the number of Data Trace Windows can be set. <ul style="list-style-type: none"> Refer to 13.3.7 (4) <i>Select Monitor Setting Dialog Box.</i>
	Object Variable Setting	Displays the Object Variable Setting Dialog Box so that the variables used by imported files can be registered as Monitor Page variables (monitor variables). <ul style="list-style-type: none"> Refer to 13.3.7 (9) <i>Object Variable Setting Dialog Box.</i>
	Data Display	Changes the data display type for variables selected from the list. Decimal, unsigned decimal, hexadecimal, or binary can be selected. <ul style="list-style-type: none"> The data display selection is invalid when no variables are selected.
	Cursor Mode	Selects <i>Cursor A/B</i> , <i>Cursor A</i> , <i>Cursor B</i> , and <i>Normal</i> for the cursors linked to data display positions. When <i>Cursor A</i> , <i>Cursor B</i> , or <i>Cursor A/B</i> is selected, the cursor position on the graph is linked with the data position displayed on the Monitor Page and File Page of the List Area. <ul style="list-style-type: none"> When cursor A (or cursor B) is not displayed, <i>Cursor A (B)</i> cannot be selected. When <i>Cursor A/B with Same Interval</i> is not set in the Graph Area, <i>Cursor A/B</i> cannot be selected. The status will not change if disabled selections are selected.
	List Display Direction	Toggles the list display direction between vertical and horizontal. <ul style="list-style-type: none"> When OFF, all variable data is displayed in the horizontal direction. When ON, all variable data is displayed in the vertical direction.
		 <p style="text-align: center;">Vertical List Display Example</p>
	Find	When this button is clicked with a Monitor Variable in the list selected, the Find Dialog Box is displayed and the graph maximum value, minimum value, local maximum value, local minimum value, and time axis can be found. <ul style="list-style-type: none"> Refer to 13.3.7 (10) <i>Find Dialog Box.</i>
	Calculate	When this button is clicked with a Monitor Variable in the list selected, the Calculate Dialog Box is displayed and the area, average, and absolute average calculation results can be referenced for the selected variable. <ul style="list-style-type: none"> Refer to 13.3.7 (11) <i>Calculate Dialog Box.</i>
	Maximum List Display	Hides the graph and maximizes the list display. <ul style="list-style-type: none"> This icon is active only during normal list display.
	Normal List Display	Clears the maximum list display and returns you to the normal display (graph and list). <ul style="list-style-type: none"> This icon is active only during maximum list display.

(3) Pop-up Menu


The following pop-up menu is displayed by right-clicking in the List Area.



The following table list the operations in the above pop-up menu that cannot be executed using the list buttons.

Icon	Menu Item	Content
	Maximum/Minimum value (M)	Toggles between displaying and hiding the maximum and minimum values in the List Area. <ul style="list-style-type: none"> This operation is the same as selecting Display - Maximum/Minimum Value from the Main Menu. For details, refer to 13.3.7 (5) Monitor Pages.
	Variable Comment (O)	Toggles between displaying and hiding variable comments in the List Area.
	Cursor Position (P)	Toggles between displaying and hiding <i>Cursor A</i> , <i>Cursor B</i> , and <i>Difference A-B</i> in the List Area. <ul style="list-style-type: none"> This operation is the same as selecting Display - Cursor Position from the Main Menu. For details, refer to 13.3.7 (5) Monitor Pages.
–	Convert Unit (U)	Toggles between displaying and hiding <i>Convert Unit</i> in the List Area. <ul style="list-style-type: none"> This operation is the same as selecting Display - Convert Unit from the Main Menu. For details, refer to <i>Convert Unit (xN)</i> 13.3.7 (5) Monitor Pages.
–	Adjust Cell Width (W)	Adjusts the width of cells in the List Area to the width of the cell where the cursor is located.

(4) Select Monitor Setting Dialog Box

The **Select Monitor Setting** Dialog Box is displayed by clicking the **Monitor Setting** Button (). The **Data Trace** Window displayed in the **main window** can be selected from *Monitor 1* to *Monitor 4*.

The default setting is for only *Monitor 1* to be displayed. For example, selecting *Monitor 3* and clicking the **OK** Button will cause *Monitor 1* and *Monitor 3* to be displayed in the **main window**.

A maximum of 16 Monitor Variables can be assigned on a single **Data Trace** Window (**Monitor** Window). The number of objects monitored can be expanded by setting multiple Monitor screens, and the objects can be easily displayed by switching among the Monitor screens.



(5) Monitor Pages

Monitor Variables can be displayed, assigned, deleted, and edited at a Monitor Page.

- For details on assigning and editing Monitor Variables, refer to 13.3.7 (8) *Assigning Monitor Variables*.

The following table describes the items in a Monitor Page display, using the illustration below as an example.

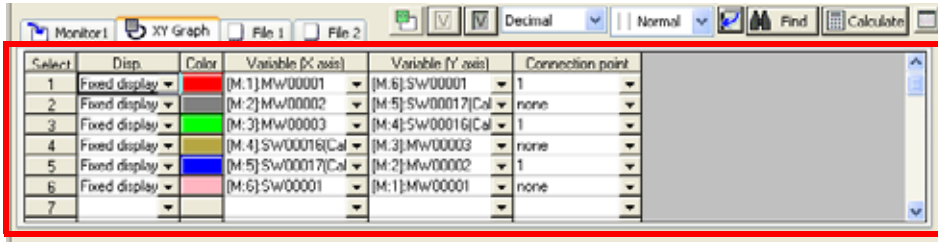
Select	Disp	Color	Variable	Program	Comment	Y axis scale	Maximum value	Minimum value	Cursor A	Cursor B	Difference
M.2	<input checked="" type="checkbox"/>		MW00002			Auto	10240	10240			
M.3	<input checked="" type="checkbox"/>		MW00003			Auto	10240	10240			
M.4	<input checked="" type="checkbox"/>		SW00016		Calendar: Month: Auto		36	36			
M.5	<input checked="" type="checkbox"/>		SW00017		Calendar: Hours: Auto		8999	8999			
M.6	<input checked="" type="checkbox"/>		SW00001			Auto	1801	1800			
M.7	<input checked="" type="checkbox"/>		SW00020		System Program: Auto						

Item	Contents
Select	Selects the Monitor Variable that is to be edited. It is possible to view different data displays, search, calculate, perform offset adjustments, and change the cursor to a cross. The following items are displayed. M:y: Number y of monitor Fx:y: Number y of file "x" SUB: Difference between two variables ADD: Sum of two variables REF: Reference variable
Display	Toggles between displaying (<input checked="" type="checkbox"/>) and hiding (<input type="checkbox"/>) a graph for a given variable.
Color	Selects the color for a graph. The Select Color Dialog Box is displayed by double-clicking a cell. The color can then be selected and set.
Variable	Used to enter the variable name or register for the trace object. <ul style="list-style-type: none"> • Variables can be entered by dragging and dropping from the Variable Subwindow. • A maximum of 16 registers or variables can be entered.
Program	For a D register, enter the name of the program in which the D register is used.
Comment	Comments are displayed (display only).
Y axis scale	Selects one of the following as the Y-axis scale: <i>Auto</i> , <i>Y1 Axis</i> , or <i>Y2 Axis</i> . When <i>Auto</i> is set, the scale is automatically adjusted and displayed for each Monitor Variable. When <i>Y1 Axis</i> is selected, the scale data is displayed at the left side of the graph; and when <i>Y2 Axis</i> is selected, the scale data is displayed at the right side of the graph.
Maximum value (See note.)	Displayed by selecting List - Maximum/Minimum Value from the Main Menu. Maximum values for trace data are displayed (display only).
Minimum value (See note.)	Displayed by selecting List - Maximum/Minimum Value from the Main Menu. Minimum values for trace data are displayed (display only).
Cursor A (See note.)	Displayed by selecting List - Cursor Position from the Main Menu. Values for cursor A are displayed (display only).
Cursor B (See note.)	Displayed by selecting List - Cursor Position from the Main Menu. Values for cursor B are displayed (display only).
Difference (A-B) (See note.)	Displayed by selecting List - Cursor Position from the Main Menu. The difference between the values for cursors A and B is displayed (display only).
Convert Unit (xN) (See note.)	Displayed by selecting List - Convert Unit from the Main Menu. Sets values with a multiplication factor for unit conversion. Variable values: The product of the two values is displayed. Set for operations such as replacing machine coordinate systems.

Note: The *Maximum values* and *Minimum values*, *Cursors A and B*, *Difference (A-B)*, and *Unit Conversion (xN)* are not displayed by default. If they do not appear in the List Area when they are displayed from the Main Menu, then display them by reducing the cell widths.

(6) X-Y Display Page

In the X-Y Display Page, the Monitor Variables used for displaying an X-Y graph as the graph can be assigned, deleted, edited, and displayed. The List Area appears as shown below when the X-Y Display Page is displayed.



The following table shows the items in the X-Y Display Page.

Item	Contents
Select	Selects the object to be activated. Once the object is activated, then the object can be adjusted and the cross cursor can be displayed.
Display	Selects one of the following as the method for display the graph: <i>hidden</i> , <i>fixed display</i> , or <i>playback</i> . <i>Hidden</i> : Data is not displayed on a graph. <i>Fixed display</i> : Data is displayed on a graph when tracing is executed. <i>Playback</i> : data is displayed on a graph when playback is executed.
Color	Selects the color for a graph. The Select Color Dialog Box is displayed by double-clicking a cell. The color can then be selected and set.
Variable (X Axis)	Specifies the name of a variable to be traced on the X axis (the horizontal axis). The variable name can be selected from the variables set on the Monitor Page.
Variable (Y Axis)	Specifies the name of a variable to be traced on the Y axis (the vertical axis). The variable name can be selected from the variables set on the Monitor Page.
Connection Point	Sets the number in the model display to which to connect. Either <i>Nothing</i> or the <i>Select</i> number set for the X-Y page can be selected.
Cursor A (See note.)	Displayed by selecting List - Cursor Position from the Main Menu. Values for cursor A are displayed (display only).
Cursor B (See note.)	Displayed by selecting List - Cursor Position from the Main Menu. Values for cursor B are displayed (display only).
Difference (A-B) (See note.)	Displayed by selecting List - Cursor Position from the Main Menu. The difference between the values for cursors A and B is displayed (display only).

Note: The *Cursor A*, *Cursor B*, and *Difference (A-B)* are not displayed by default. If they do not appear in the List Area, then display them by reducing the cell widths.

(7) File Pages

Monitor Variable data imported from specified files (CSV files) can be displayed in File Pages. Use the following procedure to import the data.

1. Click the **File** Tab in the List Area to display a File Page.
2. Select **File - Import** from the Main Menu.
The **Open File** Dialog Box will be displayed.
3. Select the file (.csv) from which to import data, and click the **Open** Button.
The data in the selected file will be displayed.

The items displayed on a File Page are the same as those on a Monitor Page. Variables, programs, and comments depend on data imported from files, so they cannot be edited.

The default setting for the number of File Pages displayed is two, but the number can be set for a maximum of eight.

- Variables displayed on a File Page can be assigned as Monitor Variables, to be monitored on a Monitor Page. For details, refer to *13.3.7 List Area Operations*.
- For details on setting the number of File Pages displayed, refer to *13.2.8 (3) [d] Setting the List Tab Page*.

(8) Assigning Monitor Variables

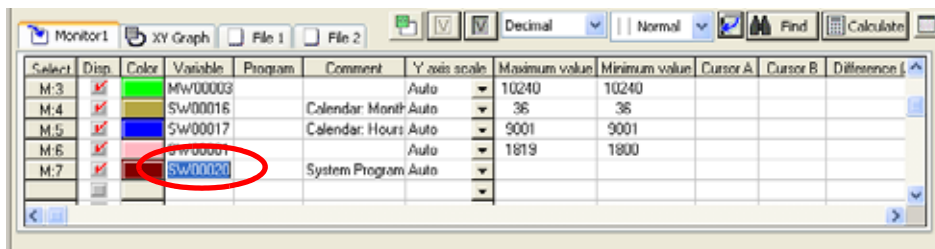
The data trace function can be used by assigning the variables that are to be monitored (i.e., the Monitor Variables) in the List Area. A maximum of 16 Monitor Variables can be assigned.

- Up to 64 (16 x 4) Monitor Variables can be assigned by changing the monitor setting. Only 16 Monitor Variables, however, can be displayed at one time. Refer to 13.3.7 (4) *Select Monitor Setting Dialog Box*.

The following methods can be used to assign Monitor Variables from the **Data Trace Window**.

■ Entering the Variable Name (Register) to the *Variable* Cell in a Monitor Page

Double-click the cell to enter the input mode. The variable name (register) can either be directly entered or it can be entered by dragging and dropping from the Variable Subwindow.



■ Assigning Variables from the Ladder Program Edit Window

Right-click a variable object in the **Ladder Program Edit** Window and select *Add to Scope* from the pop-up menu. The variable will be assigned as a trace data variable.

■ Deleting Variables from the List (1)

In a Monitor Page or X-Y Display Page, right-click the variable to be deleted and select *Delete* from the pop-up menu. Alternatively, select *Edit - Delete* from the Main Menu.

The selected variable will be deleted from the list, and that row will be left empty.


■ Deleting Variables from the List (2)

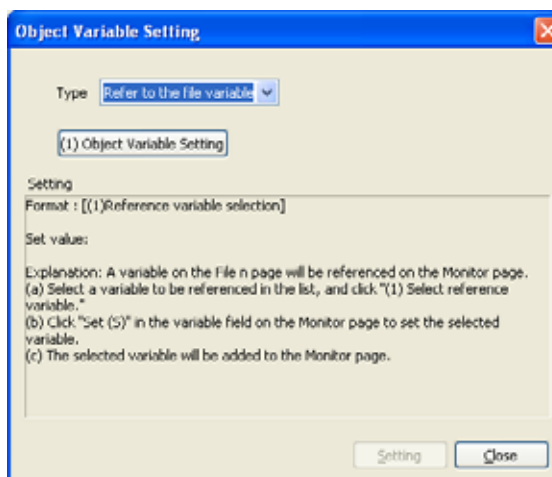
In the Monitor Page, select the variable to be deleted, and then select *Edit - Delete Record* from the Main Menu. The selected variable row will be deleted.

■ Inserting an Empty Row

In the Monitor Page, select the variable above which the row is to be inserted, and then select *Edit - Insert Record* from the Main Menu. The empty row will be inserted above the selected variable.

(9) Object Variable Setting Dialog Box

The **Object Variable Setting** Dialog Box shown below is displayed by clicking the **Object Variable Setting** Button (). With this dialog box, variables displayed on a File Page can be assigned to a Monitor Page as Monitor Variables.



Use the following procedure to set a reference variable.

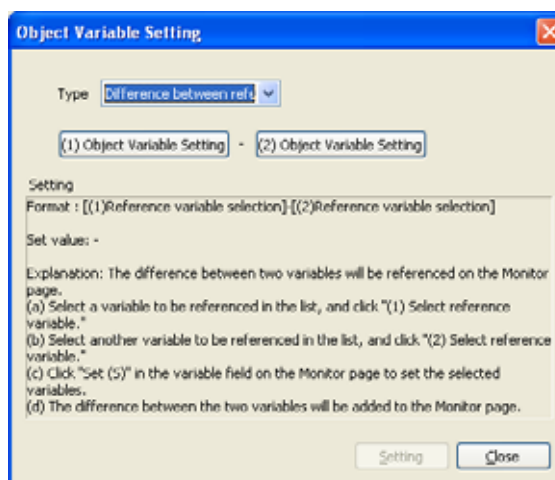
1. With the above dialog box displayed, select the variable to be referenced from the list and click the **(1) Object Variable Setting** Button.

The selected variable name will be displayed in the *Set value* area.


2. Select the variable field on the Monitor Page that is to be set from the list, and click the **Setting** Button in the **Object Variable Setting** Dialog Box.

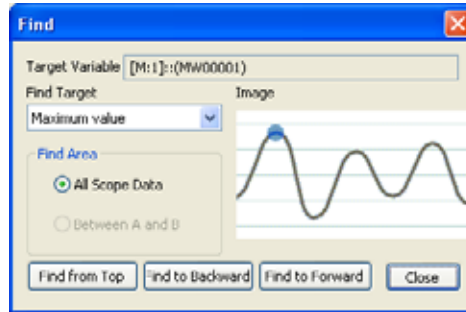
The selected reference variable will be added to the selected variable field.

Not only file variable, but reference variable difference or sum can be selected as the reference variable type. When *Difference between reference variables* is selected as the type, the **Object Variable Setting** Dialog Box will appear as shown below. It will be similar when *Sum of reference variables* is selected.


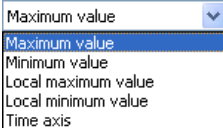
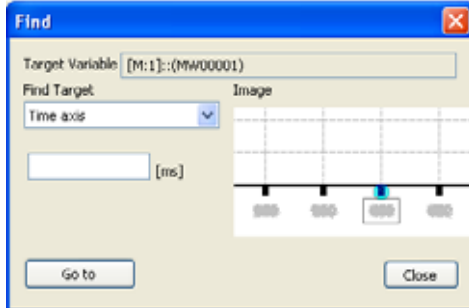
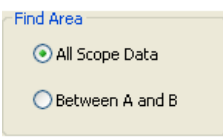
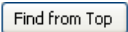
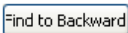
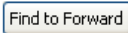





(10) Find Dialog Box


With a Monitor Variable selected in the list, click the **Find** Button (). The **Find** Dialog Box will be displayed, and the maximum value, minimum value, local maximum value, local minimum value, and time axis can be found for the selected variable.

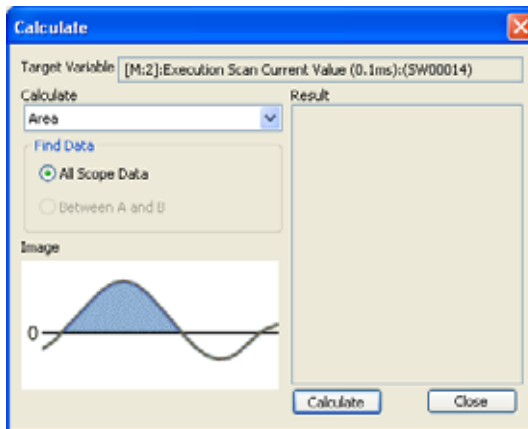


The following operations can be executed in the **Find** Dialog Box.


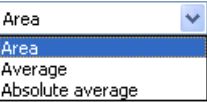



Icon	Name	Contents
	Target Variable	Displays the variable name that is to be found.
	Find Target	<p>Selects one of the following as the find object: <i>Maximum value</i>, <i>Minimum value</i>, <i>Local maximum value</i>, <i>Local minimum value</i>, and <i>Time axis</i>. When <i>time axis</i> is selected, the dialog box will appear as shown below.</p>  <p>Display Example: When <i>Time Axis</i> is Selected</p>
	Find Area	<p>Selects either <i>All Scope Data</i> or <i>Between A and B</i> as the find area.</p> <ul style="list-style-type: none"> <i>Between A and B</i> cannot be selected when cursors A and B are hidden.
	Find from Top	Searches from the top of the find area.
	Find to Backward	Searches backward from the present position.
	Find to Forward	Searches forward from the present position.
	Close	Closes the Find Dialog Box.
	Time Setting	<p>Sets the search time in units of ms.</p> <ul style="list-style-type: none"> Displayed only when <i>time axis</i> is set as the find target.
	Go To	<p>Jumps to the data for the set time (proximity).</p> <ul style="list-style-type: none"> Displayed only when <i>time axis</i> is set as the find target.

(11) Calculate Dialog Box

With a Monitor Variable selected in the list, click the **Calculate** Button (). The **Calculate** Dialog Box will be displayed, and the area, average, and absolute average calculation results for the selected variable can be referenced.



The following operations can be executed in the **Calculate** Dialog Box.

Icon	Name	Contents
	Target Variable	Displays the variable name for which a calculation is to be performed.
	Calculation Type	Selects one of the following as the calculation type: <i>Area</i> , <i>Average</i> , or <i>Absolute average</i> .
	Find Area	Selects either <i>All Scope Data</i> or <i>Between A and B</i> as the find area. <ul style="list-style-type: none"> • <i>Between A and B</i> cannot be selected when cursors A and B are hidden.
	Calculate	Executes the calculation. The result is displayed in the <i>Result</i> area.
	Close	Closes the Calculate Dialog Box.

13.3.8 Other Functions

This section describes other functions, including saving and deleting trace definition data, setting defaults, printing, and making optional settings.

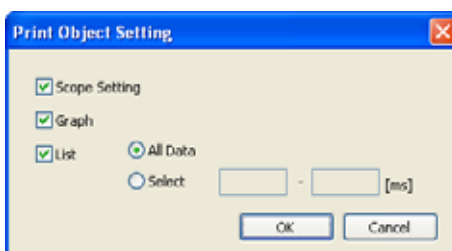
(1) Saving and Deleting Trace Definition Data and Setting Defaults

Operations such as saving and deleting Trace Definitions can be executed from the File Menu.

Item	Operation	Contents	Remarks
Default Setting	File (E) → Set to Default (E)	Returns the Trace Definitions to the default status.	All Monitor Variables that have been assigned will be deleted.
Save Settings	File (E) → Save Settings (S)	Saves the Trace Definitions.	–
Delete Settings	File (E) → Delete Settings (D)	Deletes the Trace Definitions.	–

(2) Print Settings

Data Trace Definitions, graphs, and lists can be printed using the following procedure. Select **File - Print Object Setting** from the Main Menu. The **Print Object Setting** Dialog Box will be displayed. Check the items to be printed, and click the **OK** Button.



- Items which are set in the **Print** Tab Page of the **Option** Dialog Box to not be printed become inactive in the display. For details, refer to 13.2.7 (3) [e] *Setting the Print Tab Page*.

Select **File - Print** from the Main Menu to execute printing according to the settings in the **Print Object Setting** Dialog Box.

(3) Optional Settings

Optional settings can be made related to displays and printing.

Select **Display - Option** from the Main Menu. The **Option** Dialog Box will be displayed. Optional settings can be made by selecting the **Set**, **Graph**, **XY graph**, **List**, or **Print** Tab Page.

Reset Button

The set values will return to their status when the dialog box was opened.

Set as Default Button

The following message will be displayed: “The present option data will be set as the default. Yes or No?” Click the **OK** Button. The present data will be set as the default.

Apply Button

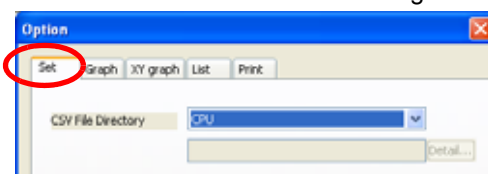
The option data will be overwritten, and the set value will be immediately reflected.

[a] Setting the Set Tab Page

This tab page is used to set the default directory for when trace data is imported or exported.

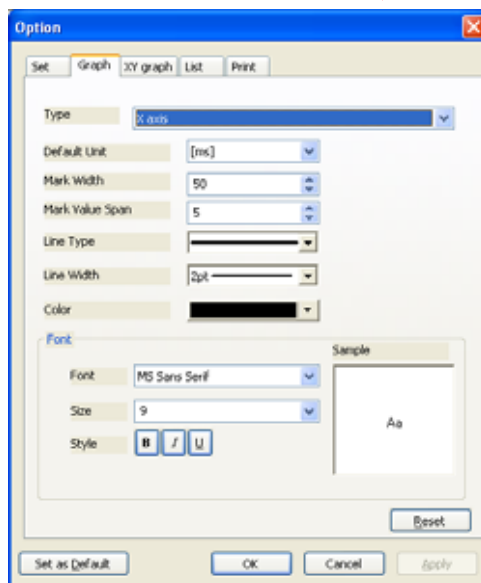
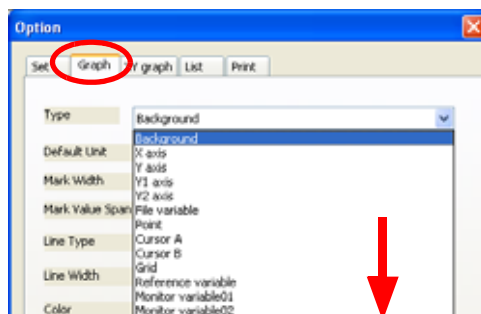
CPU: The directory installed by MPE720 version 6 is set.

User settings: Click the **Detail** Button and make the settings in the **Folder Reference** Dialog Box.



[b] Setting the Graph Tab Page

The general graph settings can be made on this tab page. Select the elements to be set from the *Type* list, and then set the items.

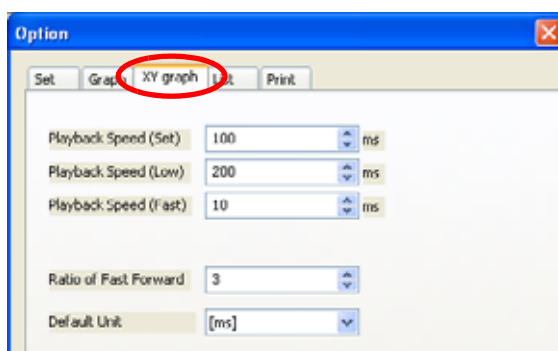


Item	Setting	Type							
		Back-ground color	X axis	Y axis, Y1 axis, Y2 axis	File variable	Points	A and B cursors	Grid	Reference variables Monitor Variables (1 to 16)
Default Unit	Sets the default values for the X axis units (data, ms, sec, mm).		✓						
Mark Width	Sets the size of one X-axis mark in the default units. (When the default unit is ms, one mark will be 50 ms when the mark width is set to 50.)		✓						
Mark Value Span	Sets the span of values (step) displayed for marks.		✓	✓					
Line Type	Sets a solid line, wavy line, broken line, etc.		✓	✓	✓		✓	✓	✓
Line Width	Sets a line width from 1 pt. to 6 pt.		✓	✓	✓	✓	✓	✓	✓
Color	Displays the Select Color Dialog Box.	✓	✓	✓	✓	✓	✓	✓	✓
Font	Font		✓	✓					
	Size		✓	✓					
	Style	B : Bold <i>I</i> : Italic <u>U</u> : Underline ♦ Multiple selection possible. When OFF: Regular		✓	✓				
	Sample	Displays a sample of font, size, and style settings (display only)		✓	✓				

✓ : Can be set.

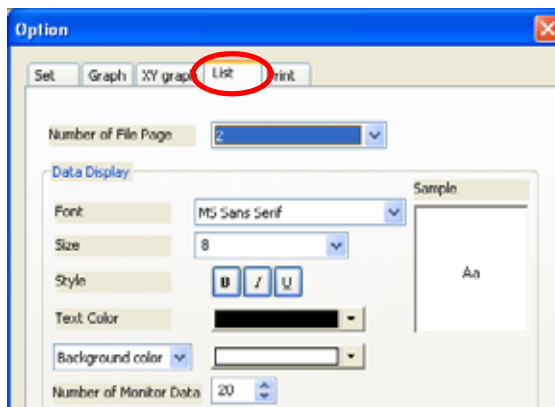
[c] Setting the X-Y Graph Tab Page

Settings related to X-Y graph playback can be made on this tab page.



[d] Setting the List Tab Page

Settings related to the List Area display can be made on this tab page.



Number of File Page: Select the default number of File Pages in the list, from 1 to 8.

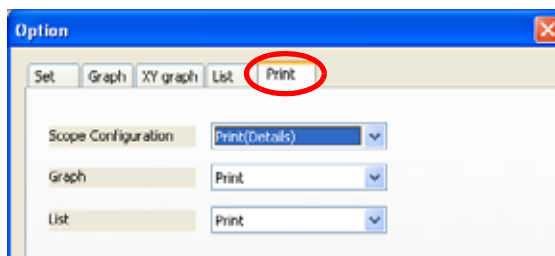
Number of Monitor Data: Set the number of data items to be displayed in the List Area while tracing is being executed.

- All data is displayed when stopped or when a snapshot is taken.

For details on other settings, refer to 13.2.7 (3) [b] *Setting the Graph Tab Page*.

[e] Setting the Print Tab Page

Settings related to print object settings (*File - Print Object Setting* from the Main Menu) can be made on this tab page.



Scope Configuration

Print (Simple): Used for trace data printing when *Scope Configuration* is selected as the print object.

Print (Detail): Used for trace data printing when *Scope Configuration* is selected as the print object.

Do Not Print: *Scope Configuration* cannot be selected as the print object.

Graph

Print: *Graph* can be selected as the print object.

Do Not Print: *Graph* cannot be selected as the print object.

List

Print: *List* can be selected as the print object.

Do Not Print: *List* cannot be selected as the print object.

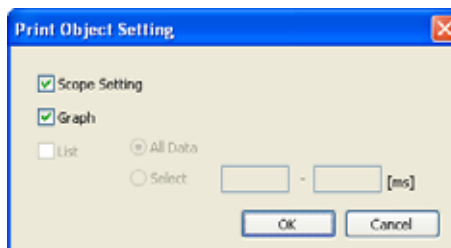


Fig. 13.2 Print Object Setting Dialog Box (When *List* Is Set to *Do Not Print*)

13.4 XY Tracing

13.4.1 Overview of XY Tracing

(1) What is XY Tracing?

XY tracing is a function to enable visual analysis of the locus of two axes by obtaining the position data (target positions, feedback positions) of the X- and Y-axis at every scan and plotting them on a two dimensional planar graph.

13.4.2 Starting XY Trace

The **XY Trace** Tab Page can be displayed in the main window by using any of the following methods.

1. Opening from the System Subwindow

Double-click **Scope1**, **Scope2**, **Scope3**, or **Scope4** and click the **XY Trace** Button in the **Trace Type** Window. Select **Scope1**, **Scope2**, **Scope3**, or **Scope4**, right-click the selected icon and select **Open in XY Trace** from the pop-up menu that will be displayed.

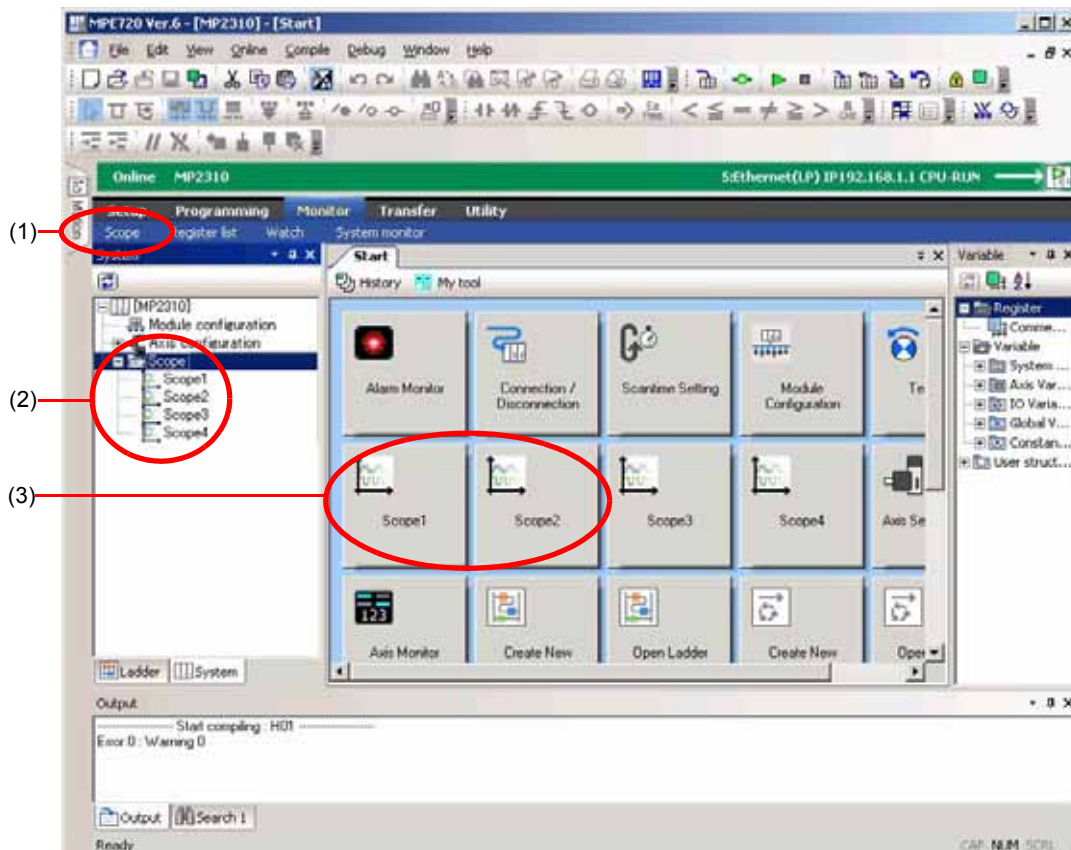
2. Opening from the My Tool Window

Click the **Scope1**, **Scope2**, **Scope3**, or **Scope4** Button registered in the **My Tool** Window and click the **XY Trace** Button in the **Trace Type** Window.

- By default, only the **Scope1** and **Scope2** Buttons are displayed. For the details on the display of the **My Tool** Window, refer to 1.6.2 *My Tool Window*.

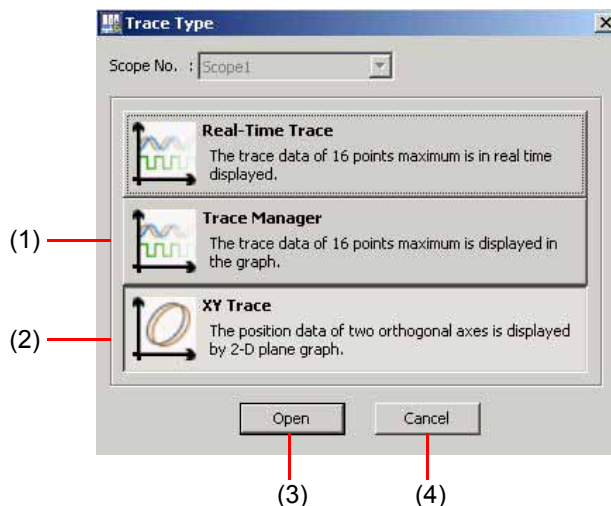
3. Opening from the Launcher

Select **Monitor - Trace** in the Launcher and click the **XY Trace** Button in the **Trace Type** Window.



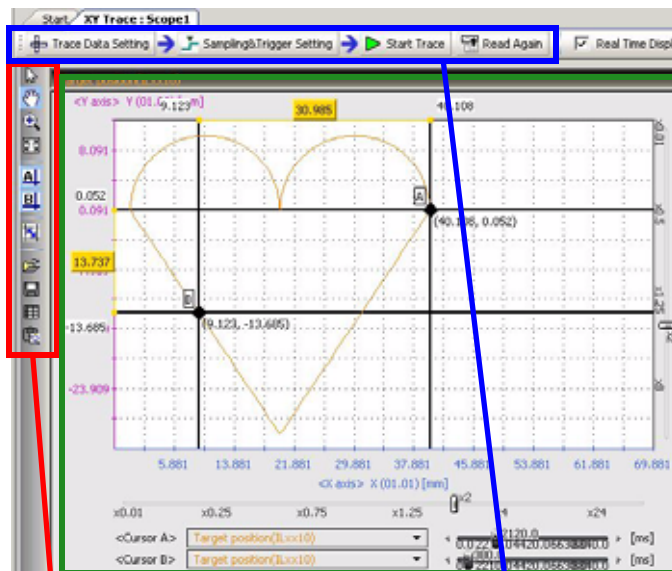
13.4.3 Names and Descriptions of Components of XY Tracing

(1) Trace Type Window



No.	Component	Description
(1)	Trace Manager	Plots up to 16 trace data points on a graph.
(2)	XY Trace	Plots the position data of two orthogonal axes on a two dimensional planar graph.
(3)	Open	Starts tracing of the selected trace type.
(4)	Cancel	Returns you to the main window without starting tracing of the selected trace type.

(2) Overall View

























Graph Toolbar
Contains the buttons to be used for the analysis of trace data.

Tracing Toolbar
Selects axes, sets conditions for obtaining trace data, and starts tracing, in this order.

XY Graph
Displays the trace data. Analysis can be performed on the XY Trace Tab Page using the graph toolbar, slider, and cursor.

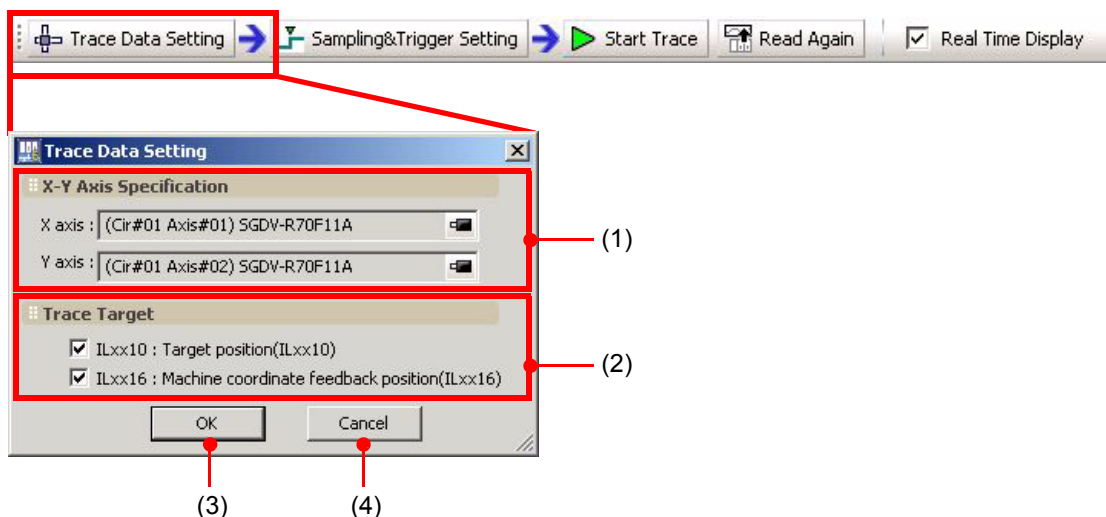
(3) Graph Toolbar

	Icon	Function
		Selection Icon: Enlarges the view on double-clicking at the desired position.
		Scroll Icon: Moves the display position. Double-clicking at the desired position enlarges the view.
		Enlarge Icon: Enlarges the view on selecting the desired position by dragging or double-clicking.
		Reset Icon: Returns the view to the original magnification.
		Cursor A: Displays cursor A and shows the X and Y values at the intersections of the graphs.
		Cursor B: Displays cursor B and shows the X and Y values at the intersections of the graphs.
		Coordinate Cursor A/B Icon: Displays the difference value between cursors A and B and coordinates the movement of cursors A and B, separated by a fixed distance.
		Open External Files Icon: Displays the Open Dialog Box to enable reading of trace data from a file.
		Save Icon: Displays the Save As Dialog Box.
		List View Icon: Displays the data in the list format.
		Copy Graph Icon: Copies the graph display image to the clipboard.

(4) Tracing Toolbar

[a] Trace Data Setting

The axes can be selected and tracing targets can be set here.



No.	Component	Description
(1)	X-Y Axis Specification	Select the X- and Y-axis.
(2)	Trace Target	Set tracing targets. The following two motion parameters are available. ILxx10: Target position (ILxx10) ILxx16: Machine coordinate feedback position (ILxx16)
(3)	OK	Sets the X-/Y-axis and tracing targets, and enables the Sampling & Trigger Setting Button.
(4)	Cancel	Returns you to the XY Trace Tab Page without setting the X-/Y-axis and tracing targets.

[b] Sampling & Trigger Setting

The trace name can be set and sampling and trigger settings can be made here.

For the details on Sampling & Trigger Setting, refer to 13.2.3 (4) [b] *Sampling & Trigger Setting*.

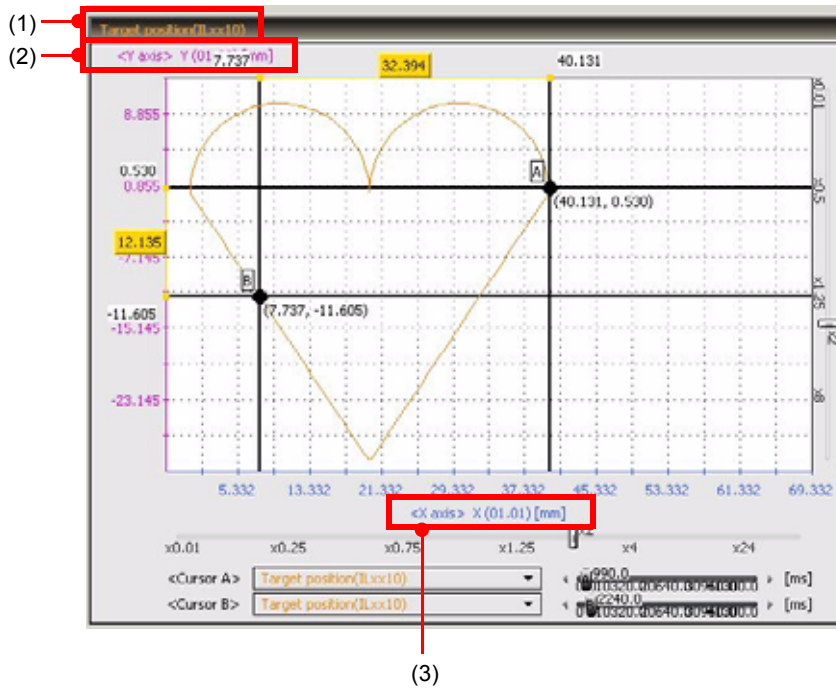
[c] Start/Stop Trace



Function	Description
Start Trace	Starts tracing. The trace data are obtained and displayed in real time.
Real Time Display	The movement of the axes during tracing is displayed in real time if this check box is checked. * The data transition is displayed only on one Trace Tab Page when multiple Trace Tab Pages are open.
Stop Trace	Stops tracing. All the buffer trace data are obtained and displayed on stopping.

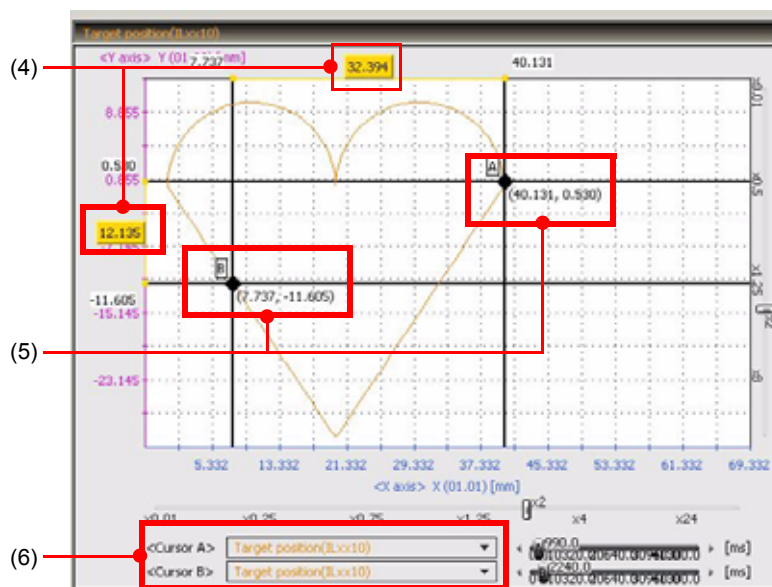
(5) XY Graph

[a] Graph



No.	Indication	Function
(1)	–	Displays the parameters selected for the tracing target.
(2)	–	Displays the X- and Y-axis.
(3)	–	Displays the scales of the X- and Y-axis.

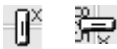

[b] Cursors



No.	Indication	Function
(4)		The X- and Y-axis coordinate values are displayed at the intersection of cursor A or cursor B and the graph.
(5)	—	Displays the difference value between cursors A and B.
(6)	<div style="border: 1px solid gray; padding: 2px; margin-bottom: 2px;"><Cursor A></div> <div style="border: 1px solid gray; padding: 2px;"><Cursor B></div>	Select the tracing targets using the Cursor Setting Drop-down List Boxes. ILxx10: Target position (ILxx10) ILxx16: Machine coordinate feedback position (ILxx16)

[c] Sliders



No.	Indication	Function
(7)		Reduces/enlarges the view on dragging the Scale Factor Sliders up/down or left/right. The scale factor can be changed in the range from 0.01 to 64 times.
(8)		Moves cursor A or B on dragging the Time Axis Sliders left/right. On clicking the button at the left or right, the slider moves at every scan.

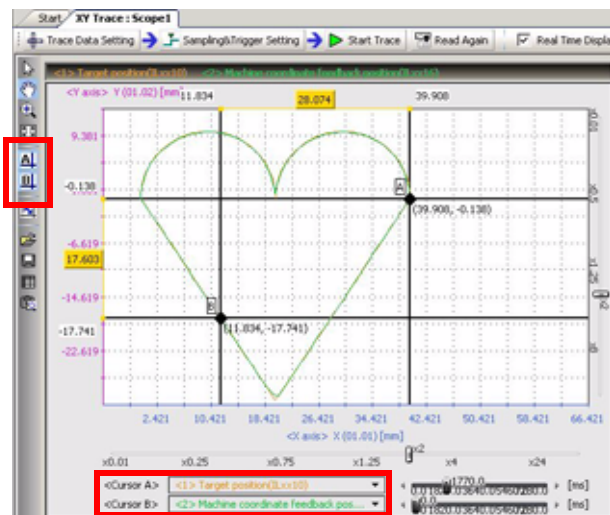
13.4.4 Analyzing X-/Y-Axis Data

It is possible to analyze the graph or replay the locus with the cursor A/B or enlarge/reduce functions.

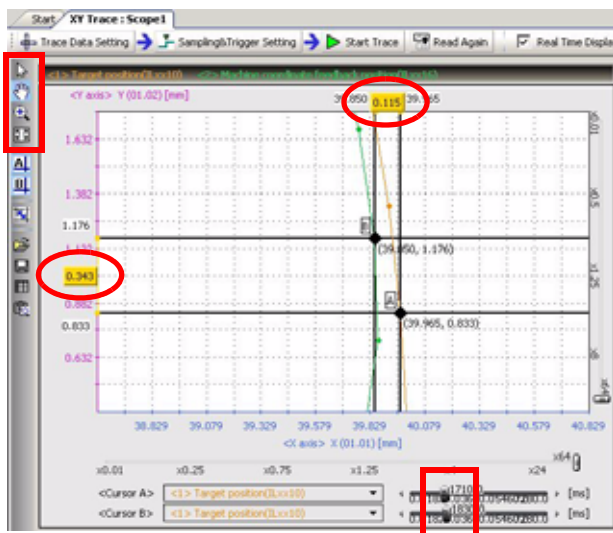
(1) Analyzing the Graph

[a] Analyzing the Difference (Delay) of the Feedback Positions Against the Target Positions

1. Click Cursor A and B Icons in the Graph Toolbar to display the cursors.
2. Select the target positions and feedback positions for cursors A and B using the Cursor Setting Drop-down List Boxes.



3. Set the Buffer Data Time Axis Sliders at the time to be analyzed.
4. Analyze the difference value between the target and feedback positions.
It is possible to enlarge/reduce the view of the desired position using the Graph Toolbar.

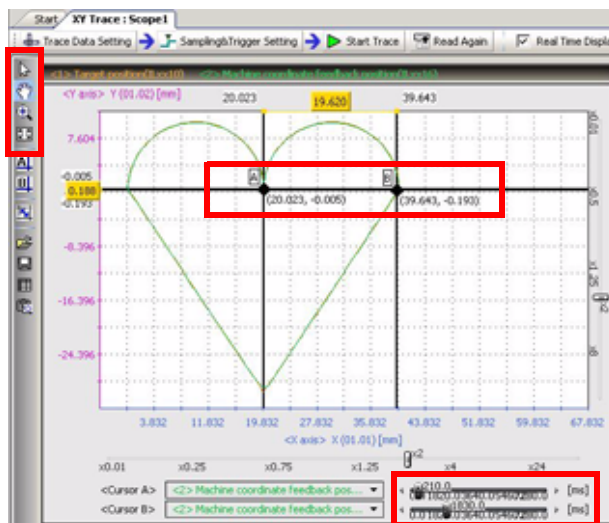


[b] Measuring Axis Movement Time

1. Click Cursor A and B Icons in the Graph Toolbar to display the cursors.
2. Set the same data for cursors A and B using the Cursor Setting Drop-down List Boxes.



3. Select two points to be measured.
4. Measure the time difference between the two points using the Time Axis Sliders. It is possible to enlarge/reduce the view of the desired position using the Graph Toolbar.



(2) Replaying the Locus of Axis Movement

1. Click Cursor A and B Icons in the Graph Toolbar to display the cursors.
2. Select cursors A and B using the Cursor Setting Drop-down List Boxes.
3. Analyze the locus of axis movement by moving the Time Axis Sliders.



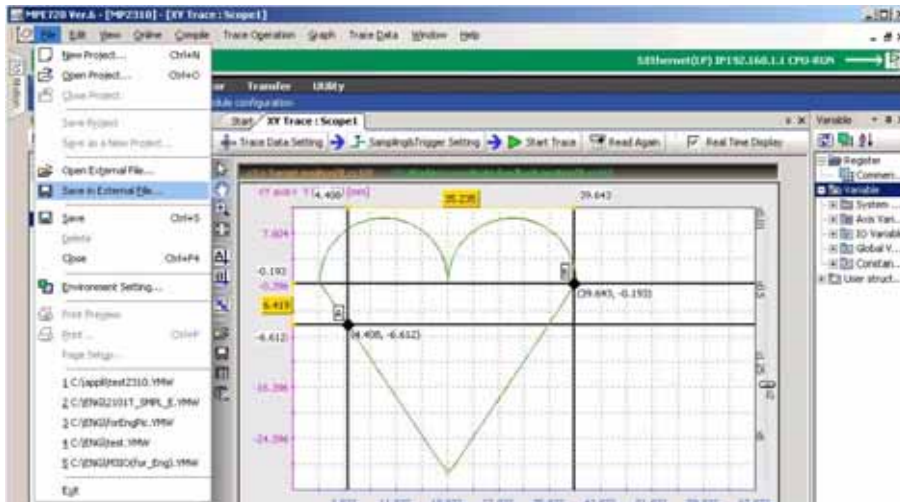
13.4.5 Saving Trace Data

Trace data can be saved to a CSV file.

Saving trace data to a CSV file enables analysis.

1. Saving from the Main Menu.

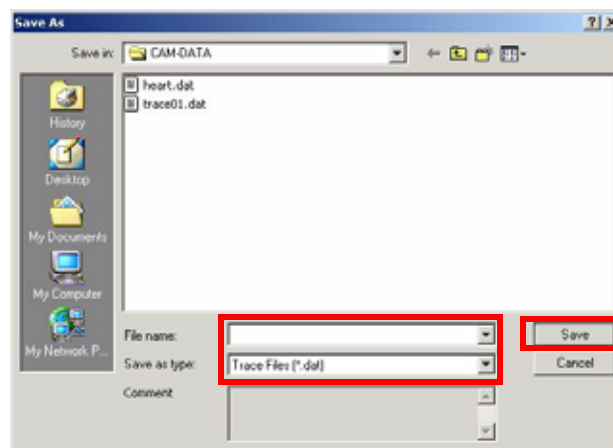
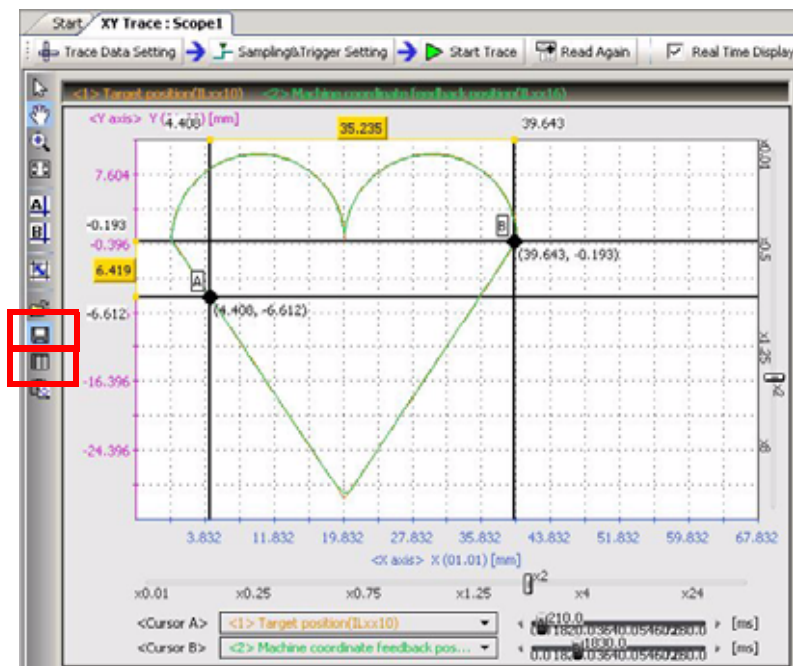
Select **File - Save in External File** from the Main Menu. Specify the name of the CSV file to save the trace data.



2. Saving from the toolbar

Click the **Save in External File** Icon. Specify the name of the CSV file to save the trace data.

- It is also possible to display the data in the list format and paste the list to an Excel file.



13.4.6 Copying the Graph

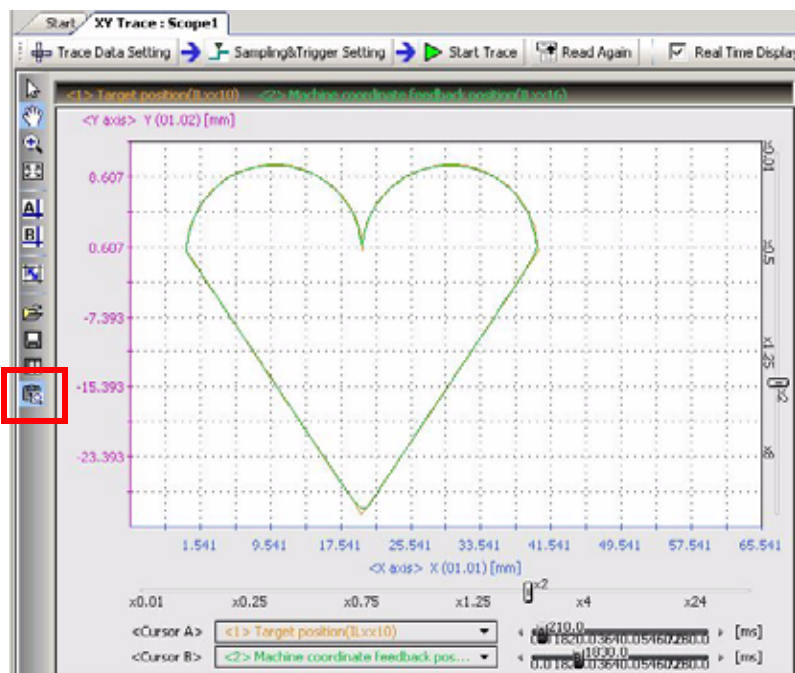
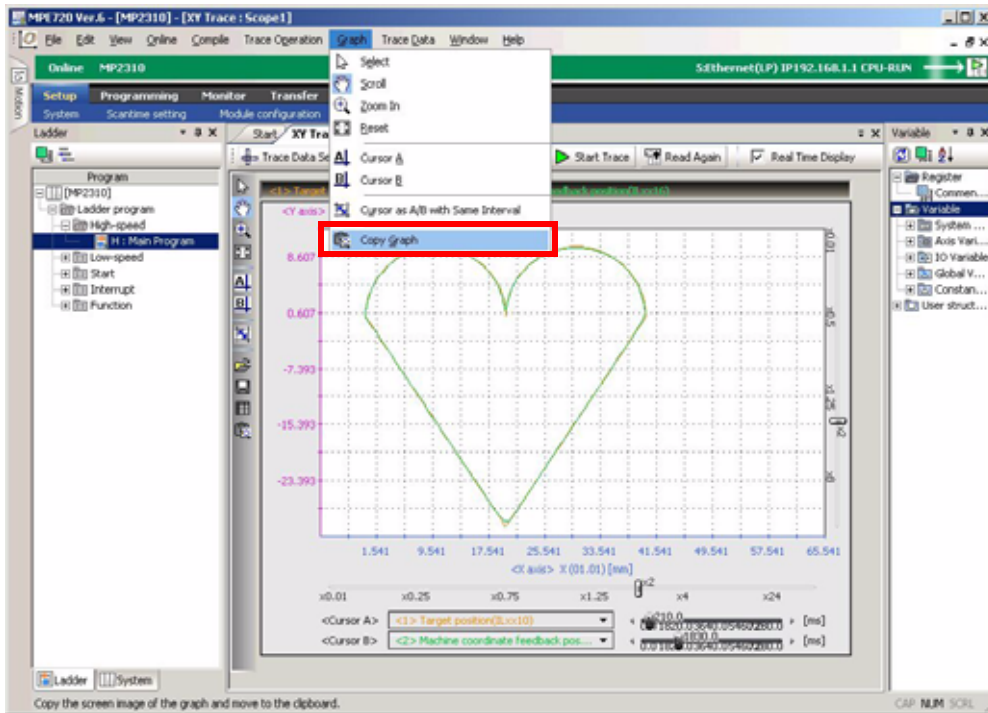
The image of the graph display can be copied to the clipboard.

1. Saving from the Main Menu.

Select **Graph - Copy Graph** from the Main Menu. The image of the graph display will be copied to the clipboard.

2. Saving from the toolbar

Click the **Copy Graph** Icon. The image of the graph display will be copied to the clipboard.



14

Tuning Panel

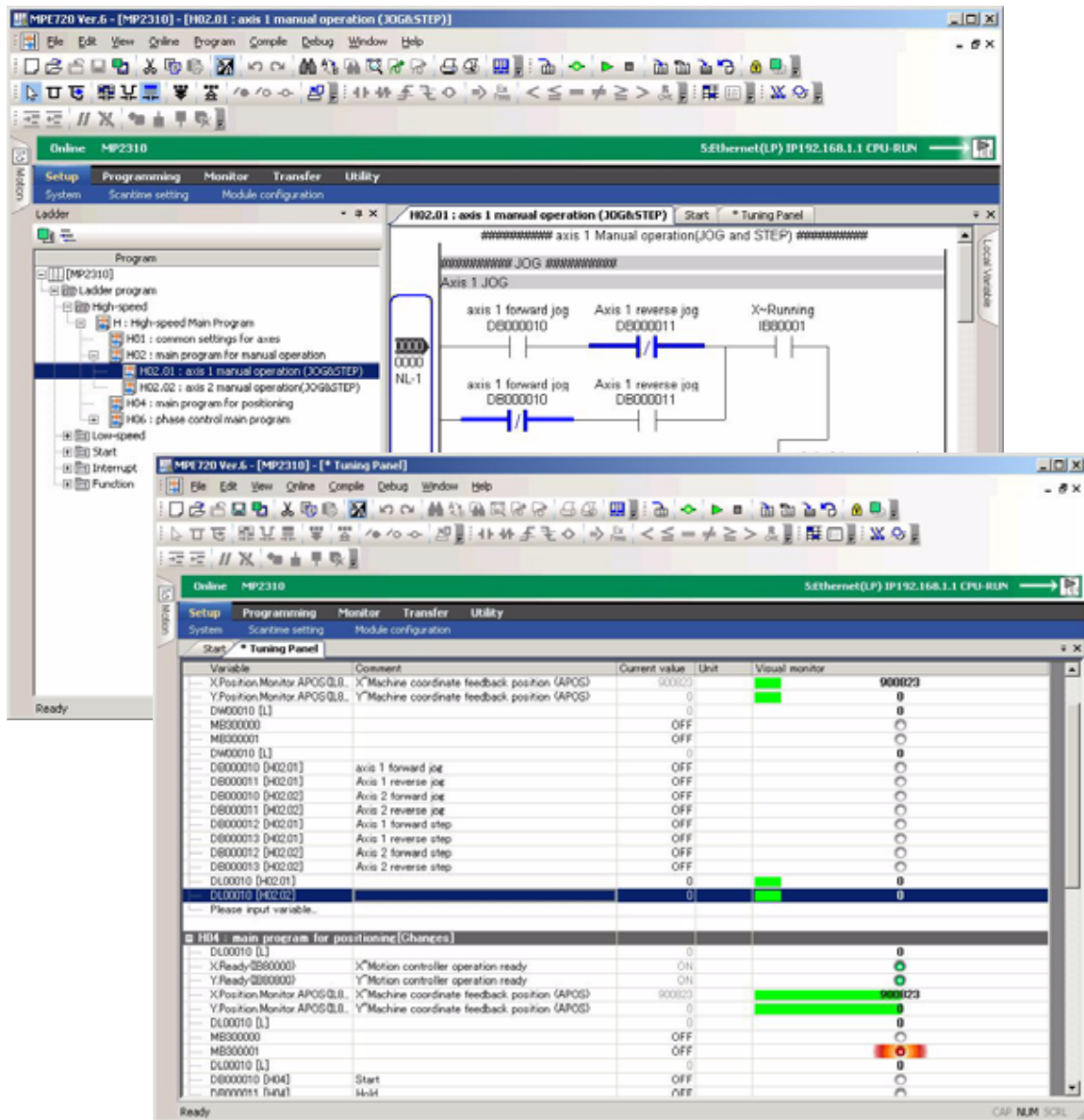
This chapter describes the overview and the functions of Tuning Panel.

14.1 Overview of the Tuning Panel	14-2
14.1.1 What is the Tuning Panel?	14-2
14.2 Starting the Tuning Panel	14-3
14.3 Names and Descriptions of Components of Tuning Panel	14-4
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14.1 Overview of the Tuning Panel

14.1.1 What is the Tuning Panel?

By registering the desired variables (registers) and displaying/editing the current value data, the created application programs can be operated or tested. The display of the current value data of the registered variables can be changed in accordance with the tuning status.



14.2 Starting the Tuning Panel

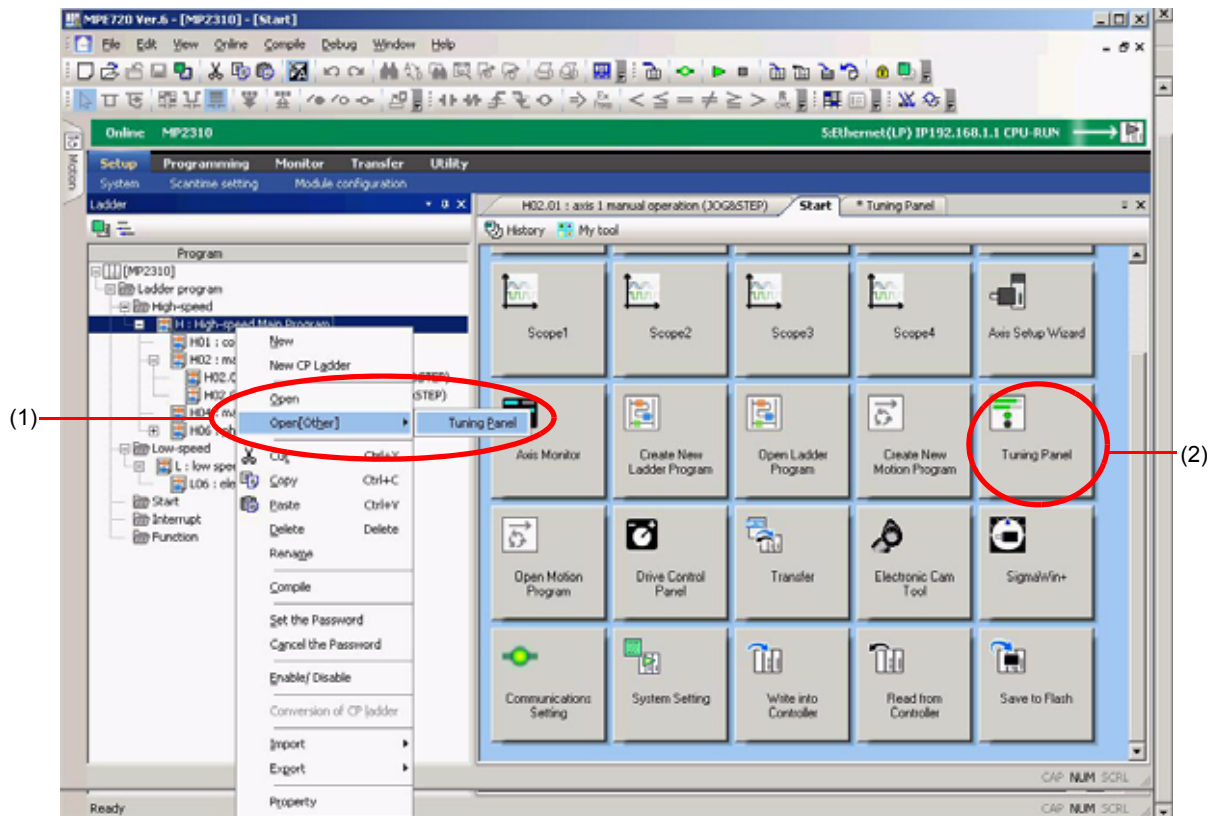
Open the **Tuning Panel** Tab Page in the main window.

1. Opening from the ladder program

Select a program in the Ladder Subwindow, right-click the program, and select **Open [Other] - Tuning Panel** from the pop-up menu that will be displayed.

2. Opening from the **My Tool** Window

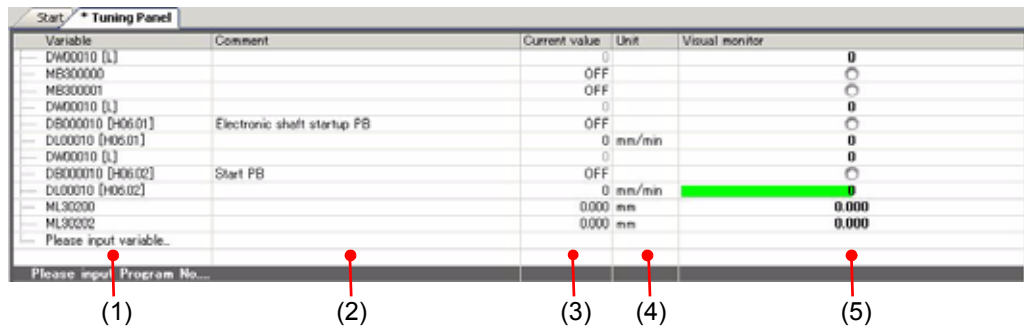
Click the **Tuning Panel** Button registered in the **My Tool** Window.



14.3 Names and Descriptions of Components of Tuning Panel

14.3.1 Tuning Panel Tab Page

The current value data of the registered variables are displayed. The display can be changed in accordance with the tuning status.



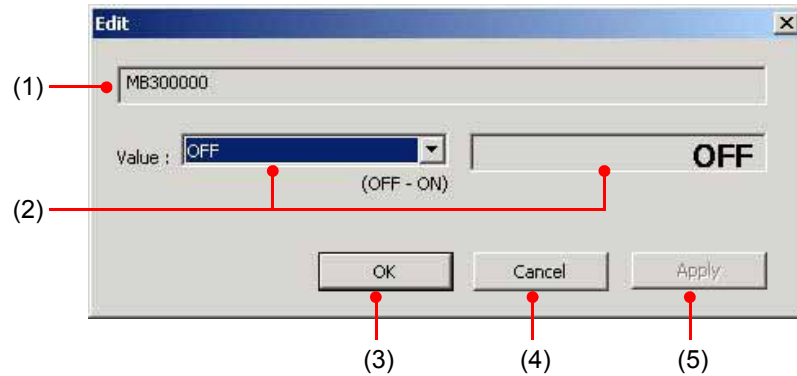
No.	Name	Description
(1)	Variable	Displays the variables or registers. The method of display of variables is based on the setting for Variables - Variable Display Format in the item tree in the Environment Setting Dialog Box.
(2)	Comment	Displays the comment registered for the variables. A maximum of 255 alphanumeric characters can be entered in the Comment Field. The comment entered here will be reflected in the list of variables and in the list of comments in the Variable Subwindow.
(3)	Current value	Displays the current value of the variables in the specified format. The current values are updated in a fixed cycle and can be edited in the Edit Dialog Box.
(4)	Unit	Displays the unit. The unit can be specified in the Edit Dialog Box.
(5)	Visual monitor	Monitors the current values of the variables (registers). The upper and lower values of current value data are checked against the upper and lower limits and the values are displayed in different colors, making it possible to tell at a glance whether they are within the range or not. When the current value is within the upper and lower limits: Displayed in green When the current value is outside the upper and lower limits: Displayed in red

14.3.2 Current Value Data

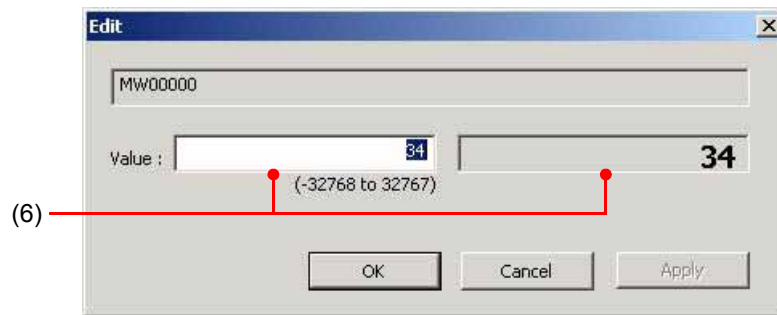
On double-clicking the *Current value* Field of each variable or directly entering a value, the **Edit** Dialog Box will be displayed.

The current value data can be edited in this dialog box.

■ For bit type variables:



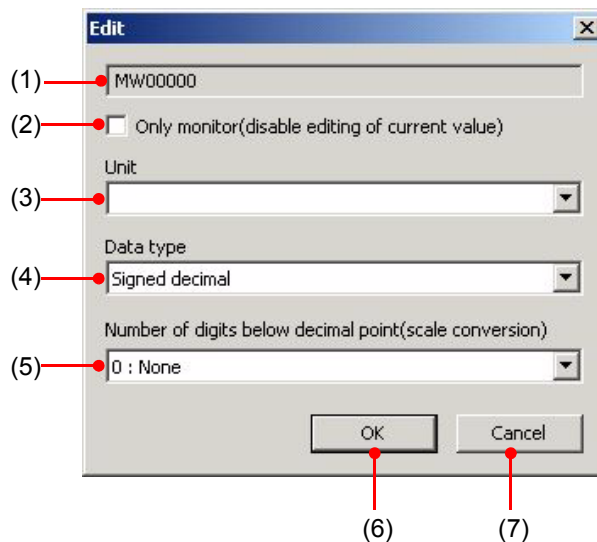
■ For variables other than bit type:



No.	Component	Description
(1)	Variable (register)	Displays the registered variable.
(2)	Value (ON/OFF)	Select ON or OFF.
(3)	OK	Sets the changes and returns you to the Tuning Panel Tab Page.
(4)	Cancel	Returns you to the Tuning Panel Tab Page without setting the changes.
(5)	Apply	Sets the changes to the current value data.
(6)	Value (numeral)	The current value can be changed within the permissible range.

14.3.3 Unit

On double-clicking the **Unit** Field of each variable or directly entering a value, the **Edit** Dialog Box will be displayed. The monitor mode in which editing of the current value is disabled, the unit of the current value data, and the scale conversion for the current value data can be specified in this dialog box.



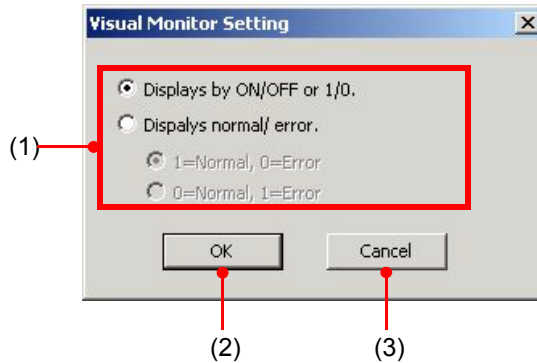
No.	Component	Description
(1)	Variable (register)	Displays the registered variable.
(2)	Only monitor	Checking the check box disables editing of the current value data, allowing monitoring only.
(3)	Unit	Select the desired unit. [a] mm, [b] pulse, [c] deg, [d] inch, [e] μm
(4)	Data type	Select the display format from among the following three options. [a] Signed decimal, [b] Unsigned decimal, [c] Hexadecimal
(5)	Number of digits below decimal point	Select the number of decimal places.
(6)	OK	Sets the changes and returns you to the Tuning Panel Tab Page.
(7)	Cancel	Returns you to the Tuning Panel Tab Page without setting the changes.

14.3.4 Visual Monitor

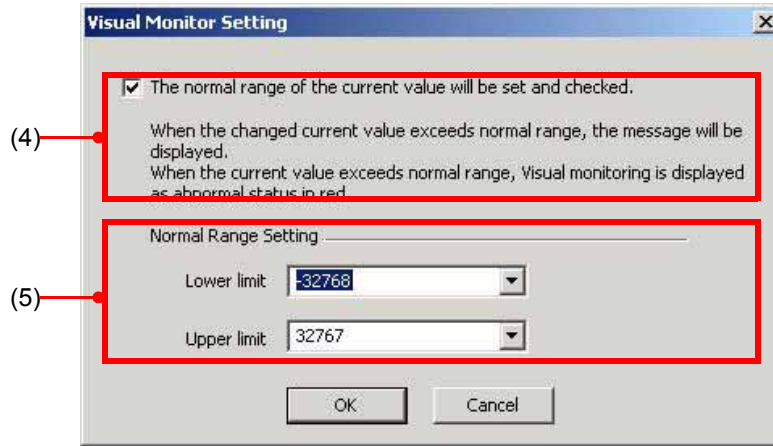
On double-clicking the *Visual monitor* Field of each variable or directly entering a value, the **Visual Monitor Setting** Dialog Box will be displayed.

The settings for the Visual Monitor that enables visual comprehension of the current value data can be edited in this dialog box.

- For bit type variables:



- For variables other than bit type:



No.	Component	Description
(1)	Display method	Select either <i>Displays by ON/OFF or 1/0.</i> or <i>Displays normal/error.</i> When <i>Displays normal/error.</i> is selected, select either of the following options. <ul style="list-style-type: none"> • 1 = Normal, 0 = Error 1 = Normal: Green, 0 = Error: Red • 0 = Normal, 1 = Error 0 = Normal: Green, 1 = Error: Red
(2)	OK	Sets the changes and returns you to the Tuning Panel Tab Page.
(3)	Cancel	Returns you to the Tuning Panel Tab Page without setting the changes.
(4)	Normal/error check	If the check box is unchecked, the fields in (5) are disabled.
(5)	Normal Range Setting	Set the upper and lower limits within the permissible range.

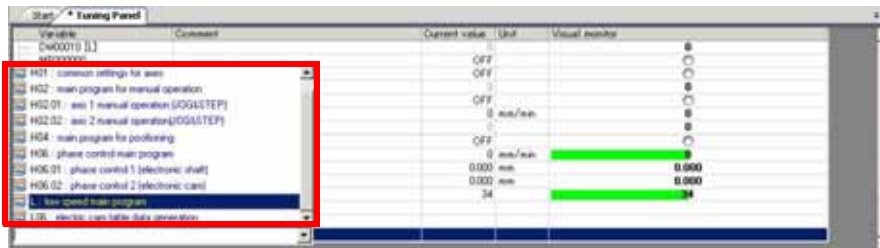
14.4 Registering/Displaying/Editing with the Tuning Panel

By registering the desired variables and displaying/editing the current value, application programs can be operated or adjusted, and the operating status of axes can be monitored.

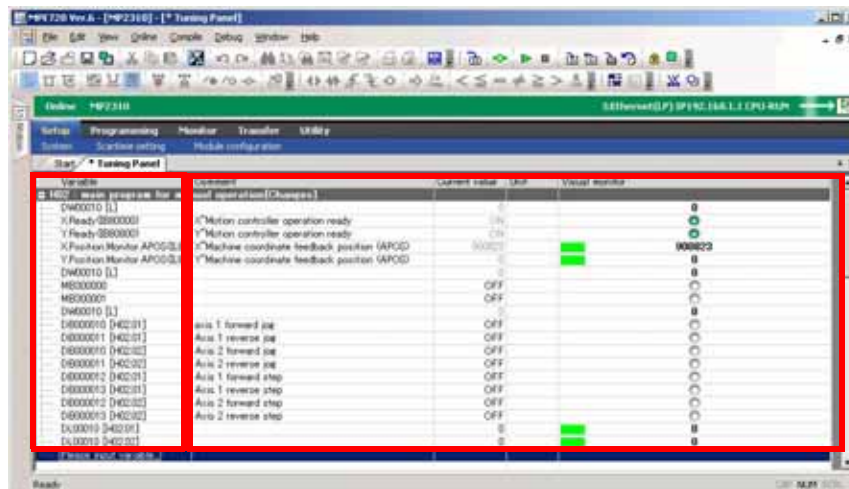
14.4.1 Registering Variables

The desired variables can be registered in the Tuning Panel as follows.

1. Open the **Tuning Panel** Tab Page. On double-clicking **Please input program name**, the list of created application programs will be displayed.

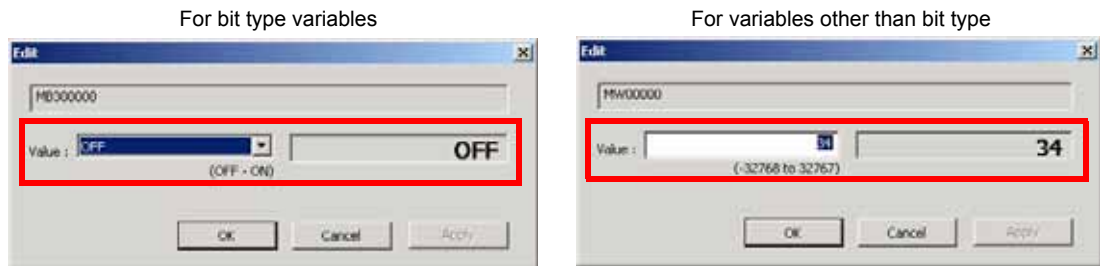


2. Select a program and enter the variables (registers) required for adjusting the operation of the program. The current value data for the entered variables will be displayed.



14.4.2 Editing the Current Value

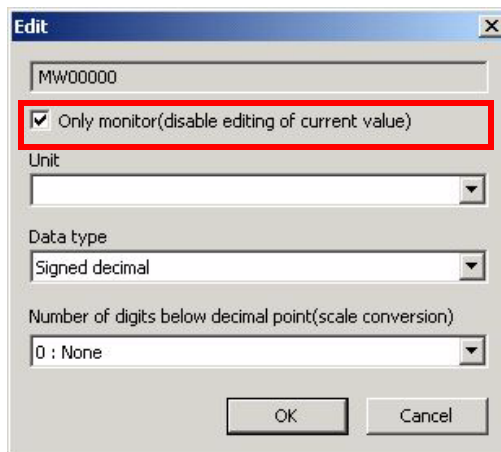
1. Double-click the **Current value** Field for each variable to display the **Edit** Dialog Box.
2. Set ON or OFF for bit type variables or values for variables other than bit type.



14.4.3 Changing Display of the Current Value Data

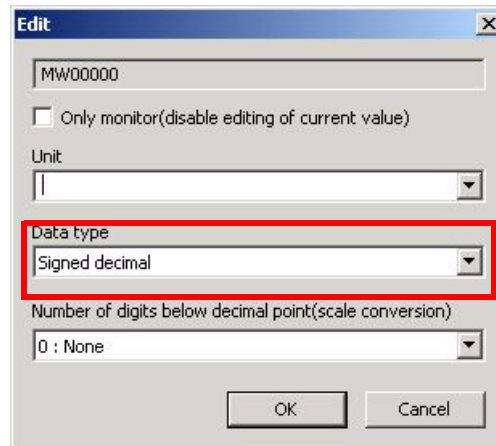
(1) Disabling Editing of the Current Value Data

1. Double-click the **Unit** Field for each variable to display the **Edit** Dialog Box.
2. Check the **Only monitor (disable editing of current value)** Check Box.
 - Editing of the current value data is disabled, allowing monitoring only.

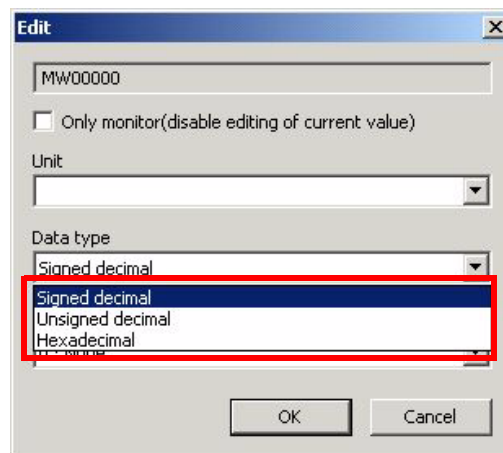


(2) Changing the Display Format of the Current Value Data

1. Double-click the **Unit** Field for each variable to display the **Edit** Dialog Box.

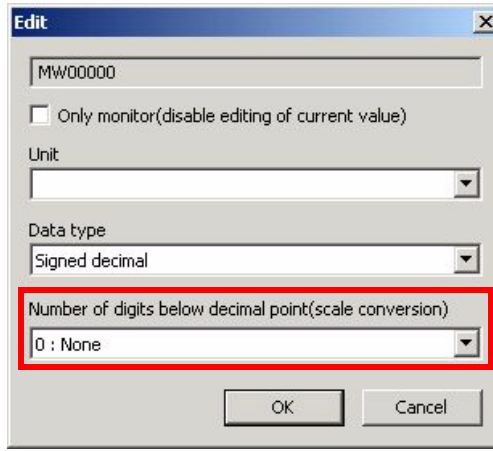


2. Select a display format from the **Data type** Drop-down List Box.

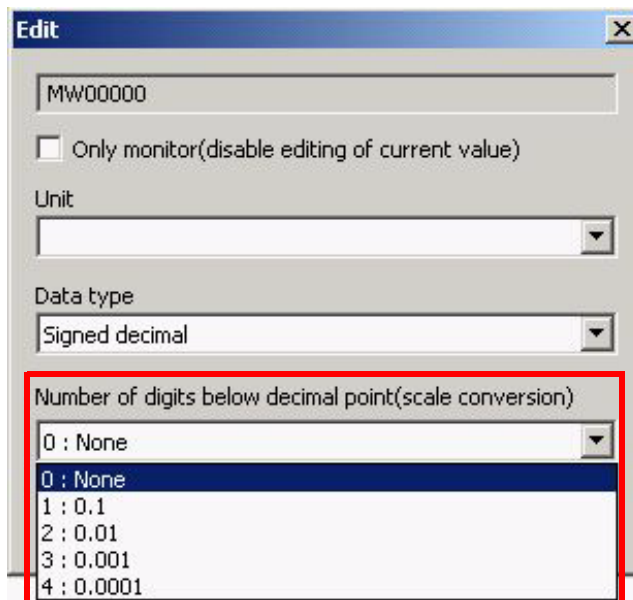


(3) Scale Conversion of the Current Value Data

1. Double-click the **Unit** Field for each variable to display the **Edit** Dialog Box.



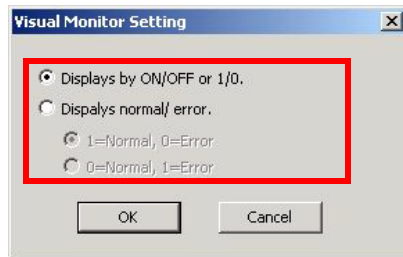
2. Select a number of decimal places from the **Number of digits below decimal point (scale conversion)** Drop-down List Box.
 - If **None** is selected, the current value is displayed in the scale of the register.



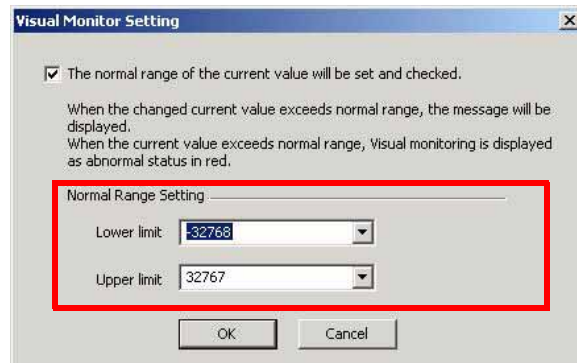
(4) Changing the Display Method of Visual Monitor

1. Double-click the **Visual monitor** Field for each variable to display the **Visual Monitor Setting** Dialog Box.
2. Set the display method for values within or outside the upper and lower limits for bit type variables, and set the upper and lower limits for variables other than bit type.

For bit type variables



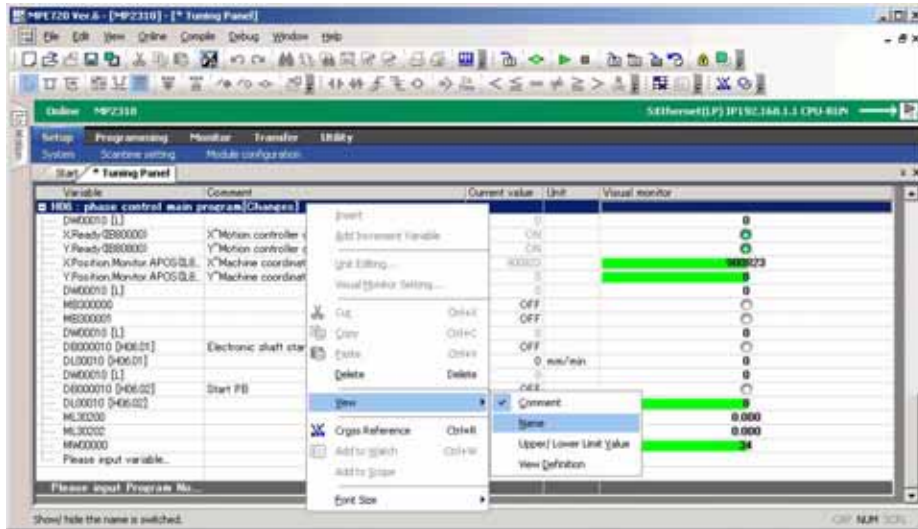
For variables other than bit type



14.4.4 Other Settings

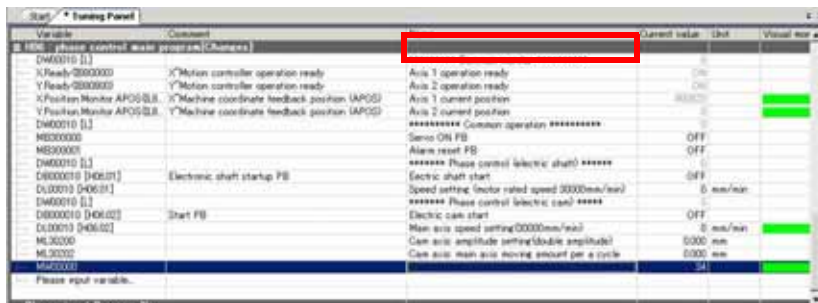
(1) Setting the Name

1. Right-click on the **Tuning Panel** Tab Page and select **View - Name** from the pop-up menu that will be displayed.



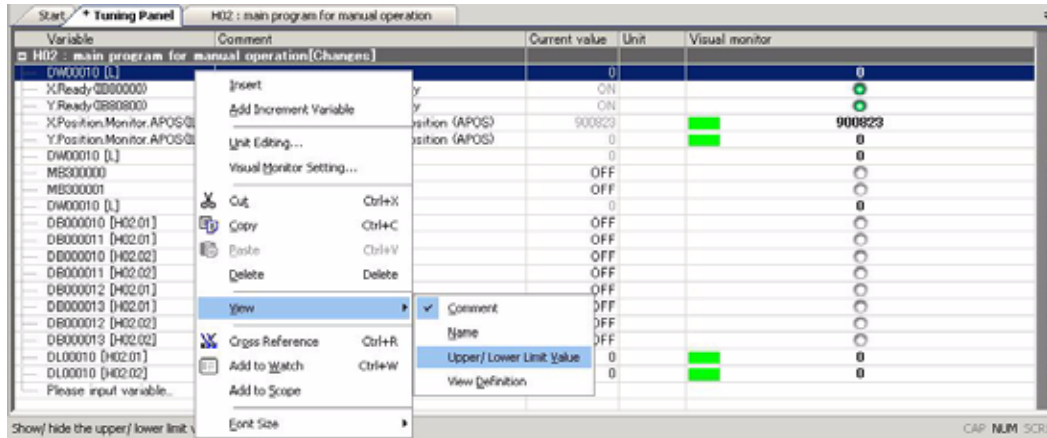
2. The **Name** Column will be displayed on the **Tuning Panel** Tab Page. Click the **Name** Field and enter the name.

* A maximum of 48 alphanumeric characters can be entered in the **Name** Field.

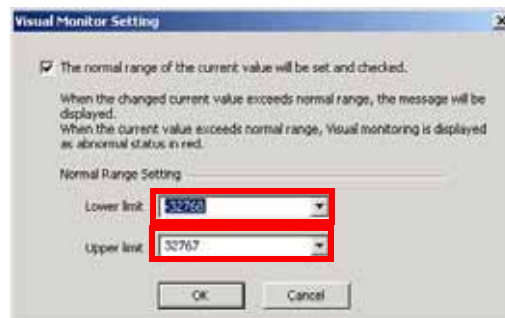
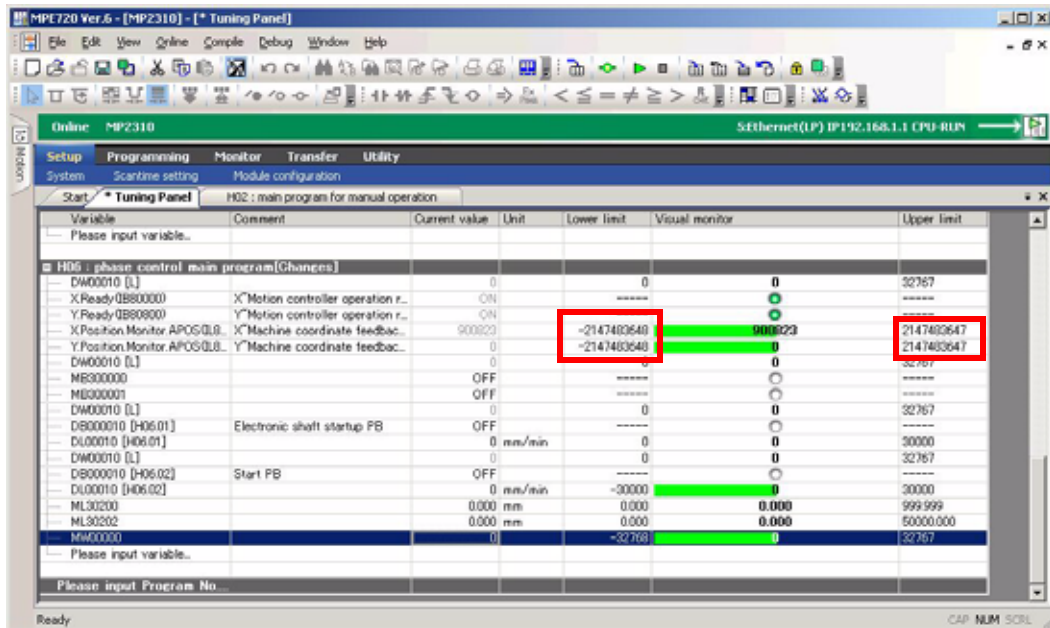


(2) Setting the Upper and Lower Limits

1. Right-click on the **Tuning Panel** Tab Page and select **View - Upper/Lower Limit Value** from the pop-up menu that will be displayed.

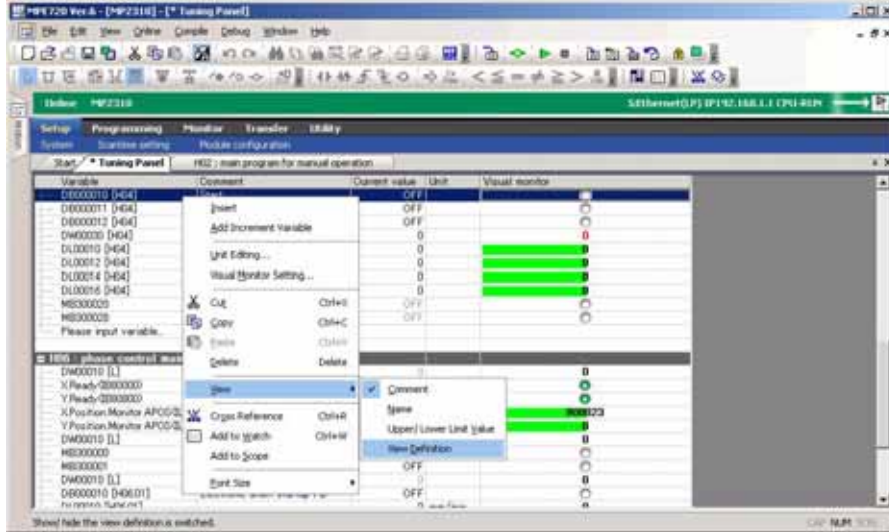


2. The **Lower limit** and **Upper limit** Columns will be displayed on the **Tuning Panel** Tab Page. On double-clicking the **Lower limit** or **Upper limit** Field or directly entering a value, the **Visual Monitor Setting** Dialog Box will be displayed. Set the lower and upper limits within the permissible range.



(3) Changing View Definition of the Current Value Data

1. Right-click on the **Tuning Panel** Tab Page and select **View - View Definition** from the pop-up menu that will be displayed.



2. The **View definition** Column will be displayed in the **Tuning Panel** Tab Page. Click the **View definition** Field and edit the value.

* Changing the view definition may require changing of the upper/lower limit depending on the setting.

Variable	Comment	View definition	Current value	Unit	Visual monitor
---	Please input variable...				
H06 : phase control main program(Changes)					
DW00010 [L]		XXXXXX	0		0
XReady0800000	XMotion controller operation r...	ON-OFF	ON		0
YReady0800000	YMotion controller operation r...	ON-OFF	ON		0
XPosition.Monitor APOS QLS	XMachine coordinate feedbac...	XXXXXXXX	900023		900123
YPosition.Monitor APOS QLS	YMachine coordinate feedbac...	XXXXXXXX	0		0
DW00010 [L]		XXXXXX	0		0
MS300000		ON-OFF	OFF		0
MS300001		ON-OFF	OFF		0
DW00010 [L]		XXXXXX	0		0
D000010 [H06.01]	Electronic shaft startup PB	ON-OFF	OFF		0
DW00010 [L]		XXXXXX	0	mm/min	0
D000010 [H06.02]	Start PB	ON-OFF	OFF		0
D000010 [H06.02]		ON-OFF	OFF	mm/min	0
ML00000		XXX, XXX	0.000	mm	0.000
ML00002		XXXXX, XXXX	0.000	mm	0.000
MM000000		XXXXX, XXXX	0		0
---	Please input variable...				

<Method of entry of view definition>

X: Represents a digit.

.: Indicates the location of the decimal point.

U: Represents an unsigned decimal value when specified at the head.

H: Represents a hexadecimal value when specified at the head.

Examples: View definition → Data

Word/Long type

XXXXX: Signed decimal

UXXXXXXXXXX: Unsigned decimal

HXXXXX: Hexadecimal

Float type

XXXXXXXX: Real without exponent

X.XXXXXXE-XXX: Real with exponent

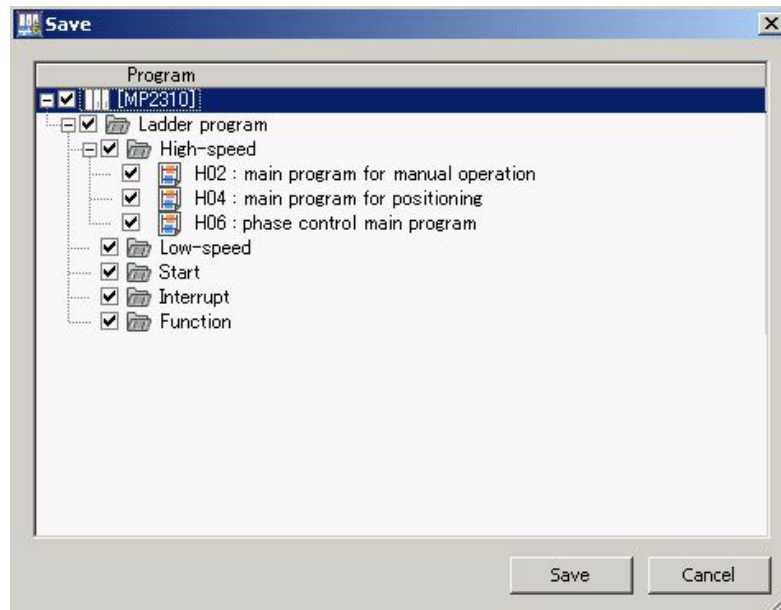
14.5 Saving Tuning Data

The data edited in the Tuning Panel can be stored in the registered programs.

1. Saving from the Main Menu.

Select **File - Save** to display the **Save** Dialog Box.

Check the ladder programs to be saved and click the **Save** Button.



- When the ladder program is deleted, the tuning data will also be deleted.

Appendices

A Variable Tables	A-2
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A.2 Axis Variable Details	A-5
A.3 I/O Variables	A-27
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A Variable Tables

A.1 Variables that are Automatically Assigned by System

The following table provides details on “Variables that are Automatically Assigned by System” provided by MPE720 version 6.

Variable Name		Register	Comments	
OnCoil		SB000004	Always ON	
CPU		-	Machine controller	
	Status	-	CPU status	
		Ready	SB000400	Ready to run
		Running	SB000401	Running
		Alarm	SB000402	Alarm
		Error	SB000403	Error
		Flash	SB000406	Flash driving
		WriteEnable	SB000407	Possible to write
		StopRequest	SB00040E	Request to stop running
		RunSwitch	SB00040F	RUN switch ON when the power turns ON
	BatteryAlarm	SB000487	Battery alarm	
	Error	-	CPU error status	
		Failure	SB000410	Serious error
		Exception	SB000413	Exception error
		ProgramError	SB000418	User operation error
		IOError	SB000419	I/O error
	Info	-	CPU information	
		SoftwareVersion	SW00020	System program software version number
		MemorySizeAvailable	SL00026	Available program memory (in units of byte)
		MemorySizeTotal	SL00028	All module memory (in unites of byte)
	Switches	-	CPU switch	
		Configure	SB000482	Self configuration
		Initialize	SB000483	Clear memory at startup
		Stop	SB000485	User program stop
HighScan		-	High-speed scan relay	
	FirstScan	SB000001	After high-speed scan starts, only the first scan ON	
	Flicker	-	Flicker	
		FlickerScan	SB000010	1-scan flicker relay (high-speed)
		Friccker500ms	SB000011	0.5s flicker relay (high-speed)
		Flicker1s	SB000012	1.0s flicker relay (high-speed)
		Flicker2s	SB000013	2.0s flicker relay (high-speed)
	Sampling	-	Sampling relay	
		Sampling500ms	SB000014	0.5s sampling relay (high-speed)
		Sampling1s	SB000015	1.0s sampling relay (high-speed)
		Sampling2s	SB000016	2.0s sampling relay (high-speed)
		Sampling60s	SB000017	60.0s sampling relay (high-speed)
	OnAfter	-	Relay after high-speed scan start	
		OnAfter1s	SB000018	ON 1.0s after high-speed scan start
		OnAfter2s	SB000019	ON 2.0s after high-speed scan start
		OnAfter5s	SB00001A	ON 5.0s after high-speed scan start

A.1 Variables that are Automatically Assigned by System

Variable Name		Register	Comments	
LowScan		-	Low-speed scan relay	
	FirstScan	SB000003	After low-speed scan starts, only the first scan ON	
	Flicker	-	Flicker relay	
		FlickerScan	SB000030	1-scan flicker relay (low-speed)
		Flicker500ms	SB000031	0.5s flicker relay (low-speed)
		Flicker1s	SB000032	1.0s flicker relay (low-speed)
		Flicker2s	SB000033	2.0s flicker relay (low-speed)
	Sampling	-	Sampling relay	
		Sampling500ms	SB000034	0.5s sampling relay (low-speed)
		Sampling1s	SB000035	1.0s sampling relay (low-speed)
		Sampling2s	SB000036	2.0s sampling relay (low-speed)
		Sampling60s	SB000037	60.0s sampling relay (low-speed)
	OnAfter	-	Relay after low-speed scan start	
		OnAfter1s	SB000038	ON 1.0s after low-speed scan start
	OnAfter2s	SB000039	ON 2.0s after low-speed scan start	
	OnAfter5s	SB00003A	ON 5.0s after low-speed scan start	
ErrorHigh		-	High-speed program error	
	Count	SW00084	Program error count (high-speed program)	
	Code	SW00085	Program error code (high-speed program)	
	ProgramNumber	SW00154	Error program number (high-speed program)	
	ReferProgramNumber	SW00155	Referencing called program number (high-speed program)	
	ReferStep	SW00156	Referencing called step number (high-speed program)	
ErrorLow		-	Low-speed program error	
	Count	SW00088	Error count (low-speed program)	
	Code	SW00089	Error code (low-speed program)	
	ProgramNumber	SW00186	Error program number (low-speed program)	
	ReferProgramNumber	SW00187	Referencing called program number (low-speed program)	
	ReferStep	SW00189	Referencing called step number (low-speed program)	
ErrorStart		-	Start program error	
	Count	SW00080	Error count (start program)	
	Code	SW00081	Error code (start program)	
	ProgramNumber	SW00122	Error program number (start program)	
	ReferProgramNumber	SW00123	Referencing called program number (start program)	
	ReferStep	SW00124	Referencing called step number (start program)	
ErrorInterrupt		-	Interrupt program error	
	Count	SW00082	Error count (interrupt program)	
	Code	SW00083	Error coder (interrupt program)	
	ProgramNumber	SW00138	Error program number (interrupt program)	
	ReferProgramNumber	SW00139	Referencing called program number (interrupt program)	
	ReferStep	SW00140	Referencing called step number (interrupt program)	

A Variable Tables

A.1 Variables that are Automatically Assigned by System

Variable Name		Register	Comments	
ErrorIO		-	I/O error	
	Count	SW00200	I/O error count	
	InputCount	SW00201	Input error count	
	InputAddress	SW00202	Input error address	
	OutputCount	SW00203	Output error count	
	OutputAddress	SW00204	Output error address	
ScanTime		-	Scan time	
	High	-	High-speed scan	
		HSet	SW00004	High-speed scan set value (0.1 ms)
		HCurrent	SW00005	High-speed scan current value (0.1 ms)
		HMaximum	SW00006	High-speed scan max. value (0.1 ms)
		HOverCount	SW00044	High-speed scan timeover counter
	Low	-	Low-speed scan	
		LSet	SW00010	Low-speed scan set value (0.1 ms)
		LCurrent	SW00011	Low-speed scan current value (0.1 ms)
		LMacimum	SW00012	Low-speed scan max. value (0.1 ms)
		LOverCount	SW00046	Low-speed scan timeover counter
	Current	SW00014	Execution scan current value (0.1 ms)	
	Calendar		-	Calendar
	Year	SW00015	Calendar: Year	
	MonthDate	SW00016	Calendar: Month and date	
	HoursMinutes	SW00017	Calendar: Hours and minutes	
	Second	SW00018	Calendar: Seconds	
	Day	SW00019	Calendar: Day of week	

A.2 Axis Variable Details

The following table lists the axis variables registered for each logical axis.

- Register IW (IB/IL/IF/IA) xx00 indicates the leading input register address +00.
- Register OW (OB/OL/OF/OA) xx00 indicates the leading output register address +00.

(1) SVB-Module Variables for Use with the SERVOPACK

Variable		Register	Comments	
ServoOn		OBxx000	Servo ON	
CommunicationReset		OBxx00E	Communication reset	
MLOCK		OBxx001	Machine lock	
AlarmClear		OBxx00F	Alarm clear	
ForwardTorqueLimit		OBxx008	Forward external torque limit input	
ReverseTorqueLimit		OBxx009	Reverse external torque limit input	
Ready		IBxx000	Motion controller operation ready	
Running		IBxx001	Running	
SystemBusy		IBxx002	System busy	
ServoReady		IBxx003	Servo ready	
MLKL		IBxx0C6	Machine lock ON (MLKL)	
UnitsSelection		OWxx03	Function 1	
SignalSelection		OWxx04	Function 2	
MotorType		IWxx3F	Motor type	
MotionCommand		-	Motion command	
	CommandCode	OWxx08	Motion command	
	ResponseCode	IWxx08	Motion command response code	
	Control	OWxx09	Motion command control flag	
		Pause	OBxx090	Command pause
		Abort	OBxx091	Command abort
		Direction	OBxx092	JOG/STEP direction
	Status	IWxx09	Motion command status	
		Busy	IBxx090	Motion command executing (BUSY) flag
		Hold	IBxx091	Motion command hold completed (HOLD)
		Fail	IBxx093	Motion command error occurrence (FAIL)
		Complete_ABS_RST	IBxx097	ABS encoder initialization completed
		Complete	IBxx098	Motion command execution completed (COMPLETE)
MotionSubCommand		-	Motion sub command	
	CommandCode	OWxx0A	Motion sub command	
	ResponseCode	IWxx0A	Motion sub command response code	
	Status	IWxx0B	Motion sub command status	
		Busy	IBxx0B0	Motion sub command executing (BUSY) flag
		Fail	IBxx0B3	Motion sub command error occurrence (FAIL)
		Complete	IBxx0B8	Motion sub command execution completed (COMPLETE)

Variable		Register	Comments	
Position		-	Position	
	Command		Position reference	
	MoveType	OBxx095	Position reference type	
	PhaseCompensationType	OBxx096	Phase compensation type with an electronic cam	
	Position	OLxx1C	Position reference setting	
	StepDistance	OLxx44	STEP distance	
	EXPOffset	OLxx46	External positioning move distance	
	PhaseCompensation	OLxx28	Phase compensation	
	PhasePositionLoopEnable	OBxx051	Disable phase reference generation	
	Setting		-	Position setting
	POSCOMPWidth	OLxx1E	Position completed width	
	NEARWidth	OLxx20	Position completed width 2	
	ZEROWidth	OWxx3D	Home window	
	POSCOMPTimeOut	OWxx26	Position complete timeout	
	PERRLevel	OBxx010	Deviation abnormal detection error level	
	Position.Setting.PER-RLimit	OLxx22	Deviation abnormal detection value	
	Status		-	Position status
	DEN	IBxx0C0	Distribution completed (DEN)	
	POSCOMP	IBxx0C1	Positioning completed (POSCOMP)	
	NEAR	IBxx0C3	Position proximity (NEAR)	
	ZERO	IBxx0C4	Zero point position (ZERO)	
	ZRNC	IBxx0C5	Zero point return (Setting) completed (ZRNC)	
	Monitor		-	Position monitor
	TPOS	ILxx0E	Machine coordinate target position (TPOS)	
	CPOS	ILxx10	Target position (CPOS)	
	MPOS	ILxx12	Machine coordinate system position (MPOS)	
	APOS	ILxx16	Machine coordinate feedback position (APOS)	
	LPOS	ILxx18	Machine coordinate latch position (LPOS)	
	PERR	ILxx1A	Position error (PERR)	
	Turns	ILxx1E	POSMAX number of turns	
	Latch		-	Latch
	Enable	OBxx004	Latch request	
	EnableComplete	IBxx004	Latch request completed	
ZoneEnable	OBxx094	Latch zone enable		
ZoneLowerLimit	OLxx2A	Latch zone lower limit setting		
ZoneUpperLimit	OLxx2C	Latch zone upper limit setting		
LCOMP	IBxx0C2	Latch completed (LCOMP)		
Coordinate		-	Coordinate	
MachineOffset	OLxx48	Zero point offset		
WorkOffset	OLxx4A	Work coordinate system offset		
PresetRequest	OBxx006	POSMAX preset		
PresetTurns	OLxx4C	Preset data of POSMAX turns		
PresetComplete	IBxx0C9	POSMAX turn number presetting completed (TPRSE)		

Variable		Register	Comments
AbsEncoder	AbsEncoder	-	ABS encoder
	AbsDataRestore	OBxx007	Infinite length axis position information LOAD request
	AbsDataRestored	IBxx0C8	ABS system infinite length position control information (ABSLDE)
	SetEncoderPositionL	OLxx5E	Absolute position at power OFF (Lower 2 words)
	SetEncoderPositionH	OLxx60	Absolute position at power OFF (Upper 2 words)
	SetPulsePositionL	OLxx62	Modularized position at power OFF (Lower 2 words)
	SetPulsePositionH	OLxx64	Modularized position at power OFF (Upper 2 words)
	GetEncoderPositionL	ILxx5E	Absolute position at power OFF (Lower 2 words)
	GetEncoderPositionH	ILxx60	Absolute position at power OFF (Upper 2 words)
	GetPulsePositionL	ILxx62	Modularized position at power OFF (Lower 2 words)
GetPulsePositionH	ILxx64	Modularized position at power OFF (Upper 2 words)	
Speed		-	Speed
Speed	Speed	OLxx10	Speed reference
	TorqueLimit	OLxx14	Positive side limiting torque setting at speed reference
	SecondlySpeedCompensation	OLxx16	Secondary speed compensation
	Override	OWxx18	Speed override
	Acceleration	OLxx36	Linear acceleration time
	Deceleration	OLxx38	Linear deceleration time
	S_CurveTime	OWxx3A	S-curve acceleration time
	SpeedMonitor	ILxx20	Speed reference output monitor
FeedbackSpeed	ILxx40	Feedback speed	
Torque		-	Torque
Torque	Torque	OLxx0C	Torque reference
	SpeedLimit	OWxx0E	Speed limit during torque reference
	TorqueMonitor	ILxx42	Feedback torque
ZeroPointReturn		-	Home return
ZeroPointReturn	Method	OWxx3C	Home return type
	ApproachSpeed	OLxx3E	Approach speed
	CreepSpeed	OLxx40	Creep speed
	Direction	OBxx093	Home direction
	Offset	OLxx42	Home offset
	InputSelect	OBxx05B	INPUT signal for zero point return

Variable		Register	Comments
Gain		-	Gain
	IntegralClear	OBxx00B	Integration reset
	SpeedLoopType	OBxx013	Speed loop P/PI switch
	SelectSecond	OBxx014	Gain switch
	GainSwit2	OBxx015	Gain switch 2
	PositionLoop	OWxx2E	Position loop gain
	SpeedLoop	OWxx2F	Speed loop gain
	PositionFeedForward	OWxx30	Speed feed forward compensation
	SpeedCompensation	OWxx31	Speed compensation
	PositionIntegration	OWxx32	Position integration time constant
	SpeedIntegration	OWxx34	Speed integration time constant
Alarm		IWxx04	Alarm
	ServoAlarm	IBxx040	Servo driver error
	P_OT	IBxx041	Positive overtravel
	N_OT	IBxx042	Negative overtravel
	P_SOT	IBxx043	Positive soft limit
	N_SOT	IBxx044	Negative soft limit
	ServoOff	IBxx045	Servo OFF
	POSCOMPTimeOut	IBxx046	Positioning time over
	PositionOutOfRange	IBxx047	Excessive positioning moving amount
	SpeedOutOfRange	IBxx048	Excessive speed
	FollowingError	IBxx049	Excessive following error
	FilterTypeChanged	IBxx04A	Filter type change error
	FilterTimeChanged	IBxx04B	Filter time constant change error
	NotZRNC	IBxx04D	Zero point not set
	ServoParameterError	IBxx04F	Servo driver parameter setting error
	ServoCommunicationTimeout	IBxx050	Servo driver synchronization communication error
	ServoCommunicationError	IBxx051	Servo driver communication error
	ServoCommandTimeout	IBxx052	Servo driver command timeout error
	ABSEncoderOverrange	IBxx053	ABS encoder count exceeded
	ScanTimeSettingError	IBxx056	Scanning set error
	MotorTypeError	IBxx05E	Motor type set error
	ConnectionEncoderDiffers	IBxx05F	Connected encoder type error
Warning		ILxx02	Warning
	ParameterNumber	IWxx01	Over range parameter number
	FollowingError	IBxx020	Excessive following error
	SettingParameter	IBxx021	Setting parameter error
	FixedParamter	IBxx022	Fixed parameter error
	ServoWarning	IBxx023	Servo driver error
	MotionCommand	IBxx024	Motion command setting error
	P_OT	IBxx026	Positive overtravel
	N_OT	IBxx027	Negative overtravel
	ServoNotEnabled	IBxx028	Servo not ON
	Communication	IBxx029	Servo driver communication warning

Variable		Register	Comments
Servo		-	Network servo
	MonitorALMNo	OWxx4F	Servo alarm monitor number.
	ALMCode	IWxx2D	Servo alarm code
	Status	IWxx2C	Network servo status
	ALM	IBxx2C0	Alarm occurred (ALM)
	WARNING	IBxx2C1	Warning occurred (WARNING)
	CMDRDY	IBxx2C2	Command ready (CMDRDY)
	SVON	IBxx2C3	Servo ON (SVON)
	PON	IBxx2C4	Main power ON (PON)
	MLOCK	IBxx2C5	Machine lock (MLOCK)
	ZPOINT	IBxx2C6	Zero point (ZPOINT)
	PSET	IBxx2C7	Positioning completed (PSET)
	DEN	IBxx2C8	Distribution completed (DEN)
	T_LIM	IBxx2C9	Torque being limited (T_LIM)
	L_CMP	IBxx2CA	Latch completed (L_CMP)
	NEAR	IBxx2CB	Position proximity (NEAR)
	P_SOT	IBxx2CC	Positive soft limit (P_SOT)
	N_SOT	IBxx2CD	Negative soft limit (N_SOT)
	IO	IWxx2E	Network servo I/O monitor
	FowardSideLimitSwitch-Input	IBxx2E0	Forward side limit switch input
	ReverseSideLimitSwitch-Input	IBxx2E1	Reverse side limit switch input
	DecelerationDogSwitch-Input	IBxx2E2	Deceleration dog switch input
	PA	IBxx2E3	Encoder phase-A input (PA)
	PB	IBxx2E4	Encoder phase-B input (PB)
	PC	IBxx2E5	Encoder phase-C input (PC)
	EXT1	IBxx2E6	First external latch input (EXT1)
	EXT2	IBxx2E7	Second external latch input (EXT2)
	EXT3	IBxx2E8	Third external latch input (EXT3)
	Brake	IBxx2E9	Brake output (BRK)
	Monitor	-	Network servo monitor information
	Monitor2Enable	OBxx020	Monitor 2 enabled
	MonitorCode	OWxx4E	Servo user monitor
	MonitorCodeResponse	IWxx2F	Network servo user monitor information
	Monitor2	ILxx30	Servo user monitor 2
	ServoUserMonitor3	ILxx32	Servo user monitor 3
	Monitor4	ILxx34	Servo user monitor 4

Variable		Register	Comments
ServoParameter		-	Servo parameter
	MotionCommand		-
		SetNumber	OWxx50
		SetSize	OWxx51
		SetValue	OLxx52
		GetNumber	IWxx36
		GetValue	ILxx38
	MotionSubCommand		-
		SetNumber	OWxx54
		SetSize	OWxx55
		SetValue	OLxx56
		GetNumber	IWxx37
		GetValue	ILxx3A
		FixParameterNumber	OWxx5C
		FixParameterValue	ILxx56

(2) SVB-Module Variables for Use with the Inverter

Variable		Register	Comments	
DrivePermission		OBxx00D	Drive permission	
CommunicationReset		OBxx00E	Communication reset	
AlarmClear		OBxx00F	Alarm clear	
Ready		IBxx000	Motion controller operation ready	
SystemBusy		IBxx002	System busy	
InverterReady		IBxx003	Inverter ready	
SpeedReference		OWxx11	Speed reference	
TorqueReference		OWxx12	Torque reference	
TorqueCompensationOption		OWxx13	Torque compensation (optional)	
MultiFunctionAnalogOutputFMOption		OWxx14	Multi-function analog output FM (option)	
MultiFunctionAnalogOutputAMOption		OWxx15	Multi-function analog output AM (option)	
OutputFrequency		IWxx11	Output frequency	
OutputCurrent		IWxx12	Output current	
MotorSpeedOption		IWxx13	Motor speed (optional)	
TorqueReferenceU109Option		IWxx14	Torque reference (U1-09) (option)	
EncoderCounterOption		IWxx15	Encoder counter (optional)	
FrequencyReferenceU101Option		IWxx16	Frequency reference (U1-01) (option)	
MultiFunctionAnalogInputA2Option		IWxx17	Multi-function analog input A2 (option)	
MainBusVoltageOption		IWxx18	Main bus voltage (option)	
AlarmCodeOption		IWxx19	Alarm code (option)	
WarningCodeOption		IWxx1A	Warning code (option)	
AnalogInput3Option		IWxx1C	Multi-function analog A3 (option)	
InputOption		IWxx1D	Multi-function input terminal (option)	
AnalogInput1Option		IWxx1E	Multi-function analog input A1 (option)	
EncoderCounterCH2Option		IWxx1F	Encoder counter (CH2) (option)	
Command		-	Command	
	CommandCode		OWxx08	Command
	ResponseCode		IWxx08	Command response code
	ResponseAlarmCode		IWxx30	Response alarm code
	InverterAlarmCode		IWxx32	Inverter alarm code
	Status		IWxx09	Motion command status
		Busy	IBxx090	Command executing (BUSY) flag
		Fail	IBxx093	Command error occurrence (FAIL)
	Complete	IBxx098	Command execution completed (COMPLETE)	
SubCommand		-	Sub command	
	CommandCode		OWxx0A	Sub command
	ResponseCode		IWxx0A	Sub command response code
	AuxiliaryInverterAlarmCode		IWxx33	Auxiliary inverter alarm code
	Status		IWxx0B	Sub command status
		Busy	IBxx0B0	Sub command executing (BUSY) flag
		Fail	IBxx0B3	Sub command error occurrence (FAIL)
		Complete	IBxx0B8	Sub command execution completed (COMPLETE)
	SubCommandResponseStatus		IWxx31	Sub command response status
		SubCommandAlarm	IBxx310	Sub command alarm
		SubCommandWarning	IBxx311	Sub command warning
		SubCommandReady	IBxx312	Sub command ready

Variable		Register	Comments
Alarm		IWxx04	Alarm
	ServoParameterError	IBxx04F	Servo driver parameter setting error
	ServoCommunicationTimeout	IBxx050	Servo driver synchronization communication error
	ServoCommunicationError	IBxx051	Servo driver communication error
	ServoCommandTimeout	IBxx052	Servo driver command timeout error
Warning		ILxx02	Warning
	ParameterNumber	IWxx01	Over range parameter number
	SettingParameter	IBxx021	Setting parameter error
	FixedParamter	IBxx022	Fixed parameter error
	Command	IBxx024	Command setting error
	Communication	IBxx029	Driver communication warning
	SubCommandSetError	IBxx02A	Sub command set error
OutputDataOptionSelection		OWxx0C	Output data option selection
	TorqueCompensation	OBxx0C0	Torque compensation
	MultiFunctionAnalogOutputFM	OBxx0C2	Multi-function analog output FM
	MultiFunctionAnalogOutputAM	OBxx0C1	Multi-function analog output AM
	MultiFunctionTerminalOutput	OBxx0C3	Multi-function terminal output
AuxiliaryOutputDataOptionSelection		OWxx0E	Auxiliary output data option selection
	TorqueCompensation	OBxx0E0	Torque compensation
	MultiFunctionAnalogOutputFM	OBxx0E1	Multi-function analog output FM
	MultiFunctionAnalogOutputAM	OBxx0E2	Multi-function analog output AM
	MultiFunctionTerminalOutput	OBxx0E3	Multi-function terminal output
InputDataOptionSelection		OWxx0D	Input data option selection
	MotorSpeed	OBxx0D0	Motor speed
	TorqueReferenceU109	OBxx0D1	Torque reference (U1-09)
	EncoderCounter	OBxx0D2	Encoder counter
	FrequencyReferenceU101	OBxx0D3	Frequency reference (U1-01)
	MultiFunctionAnalogInputA2	OBxx0D4	Multi-function analog input A2
	MainBusVoltage	OBxx0D5	Main bus voltage
	AlarmCode	OBxx0D6	Alarm code
	WarningCode	OBxx0D7	Warning code
	MultiFunctionAnalogInputA3	OBxx0D9	Multi-function analog input A3
	MultiFunctionInputTerminal	OBxx0DA	Multi-function input terminal
	MultiFunctionAnalogInputA1	OBxx0DB	Multi-function analog input A1
	EncoderCounterCH2	OBxx0DC	Encoder counter (CH2)
InputDataOptionSelectionMonitor		IWxx0D	Input data option selection monitor
	MotorSpeed	IWxx0D0	Motor speed
	TorqueReferenceU109	IWxx0D1	Torque reference (U1-09)
	EncoderCounter	IWxx0D2	Encoder counter
	FrequencyReferenceU101	IWxx0D3	Frequency reference (U1-01)
	MultiFunctionAnalogInputA2	IWxx0D4	Multi-function analog input A2
	MainBusVoltage	IWxx0D5	Main bus voltage
	AlarmCode	IWxx0D6	Alarm code
	WarningCode	IWxx0D7	Warning code
	MultiFunctionAnalogInputA3	IWxx0D9	Multi-function analog input A3
	MultiFunctionInputTerminal	IWxx0DA	Multi-function input terminal
	MultiFunctionAnalogInputA1	IWxx0DB	Multi-function analog input A1
	EncoderCounterCH2	IWxx0DC	Encoder counter (CH2)

Variable	Register	Comments
AuxiliaryInputDataOptionSelection	OWxx0F	Auxiliary input data option selection
MotorSpeed	OBxx0F0	Motor speed
TorqueReferenceU109	OBxx0F1	Torque reference (U1-09)
EncoderCounter	OBxx0F2	Encoder counter
FrequencyReferenceU101	OBxx0F3	Frequency reference (U1-01)
MultiFunctionAnalogInputA2	OBxx0F4	Multi-function analog input A2
MainBus Voltage	OBxx0F5	Main bus voltage
AlarmCode	OBxx0F6	Alarm code
WarningCode	OBxx0F7	Warning code
MultiFunctionAnalogInputA3	OBxx0F9	Multi-function analog input A3
MultiFunctionInputTerminal	OBxx0FA	Multi-function input terminal
MultiFunctionAnalogInputA1	OBxx0FB	Multi-function analog input A1
EncoderCounterCH2	OBxx0FC	Encoder counter (CH2)
AuxiliaryInputDataOptionSelectionMonitor	IWxx0F	Auxiliary input data option selection monitor
MotorSpeed	IBxx0F0	Motor speed
TorqueReferenceU109	IBxx0F1	Torque reference (U1-09)
EncoderCounter	IBxx0F2	Encoder counter
FrequencyReferenceU101	IBxx0F3	Frequency reference (U1-01)
MultiFunctionAnalogInputA2	IBxx0F4	Multi-function analog input A2
MainBus Voltage	IBxx0F5	Main bus voltage
AlarmCode	IBxx0F6	Alarm code
WarningCode	IBxx0F7	Warning code
MultiFunctionAnalogInputA3	IBxx0F9	Multi-function analog input A3
MultiFunctionInputTerminal	IBxx0FA	Multi-function input terminal
MultiFunctionAnalogInputA1	IBxx0FB	Multi-function analog input A1
EncoderCounterCH2	IBxx0FC	Encoder counter (CH2)
InputCommand	OWxx10	Input command
ForwardRUN	OBxx100	Forward RUN
ReverseRUN	OBxx101	Reverse RUN
MultiFunctionInputCommandS3	OBxx102	Multi-function input command S3
MultiFunctionInputCommandS4	OBxx103	Multi-function input command S4
MultiFunctionInputCommandS5	OBxx104	Multi-function input command S5
MultiFunctionInputCommandS6	OBxx105	Multi-function input command S6
MultiFunctionInputCommandS7	OBxx106	Multi-function input command S7
MultiFunctionInputCommandS8	OBxx107	Multi-function input command S8
ExternalFaultInputEF0	OBxx108	External fault input (EF0)
FaultReset	OBxx109	Fault reset
MultiFunctionInputCommandS9	OBxx10A	Multi-function input command S9
MultiFunctionInputCommandS10	OBxx10B	Multi-function input command S10
MultiFunctionInputCommandS11	OBxx10C	Multi-function input command S11
MultiFunctionInputCommandS12	OBxx10D	Multi-function input command S12
FaultTraceClearCommand	OBxx10E	Fault trace clear command
ExternalBaseBlockCommand	OBxx10F	External base block command

Variable		Register	Comments
Status		IWxx10	Status
	Alarm	IBxx100	Alarm
	Warning	IBxx101	Warning
	CommandReady	IBxx102	Command ready
	BaseBlock	IBxx103	Base block
	PowerON	IBxx104	Power ON
	DuringRunning	IBxx105	During running
	ZeroSpeed	IBxx106	Zero speed
	ReverseOperation	IBxx107	Reverse operation
	DuringReset	IBxx108	During reset
	DuringSpeedCoincident	IBxx109	During speed coincidence
	InverterReady	IBxx10A	Inverter ready
	OPEError	IBxx10B	OPE error
	MomentaryPowerCut	IBxx10C	Momentary/power cut
	RemoteOperation	IBxx10D	Remote operation
	MotorSelection	IBxx10E	Motor selection
SetZeroCompleted	IBxx10F	Set zero completed	
MultiFuncctionTerminalOutputOption		OWxx16	Multi-function terminal output (option)
	ConstantOutputM1M2MAMB	OBxx160	Contact output (M1-M2) (MA-MB)
	PHC1OutputConstantP1PC	OBxx161	PHC1 output (Contact P1-PC)
	PHC2OutputConstantP2PC	OBxx162	PHC1 output (P2-PC)
	PHC3OutputConstantP3PC	OBxx163	PHC1 output (P3-C3)
	PHC4OutputConstantP4PC	OBxx164	PHC1 output (P4-C4)
DigitalInputTerminalOption		IWxx1D	Digital input terminal (option)
	Terminal1Status	IBxx1D0	Terminal 1 status
	Terminal2Status	IBxx1D1	Terminal 2 status
	Terminal3Status	IBxx1D2	Terminal 3 status
	Terminal4Status	IBxx1D3	Terminal 4 status
	Terminal5Status	IBxx1D4	Terminal 5 status
	Terminal6Status	IBxx1D5	Terminal 6 status
	Terminal7Status	IBxx1D6	Terminal 7 status
	Terminal8Status	IBxx1D7	Terminal 8 status
	Terminal9Status	IBxx1D8	Terminal 9 status
	Terminal10Status	IBxx1D9	Terminal 10 status
	Terminal11Status	IBxx1DA	Terminal 11 status
	Terminal12Status	IBxx1DB	Terminal 12 status
Inverter		-	Inverter
	InverterAlarmMonitorNumber	OWxx32	Inverter alarm monitor number
	AuxiliaryInverterAlarmMonitorNumber	OWxx33	Auxiliary inverter alarm monitor number
	InverterType	IWxx50	Inverter/type
	InverterSoftwareVersionCommunication-Board	OWxx60	Inverter/software version (option)
	InverterSoftwareVersionMain	IWxx68	Inverter/software version (main)

Variable		Register	Comments
InverterParameter		-	Inverter parameter
	Command	-	Inverter command parameter
	InverterUserConstantNumber	OWxx3C	Inverter user constant number
	InverterUserConstantNumberSize	OWxx3D	Inverter user constant number size
	InverterUserConstantSetPoint1	OWxx3E	Inverter user constant set point 1
	InverterUserConstantSetPoint2	OWxx3F	Inverter user constant set point 2
	InverterUserConstantSetPoint3	OWxx40	Inverter user constant set point 3
	InverterUserConstantSetPoint4	OWxx41	Inverter user constant set point 4
	InverterUserConstantNumber	IWxx3C	Inverter user constant number
	UserInverterConstantReadingData1	IWxx3E	Inverter user constant reading data 1
	UserInverterConstantReadingData2	IWxx3F	Inverter user constant reading data 2
	UserInverterConstantReadingData3	IWxx40	Inverter user constant reading data 3
	UserInverterConstantReadingData4	IWxx41	Inverter user constant reading data 4
	SubCommand	-	Inverter sub command parameter
	AuxiliaryInverterUserConstantNumber	OWxx42	Auxiliary inverter user constant number
	AuxiliaryInverterUserConstantNumberSize	OWxx43	Auxiliary inverter user constant number size
	AuxiliaryInverterUserConstantSetPoint1	OWxx44	Auxiliary inverter user constant set point 1
	AuxiliaryInverterUserConstantSetPoint2	OWxx45	Auxiliary inverter user constant set point 2
	AuxiliaryInverterUserConstantSetPoint3	OWxx46	Auxiliary inverter user constant set point 3
	AuxiliaryInverterUserConstantSetPoint4	OWxx47	Auxiliary inverter user constant set point 4
	FixedParameterNumber	OWxx48	Fixed parameter number
	AuxiliaryInverterUserConstantNumber	IWxx42	Auxiliary inverter user constant number
	AuxiliaryInverterUserConstantReadingData1	IWxx44	Auxiliary inverter user constant reading data 1
AuxiliaryInverterUserConstantReadingData2	IWxx45	Auxiliary inverter user constant reading data 2	
AuxiliaryInverterUserConstantReadingData3	IWxx46	Auxiliary inverter user constant reading data 3	
AuxiliaryInverterUserConstantReadingData4	IWxx47	Auxiliary inverter user constant reading data 4	
FixedParameterMonitor	IWxx48	Fixed parameter monitor	

Variable	Register	Comments
TransmissionReference	-	Transmission
TransmissionReferenceOutputData0	OWxx70	Transmission reference output data 0
TransmissionReferenceOutputData1	OWxx71	Transmission reference output data 1
TransmissionReferenceOutputData2	OWxx72	Transmission reference output data 2
TransmissionReferenceOutputData3	OWxx73	Transmission reference output data 3
TransmissionReferenceOutputData4	OWxx74	Transmission reference output data 4
TransmissionReferenceOutputData5	OWxx75	Transmission reference output data 5
TransmissionReferenceOutputData6	OWxx76	Transmission reference output data 6
TransmissionReferenceOutputData7	OWxx77	Transmission reference output data 7
TransmissionReferenceOutputData8	OWxx78	Transmission reference output data 8
TransmissionReferenceOutputData9	OWxx79	Transmission reference output data 9
TransmissionReferenceOutputData10	OWxx7A	Transmission reference output data 10
TransmissionReferenceOutputData11	OWxx7B	Transmission reference output data 11
TransmissionReferenceOutputData12	OWxx7C	Transmission reference output data 12
TransmissionReferenceOutputData13	OWxx7D	Transmission reference output data 13
TransmissionReferenceOutputData14	OWxx7E	Transmission reference output data 14
TransmissionReferenceOutputData15	OWxx7F	Transmission reference output data 15
TransmissionReferenceInputData0	IWxx70	Transmission reference input data 0
TransmissionReferenceInputData1	IWxx71	Transmission reference input data 1
TransmissionReferenceInputData2	IWxx72	Transmission reference input data 2
TransmissionReferenceInputData3	IWxx73	Transmission reference input data 3
TransmissionReferenceInputData4	IWxx74	Transmission reference input data 4
TransmissionReferenceInputData5	IWxx75	Transmission reference input data 5
TransmissionReferenceInputData6	IWxx76	Transmission reference input data 6
TransmissionReferenceInputData7	IWxx77	Transmission reference input data 7
TransmissionReferenceInputData8	IWxx78	Transmission reference input data 8
TransmissionReferenceInputData9	IWxx79	Transmission reference input data 9
TransmissionReferenceInputData10	IWxx7A	Transmission reference input data 10
TransmissionReferenceInputData11	IWxx7B	Transmission reference input data 11
TransmissionReferenceInputData12	IWxx7C	Transmission reference input data 12
TransmissionReferenceInputData13	IWxx7D	Transmission reference input data 13
TransmissionReferenceInputData14	IWxx7E	Transmission reference input data 14
TransmissionReferenceInputData15	IWxx7F	Transmission reference input data 15

(3) SVR-Module Variables

Variable		Register	Comments
ServoOn		OBxx000	Servo ON
AlarmClear		OBxx00F	Alarm clear
Ready		IBxx000	Motion controller operation ready
Running		IBxx001	Running
UnitsSelection		OWxx03	Function 1
MotionCommand		-	Motion command
	CommandCode		OWxx08
	ResponseCode		IWxx08
	Control		OWxx09
		Pause	OBxx090
		Abort	OBxx091
		Direction	OBxx092
	Status		IWxx09
		Busy	IBxx090
		Hold	IBxx091
		Fail	IBxx093
Complete		IBxx098	
MotionSubCommand		-	
	CommandCode		OWxx0A
	ResponseCode		IWxx0A
	Status		IWxx0B
		Busy	IBxx0B0
		Fail	IBxx0B3
		Complete	IBxx0B8
Position		-	
	Command		-
		MoveType	OBxx095
		Position	OLxx1C
		StepDistance	OLxx44
	Setting		-
	ZEROWidth	OWxx3D	
	Status		-
		DEN	IBxx0C0
		POSCOMP	IBxx0C1
		NEAR	IBxx0C3
		ZERO	IBxx0C4
		ZRNC	IBxx0C5
	Monitor		-
		TPOS	ILxx0E
		CPOS	ILxx10
		MPOS	ILxx12
		APOS	ILxx16
		IncPosition	ILxx1C
		Turns	ILxx1E

Variable		Register	Comments	
	Coordinate	-	Coordinate	
		MachineOffset	OLxx48	Zero point offset
		WorkOffset	OLxx4A	Work coordinate system offset
		PresetRequest	OBxx006	POSMAX preset
		PresetTurns	OLxx4C	Preset data of POSMAX turns
	PresetComplete	IBxx0C9	POSMAX turn number presetting completed (TPRSE)	
Speed		-	Speed	
	Speed	OLxx10	Speed reference	
	SecondlySpeedCompensation	OLxx16	Secondary speed compensation	
	Acceleration	OLxx36	Linear acceleration time	
	Deceleration	OLxx38	Linear deceleration time	
	S_CurveTime	OWxx3A	S-curve acceleration time	
	BiasSpeedForExponentialAcceleration-DecelerationFilter	OWxx3B	Bias speed for exponential acceleration/deceleration filter	
	FeedbackSpeed	ILxx40	Feedback speed	
Torque		-	Torque	
	Torque	OLxx0C	Torque reference	
	TorqueMonitor	ILxx42	Torque reference monitor	
Gain		-	Gain	
	SpeedCompensation	OWxx31	Speed compensation	
Alarm		IWxx04	Alarm	
	ServoOff	IBxx045	Servo OFF	
	ParameterNumber	IWxx01	Over range parameter number	
	SettingParameter	IBxx021	Setting parameter error	
	FixedParameter	IBxx022	Fixed parameter error	
	MotionCommand	IBxx024	Motion command setting error	
ServoParameter		-	Servo parameter	
	MotionSubCommand	-	Motion sub command parameter	
		FixParameterNumber	OWxx5C	Fixed parameter number
		FixParameterValue	ILxx56	Fixed parameter monitor

(4) SVA-Module Variables

Variable		Register	Comments		
ServoOn		OBxx000	Servo ON		
MLOCK		OBxx001	Machine lock		
AlarmClear		OBxx00F	Alarm clear		
Ready		IBxx000	Motion controller operation ready		
Running		IBxx001	Running		
ServoReady		IBxx003	Servo ready		
MLKL		IBxx0C6	Machine lock ON (MLKL)		
AbsoluteEncoderCumulativeRevolutions		ILxx4A	Number of accumulated rotations of absolute encoder		
InitialNumberOfIncrementalPulses		ILxx4C	Number of initial incremental pulses		
UnitsSelection		OWxx03	Function 1		
SignalSelection		OWxx04	Function 2		
MotionCommand		-	Motion command		
	CommandCode		OWxx08	Motion command	
	ResponseCode		IWxx08	Motion command response code	
	Control		OWxx09	Motion command control flag	
		Pause		OBxx090	Command pause
		Abort		OBxx091	Command abort
		Direction		OBxx092	JOG/STEP direction
	Status		IWxx09	Motion command status	
		Busy		IBxx090	Motion command executing (BUSY) flag
		Hold		IBxx091	Motion command hold completed (HOLD)
		Fail		IBxx093	Motion command error occurrence (FAIL)
Complete		IBxx098	Motion command execution completed (COMPLETE)		
MotionSubCommand		-	Motion sub command		
	CommandCode		OWxx0A	Motion sub command	
	ResponseCode		IWxx0A	Motion sub command response code	
	Status		IWxx0B	Motion sub command status	
		Busy		IBxx0B0	Motion sub command executing (BUSY) flag
		Fail		IBxx0B3	Motion sub command error occurrence (FAIL)
		Complete		IBxx0B8	Motion sub command execution completed (COMPLETE)

Variable		Register	Comments	
Position		-	Position	
	Command		Position reference	
	MoveType	OBxx095	Position reference type	
	PhaseCompensationType	OBxx096	Phase compensation type with an electronic cam	
	Position	OLxx1C	Position reference setting	
	PositionCompensation	OLxx24	Position compensation	
	StepDistance	OLxx44	STEP distance	
	EXPOffset	OLxx46	External positioning move distance	
	PhaseCompensation	OLxx28	Phase compensation	
	PhasePositionLoopEnable	OBxx051	Disable phase reference generation	
	AbsoluteReadRequest	OBxx005	Absolute position reading demand	
	Setting		-	Position setting
	POSCOMPWidth	OLxx1E	Position completed width	
	NEARWidth	OLxx20	Position completed width 2	
	ZEROWidth	OWxx3D	Home window	
	POSCOMPTimeOut	OWxx26	Position complete timeout	
	PERRLevel	OBxx010	Deviation abnormal detection error level	
	Position.Setting.PER-RLimit	OLxx22	Deviation abnormal detection value	
	Status		-	Position status
	DEN	IBxx0C0	Distribution completed (DEN)	
	POSCOMP	IBxx0C1	Positioning completed (POSCOMP)	
	NEAR	IBxx0C3	Position proximity (NEAR)	
	ZERO	IBxx0C4	Zero point position (ZERO)	
	ZRNC	IBxx0C5	Zero point return (Setting) completed (ZRNC)	
	AbsolutePositionRead-Completed	IBxx0C7	Absolute position read completed	
	RotationalDirectionOfAbsoluteEncoder	IBxx0CA	Report of rotating direction when absolute encoder is used	
	Monitor		-	Position monitor
	TPOS	ILxx0E	Machine coordinate target position (TPOS)	
	CPOS	ILxx10	Target position (CPOS)	
	MPOS	ILxx12	Machine coordinate system position (MPOS)	
	APOS	ILxx16	Machine coordinate feedback position (APOS)	
	LPOS	ILxx18	Machine coordinate latch position (LPOS)	
	PERR	ILxx1A	Position error (PERR)	
IncPosition	ILxx1C	Target position difference monitor		
Turns	ILxx1E	POSMAX number of turns		
Latch		-	Latch	
Enable	OBxx004	Latch request		
ZoneEnable	OBxx094	Latch zone enable		
ZoneLowerLimit	OLxx2A	Latch zone lower limit setting		
ZoneUpperLimit	OLxx2C	Latch zone upper limit setting		
LCOMP	IBxx0C2	Latch completed (LCOMP)		

Variable		Register	Comments
	Coordinate	-	Coordinate
	MachineOffset	OLxx48	Zero point offset
	WorkOffset	OLxx4A	Work coordinate system offset
	PresetRequest	OBxx006	POSMAX preset
	PresetTurns	OLxx4C	Preset data of POSMAX turns
	PresetComplete	IBxx0C9	POSMAX turn number presetting completed (TPRSE)
	AbsEncoder	-	ABS encoder
	AbsDataRestore	OBxx007	Infinite length axis position information LOAD request
	AbsDataRestored	IBxx0C8	ABS system infinite length position control information (ABSLDE)
	SetEncoderPositionL	OLxx5E	Absolute position at power OFF (Lower 2 words)
	SetEncoderPositionH	OLxx60	Absolute position at power OFF (Upper 2 words)
	SetPulsePositionL	OLxx62	Modularized position at power OFF (Lower 2 words)
	SetPulsePositionH	OLxx64	Modularized position at power OFF (Upper 2 words)
	GetEncoderPositionL	ILxx5E	Absolute position at power OFF (Lower 2 words)
	GetEncoderPositionH	ILxx60	Absolute position at power OFF (Upper 2 words)
GetPulsePositionL	ILxx62	Modularized position at power OFF (Lower 2 words)	
GetPulsePositionH	ILxx64	Modularized position at power OFF (Upper 2 words)	
Speed	-	Speed	
SpeedAmendsDuringPositionControl	OBxx012	Speed amends is effective at the position command	
Speed	OLxx10	Speed reference	
ForwardSpeedLimit	OWxx12	Positive speed limit	
ReverseSpeedLimit	OWxx13	Negative speed limit	
TorqueLimit	OLxx14	Positive side limiting torque setting at speed reference	
SecondlySpeedCompensation	OLxx16	Secondary speed compensation	
Override	OWxx18	Speed override	
Acceleration	OLxx36	Linear acceleration time	
Deceleration	OLxx38	Linear deceleration time	
S_CurveTime	OWxx3A	S-curve acceleration time	
BiasSpeedForExponentialAcceleration-DecelerationFilter	OWxx3B	Bias speed for exponential acceleration/deceleration filter	
SpeedMonitor	ILxx20	Speed reference output monitor	
IntegralOutputMonitor	ILxx24	Integral output monitor	
PrimaryLagMonitor	ILxx26	Primary lag monitor	
PositionLoopOutputMonitor	ILxx28	Position loop output monitor	
FeedbackSpeed	ILxx40	Feedback speed	
Torque	-	Torque	
Torque	OLxx0C	Torque reference	
SpeedLimit	OWxx0E	Speed limit during torque reference	
TorqueReferencePrimaryLagFilter	OWxx33	Torque reference 1st-order lag filter	
TorqueMonitor	ILxx42	Feedback torque	

Variable		Register	Comments
ZeroPointReturn		-	Home return
	Method	OWxx3C	Home return method
	ApproachSpeed	OLxx3E	Approach speed
	CreepSpeed	OLxx40	Creep speed
	Direction	OBxx093	Home direction
	Offset	OLxx42	Home offset
	DecelerationLS	OBxx058	Deceleration LS signal selection
	ReverceLimit	OBxx059	Zero point return reverse run side limit signal selection
	ForwardLimit	OBxx05A	Zero point return forward run side limit signal selection
	InputSelect	OBxx05B	INPUT signal for zero point return
Gain		-	Gain
	IntegralClear	OBxx00B	Integration reset
	PositionLoop	OWxx2E	Position loop gain
	PositionFeedForward	OWxx30	Speed feed forward compensation
	SpeedCompensation	OWxx31	Speed compensation
	PositionIntegration	OWxx32	Position integration time constant
	PrimaryLagTimeConstant	OWxx33	Primary delay time constant
Alarm		IWxx04	Alarm
	ServoAlarm	IBxx040	Servo driver error
	P_OT	IBxx041	Positive overtravel
	N_OT	IBxx042	Negative overtravel
	P_SOT	IBxx043	Positive soft limit
	N_SOT	IBxx044	Negative soft limit
	ServoOff	IBxx045	Servo OFF
	POSCOMPTimeOut	IBxx046	Positioning time over
	SpeedOutOfRange	IBxx048	Excessive speed
	FollowingError	IBxx049	Excessively following error
	NotZRNC	IBxx04D	Zero point not set
	ABSEncoderOverrange	IBxx053	ABS encoder count exceeded
	PGDisconnectedError	IBxx054	PG disconnection error
	AccumulatedRotationsReceiveError	IBxx055	Receiving error of accumulated number of rotations
	MotionCommand	IBxx024	Motion command setting error
	P_OT	IBxx026	Positive overtravel
	N_OT	IBxx027	Negative overtravel
	AnalogAdjustNotReadyWarning	IBxx02B	Analog adjust not ready warning
ServoParameter		-	Servo parameter
	MotionSubCommand	-	Motion sub command parameter
	FixParameterNumber	OWxx5C	Fixed parameter number
	FixParameterValue	ILxx56	Fixed parameter monitor
GeneralPurposeAI		-	General-purpose AI
	A11	IWxx59	General-purpose AI monitor 1
	A12	IWxx5A	General-purpose AI monitor 2
GeneralPurposeAO		-	General-purpose AO
	AO1	OWxx1A	General-purpose AO1
	AO2	OWxx1B	General-purpose AO2

Variable		Register	Comments
GeneralPurposeDIMonitor		IWxx58	General-purpose DI monitor
	DI_0	IBxx580	General-purpose DI_0
	DI_1	IBxx581	General-purpose DI_1
	DI_2	IBxx582	General-purpose DI_2
	DI_3	IBxx583	General-purpose DI_3
	DI_4	IBxx584	General-purpose DI_4
	DI_5	IBxx585	General-purpose DI_5
	PGDisconnectedStatus	IBxx587	PG wire breaking down status
GeneralPurposeDO		OWxx5D	General-purpose DO
	DO_0	OBxx5D0	General-purpose DO_0
	DO_1	OBxx5D1	General-purpose DO_1
	DO_2	OBxx5D2	General-purpose DO_2
	DO_3	OBxx5D3	General-purpose DO_3
	DO_4	OBxx5D4	General-purpose DO_4
	DO_5	OBxx5D5	General-purpose DO_5

(5) PO-Module Variables

Variable		Register	Comments	
ServoOn		OBxx000	Servo ON	
MLOCK		OBxx001	Machine lock	
AlarmClear		OBxx00F	Alarm clear	
Ready		IBxx000	Motion controller operation ready	
Running		IBxx001	Running	
MLKL		IBxx0C6	Machine lock ON (MLKL)	
UnitsSelection		OWxx03	Function 1	
MotionCommand		-	Motion command	
	CommandCode	OWxx08	Motion command	
	ResponseCode	IWxx08	Motion command response code	
	ResponseAlarmCode	IWxx30	Motion command response alarm code	
	InverterAlarmCode	IWxx32	Inverter alarm code	
	Control	OWxx09	Motion command control flag	
		Pause	OBxx090	Command pause
		Abort	OBxx091	Command abort
		Direction	OBxx092	JOG/STEP direction
	Status	IWxx09	Motion command status	
		Busy	IBxx090	Motion command executing (BUSY) flag
		Hold	IBxx091	Motion command hold completed (HOLD)
		Fail	IBxx093	Motion command error occurrence (FAIL)
		Complete	IBxx098	Motion command execution completed (COMPLETE)
	Command		-	Command
	CommandCode	OWxx08	Command	
	ResponseCode	IWxx08	Command response code	
	ResponseAlarmCode	IWxx30	Response alarm code	
	InverterAlarmCode	IWxx32	Inverter alarm code	
	Control	OWxx09	Command control flag	
		Pause	OBxx090	Command pause
		Abort	OBxx091	Command abort
		Direction	OBxx092	JOG/STEP direction
	Status	IWxx09	Command status	
		Busy	IBxx090	Command executing (BUSY) flag
		Hold	IBxx091	Command hold completed (HOLD)
		Fail	IBxx093	Command error occurrence (FAIL)
		Complete	IBxx098	Command execution completed (COMPLETE)
	MotionSubCommand		-	Motion sub command
	CommandCode	OWxx0A	Motion sub command	
	ResponseCode	IWxx0A	Motion sub command response code	
	AuxiliaryInverterAlarmCode	IWxx33	Auxiliary inverter alarm code	
	Status	IWxx0B	Motion sub command status	
		Busy	IBxx0B0	Motion sub command executing (BUSY) flag
		Fail	IBxx0B3	Motion sub command error occurrence (FAIL)
		Complete	IBxx0B8	Motion sub command execution completed (COMPLETE)
	SubCommandResponseStatus	IWxx31	Motion sub command response status	
		SubCommandAlarm	IBxx310	Motion sub command alarm
		SubCommandWarning	IBxx311	Motion sub command warning
		SubCommandReady	IBxx312	Motion sub command ready

Variable		Register	Comments	
SubCommand		-	Sub command	
	CommandCode	OWxx0A	Sub command	
	ResponseCode	IWxx0A	Sub command response code	
	AuxiliaryInverterAlarmCode	IWxx33	Auxiliary inverter alarm code	
	Status	IWxx0B	Sub command status	
	Busy	Fail	IBxx0B3	Sub command error occurrence (FAIL)
		Complete	IBxx0B8	Sub command execution completed (COMPLETE)
		SubCommandResponseStatus	IWxx31	Sub command response status
	SubCommandAlarm	SubCommandWarning	IBxx311	Sub command warning
		SubCommandReady	IBxx312	Sub command ready
		Position		-
Command		-	Position reference	
	MoveType	OBxx095	Position reference type	
	PhaseCompensationType	OBxx096	Phase compensation type with a electronic cam	
	Position	OLxx1C	Position reference setting	
	PositionCompensation	OLxx24	Position compensation	
	StepDistance	OLxx44	STEP distance	
	EXPOffset	OLxx46	External positioning move distance	
	PhaseCompensation	OLxx28	Phase compensation	
	PhasePositionLoopEnable	OBxx051	Disable phase reference generation	
	AbsoluteReadRequest	OBxx005	Absolute position reading demand	
Setting		-	Position setting	
	POSCOMPWidth	OLxx1E	Position completed width	
	NEARWidth	OLxx20	Position completed width 2	
	ZEROWidth	OWxx3D	Home window	
	POSCOMPTimeOut	OWxx26	Position complete timeout	
	PERRLevel	OBxx010	Deviarion abnormal detection error level	
	Position.Setting.PER-RLimit	OLxx22	Deviation abnormal detection value	
Status		-	Position status	
	DEN	IBxx0C0	Distribution completed (DEN)	
	POSCOMP	IBxx0C1	Positioning completed (POSCOMP)	
	NEAR	IBxx0C3	Position proximity (NEAR)	
	ZERO	IBxx0C4	Zero point position (ZERO)	
	ZRNC	IBxx0C5	Zero point return (Setting) completed (ZRNC)	
Monitor		-	Position monitor	
	TPOS	ILxx0E	Machine coordinate target position (TPOS)	
	CPOS	ILxx10	Target position (CPOS)	
	MPOS	ILxx12	Machine coordinate system position (MPOS)	
	APOS	ILxx16	Machine coordinate feedback position (APOS)	
	Turns	ILxx1E	POSMAX number of turns	
Coordinate		-	Coordinate	
	MachineOffset	OLxx48	Zero poing offset	
	WorkOffset	OLxx4A	Work coordinate system offset	
	PresetRequest	OBxx006	POSMAX preset	
	PresetTurns	OLxx4C	Preset data of POSMAX turns	
	PresetComplete	IBxx0C9	POSMAX turn number presetting completed (TPRSE)	

Variable		Register	Comments
Speed		-	Speed
	Speed	OLxx10	Speed reference
	Override	OWxx18	Speed override
	BiasSpeed	OWxx19	Bias speed
	Acceleration	OLxx36	Linear acceleration time
	Deceleration	OLxx38	Linear deceleration time
	S_CurveTime	OWxx3A	S-curve acceleration time
	BiasSpeedForExponentialAcceleration- DecelerationFilter	OWxx3B	Bias speed for exponential acceleration/decelera- tion filter
	SpeedMonitor	ILxx20	Speed reference output monitor
ZeroPointReturn		-	Home return
	Method	OWxx3C	Home return type
	ApproachSpeed	OLxx3E	Approach speed
	CreepSpeed	OLxx40	Creep speed
	Direction	OBxx093	Home direction
	Offset	OLxx42	Home offset
	DecelerationLS	OBxx058	Deceleration LS signal selection
	ReverseLimit	OBxx059	Zero point return reverse run side limit signal selection
	ForwardLimit	OBxx05A	Zero point return forward run side limit signal selection
Alarm		IWxx04	Alarm
	P_SOT	IBxx043	Positive soft limit
	N_SOT	IBxx044	Negative soft limit
	ServoOff	IBxx045	Servo OFF
	SpeedOutOfRange	IBxx048	Excessive speed
	NotZRNC	IBxx04D	Zero point not set
Warning		ILxx02	Warning
	ParameterNumber	IWxx01	Over range parameter number
	SettingParameter	IBxx021	Setting parameter error
	FixedParamter	IBxx022	Fixed parameter error
	MotionCommand	IBxx024	Motion command setting error
ServoParameter		-	Servo parameter
	MotionSubCommand		-
		FixParameterNumber	OWxx5C
		FixParameterValue	ILxx56
GeneralPurposeDIMonitor		IWxx58	General-purpose DI monitor
	DI_0	IBxx580	General-purpose DI_0
	DI_1	IBxx581	General-purpose DI_1
	DI_2	IBxx582	General-purpose DI_2
	DI_3	IBxx583	General-purpose DI_3
	DI_4	IBxx584	General-purpose DI_4
GeneralPurposeDO		OWxx5D	General-purpose DO
	DO_1	OBxx5D1	General-purpose DO_1
	DO_2	OBxx5D2	General-purpose DO_2
	DO_3	OBxx5D3	General-purpose DO_3

A.3 I/O Variables

The names and models of the I/O Modules that are used for I/O variables are listed below. Refer to the table on the reference page for related variables.

I/O Module Name	I/O Module Model	Reference Page
IO	*1	A-27
LIO-01, LIO-02	JAPMC-IO2300, JAPMC-IO2301	A-28
CNTR	*2	A-28
LIO-04, LIO-05	JAPMC-IO2303, JAPMC-IO2304	A-29
LIO-06	JAPMC-IO2305-E	A-29
DO-01	JAMP-DO2300	A-30
AI-01	JAPMC-AN2300	A-30
AO-01	JAPMC-AN2310-E	A-30
CNTR-01	JAPMC-PL2300-E	A-31
MECHATROLINK Distributed I/O		
24-VDC 64-point I/O	JEPMC-IO350, JEPMC-IO2310/2330	A-33
24-VDC 128-point I/O	JEPMC-IO2320	A-33
Reversible Counter 2-channel	120EHC21140, JEPMC-PL2900	A-34
Pulse Output 2-channel	120MMB20230, JEPMC-PL2910	A-35
Analog Input	120AVI02030, JEPMC-AN2900	A-37
Analog Output	120AVO01030, JEPMC-AN2910	A-37
100/200-VAC 8-point Output	120DAO83330	A-37
100/200-VAC 8-point Input	120DAI53330, 120DAI73330	A-38
Wide-range voltage relay contact, 8-point Output	120DRA83030	A-37
24-VDC 16-point Input	120DDI34330, JAMSCIO2900	A-38
24-VDC 16-point Output	120DDO34340, JAMSCIO2910	A-38

* 1. Built in the CPU of the Machine Controller (MP2100/MP2500, MP2100M/MP2500M, and MP2300)

* 2. Counter function of LIO-01/LIO-02 Module

- Register "IW (IB/IL/IF/IA) xx00" indicates the leading input register address + 00.
- Register "OW (OB/OL//OF/OA) xx00" indicates the leading output register address + 00.

The variables for the I/O Modules listed above are described below.

(1) I/O Module Variables

Variable	Register	Comments
IO_IN	IAxx00	Local I/O, 16 inputs
DI_00	IBxx000	Input 0
⋮	⋮	⋮
DI_15	IBxx00F	Input 15
IO_OUT	OAXx01	Local I/O, 16 outputs
DO_00	OBxx010	Output 0
⋮	⋮	⋮
DO_15	OBxx01F	Output 15

(2) LIO-01 Module Variables

Variable		Register	Comments
LIO_IN		IAxx00	Local I/O, 16 inputs
	DI_00	IBxx000	Input 0
	⋮	⋮	⋮
	DI_15	IBxx00F	Input 15
LIO_OUT		OAx01	Local I/O, 16 outputs
	DO_00	OBxx010	Output 0
	⋮	⋮	⋮
	DO_15	OBxx01F	Output 15

(3) CNTR Module Variables

Variable		Register	Comments	
CNTR_IN		IAxx00	Counter Input	
	RUNSTS		IWxx00	Status
		DataError	IBxx000	Data Setting Error
		FixedParameterError	IBxx001	Fixed Parameter Error
		PresetCompleted	IBxx002	Count Value Preset Completed
		PIlatchCompleted	IBxx003	PI Latch Completed
		PulseAB0	IBxx004	Pulse-A/B 0
		CoincidenceSignal	IBxx005	Coincidence Detection
		PulseAStatus	IBxx006	Phase-A Status
		PulseBStatus	IBxx007	Phase-B Status
		WritingFixedParameter	IBxx009	Writing Fixed Parameter
		DisconnectedAlarm	IBxx00A	Disconnect Alarm
		POSMAXCompleted	IBxx00C	POSMAX Turns Preset Completed
		ModuleReady	IBxx00F	Module Ready
		PDV	ILxx02	Incremental pulses
		PFB	ILxx04	Counter Value
		FREQ	ILxx06	PI latch Value
		PDVG	ILxx08	Incremental Pulse After Conversion
		PFBG	ILxx0A	Current Count Value After Conversion
		FREQG	ILxx0C	PI Latch Value After Conversion
	POSMAX	ILxx0E	Number of POSMAX Turns	
	FeedBackSpeed	ILxx10	Feedback Speed	
CNTR_OUT		OAx00	Counter Output	
	RUNMOD		OWxx00	Command Settings
		Prohibited	OBxx000	Count Disable
		PresetRequest	OBxx001	Count Preset Request
		PIlatchRequest	OBxx002	PI Latch Detection Request
		CoincidenceRequest	OBxx003	Coincidence Detection Request
		POSMAXRequest	OBxx004	POSMAX Turns Preset Request
		FunctionSelections	OWxx01	Function Selection
		PPSDAT	OLxx02	Count Preset Value
		COINDAT	OLxx04	Coincidence Detection Value
		POSMAX	OLxx06	POSMAX Turns Preset Value

(4) LIO-04, LIO-05 Module Variables

Variable		Register	Comments
LIO32_IN		IAxx00	Local I/O, 32 inputs
	DI_00	IBxx000	Input 0
	⋮	⋮	⋮
	DI_31	IBxx01F	Input 31
LIO32_OUT		OAx00	Local I/O, 32 outputs
	DO_00	OBxx000	Output 0
	⋮	⋮	⋮
	DO_31	OBxx01F	Output 31

(5) LIO-06 Module Variables

Variable		Register	Comments	
DIO_IN		IAxx00	Digital 8 inputs	
	DI_00	IBxx000	Input 0	
	⋮	⋮	⋮	
	DI_07	IBxx007	Input 7	
DIO_OUT		OAx00	Digital 8 outputs	
	DO_00	OBxx000	Output 0	
	⋮	⋮	⋮	
	DO_07	OBxx007	Output 7	
AI_IN		IAxx01	Analog inputs	
	CH1	IWxx01	Analog input CH1	
AVO_OUT		OAx01	Analog outputs	
	CH1	OWxx01	Analog output CH1	
CNTR_IN		IAxx00	Counter inputs	
	RUNSTS		IWxx00	Status
		DataError	IBxx000	Data Setting Error
		FixedParameterError	IBxx001	Fixed Parameter Setting Error
		PresetCompleted	IBxx002	Count Value Preset Completed
		PIlatchCompleted	IBxx003	PI Latch Completed Signal
		PulseAB0	IBxx004	Pulse A/B 0
		CoincidenceSignal	IBxx005	Coincidence Detection Signal
		PulseAStatus	IBxx006	Pulse-A Status Display
		PulseBStatus	IBxx007	Pulse-B Status Display
		WritingFixedParameter	IBxx009	Writing Fixed Parameter
		DisconnectedAlarm	IBxx00A	Disconnect Alarm
		POSMAXCompleted	IBxx00C	POSMAX Turn Number Presetting Completed
	ModuleReady	IBxx00F	Module Ready	
	PDV		ILxx02	Number of Incremental Pulses
	PFB		ILxx04	Current Counter Value
	FREQ		ILxx06	PI Latch Data
	PDVG		ILxx08	Number of Incremental Pulses after Conversion
	PFBG		ILxx0A	Current Counter Value after Conversion
	FREQG		ILxx0C	PI Latch Data after Conversion
POSMAX		ILxx0E	POSMAX Turn Number	
FeedBackSpeed		ILxx10	Feedback Speed	

Variable		Register	Comments	
CNTR_OUT		OAx00	Counter Output	
	RUNMOD	OWxx00	Command Settings	
		Prohibited	OBxx000	Count Prohibited
		PresetRequest	OBxx001	Count Preset Request
		PILatchRequest	OBxx002	PI Latch Detection Request
		CoincidenceRequest	OBxx003	Coincidence Detection Request
		POSMAXRequest	OBxx004	POSMAX Turn Number Presetting Demand
	FunctionSelections	OWxx01	Function Selections	
	PPSDAT	OLxx02	Count Preset Data	
	COINDAT	OLxx04	Coincidence Detection Setting	
POSMAX	OLxx06	Preset Data of POSMAX Turns		

(6) DO-01 Module Variables

Variable		Register	Comments
DO_OUT		OAx00	Digital outputs
	DO_00	OBxx000	Output 0
	⋮	⋮	⋮
	DO_63	OBxx03F	Output 63

(7) AI-01 Module Variables

Variables		Register	Comments
AI_IN		IAxx00	Analog inputs
	CH1	IWxx00	Analog input CH1
	⋮	⋮	⋮
	CH8	IWxx07	Analog input CH8

(8) AO-01 Module Variables

Variable		Register	Comments
AVO_OUT		OAx00	Analog outputs
	CH1	OWxx00	Analog output CH1
	⋮	⋮	⋮
	CH4	OWxx03	Analog output CH4

(9) CNTR-01 Module Variables

Variable		Register	Comments
CNTR1_IN		IAxx00	1 Channel Counter Input
	RUNSTS	IWxx00	Status
	DataError	IBxx000	Data Setting Error
	FixedParameterError	IBxx001	Fixed Parameter Error
	PresetCompleted	IBxx002	Count Value Preset Completed
	PIlatchCompleted	IBxx003	PI Latch Completed
	Pulse0	IBxx004	Pulse A/B 0
	CoincidenceSignal	IBxx005	Coincidence Detection
	PulseAStatus	IBxx006	Phase-A Status
	PulseBStatus	IBxx007	Phase-B Status
	PulseCStatus	IBxx008	Phase-C Status
	WritingFixedParameter	IBxx009	Writing Fixed Parameter
	DisconnectedAlarm	IBxx00A	Disconnect Alarm
	POSMAXCompleted	IBxx00C	POSMAX Turns Preset Completed
	MultipurposeSignal	IBxx00D	Multipurpose Signal
	ModuleReady	IBxx00F	Module Ready
	IncrementalPulses	ILxx02	Incremental Pulses
	CounterValue	ILxx04	Counter Value
	PIlatchValue	ILxx06	PI Latch Data
	IncrementPulseAfterConversion	ILxx08	Incremental Pulse after Conversion
	CountValueAfterConversion	ILxx0A	Current Count Value After Conversion
	PIlatchValueAfterConversion	ILxx0C	PI Latch Data After Conversion
	POSMAXTurnsNumber	ILxx0E	Number of POSMAX Turns
	FeedBackSpeed	ILxx10	Feedback Speed
	DetectedFrequency	ILxx12	Detected Frequency
	AverageFrequency	ILxx14	Average Frequency
	SystemMonitor	ILxx1E	System Monitor
	CNTR1_OUT		OAx00
	RUNMODE	OWxx00	Operation Mode
	Prohibited	OBxx000	Count Disable
	PresetRequest	OBxx001	Count Preset Request
	PIlatchRequest	OBxx002	PI Latch Detection Request
	CoincidenceRequest	OBxx003	Coincidence Detection Request
	POSMAXRequest	OBxx004	POSMAX Turns Preset Request
	MultipurposeOutPut	OBxx005	Multipurpose Output
	FunctionSelections	OWxx01	Function Selection
	CountPresettingData	OLxx02	Count Preset Value
	AgreedDetectionValue	OLxx04	Coincidence Detection Value
	PresetDataPOSMAXTurns	OLxx06	POSMAX Turns Preset Value
	ZoneOutputMinimumValue	OLxx08	Minimum Value of Range of Zone Output
	ZoneOutputMaximumValue	OLxx0A	Maximum Value of Range of Zone Output
	SpeedCoincidenceDetectionSetting	OLxx0C	Speed Coincidence Detection Setting
	SpeedCoincidenceDetectionWidth	OLxx0E	Speed Coincidence Detection Width
	FrequencyCoincidenceDetectionSetting	OLxx10	Frequency Coincidence Detection Setting
	FrequencyCoincidenceDetectionWidth	OLxx12	Frequency Coincidence Detection Width
	AveragingCountSetting	OLxx14	Averaging Count Setting
	SystemMonitor	OLxx1E	System Monitor

Variable		Register	Comments
CNTR2_IN		IAxx20	2 Channel Counter Input
	RUNSTS	IWxx20	Status
	DataError	IBxx200	Data Setting Error
	FixedParameterError	IBxx201	Fixed Parameter Setting Error
	PresetCompleted	IBxx202	Count Value Preset Completed
	PILatchCompleted	IBxx203	PI Latch Completed
	Pulse0	IBxx204	Pulse-A/B 0
	CoincidenceSignal	IBxx205	Coincidence Detection
	PulseAStatus	IBxx206	Phase-A Status
	PulseBStatus	IBxx207	Phase-B Status
	PulseCStatus	IBxx208	Phase- C Status
	WritingFixedParameter	IBxx209	Writing Fixed Parameter
	DisconnectedAlarm	IBxx20A	Disconnect Alarm
	POSMAXCompleted	IBxx20C	POSMAX Turns Preset Completed
	MultipurposeSignal	IBxx20D	Multipurpose Signal
	ModuleReady	IBxx20F	Module Ready
	IncrementalPulses	ILxx22	Incremental Pulses
	CounterValue	ILxx24	Counter Value
	PILatchValue	ILxx26	PI Latch Value
	IncrementPulseAfterConversion	ILxx28	Incremental Pulse After Conversion
	CountValueAfterConversion	ILxx2A	Current Counter Value After Conversion
	PILatchValueAfterConversion	ILxx2C	PI Latch Value After Conversion
	POSMAXTurnsNumber	ILxx2E	Number of POSMAX Turns
	FeedBackSpeed	ILxx30	Feedback Speed
	DetectedFrequency	ILxx32	Detected Frequency
	AverageFrequency	ILxx34	Average Frequency
	SystemMonitor	ILxx3E	System Monitor
	CNTR2_OUT		OAx20
	RUNMODE	OWxx20	Operation Mode
	Prohibited	OBxx200	Count Disable
	PresetRequest	OBxx201	Count Preset Request
	PILatchRequest	OBxx202	PI Latch Detection Request
	CoincidenceRequest	OBxx203	Coincidence Detection Request
	POSMAXRequest	OBxx204	POSMAX Turns Preset Request
	MultipurposeOutPut	OBxx205	Multipurpose Output
	FunctionSelections	OWxx21	Function Selection
	CountPresettingData	OLxx22	Count Preset Value
	AgreedDetectionValue	OLxx24	Coincidence Detection Value
	PresetDataPOSMAXTurns	OLxx26	POSMAX Turns Preset Value
	ZoneOutputMinimumValue	OLxx28	Minimum Value of Range of Zone Output
	ZoneOutputMaximumValue	OLxx2A	Maximum Value of Range of Zone Output
	SpeedCoincidenceDetectionSetting	OLxx2C	Speed Coincidence Detection Setting
	SpeedCoincidenceDetectionWidth	OLxx2E	Speed Coincidence Detection Width
	FrequencyCoincidenceDetectionSetting	OLxx30	Frequency Coincidence Detection Setting
	FrequencyCoincidenceDetectionWidth	OLxx32	Frequency Coincidence Detection Width
	AveragingCountSetting	OLxx34	Averaging Count Setting
	SystemMonitor	OLxx3E	System Monitor

(10) MECHATROLINK Distributed I/O Module Variables

■ 24-VDC 64-point I/O Module

Variable		Register	Comments
IN1		ILxx00	Input Signal Connector 1
	IN01	IBxx000	Input 1
	⋮	⋮	⋮
	IN32	IBxx01F	Input 32
IN2		ILxx02	Input Signal Connector 2
	IN33	IBxx020	Input 33
	⋮	⋮	⋮
	IN64	IBxx03F	Input 64
OUT1		OLxx00	Output Signal Connector 1
	OUT01	OBxx000	Output 1
	⋮	⋮	⋮
	OUT32	OBxx01F	Output 32
OUT2		OLXX02	Output Signal Connector 2
	OUT33	OBxx020	Output 33
	⋮	⋮	⋮
	OUT64	OBxx03F	Output 64

■ 24-VDC 128-point I/O Module

Variable		Register	Comments
IN1		IWxx00	Input Signal Connector 1
	IN01	IBxx000	Input 1
	⋮	⋮	⋮
	IN64	IBxx03F	Input 64
IN2		IWxx04	Input Signal Connector 2
	IN65	IBxx040	Input 65
	⋮	⋮	⋮
	IN128	IBxx07F	Input 128
OUT1		OWxx00	Output Signal Connector 1
	OUT01	OBxx000	Output 1
	⋮	⋮	⋮
	OUT64	OBxx03F	Output 64
OUT2		OBxx04	Output Signal Connector 2
	OUT65	OBxx040	Output 65
	⋮	⋮	⋮
	OUT128	OBxx07F	Output 128

■ Reversible Counter 2-channel Module

Variable		Register	Comments	
IN		IAxx00	Input	
	Reserve1	IWxx00	Reserved for the System	
	Reserve2	IWxx01	Reserved for the System	
	InputRelay	IWxx02	Input Relays	
		RDY	IBxx020	Ready
		ACK	IBxx021	Setting Normal
		ERR	IBxx022	Error
		CARY1	IBxx028	Counter 1 Carry
		BORW1	IBxx029	Counter 1 Borrow
		N1	IBxx02A	Counter 1 Notch Output Status
		L1	IBxx02B	Counter 1 Latch Input Status
		CARY2	IBxx02C	Counter 2 Carry
		BORW2	IBxx02D	Counter 2 Borrow
		N2	IBxx02E	Counter 2 Notch Output Status
	L2	IBxx02F	Counter 2 Latch Input Status	
	InputRegsiterW1	IWxx03	Input Register Word1	
	InputRegsiterW2	IWxx04	Input Register Word2	
	InputRegsiterW3	IWxx05	Input Register Word3	
InputRegsiterW4	IWxx06	Input Register Word4		
InputRegsiterL1	ILxx03	Input Register Long1		
InputRegsiterL2	ILxx05	Input Register Long2		
OUT		OAx00	Output	
	ScanCounter	OWxx00	Scan Counter	
	Reserve1	OWxx01	Reserved for the System	
	OutputCoil1	OWxx02	Output Coil 1	
		M_SET1	OBxx020	Counter 1 Mode Set
		N_SET1	OBxx021	Counter 1 Notch Point Set
		P_SET1	OBxx022	Counter 1 Current Value Set
		C_ENB1	OBxx023	Counter 1 Count Enable
		N_ENB1	OBxx024	Counter 1 Notch Output Enable
		P_RES1	OBxx025	Counter 1 Current Value Reset
		N_RES1	OBxx026	Counter 1 Notch Output Reset
		L_RES1	OBxx027	Counter 1 Count Value Hold Reset
		M_SET2	OBxx028	Counter 2 Mode Set
		N_SET2	OBxx029	Counter 2 Notch Point Set
		P_SET2	OBxx02A	Counter 2 Current Value Set
		C_ENB2	OBxx02B	Counter 2 Count Enable
		N_ENB2	OBxx02C	Counter 2 Notch Output Enable
		P_RES2	OBxx02D	Counter 2 Current Value Reset
		N_RES2	OBxx02E	Counter 2 Notch Output Reset
		L_RES2	OBxx02F	Counter 2 Count Value Hold Reset

Variable		Register	Comments	
	OutputCoil2	OWxx03	Output Coil 2	
		N_ON1	OBxx030	Counter 1 Forced Notch Output
		N_ON2	OBxx031	Counter 2 Forced Notch Output
		MON1	OBxx038	Monitor 1
		MON2	OBxx039	Monitor 2
		MON3	OBxx03A	Monitor 3
	OutputRegsiterW1	OWxx04	Output Register Word1	
	OutputRegsiterW2	OWxx05	Output Register Word2	
	OutputRegsiterW3	OWxx06	Output Register Word3	
	OutputRegsiterW4	OWxx07	Output Register Word4	
	OutputRegsiterL1	OLxx04	Output Register Long1	
OutputRegsiterL2	OLxx06	Output Register Long2		

■ Pulse Output 2-channel Module

Variable		Register	Comments	
IN		IAxx00	Input	
	Reserve3	IWxx00	Reserved for the System	
	Reserve4	IWxx01	Reserved for the System	
	InputRelay1	IWxx02	Channel 1 Input Relays	
		RDY1	IBxx020	Channel 1 Ready
		MONSEL1	IBxx022	Channel 1 Monitor Parameters
		PACK1	IBxx024	Channel 1 Parameter Setting Normal
		PNACK1	IBxx025	Channel 1 Parameter Setting Error
		MOV1L	IBxx028	Channel 1 Positioning
		JOG1L	IBxx029	Channel 1 JOG Operation
		ZRN1L	IBxx02A	Channel 1 Zero Point Return
		OVER1	IBxx02C	Channel 1 Overheat Input Status
		TIMING1	IBxx02D	Channel 1 Magnetic Excitation Timing Input
		ZRN1	IBxx02E	Channel 1 Zero Point Signal Input Status
		IN1	IBxx02F	Channel 1 General-purpose Input Status
	InputRelay2	IWxx03	Channel 2 Input Relays	
		RDY2	IWxx030	Channel 2 Ready
		MONSEL2	IWxx032	Channel 2 Monitor Parameters
		PACK2	IWxx034	Channel 2 Parameter Setting Normal
		PNACK2	IWxx035	Channel 2 Parameter Setting Error
		MOV2L	IWxx038	Channel 2 Positioning
		JOG2L	IWxx039	Channel 2 JOG Operation
		ZRN2L	IWxx03A	Channel 2 Zero Point Return
		OVER2	IWxx03C	Channel 2 Overheat Input Status
		TIMING2	IWxx03D	Channel 2 Magnetic Excitation Timing Input
		ZRN2	IWxx03E	Channel 2 Zero Point Signal Input Status
		IN2	IWxx03F	Channel 2 General-purpose Input Status
	InputRegsiterW1	IWxx04	Input Register Word1	
	InputRegsiterW2	IWxx05	Input Register Word2	
	InputRegsiterW3	IWxx06	Input Register Word3	
	InputRegsiterW4	IWxx07	Input Register Word4	
	InputRegsiterL1	ILxx04	Input Register Long1	
	InputRegsiterL2	ILxx06	Input Register Long2	

Variable		Register	Comments
OUT		OAx00	Output
	Reserve1	OWxx00	Reserved for the System
	Reserve2	OWxx01	Reserved for the System
	OutputCoil1	OWxx02	Channel 1 Output Coils
	ARST1	OBxx020	Channel 1 Alarm Reset
	CAN1	OBxx021	Channel 1 Cancel
	MONSEL1	OBxx022	Channel 1 Monitor Selector
	PSET1	OBxx023	Channel 1 Parameter Set/Monitor Selector
	PRM10	OBxx024	Channel 1 Parameter Number 0
	PRM11	OBxx025	Channel 1 Parameter Number 1
	PRM12	OBxx026	Channel 1 Parameter Number 2
	PRM13	OBxx027	Channel 1 Parameter Number 3
	MOV1	OBxx028	Channel 1 Positioning
	JOG1	OBxx029	Channel 1 JOG Operation
	ZRN1	OBxx02A	Channel 1 Zero Point Return
	REV1	OBxx02B	Channel 1 JOG/Zero Point Return Direction
	COFF1	OBxx02D	Channel 1 Output Current OFF
	BFREE1	OBxx02E	Channel 1 Electromagnetic Brake Release
	OUT1	OBxx02F	Channel 1 General-purpose Output
	OutputCoil2	OWxx03	Channel 2 Output Coils
	ARST2	OBxx030	Channel 2 Alarm Reset
	CAN2	OBxx031	Channel 2 Cancel
	MONSEL2	OBxx032	Channel 2 Monitor Selector
	PSET2	OBxx033	Channel 2 Parameter Set/Monitor Selector
	PRM20	OBxx034	Channel 2 Parameter Number 0
	PRM21	OBxx035	Channel 2 Parameter Number 1
	PRM22	OBxx036	Channel 2 Parameter Number 2
	PRM23	OBxx037	Channel 2 Parameter Number 3
	MOV2	OBxx038	Channel 2 Positioning
	JOG2	OBxx039	Channel 2 JOG Operation
	ZRN2	OBxx03A	Channel 2 Zero Point Return
	REV2	OBxx03B	Channel 2 JOG/Zero Point Return Direction
	COFF2	OBxx03D	Channel 2 Output Current OFF
	BFREE2	OBxx03E	Channel 2 Electromagnetic Brake Release
	OUT2	OBxx03F	Channel 2 General-purpose Output
	OutputRegsiterW1	OWxx04	Output Register Word1
	OutputRegsiterW2	OWxx05	Output Register Word2
	OutputRegsiterW3	OWxx06	Output Register Word3
	OutputRegsiterW4	OWxx07	Output Register Word4
	OutputRegsiterL1	ILxx04	Output Register Long1
	OutputRegsiterL2	ILxx06	Output Register Long2

■ Analog Input Module

Variable		Register	Comments	
IN		IAxx00	Input	
	Reserve1	IWxx00	Reserved for the System	
	Reserve2	IWxx01	Reserved for the System	
	CH1	IWxx02	CH1 Analog Input Value	
	CH2	IWxx03	CH2 Analog Input Value	
	CH3	IWxx04	CH3 Analog Input Value	
	CH4	IWxx05	CH4 Analog Input Value	
	Status	IWxx06	Input Signal Status	
		CH1	IBxx061	CH1 Input Signal Status
		CH2	IBxx062	CH2 Input Signal Status
		CH3	IBxx063	CH3 Input Signal Status
	CH4	IBxx064	CH4 Input Signal Status	
OUT		OAx00	Output	
	Reserve1	OWxx00	Reserved for the System	
	Reserve2	OWxx01	Reserved for the System	

■ Analog Output Module

Variable		Register	Comments
IN		IAxx00	Input
	Reserve1	IWxx00	Reserved for the System
	Reserve2	IWxx01	Reserved for the System
OUT		OAx00	Output
	Reserve1	OWxx00	Reserved for the System
	Reserve2	OWxx01	Reserved for the System
	CH1	OWxx02	CH1 Analog Output Value
	CH2	OWxx03	CH2 Analog Output Value

■ 100/200-VAC 8-point Output Module

Variable		Register	Comments
OUT		OWxx00	Outputs
	OUT01	OBxx008	Output 1
	⋮	⋮	⋮
	OUT08	OBxx00F	Output 8

■ 100/200-VAC 8-point Input Module

Variable		Register	Comments
IN		IWxx00	Inputs
	IN01	IBxx000	Input 1
	⋮	⋮	⋮
	IN08	IBxx007	Input 8

■ Wide-range Voltage Relay Contact, 8-point Output

Variable		Register	Comments
OUT		OWxx00	Outputs
	OUT01	OBxx008	Output 1
	⋮	⋮	⋮
	OUT08	OBxx00F	Output 8

■ 24-VDC 16-point Input Module

IN		IWxx00	Inputs
	IN01	IBxx000	Input 1
	⋮	⋮	⋮
	IN16	IBxx00F	Input 16

■ 24-VDC 16-point Output Module

OUT		OWxx00	Outputs
	OUT01	OBxx000	Output 1
	⋮	⋮	⋮
	OUT16	OBxx00F	Output 16

A.4 System Structures

The following table lists the variables included in each system structure.

- "*" corresponds to M, D, or A registers.
- Register *W (B/L/F/A) xxx00 indicates the leading register address +00.

System Structure Name	Variable Name	Resister	Comments
PI_W:PI Control (integer type)	RLY	*Wxxx00	Relay I/O
	RLY.IRST	*Bxxx000	Integration reset
	Kp	*Wxxx01	P gain
	Ki	*Wxxx02	Integration adjustment gain
	Ti	*Wxxx03	Integration time
	IUL	*Wxxx04	Upper integration limit
	ILL	*Wxxx05	Lower integration limit
	UL	*Wxxx06	Upper PI limit
	LL	*Wxxx07	Lower PI limit
	DB	*Wxxx08	PI output dead band
	Y	*Wxxx09	PI output
	Yi	*Wxxx10	I offset
IREM	*Wxxx11	I remainder	
PI_F:PI Control (real number type)	RLY	*Wxxx00	Relay I/O
	RLY.IRST	*Bxxx000	Integration reset
	RESERVE	*Wxxx01	Reserve
	Kp	*Fxxx02	P gain
	Ki	*Fxxx04	Integration adjustment gain
	Ti	*Fxxx06	Integration time
	IUL	*Fxxx08	Upper integration limit
	ILL	*Fxxx10	Lower integration limit
	UL	*Fxxx12	Upper PI limit
	LL	*Fxxx14	Lower PI limit
	DB	*Fxxx16	PI output dead band
	Y	*Fxxx18	PI output
Yi	*Fxxx20	I offset	
PD_W:PD Control (integer type)	RLY	*Wxxx00	Relay I/O
	Kp	*Wxxx01	P gain
	Kd	*Wxxx02	D gain
	Td1	*Wxxx03	Divergence differential time
	Td2	*Wxxx04	Convergence differential time
	UL	*Wxxx05	Upper PD limit
	LL	*Wxxx06	Lower PD limit
	DB	*Wxxx07	PD output dead band
	Y	*Wxxx08	PD output
X	*Wxxx09	Input value storage	

(cont'd)

System Structure Name	Variable Name	Register	Comments
PD_F: PD Control (real number type)	RLY	*Wxxx00	Relay I/O
	RESERVE	*Wxxx01	Reserve
	Kp	*Fxxx02	P gain
	Kd	*Fxxx04	D gain
	Td1	*Fxxx06	Divergence differential time
	Td2	*Fxxx08	Convergence differential time
	UL	*Fxxx10	Upper PD limit
	LL	*Fxxx12	Lower PD limit
	DB	*Fxxx14	PD output dead band
	Y	*Fxxx16	PD output
	X	*Fxxx18	Input value storage
PID_W:PID Control (integer type)	RLY	*Wxxx00	Relay I/O
	RLY.IRST	*Bxxx000	Integration reset
	Kp	*Wxxx01	P gain
	Ki	*Wxxx02	I gain
	Kd	*Wxxx03	D gain
	Ti	*Wxxx04	Integration time
	Td1	*Wxxx05	Divergence differential time
	Td2	*Wxxx06	Convergence differential time
	IUL	*Wxxx07	Upper integration limit
	ILL	*Wxxx08	Lower integration limit
	UL	*Wxxx09	Upper PID limit
	LL	*Wxxx10	Lower PID limit
	DB	*Wxxx11	PID output dead band
	Y	*Wxxx12	PID output
	Yi	*Wxxx13	I offset
IREM	*Wxxx14	I remainder	
X	*Wxxx15	Input value storage	
PID_F: PID Control (real number type)	RLY	*Wxxx00	Relay I/O
	RLY.IRST	*Bxxx000	Integration reset
	RESERVE	*Wxxx01	Reserve
	Kp	*Fxxx02	P gain
	Ki	*Fxxx04	I gain
	Kd	*Fxxx06	D gain
	Ti	*Fxxx08	Integration time
	Td1	*Fxxx10	Divergence differential time
	Td2	*Fxxx12	Convergence differential time
	IUL	*Fxxx14	Upper integration limit
	ILL	*Fxxx16	Lower integration limit
	UL	*Fxxx18	Upper PID limit
	LL	*Fxxx20	Lower PID limit
	DB	*Fxxx22	PID output dead band
	Y	*Fxxx24	PID output
	Yi	*Fxxx26	I offset
X	*Fxxx28	Input value storage	

(cont'd)

System Structure Name	Variable Name	Resister	Comments
LAG_W: First-Order LAG (integer type)	RLY	*Wxxx00	Relay I/O
	RLY.IRST	*Bxxx000	LAG reset
	T	*Wxxx01	First-order lag time constant
	Y	*Wxxx02	LAG output
	REM	*Wxxx03	Remainder
LAG_F: First-Order LAG (real number type)	RLY	*Wxxx00	Relay I/O
	RLY.IRST	*Bxxx000	LAG reset
	RESERVE	*Wxxx01	Reserve
	T	*Fxxx02	First-order lag time constant
	Y	*Fxxx04	LAG output
LLAG_W: Phase LEAD/LAG (integer type)	RLY	*Wxxx00	Relay I/O
	RLY.IRST	*Bxxx000	LLAG reset
	T2	*Wxxx01	Phase lead time constant
	T1	*Wxxx02	Phase lag time constant
	Y	*Wxxx03	LLAG output
	REM	*Wxxx04	Remainder
	X	*Wxxx05	Input value storage
LLAG_F: Phase LEAD/LAG (real number type)	RLY	*Wxxx00	Relay I/O
	RLY.IRST	*Bxxx000	LLAG reset
	RESERVE	*Wxxx01	Reserve
	T2	*Fxxx02	Phase lead time constant
	T1	*Fxxx04	Phase lag time constant
	Y	*Fxxx06	LLAG output
	X	*Fxxx08	Input value storage
LAU_W: Linear Accelerator 1 (integer type)	RLY	*Wxxx00	Relay I/O
	RLY.RN	*Bxxx000	Line is running.
	RLY.QS	*Bxxx001	Quick stop
	RLY.DVDTF	*Bxxx002	DVDT operation non-execution
	RLY.DVDTS	*Bxxx003	DVDT operation selection
	RLY.ARY	*Bxxx008	In acceleration
	RLY.BRY	*Bxxx009	In deceleration
	RLY.LSP	*Bxxx00A	Zero speed
	RLY.EQU	*Bxxx00B	Coincidence
	LV	*Wxxx01	100% input level
	AT	*Wxxx02	Acceleration time
	BT	*Wxxx03	Deceleration time
	QT	*Wxxx04	Quick stop time
	V	*Wxxx05	Current speed
	DVDT	*Wxxx06	Current acceleration / deceleration
	RESERVE	*Wxxx07	Reserve
	VIM	*Wxxx08	Previous speed instruction
	DVDTK	*Wxxx09	DVDT coefficient
REM	*Lxxx10	Remainder	

(cont'd)

System Structure Name	Variable Name	Register	Comments
LAU_F: Linear Accelerator 1 (real number type)	RLY	*Wxxx00	Relay I/O
	RLY.RN	*Bxxx000	Line is running.
	RLY.QS	*Bxxx001	Quick stop
	RLY.ARY	*Bxxx008	In acceleration
	RLY.BRY	*Bxxx009	In deceleration
	RLY.LSP	*Bxxx00A	Zero speed
	RLY.EQU	*Bxxx00B	Coincidence
	RESERVE	*Wxxx01	Reserve
	LV	*Fxxx02	100% input level
	AT	*Fxxx04	Acceleration time
	BT	*Fxxx06	Deceleration time
	QT	*Fxxx08	Quick stop time
	V	*Fxxx10	Current speed
	DVDT	*Fxxx12	Current acceleration/deceleration
SLAU_W: Linear Accelerator 2 (integer type)	RLY	*Wxxx00	Relay I/O
	RLY.RN	*Bxxx000	Line is running.
	RLY.QS	*Bxxx001	Quick stop
	RLY.DVDTF	*Bxxx002	DVDT 1 operation non-execution
	RLY.DVDTS	*Bxxx003	DVDT 1 operation selection
	RLY.ARY	*Bxxx008	In acceleration
	RLY.BRY	*Bxxx009	In deceleration
	RLY.LSP	*Bxxx00A	Zero speed
	RLY.EQU	*Bxxx00B	Coincidence
	RLY.CCF	*Bxxx00D	Work relay
	RLY.BBF	*Bxxx00E	Work relay
	RLY.AAF	*Bxxx00F	Work relay
	LV	*Wxxx01	100% input level
	AT	*Wxxx02	Acceleration time
	BT	*Wxxx03	Deceleration time
	QT	*Wxxx04	Quick stop time
	AAT	*Wxxx05	S-curve acceleration time
	BBT	*Wxxx06	S-curve deceleration time
	V	*Wxxx07	Current speed
	DVDT1	*Wxxx08	Current acceleration/deceleration 1
	RESERVE1	*Wxxx09	Reserve
	ABMD	*Wxxx10	Speed increase upon holding
	REM1	*Wxxx11	Remainder
	RESERVE2	*Wxxx12	Reserve
	VIM	*Wxxx13	Previous speed instruction
	DVDT2	*Lxxx14	Current acceleration/deceleration 2
	DVDT3	*Lxxx16	Current acceleration/deceleration 3
REM2	*Lxxx18	Remainder	
REM3	*Wxxx20	Remainder	
DVDTK	*Wxxx21	DVDT1 coefficient	

(cont'd)

System Structure Name	Variable Name	Resister	Comments
SLAU_F: Linear Accelerator 2 (real number type)	RLY	*Wxxx00	Relay I/O
	RLY.RN	*Bxxx000	Line is running.
	RLY.QS	*Bxxx001	Quick stop
	RLY.ARY	*Bxxx008	In acceleration
	RLY.BRY	*Bxxx009	In deceleration
	RLY.LSP	*Bxxx00A	Zero speed
	RLY.EQU	*Bxxx00B	Coincidence
	RESERVE	*Wxxx01	Reserve
	LV	*Fxxx02	100% input level
	AT	*Fxxx04	Acceleration time
	BT	*Fxxx06	Deceleration time
	QT	*Fxxx08	Quick stop time
	AAT	*Fxxx10	S-curve acceleration time
	BBT	*Fxxx12	S-curve deceleration time
	V	*Fxxx14	Current speed
	DVDT	*Fxxx16	Current acceleration/deceleration
ABMD	*Fxxx18	Speed increase upon holding	
PWM:Pulse Width Modulation	RLY	*Wxxx00	Relay I/O
	RLY.PWMRST	*Bxxx000	PWM reset
	RLY.PWMOUT	*Bxxx008	PWM output
	PWMT	*Wxxx01	PWM cycle
	ONCNT	*Wxxx02	ON output setting timer
	CVON	*Wxxx03	ON output counting timer
	CVONREM	*Wxxx04	ON output counting timer remainder
	OFFCNT	*Wxxx05	OFF output setting timer
	CVOFF	*Wxxx06	OFF output counting timer
	CVOFFREM	*Wxxx07	OFF output counting timer remainder
MSG_SND_IN: Send Message Input	EXECUTE	*Bxxx000	Instruction
	ABORT	*Bxxx001	Forced interruption instruction
	DEV_TYP	*Wxxx01	Type of transmission device
	PRO_TYP	*Wxxx02	Transmission protocol
	CIR_NO	*Wxxx03	Circuit Number
	CH_NO	*Wxxx04	Transmission buffer channel Number

(cont'd)

System Structure Name	Variable Name	Register	Comments
MSG_SND_PARAM: Send Message Parameter	RESULT	*Wxxx00	Process result
	STS	*Wxxx01	Status
	ST_NO	*Wxxx02	Called station #
	OPTION	*Wxxx03	Option
	F_CODE	*Wxxx04	Function code
	DATA_ADR	*Wxxx05	Data address
	DATA_SIZE	*Wxxx06	Data size
	CPU_NO	*Wxxx07	Called CPU#
	COIL_OFFSET	*Wxxx08	Coil offset
	INRLY_OFFSET	*Wxxx09	Input relay offset
	INREG_OFFSET	*Wxxx10	Input register offset
	HOLDREG_OFFSET	*Wxxx11	Holding register offset
	RESERVE1	*Wxxx12	System reserve
	RESERVE2	*Wxxx13	System reserve
	RESERVE3	*Wxxx14	System reserve
	RESERVE4	*Wxxx15	System reserve
RESERVE5	*Wxxx16	System reserve	
MSG_SND_OUT: Send Message Output	BUSY	*Bxxx000	Message is being sent.
	COMPLETE	*Bxxx001	The sending of the message has been completed.
	ERROR	*Bxxx002	Occurrence of error
MSG_RCV_IN: Receive Message Input	EXECUTE	*Bxxx000	Instruction
	ABORT	*Bxxx001	Forced interruption instruction
	DEV_TYP	*Wxxx01	Type of transmission device
	PRO_TYP	*Wxxx02	Transmission protocol
	CIR_NO	*Wxxx03	Circuit Number
	CH_NO	*Wxxx04	Transmission buffer channel Number
MSG_RCV_PARAM: Receive Message Parameter	RESULT	*Wxxx00	Process result
	STS	*Wxxx01	Status
	ST_NO	*Wxxx02	Called station #
	OPTION	*Wxxx03	Option
	F_CODE	*Wxxx04	Function code
	DATA_ADR	*Wxxx05	Data address
	DATA_SIZE	*Wxxx06	Data size
	CPU_NO	*Wxxx07	Called CPU#
	COIL_OFFSET	*Wxxx08	Coil offset
	INRLY_OFFSET	*Wxxx09	Input relay offset
	INREG_OFFSET	*Wxxx10	Input register offset
	HOLDREG_OFFSET	*Wxxx11	Holding register offset
	W_LO	*Wxxx12	Write-in range LO
	W_HI	*Wxxx13	Write-in range HI
	RESERVE1	*Wxxx14	System reserve
	RESERVE2	*Wxxx15	System reserve
RESERVE3	*Wxxx16	System reserve	
MSG_RCV_OUT: Receive Message Output	BUSY	*Bxxx000	Message is being sent.
	COMPLETE	*Bxxx001	Message is being received.
	ERROR	*Bxxx002	Occurrence of error

(cont'd)

System Structure Name	Variable Name	Resister	Comments
TBLBR:Block Read	ROW1	*Lxxx00	Beginning row number
	COL1	*Lxxx02	Beginning column number
	RLEN	*Wxxx04	Number of row elements
	CLEN	*Wxxx05	Number of column elements
TBLBW:Block Write	ROW1	*Lxxx00	Beginning row number
	COL1	*Lxxx02	Beginning column number
	RLEN	*Wxxx04	Number of row elements
	CLEN	*Wxxx05	Number of column elements
TBL SRL:Row Search	ROW1	*Lxxx00	Head row number
	ROW2	*Lxxx02	Last row number
	COLUMN	*Lxxx04	Table element column number
	FIND	*Wxxx06	Search result
TBL SRC:Column Search	ROW	*Lxxx00	Row number
	COLUMN1	*Lxxx02	Head column number
	COLUMN2	*Lxxx04	Last column number
	FIND	*Wxxx06	Search result
TBL CL:Block Clear	ROW	*Lxxx00	Head row number
	COLUMN	*Lxxx02	Head column number
	RLEN	*Wxxx04	Number of row elements
	CLEN	*Wxxx05	Number of column elements
TBL MV:Block Move	ROW1	*Lxxx00	Head row number
	COLUMN1	*Lxxx02	Head column number
	RLEN	*Wxxx04	Number of row elements
	CLEN	*Wxxx05	Number of column elements
	ROW2	*Lxxx06	Head row number
	COLUMN2	*Lxxx08	Head column number
QTBLR:Queue Table Read	ROW	*Lxxx00	Corresponding row
	COLUMN	*Lxxx02	Head column number
	CLEN	*Wxxx04	Number of column elements
	RESERVE	*Wxxx05	System reserve
	RPTR	*Lxxx06	Read pointer
	WPTR	*Lxxx08	Write pointer
QTBLR I:Queue Table Read (pointer move)	ROW	*Lxxx00	Corresponding row
	COLUMN	*Lxxx02	Head column number
	CLEN	*Wxxx04	Number of column elements
	RESERVE	*Wxxx05	System reserve
	RPTR	*Lxxx06	Read pointer
	WPTR	*Lxxx08	Write pointer
QTBLW:Queue Table Write	ROW	*Lxxx00	Corresponding row
	COLUMN	*Lxxx02	Head column number
	CLEN	*Wxxx04	Number of column elements
	RESERVE	*Wxxx05	System reserve
	RPTR	*Lxxx06	Read pointer
	WPTR	*Lxxx08	Write pointer

(cont'd)

System Structure Name	Variable Name	Register	Comments
QTBLWI: Queue Table Write (pointer move)	ROW	*Lxxx00	Corresponding row
	COLUMN	*Lxxx02	Head column number
	CLEN	*Wxxx04	Number of column elements
	RESERVE	*Wxxx05	System reserve
	RPTR	*Lxxx06	Read pointer
	WPTR	*Lxxx08	Write pointer
MSEE:Call Motion Program	Status	*Wxxx00	Status
	Status.Run	*Bxxx000	Running
	Status.Pause	*Bxxx001	Pausing
	Status.SystemPause	*Bxxx002	Stopped
	Status.SingleBlockPause	*Bxxx004	Stopped under single block mode
	Status.Alarm	*Bxxx008	Alarm
	Status.Break	*Bxxx009	Stopped at break point
	Status.Debug	*Bxxx00B	Debugging mode
	Status.History	*Bxxx00D	Start request signal history
	Status.SystemWorkError	*Bxxx00E	No system work error
	Status.ProgramNoError	*Bxxx00F	Main program number limit error
	Control	*Wxxx01	Motion program control signals
	Control.Run	*Bxxx010	Start request
	Control.Pause	*Bxxx011	Pause request
	Control.Stop	*Bxxx012	Stop request
	Control.SingleBlockMode	*Bxxx013	Single block mode selection
	Control.SingleBlockRun	*Bxxx014	Single block start request
	Control.AlarmReset	*Bxxx015	Alarm reset request
	Control.Continue	*Bxxx016	Program continuous operation start request
	Control.Skip1	*Bxxx018	Skip1 information
Control.Skip2	*Bxxx019	Skip2 information	
Control.SetSystemWork	*Bxxx01D	System work number setting	
Control.SetInterpolate	*Bxxx01E	Interpolation override setting	
InterpolateOverride	*Wxxx02	Interpolation override	
SystemWorkNumber	*Wxxx03	System work numbers	
MLINK_SVW: Write SERVOPACK Parameter	STS	*Wxxx00	Status
	ERR_CODE	*Wxxx01	Error code
	CIR_NO	*Wxxx02	Circuit Number
	AXIS_NO	*Wxxx03	Axis Number
	SYSTEM1	*Wxxx04	System 1
	SYSTEM2	*Wxxx05	System 2

B Reserved Words

The following words cannot be used for variable names regardless of case.

ABS	LOG	TON
ACC	LOG10	TPS
ACCMODE	LONG	TRUE
ACOS	MCC	TYPDEF
ACS	MCW	UFC
ARCTAN	MOD	UNION
ASIN	MOV	UNSIGNED
ASN	MSEE	VCR
ATAN	MUFC	VCS
ATN	MVM	VEL
AUTO	MVS	VOID
BCD	MVT	VOLATILE
BIN	NON	WAX
BLK	OFF	WCD
BREAK	ON	WCE
CASE	PFN	WCT
CHAR	PFORK	WDA
CLR	PJOINT	WDB
CONST	PLD	WDC
CONTINUE	PLN	WDD
COS	PON	WEND
DCC	POS	WHILE
DEFAULT	REGISTER	WPM
DO	RET	WSA
DOUBLE	RETURN	ZRN
ELSE	R{	
END	SCC	
ENUM	SFL	
EOX	SFORK	
EXM	SFR	
EXP	SHORT	
EXTERN	SIGNED	
FALSE	SIN	
FEND	SIZEOF	
FLOAT	SJOINT	
FMX	SKP	
FOR	SNGD	
GOTO	SNGE	
IAC	SPH	
IDC	SPL	
IEND	SQRT	
IF	SQT	
IFP	STATIC	
INC	STRUCT	
INP	SWITCH	
INT	S{	
IOW	TAN	
JOINTO	TCN	
KCC	TCR	
KCW	TCS	
LCC	TIM	
LCW	TOF	

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			3.5.6	Addition: Forcing Coils ON/OFF
			3.6	Addition: Converting CP Ladder Programs
			5.6	Addition: User Structures
			5.8	Addition: Export/Import of Variables
			10.1.3	Addition: Individual/Batch Printing of Ladder Programs
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