MITSUBISHI

Mitsubishi Industrial Robot

CRn-500 Series

RT ToolBox

"Robot Total Engineering Support Software"

Instruction Manual

(3A-01C-WINE/3A-02C-WINE)

MELFA
BFP-A8090-J

Revision History

Date of print	Specifications No.	Revision details
2000-4-28	BFP-A8090-*	First release
2000-7-10	BFP-A8090-A	Change "file open/save as" (Program Editor) Add “Program conversion” Change “Program Management”
2001-9-3	BFP-A8090-B	Add “Copying and pasting the position array variables” in Program Editing tool. Change “Search” and “Replace” in Program Editing tool. Change “Program monitor” Add “backup/restore the Robot Origin Parameter” in Maintenance tool. Change “Backup(Load/Save)” in Maintenance tool. Add “Print of Parameters” in Maintenance tool.
2001-10-31	BFP-A8090-C	(Corresponds to the version C2) Add “History” function to Program Editing tool. Change “Position Variable Batch Edit Window” in Program Editing tool. Add “Find In Files” function to Program Editing tool. Change “Program Manager Setup Window” in Program Editing tool. Add “Viewpoint change function using the mouse” to Robot Graphic Display. Add “Reading, editing and writing robot origin data” to Maintenance tool. Add “Instructions related to position data” to conversion targets of program conversion.
2002-3-18	BFP-A8090-D	(Corresponds to the version D1) Corresponds to the Windows® 2000/Windows® XP Add “Multiple Robot Controller Comunication” function. Change “Special-Purpose I/O Signal” to “Named I/O Signal”. Accelerate JOG Operation of Simul.ation. Add “OVRD setting function” to Simulation.
2002-12-20	BFP-A8090-E	(Corresponds to the version D2) The floppy disks is abolished. The description addition which encloses communication middleware "MelfaRXM.OCX" in the standard version, and the Chapter about a setup "14. Setup of the communication middleware "MelfaRXM.ocx"" is added.
2003-6-10	BFP-A8090-F	(Corresponds to the version E1) The chapter was divided for each tool. Add “Position Repair Support Tool” and “Maintenance Forecast”.
2005-1-20	BFP-A8090-G	(Corresponds to the version F1) Corresponds to the MELSOFT
2005-5-1	BFP-A8090-H	(Corresponds to the version F2) Corresponds to the RH-SH series in Position Repair Support Tool.
2006-10-10	BFP-A8090-J	(Corresponds to the version F3) Error in writing correction.

Contents

INTRODUCTION

Thank you for purchasing Mitsubishi Electric Industrial Robot MELFA.
This document is the operation manual for the MELSOFT "**RT ToolBox** Robot Total Engineering Support Software".
By fully utilizing the features of this software, you can perform the initial startup of the robot, and create, edit and control the robot programs.
To operate the robot in a safe manner, be sure to read this manual and safety manual of attachment to the robot arm thoroughly in advance. Also, keep this manual in a location that provides an easy access whenever you need to refer to it.

Target Version of This Manual

This manual is for the "**RT ToolBox** Robot Total Engineering Support Software" of version **F2** or later.
"**RT ToolBox** Robot Total Engineering Support Software" version **F2** edition corresponds to the version **K4** of a robot controller.

Target Readers of This Manual

This manual is written on the assumption that the readers have sufficient knowledge of the basic operation of the personal computers, Windows 98/Me/NT 4.0/2000/XP as well as the robot controllers.
If you are unfamiliar with the basic operation of the personal computers, please read the user's manual of your personal computer.

Symbols Used in This Manual

⚠ ***DANGER***	Indicates that incorrect handling is most likely to cause hazardous conditions, resulting in death or severe injury of the operator.
⚠ ***WARNING***	Indicates a possibility that incorrect handling may cause hazardous conditions, resulting in death or severe injury of the operator.
⚠ ***CAUTION***	Indicates that incorrect handling may cause hazardous conditions, resulting in injury of the operator, or only physical damage.

Please read this operation manual thoroughly and be sure to learn the correct operating procedures.

How to Ensure Stable Communication Between the "RT ToolBox Robot Total Engineering Support Software" and the Robot Controller

When communicating with the robot controller (hereinafter referred to as the R/C) using the "**RT ToolBox** Robot Total Engineering Support Software" (hereinafter referred to as the Software), depending on the personal computer model and settings the communication may become unstable in a batch backup or program upload/download where large amounts of data are transmitted. To ensure stable communication with the R/C, change the communication settings (communication protocol) of the R/C and the Software as shown below. If the communication settings of the R/C and the Software do not match, normal communication cannot be established. Be sure to change the settings on both the R/C and Software sides.

(1) The Robot Controller

As for the R/C communication settings, change the following parameters:

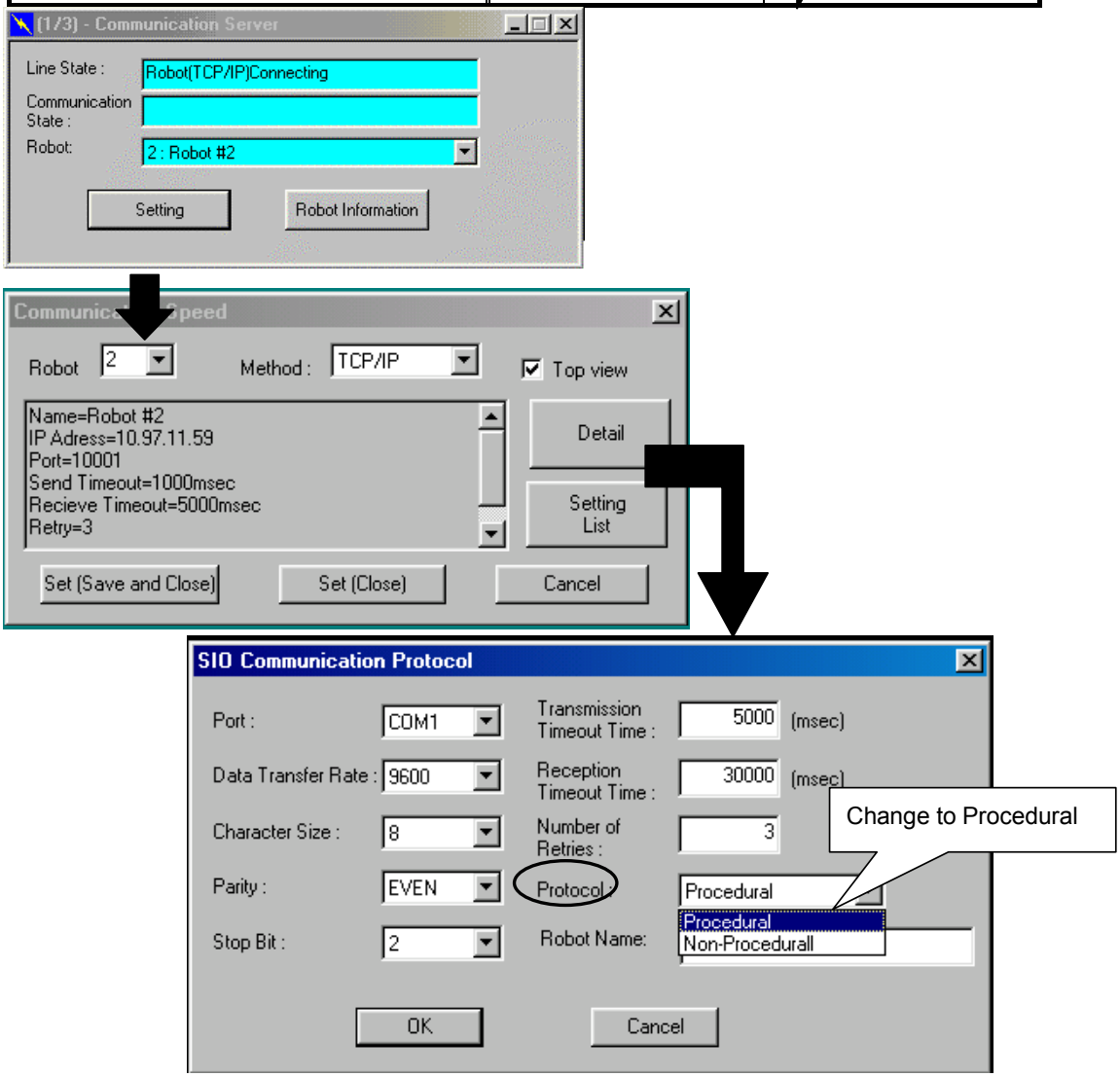
Parameter	Default	Change to
communication protocol (CPRC232)	0 (Non-Procedural)	1 (Procedural)

* To communicate with the personal computer via an extended RS-232C port by using an extension serial interface board, change the parameters of the extended RC-232C port.

(2) "RT ToolBox Robot Total Engineering Support Software"

Change the communication settings of this Software through the "communication server."

Parameter	Default	Change to
Protocol	Non-Procedural	Procedural



- When communicating with the R/C using your custom software, reset the R/C protocol setting to "Non-Procedural" in advance

1. Before starting use

The manual is in the CR-ROM as the Adobe PDF file.

D:/Doc/BFP-A8090.pdf

* Example for the CD-ROM drive is “D:”.

For reading the manual, Adobe Acrobat Reader Ver.5.0 or more is required.

If Adobe Acrobat Reader isn’t installed, please download from following Adobe Systems Incorporated URL(As of December, 2004).

URL: http://www.adobe.com/

This chapter explains the precautions to be observed when using this software.

1.1. Using the instruction manual

The contents of this instruction manual are briefly explained in this section. Refer to the required section as necessary.

1. Before starting use

The precautions before starting use are explained. Please read before starting use.

2. Preparation before use

The methods of starting up this software are explained.

3. Basic function and windows operations

The functions of this software, and the basic windows operations required for using this software are explained.

4. Starting use

This is a tutorial section for learning the series of operation methods when using this software for the first time.

5. Program editing tool

A detailed explanation of making and saving the robot program.

6. Monitoring

All of the information in the currently connected robot controller can be constantly displayed.

7. Parameter editing tool

The parameters in a Robot controller can be referred to and rewritten.

8. Backup/restore

A backup of the data in the robot controller can be downloaded to the personal computer, and the backup data saved in the personal computer can be uploaded to the robot controller.

9. Remote maintenance

The data of a robot at a remote location can be monitored and serviced over a telephone line.

10. Simulation

Confirmation of robot program operation with off-line simulation using CG [Computer Graphics], and calculation of cycle time

The Simulation function becomes correspondence only of a standard version(STD).

11. Program conversion

The program conversion converts the position data as well as the instructions (DJ, MP, and PD instructions of the Move Master command) related to the position data so that the robot programs created and saved by the "Robot Programming Supporter" can be used with this new S/W.

12. Position repair

In case a deformation of a tool occurs due to interference or a deviation from origin point (OP) occurs due to the replacement of the motor during maintenance, the previous position data retained in the controller can be used by performing a teaching operation again for part of the position data.

13. Maintenance report

The parts replacement (grease replenishment, battery and belt replacements) periods can be referenced from the up-to-date operating data collected inside the controller.

14. Setup of the communication middleware “MelfaRXM.ocx”

The setup methods of the communication middleware(MelfaRXM.ocx) are explained.

A. Appendix (Function tree)

The functions of this software are shown as a tree format.

1.2. Confirming the product

(1) The check of the package

Please check if all items shown below are included in the package.
- CD-ROM "RT ToolBox Robot Total Engineering Support Software"
- Setup Guide
- END-USER SOFTWARE LICENSE AGREEMENT
- License Certification (Please make sure Product ID is printed on it)

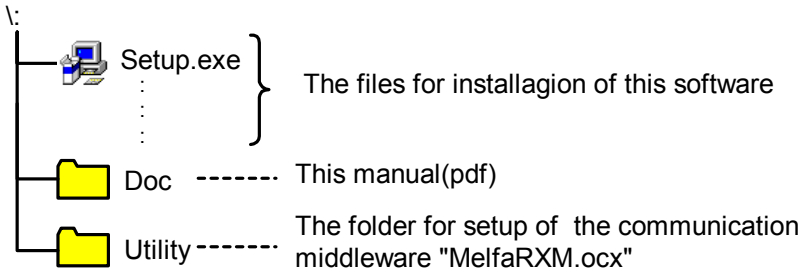
* Please contact the branch office or the agency if there is some shortage in the package.

(2) Product ID

It is necessary to input product ID when you install Version F1 or later of this software.

(3) The check of media contents

The following items are included on the CD-ROM.



(4) About the communication middleware “MelfaRXM.ocx”

MelfaRXM.ocx is the ActiveX control that communicates to robot-controller. You can create the Windows Application of "MELFA ROBOT" by using this control.

You can use "MelfaRXM.ocx" in only standard version of this software.

Please refer to "14. Setup of the communication middleware “MelfaRXM.ocx" ” about an setup of "MelfaRXM.ocx".

In case of using only the function of "**RT ToolBox** Robot Total Engineering Support Software", you don't need to install this software.

1.3. Items to be prepared by user

The items to be prepared by the user to use this personal computer software are explained in this section.

(1) Personal computer system

Prepare the following model.

* Personal computer that runs with
  Microsoft® Windows® 98 Operating System
  Microsoft® Windows® Me Operating System
  Microsoft® Windows NT® Workstation Operating System Version 4.0
  Microsoft® Windows® 2000 Operating System
  Microsoft® Windows® XP Home Edition Operating System
  Microsoft® Windows® XP Professional Operating System

Details of working environment

Item	Min. required environment	Recommended environment
CPU	Pentium133MHz	Pentium III 450 MHz or more (*)
Main memory	32MB or more	128MB or more
Hard disk	100MB of open space or more	200MB of open space or more
Display	Must have graphic function that can display SVGA (800 × 600) or more, and must be capable of displaying 16 or more colors.	
Disk unit	CD-ROM drive	
Keyboard	PC/AT compatible keyboard	
Pointing device	Device that operates in Windows® environment	
Communication port	Must have serial communication port that operates in Windows® environment. (Min. 9600bps: 1 port)	

(*) When you calculate cycle time with this software, please use the personal computer of greater performance one than that.

(2) Personal computer cable

Please prepare an RS-232C cable for connecting the controller to the personal computer.

Model name	Description
RS-MAXY-CBL	For controller's front panel
RS-AT-RCBL	For extended option box (CR1-EB3)

For more information about the RS-232C cable specification, refer to the Standard Specifications of the robot in use.

(3) Software

Microsoft® Windows® 98 Operating System
Microsoft® Windows® Me Operating System
Microsoft® Windows NT® Workstation Operating System Version 4.0
Microsoft® Windows® 2000 Operating System
Microsoft® Windows® XP Home Edition Operating System
Microsoft® Windows® XP Professional Operating System

This software is confirmed that can be operated on the following OS.

Windows® XP Professional English version
Windows® XP Professional Germany version
Windows® XP Professional Traditional Chinese version
Windows® XP Professional Korean version

2. Preparation before use

The methods of setting up this software are explained in this chapter. The setup work includes the following steps.

i) Installing this software into the personal computer
→ Read "2.1 Installation methods".
ii) Setting up the printer (Not necessary when not printing on paper)
→ Read "2.2 Setting up the printer".
iii) Connecting the robot and personal computer
→ Read "2.3 Connecting to the robot".

2.1. Installation methods

The methods for installing this software are explained in this section. The software can be installed from the CD-ROM or from the floppy disks.

If an older version of the "**RT ToolBox** Robot Total Engineering Support Software" or the "MELFA Personal Computer Support software" is installed in the personal computer, always uninstall the older version before installing the newer version.

2.1.1. Installation

* If the OS is one of those followings, you must be logged on as an Administrator or as a member of the Administrators group in order to install this software.
  - Microsoft® Windows NT® Workstation Operating System Version 4.0
  - Microsoft® Windows® 2000 Professional Operating System
  - Microsoft® Windows® XP Professional Operating System
  - Microsoft® Windows® XP Home Edition Operating System
* If an older version of the "RT ToolBox Robot Total Engineering Support Software" or the "MELFA Personal Computer Support Software" is installed in the personal computer already, be sure to uninstall the older version before installing the newer version.

(1) Set this CD-ROM in the personal computer's CD-ROM drive. The Setup screen will be started up automatically.
(2) If the screen does not start up automatically, carry out the following procedure.
  (a) Select the [start] button and [run]
  (b) Check the CD-ROM drive name. Input as shown below.
    "Drive name":/Setup.exe
  (If the CD-ROM drive is "D:", this will be "D:/ Setup.exe".)

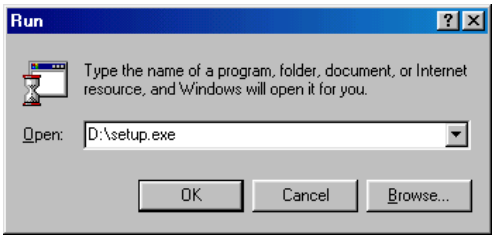
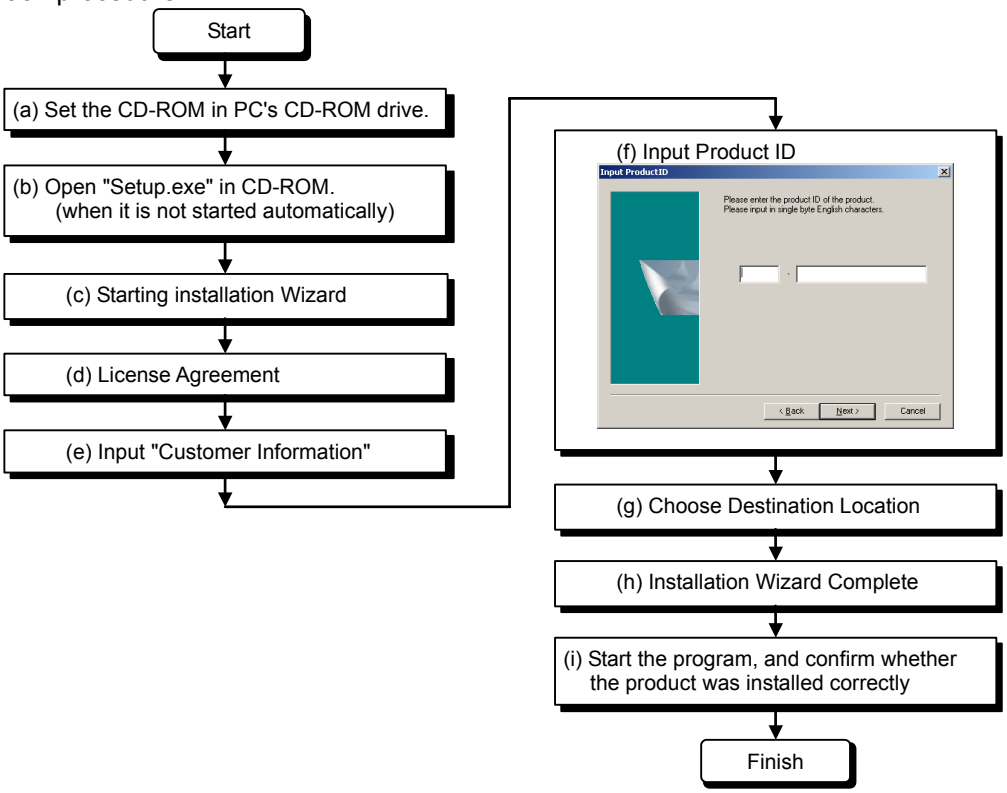


Fig. 2-1 Run

(3) Installation procedure



* Product ID is printed on the Certificate of License permission

2.1.2. Uninstallation

In Version **F1** or later of this software, Select "**RT ToolBox** English" with [Start]->[Setting]->[Control Panel]->[Add or Remove Programs], and then click on [Remove] button.

In Version **E1** or earlier of this software, Select " MELFA Personal Computer Support software " with [Start]->[Setting]->[Control Panel]->[Add or Remove Programs], and then click on [Remove] button.

Version F1 or later **Version E1 or earlier**

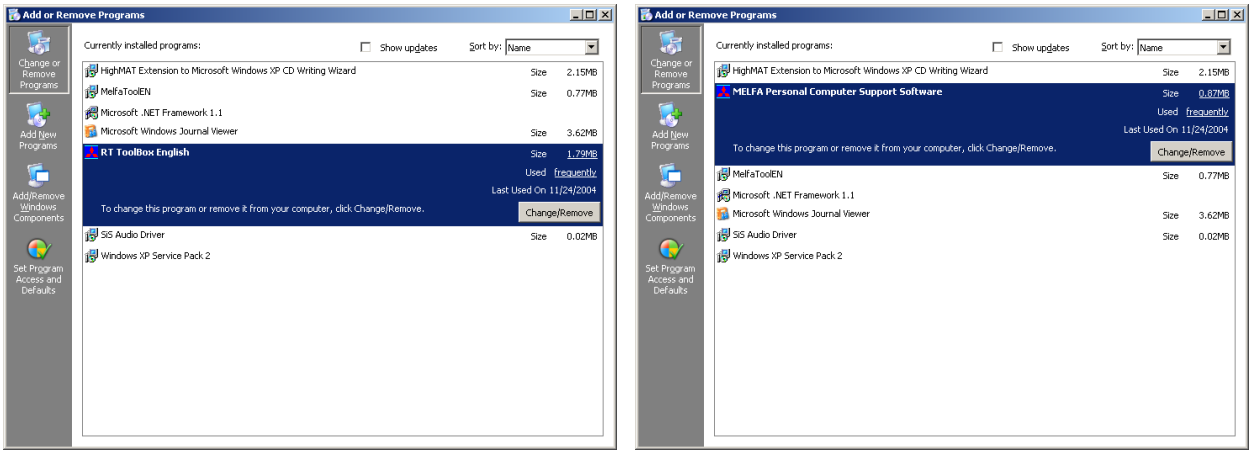


Fig. 2-2 Uninstalling the application.

When uninstalling this software, the following screens might be displayed. There is no influence on other applications even if the file shown in the following is deleted.

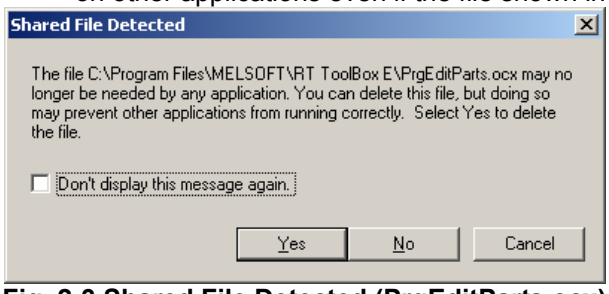


Fig. 2-3 Shared File Detected (PrgEditParts.ocx)

PrgEditParts.ocx
VisualPrgEditParts.ocx
RoboFile.dll
RoboOpenGL.ocx
EZSocketRc.dll
NarcServerApi.dll
NarcServerApiM.dll
UpDownBtn.ocx

Please do not delete files other than the above-mentioned. Other applications might not operate when it is deleted.

2.2. Setting up the printer

To print programs with this software, the printer must be setup.
The method for setting up the printer is explained in this section.

1) Double click on [My Computer] → [Printer].

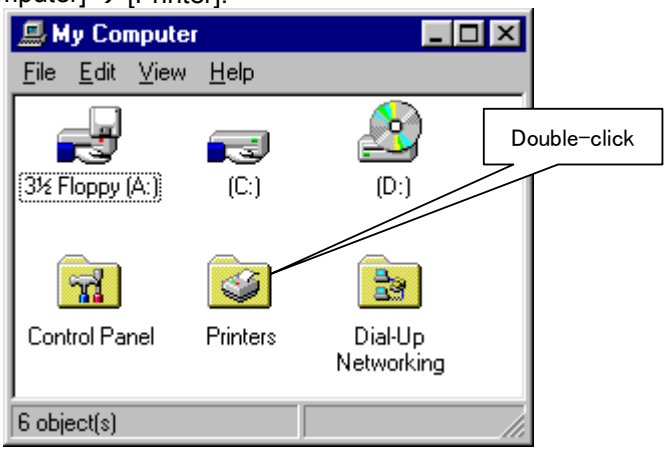


Fig. 2-4 Double-click "Printers"

2) Double click on [Add Printer].

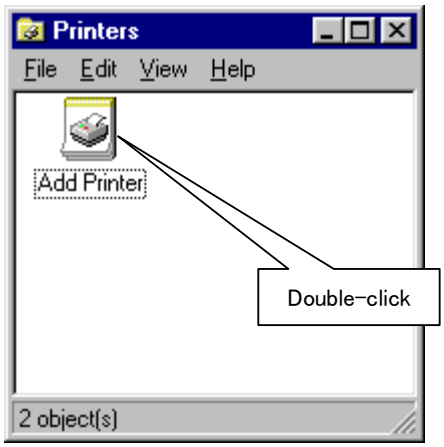


Fig. 2-5 Double-click "Add Printer"

3) Follow the instructions on the screen. The basic flow is as shown below. Refer to the instruction manual of the printer being used for details.
   i) Select the type of connected printer
   ii) Select the connected printer product name and maker
   iii) Select the port used by the printer
   iv) Set the printer name
   v) Set whether to test the printing --> Completed

2.3. Connecting to the robot

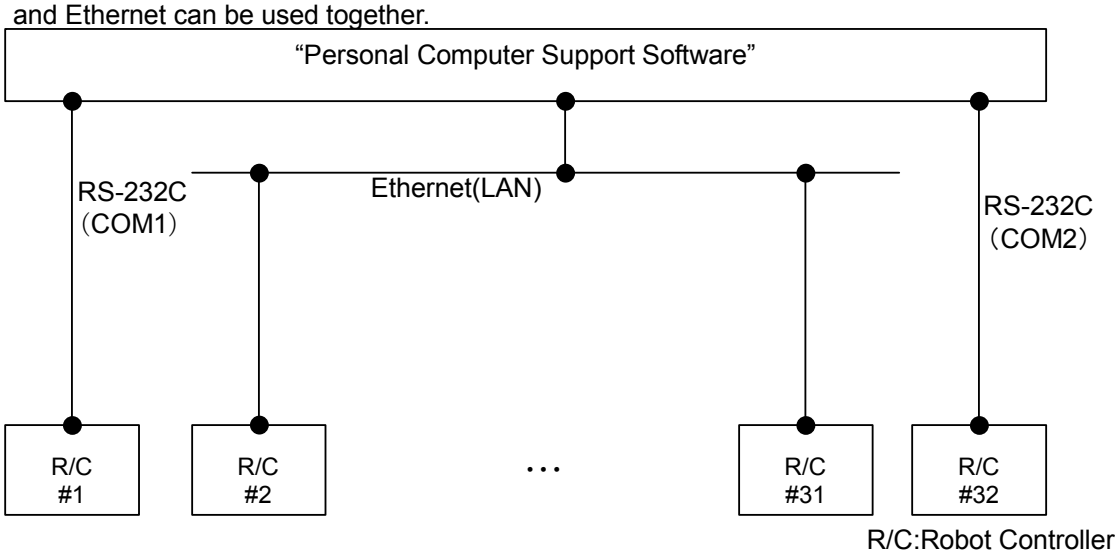
The method of connecting the controller body to the personal computer is explained in this section.
Either an RS-232-C connection or Ethernet can be used to connect the personal computer to the controller. The methods are explained in the following order in this section.

1) Using RS-232-C
2) Using Ethernet
3) Setting the communication server

* Usually, the personal computer is provided with RS-232-C as a standard. When using Ethernet, the "Ethernet interface" option is required on the robot controller and a network card is required on the personal computer.

Caution

Personal computer support software of D1 version or later can simultaneously connect with a maximum of 32 robot controllers. Please note that personal computer support software of C2 version or earlier cannot simultaneously connect with multiple robot controllers. Also, RS-232C and Ethernet can be used together.



Example of connecting multiple robot controllers

* When using Ethernet, if communication setting is performed for unconnected robots, retry processing is performed frequently and, as a result, the execution speed slows down. Therefore, set the communication setting for unconnected or powered-off robots to "Not used."
* 32-robot connection is a theoretical value; when 32 robots are actually connected, it does not guarantee the same performance as when only one robot is connected. For example, if all of the 32 robots are monitored, the status update slows down compared to when only one robot is connected. Also, such setting may affect applications that use other networks in Windows 98/Me.

2.3.1. Using RS-232-C

1) An RS-232-C cable is used for the connection between the personal computer and controller. (For a DOS/V personal computer, a 9-pin connector on the robot side and a 25-pin connector on the controller side is used.)
2) Connect the personal computer side of the cable to the standard RS-232-C connector (RS-232-C serial port

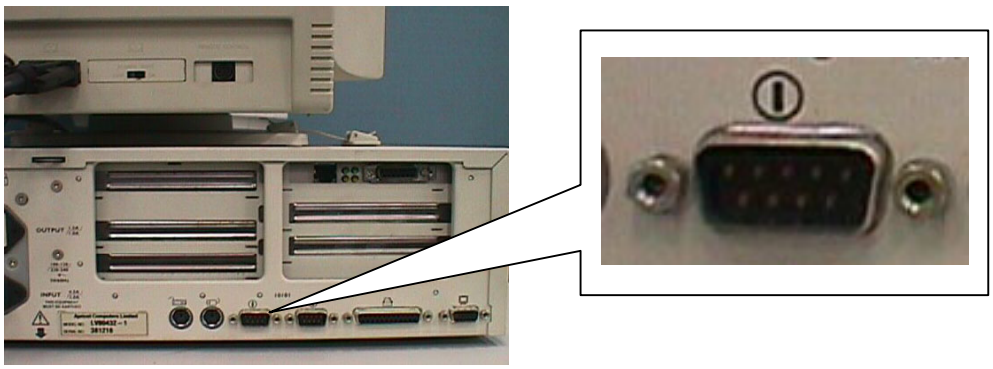


Fig. 2-6 Personal computer's RS-232-C connector

When connecting to a port other than the RS-232-C serial port 1, refer to section "2.3.3 Setting the communication server".

3) Connect the controller side to the RS-232-C connector on the front of the controller.

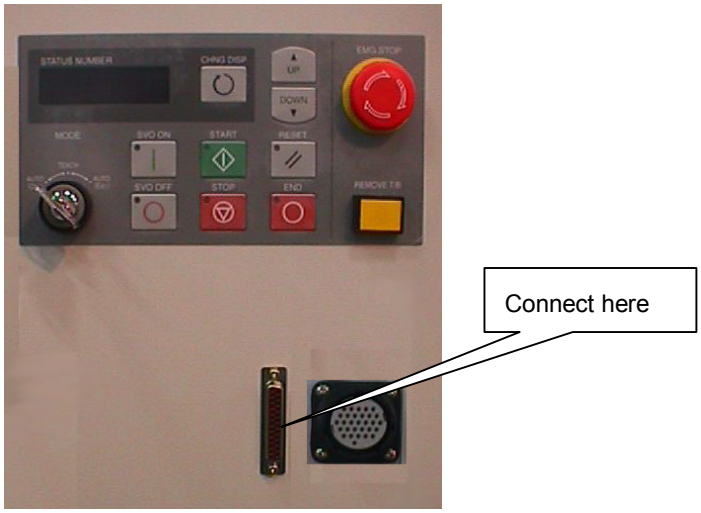


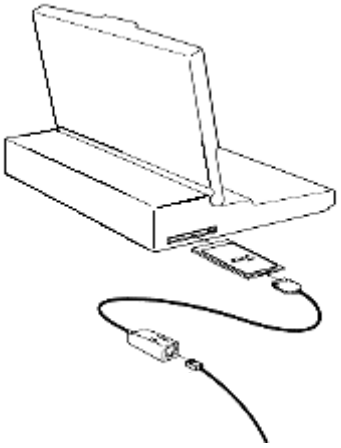
Fig. 2-7 Controller's RS-232-C connector

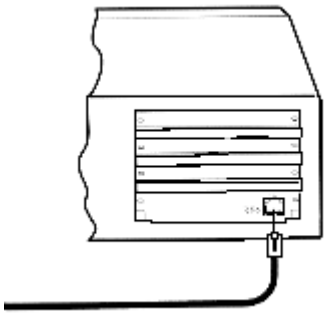
2.3.2. Using Ethernet

* To use Ethernet, the robot controller must be provided with the "Ethernet interface" option, and the personal computer must be provided with a network card. The network must also be set.

Connect the modular plug to the personal computer's network card connector.
Connect the personal computer to the network. Contact the network manager for details on setting the network address (IP address, Subnet Mask, default gateway, etc.) in the personal computer.

Connection example:





<Laptop computer> **<Desktop computer>**

Fig. 2-8 example for connection

Refer to the "Ethernet Interface Option Instruction Manual" for details on connecting to the robot controller.

When using Ethernet, refer to section "2.3.3 "**RT ToolBox** Robot Total Engineering Support Software" communication settings" and change the software's communication specifications.

2.3.3. Setting the communication server

Caution

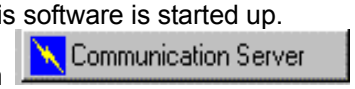
Communication with the robot controller may be disabled if the communication specifications are changed. Take special care when making changes.

The communication settings are made with the "communication server" in this software.
The "communication server" is set to the following default values when installed.

Item	Value
Communication method	RS-232C
Device No.	1
Port	COM1
Baud rate	9600
Data length	8
Parity	Even
Stop bit	2
Transmission timeout	5000 msec
Reception timeout	30000 msec
No. of retries	4 times
Protocol	Non-procedural
Robot Name	

When the communication specifications have been changed in the robot controller or when using the Ethernet interface option, change the communication specifications in the personal computer with the following procedure.

The communication server is automatically started when this software is started up.

Note that the server is iconized when started up, so click on 

on the task bar, and return to the original size.

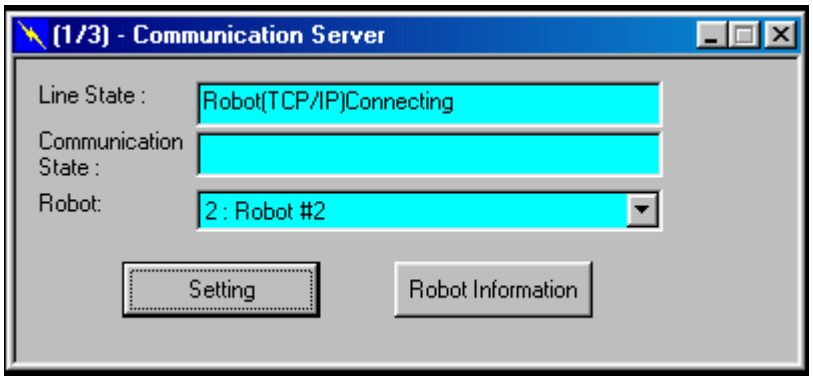


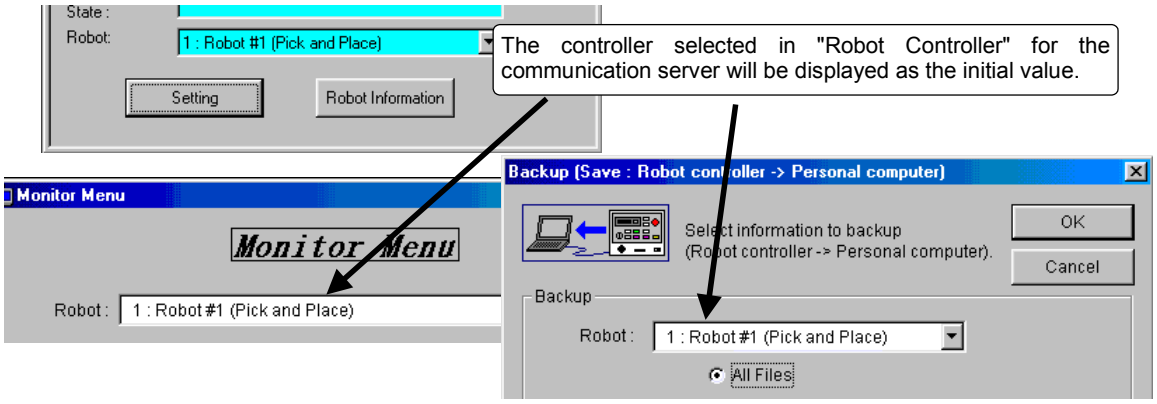
Fig. 2-9 Communication Server

[Title Bar] (AA/BB) indicates that AA is the number of robot controllers connected, and BB is the number of robot controllers for which communication settings have been made.

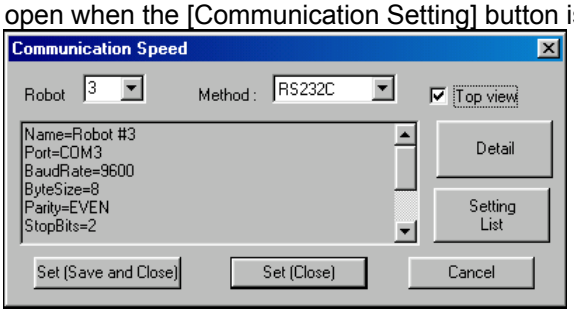
［Line State］ The connection status of the communication line with the robot is displayed. The status color indicates the status of the robot controller that is currently being selected.

Status	Content	Color
Connecting	Indicates that the connection with the robot has been established.	Blue
Connection wait	Indicates that a communication to verify connection is being made in the case of RS-232C connection. Indicates the wait status for communication port connection in the case of TCP/IP connection.	Green
Connection error	Displayed when the data reception enable signal cannot be detected because a cable has been disconnected or the robot has not been started in the case of RS-232C connection. Displayed when the communication port cannot be opened in the case of TCP/IP connection.	Red
Communication Setting error	Displayed when the communication port cannot be opened in the case of RS-232C connection. This is not displayed in the case of TCP/IP connection	Red
Waiting	Indicates the idling status displayed at the start of remote maintenance.	Green

[Communication State] The contents of communication with the robot controller are displayed.
[Robot] Select the Robot Controller which wants to display Line State and Communication State. Only the Robot Controller by which a Communication setup was carried out is displayed.
[Setting] button Changes the communication specifications.
[Robot Information] button Information on the currently connected robot can be referenced.
Also, the robot controller selected here will be the initial value of the robot controller switching combo box in each tool (Version **E1** or later).



Communication setting
The following type of window will open when the [Communication Setting] button is clicked on.



Robot..... Select the Robot Controller(1-32) for communication.
Communication method ..... Select the method to be used for communication.
Either RS-232-C or TCP/IP can be selected.
Select "TCP/IP" when carrying out communication with Ethernet.
Set the robot controllers that are not connected to “Not used.” Otherwise, the performance of the personal computer may be degraded. Robot controller 1 cannot be set to “Not used.”

[Details] button
A window for changing the communication specifications will open. The window that opens is different depending on whether RS-232-C or TCP/IP is selected for the communication method.

[Robot controller connection setting list] button
The communication settings can be specified in a table format. This is convenient when performing communication settings for a large number of robot controllers at one time.

[Set(Save and Close)] button
The communication specifications are changed and the change results are saved. Even when this software is started up next, communication will be carried out with the specifications set here.

[Set(Close)] button
The communication specifications are changed. The change results are not saved, so when this software is started up next, communication will be carried out with the previously set specifications.

[Cancel] button
The communication setting is quit without changing the communication specifications.

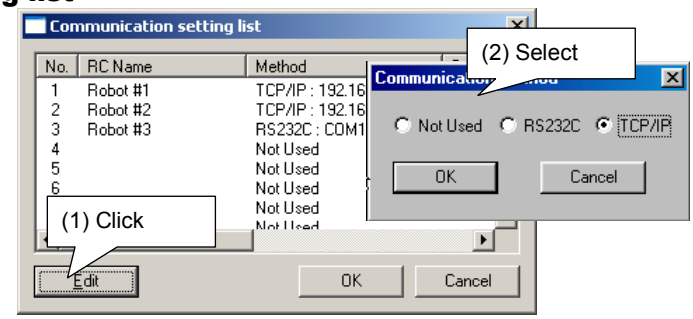
[Top view]
If this check box is set to ON, the dialog that indicates the communication status is displayed on top of the screen. If this check box is set to OFF, the dialog can be hidden.

Caution

When completed setting the communication server, iconize the server by clicking on the button.

The communication server will automatically quit when all of the personal computer support software applications are quit. Thus, do not quit the server with the button. Communication with the robot controller will be disabled when the communication server is quit.

Communication setting list



Select the item you want to set and click the [Edit] button. A dialog box for selecting the communication method appears. Select a communication method, and then click the [OK] button. A communication setting dialog box for the selected communication method appears.

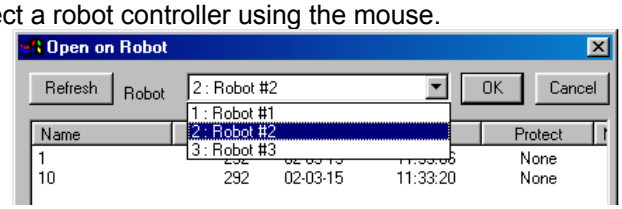
After editing is completed, click the [OK] button.

Robot controller switching operation using each tool

Once the communication settings of multiple robot controllers are made, you can switch the robot controller you want to operate by manipulating the combo box for selecting a robot controller that is provided in each tool.

The following figure shows the operation for “opening a program on the robot” in program editing.

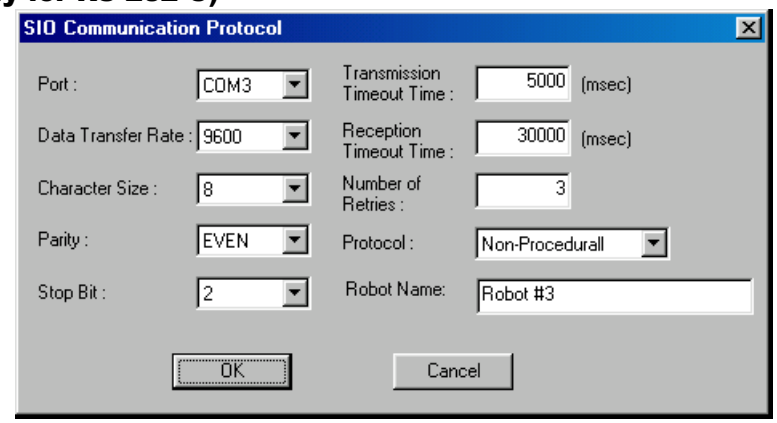
Clicking the ▼ area of the combo box displays the list of the robot controllers for which communication settings have been made. Select a robot controller using the mouse.



Caution

* Do not perform duplicate communication settings for the same robot controller.
  Doing so will generate communication errors or problems such as missing program files in the controller.
  Example of incorrect use: Connect with the same robot controller using an RS-232C and a TCP/IP.
* Before changing communication settings, be sure to close all the tools except the communication server. Otherwise, mismatching will occur in the robot controller list.
* When connecting multiple robot controllers for use, execute the operations of the robot controllers only after verifying the target of operation.

Details setting (Only for RS-232-C)



Port used	: Select from COM1, COM2, COM3 or COM4. Selection of COM1-COM8 is possible for the **C1** version or later. Select the port to which the cable is connected.
Baud rate	: Select from 4800, 9600 or 19200.
Character size	: 7 or 8 can be selected, but 8 should be set.
Parity	: Select from NON (none), ODD or EVEN.
Stop bit	: Select from 1, 1.5 or 2.
Transmission timeout	: The timeout time during transmission can be set.
Reception timeout	: The timeout time during reception can be set.
No. of retries	: Set the No. of times to retry communication.
Protocol used	: Select from Non-Procedural or Procedural.
Robot name	: A nickname consisting of up to 32 half-size characters can be assigned to a robot controller (**D1** version or later). It is not required, but the controller name assigned here will be displayed in places where you need to select a robot controller. So assigning nicknames is convenient in distinguishing them when multiple robot controllers are connected.

After changing to new settings, click on the [OK] button. The Communication Setting screen will reappear, so click on the [Set(Close)] button. (If the same settings are to be used the next time, click on the [Set(Save and Close)] button.)

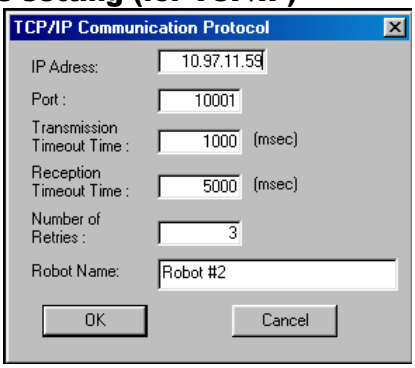
Set the following to perform a high-speed, stable communication:

Baud rate : 19200 bps

Protocol used : Procedural

It is also necessary to change the communication settings of the robot controllers at this time.

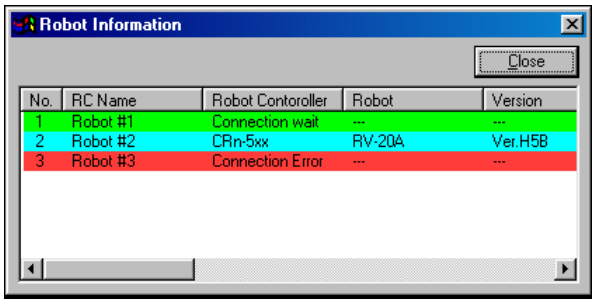
Details setting (for TCP/IP)



After setting the IP address assigned to the robot controller in [IP Address], click on the [OK] button. The Communication Setting screen will reappear, so click on the [Set(Close)] button. (If the same settings are to be used the next time, click on the [Set(Save and Close)] button.)

Robot Information

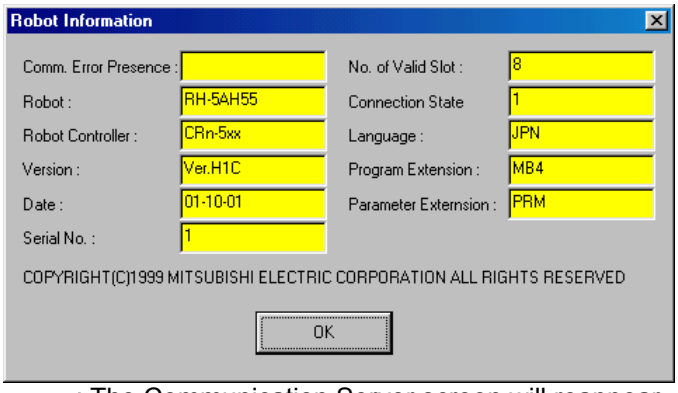
The information on the robot controllers for which communication settings have been made is displayed in a list format.



If the connection has already been completed, the robot controller information is displayed after the controller model number.

If the connection has not been completed, the description of a communication error is displayed in the controller model number field.

Double-clicking the controller number in the list displays the information on the robot selected in the dialog box.



[OK] button : The Communication Server screen will reappear.

3. Basic functions and window operations

The functions provided with this software and the basic Windows® operation methods are explained in this chapter.

3.1. Basic functions

This software functions are explained in this section.

This software has the following functions. Each function corresponds to the tools explained in Chapter 5 and following. A list of functions (Windows) is given in "A. Appendix (Function tree) for reference".

Function	Details		S/W(*1)	
			STD	mini
Applicable model	Personal computer that runs on Microsoft® Windows® 98 Microsoft® Windows® Me Microsoft® Windows NT® 4.0 Microsoft® Windows® 2000 Microsoft® Windows® XP..		OK	OK
Program editing functions	Editing functions	* MELFA BASIC IV or MOVEMASTER command(*3) compatible * Simultaneous display of multiple editing screens * Command input, command description * Editing of position data * File operation (Writing to controller, floppy disk and personal computer) * Search, Find in files and Replace function (With character, line No. or label) * Copy, cut, paste, insert (per character, line), undo (per command statement, position variable) * Line No. automatic generation, renumbering * Batch grammar check * Command template * Position variable batch editing * Position variable template * Print, print preview	OK	OK
	Management functions	* Program file management (List, copy, move, delete, content comparison, rename, protect)	OK	OK
	Debug functions	* Direct editing of programs in controller * Confirmation of program operation (step execution, direct execution) * Cycle time measurement	OK	OK
Simulation function (*2)	* Confirmation of robot program operation with off-line simulation using CG [Computer Graphics]. * Calculation of cycle time		OK	-
Monitor functions	* Robot movement monitor (robot operation state, stop signal, error monitor, program monitor (execution program, variables), general-purpose input/output signal (forced output possible), dedicated input/output signals, movement operation (movement range, current position, hand, etc.) * Operation monitor (operating time accumulation, production information, robot version) * Servo monitor (position, speed, current, load, power)		OK	OK (*5)
Parameter editing function	* Parameter setting		OK	OK
Backup/Restore	* Batch backup and Batch Restore		OK	OK
Remote maintenance function	* Monitoring and maintenance of robot at remote location using telephone line. (A separate modem is required to use this.)		OK	OK
Position repair(*4)	Support for recovery from origin point deviations		OK	OK
Maintenance forecast(*4)	Maintenance Period Forecast function		OK	OK

(*1) Software shows the following :

STD : "**RT ToolBox** Robot Total Engineering Support Software" (standard version)

mini : "**RT ToolBox** Robot Total Engineering Support Software mini"

(*2) The simulation function is compatible only with the standard version(STD).

(*3) MOVEMASTER command is only available for certain types of robot. Please verify that the type of robot that you are using is listed in the "Command List " of "Separate Volume: Standard Specification" .

(*4)These functions are supported by version E1 or later of this software. However, these functions are only available for certain types of robot and for certain controller software version. Please refer to "12. Position Repair Support Tool" and "13. Maintenance Forecast" for details.

(*5) The robot 3D monitor function in the "Movement State" is compatible only with the standard version(STD).

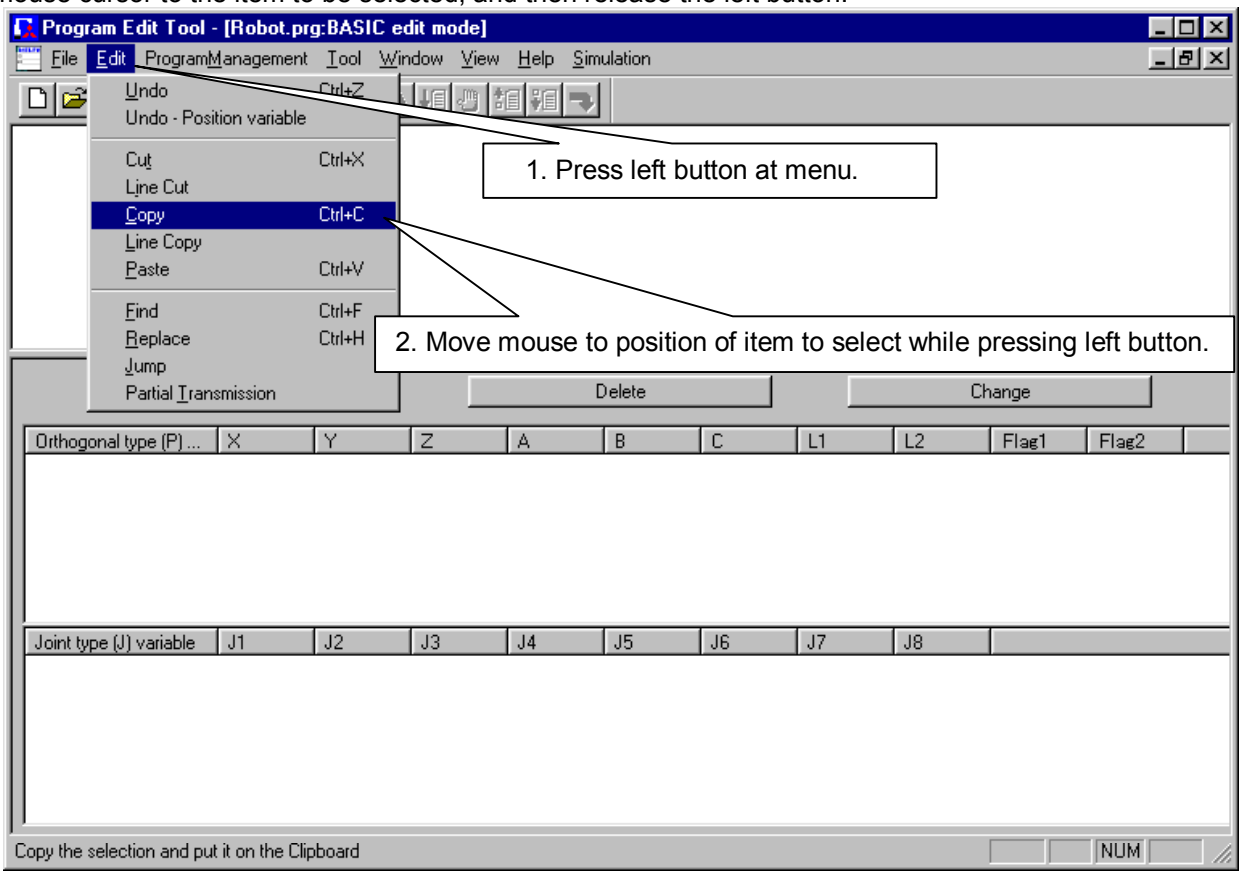
3.2. Basic Windows operations

The basic mouse operations of Windows, required when a first-time user of Windows is using this software are explained in this section.

(1) Mouse operations

Selecting a menu

When selecting a menu, move the mouse cursor to the menu characters, and then press the left mouse button. A list will appear from the selected menu, so while holding down the left mouse button, move the mouse cursor to the item to be selected, and then release the left button.



Click

This means to press the left mouse button once. This is used to press buttons, etc.

Double-click

This means to press the left mouse button twice quickly. This is used to select an item from the list.

4. Starting use

This chapter explains the series of software operations in a tutorial method for first-time users of this software.

Here, a robot program will be created using this software, and the program operation will be confirmed with simulation. Then, the program will be downloaded to the robot controller and the operation confirmed by operating the actual robot.

4.1. Starting

(1) Connect the cable with the following procedure.
Connect the personal computer and controller with an RS-232C cable(RS-MAXY-CBL or RS-AT-RCBL).
Connect the personal computer side to the standard RS-232C connector (RS-232C serial port).
Connect the controller side to the RS-232C connector on the front of the controller.
(2) Turn the controller power ON.
(3) Start up this software with the following procedure.
Turn the personal computer power ON. The following Main screen will start up automatically. If the screen does not start up, select the Windows [Start] button, and then...
<Version F1 or later>
[Programs] -> [MELSOFT Application] -> [RT ToolBox] -> [RT ToolBox].
<Version E1 >
[Programs] -> [MELFA ENG](or [MELFA mini ENG]) -> [CRn-500 PC Support Software].
<Version D2 or earlier>
[Programs] -> [MELFA ENG](or [MELFA mini ENG]) -> [MELFA PC TOOL].

Fig. 4-1 Main screen

4.2. Creating a program

Next, try editing an actual program.

(1) Starting the program editing tool

Click on the [Program Edit] button on the Main screen. The program editing tool, as shown below, will start up.

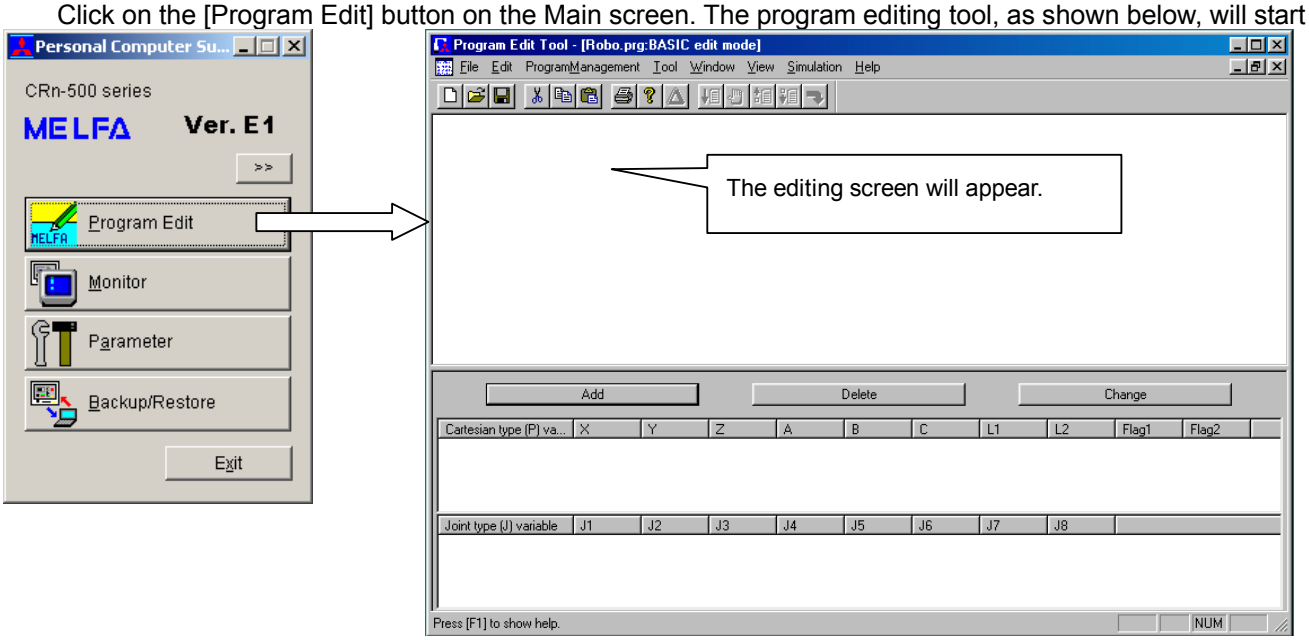


Fig. 4-2 Entire screen from Main screen to Program editing screen

(2) Newly creating a program file

To create a new program file, first click on [New] under the [File] menu, or click on the  button.
The following type of editing screen will appear.

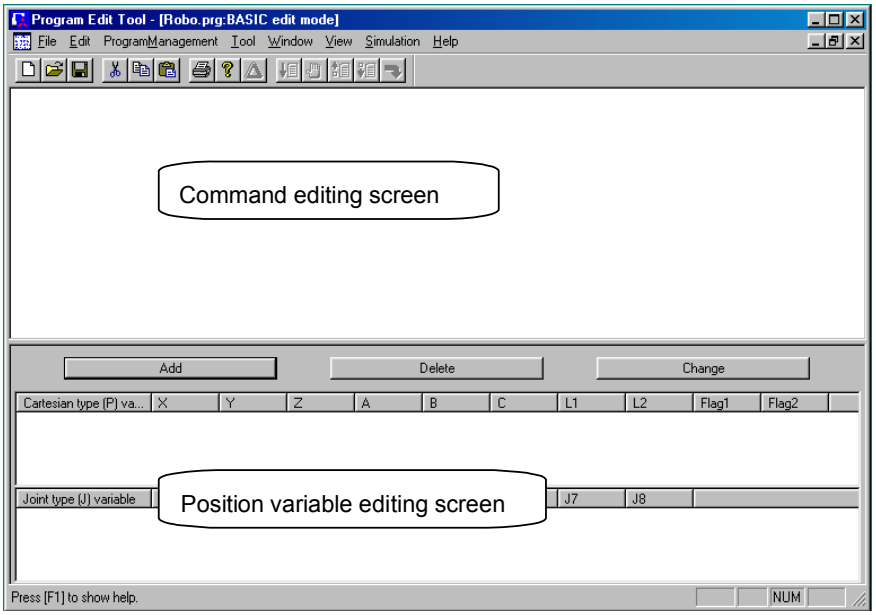


Fig. 4-3 Editing screen

(3) Editing the program

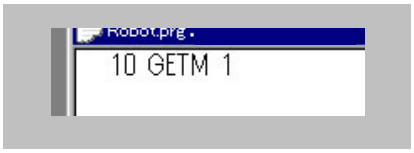
Here, a simple program using the three positions P10, P11 and P12 will be created. The program contents will move the robot in order between the three points. The list is shown below.

Program name: P100

```
10 GETM   1          'Declare to move mechanism No. 1 robot
20 MOV    P10        'Move to position P10
30 MOV    P11        'Move to position P11
40 MOV    P12        'Move to position P12
```

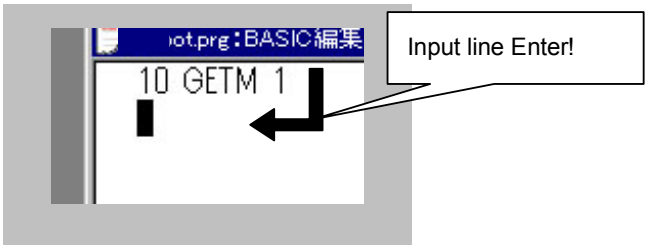
An example for inputting the first line is shown. The upper side of the editing window is the program command statement editing screen.

Input as shown below using the keyboard, and then press the Enter key.



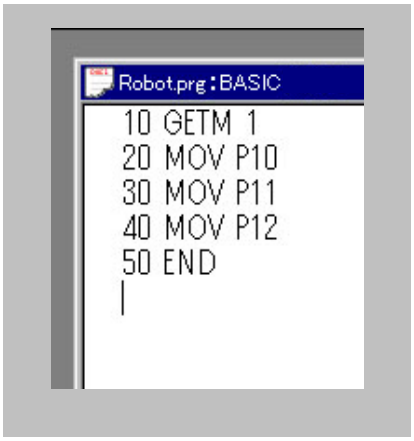
(1st line: "10 GETM 1")

The cursor will move to the next line. To change the contents of the program line, change the contents at the line, and then always press the Enter key at that line.



(Press Enter key)

Input the remaining program in the same manner.

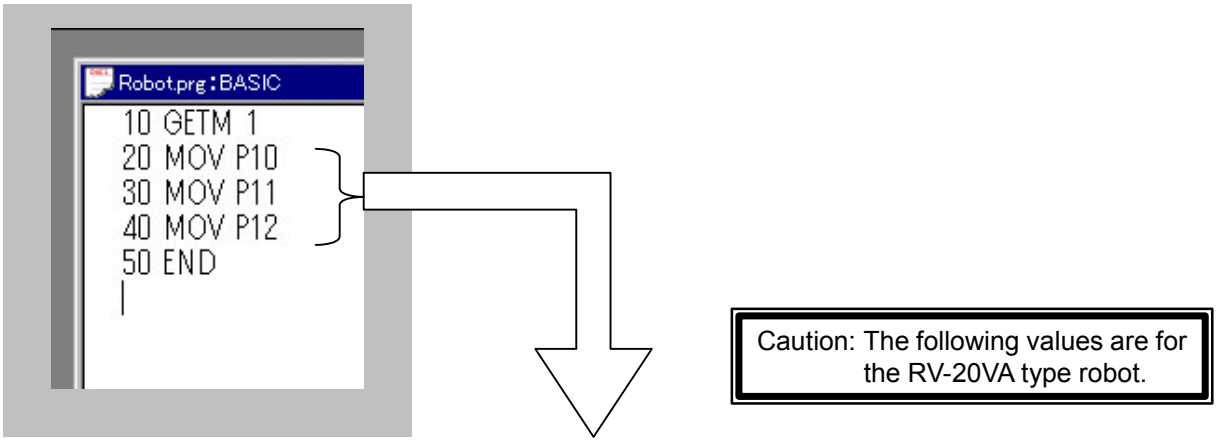


(Editing window containing the following program.)

4.3. Teaching a position

(1) Editing the position variable

Next, edit the values of the position variables P10, P11 and P12 input in the program command statement to the following values. The values marked with an × in the table are not input here.



Position variable name	X	Y	Z	A	B	C	L 1	L 2	Flag1	Flag2
P10	1060	-680	870	×	×	×	×	×	6	0
P11	900	300	1800	×	×	×	×	×	6	0
P12	933	0	1588	×	×	×	×	×	6	0

(Unit : mm)

(2) Add a position variable.

The lower side of the editing screen is the position variable editing screen.

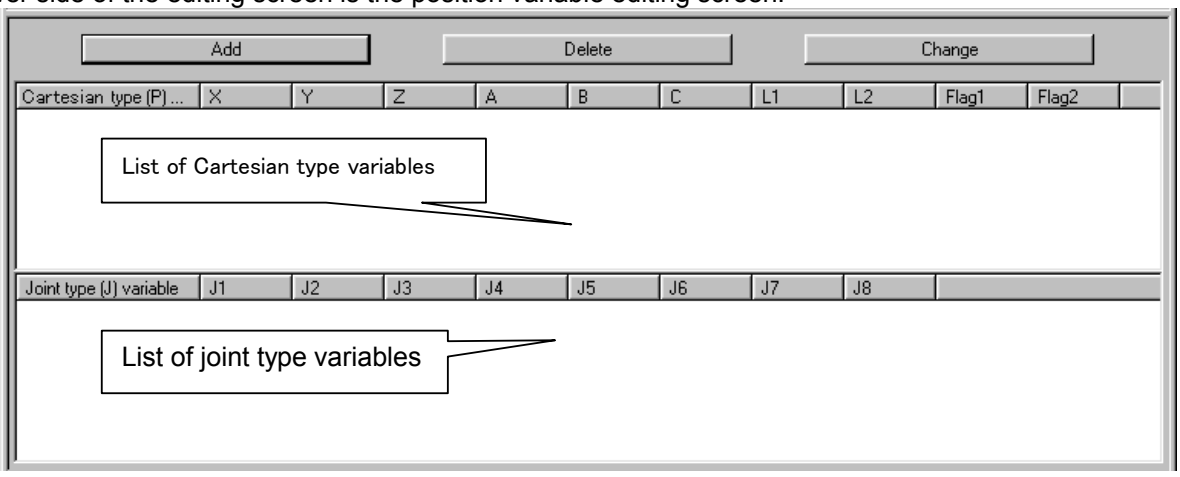


Fig. 4-4 Position variable editing screen

Input the position variable P10 value as shown below.
When the [Add] button is clicked on, the Position variable addition screen will appear.

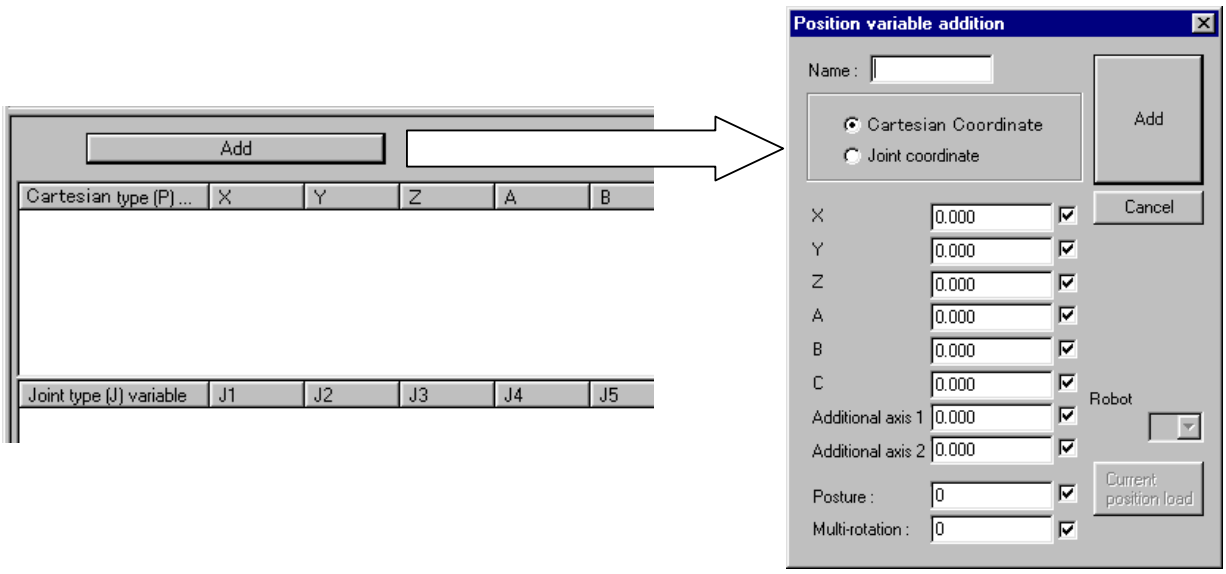
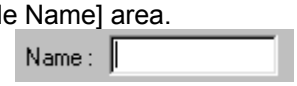


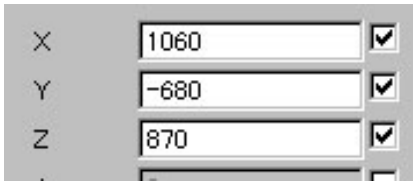
Fig. 4-5 Addition screen

Input the variable name "P10" in the [Variable Name] area.



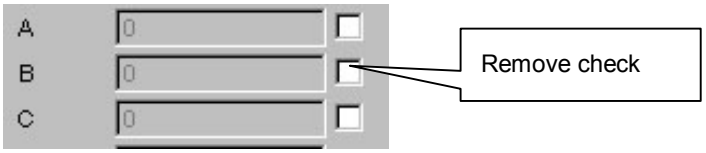
(Variable name area)

Input each value (X: 1060, Y: -680, Z: 870, Posture; 0, Multi-rotation: 0) in the [X] [Y] [Z] [Posture] and [Multi-Rotation] areas.



(Value input area)

In this case, the [Additional axis 1] [Additional axis 2] [A] [B] and [C] values are not defined, so remove the checks.



(Removing the check)

heck the described details, and click on the [Add] button. The position variables will be registered into the program, and the P10 position variable will appear in the position variable list as shown below.

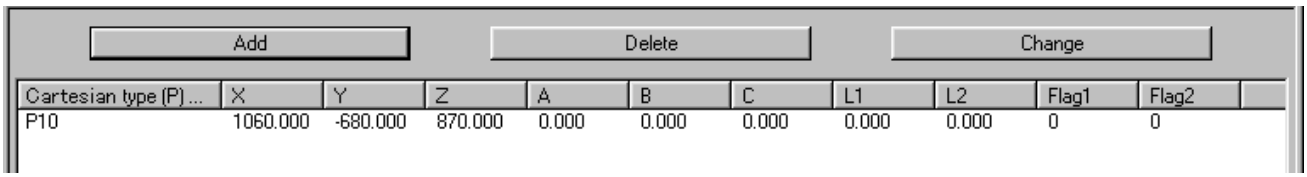


Fig. 4-6 State with P10 in list

Add the remaining two position variables in the same manner.

4.4. Confirming the operation with simulation

Next, try confirming the operation of the created robot program using simulation. Select [Execute, Stop] → [Automatic Operation] from the [Simulation] menu.

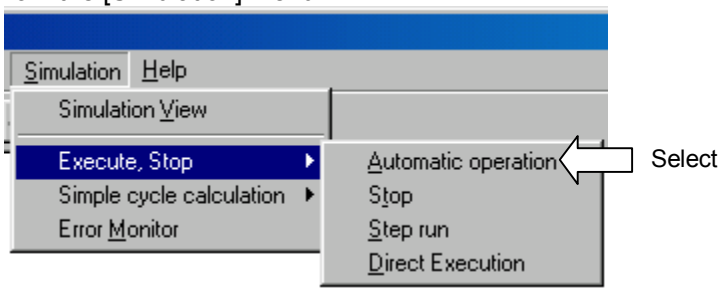


Fig. 4-7 Simulation menu

The following type of robot type and hand/workpiece setting screen will appear. In this case, select "RV-6S" from the model list, and click on the [OK] button.

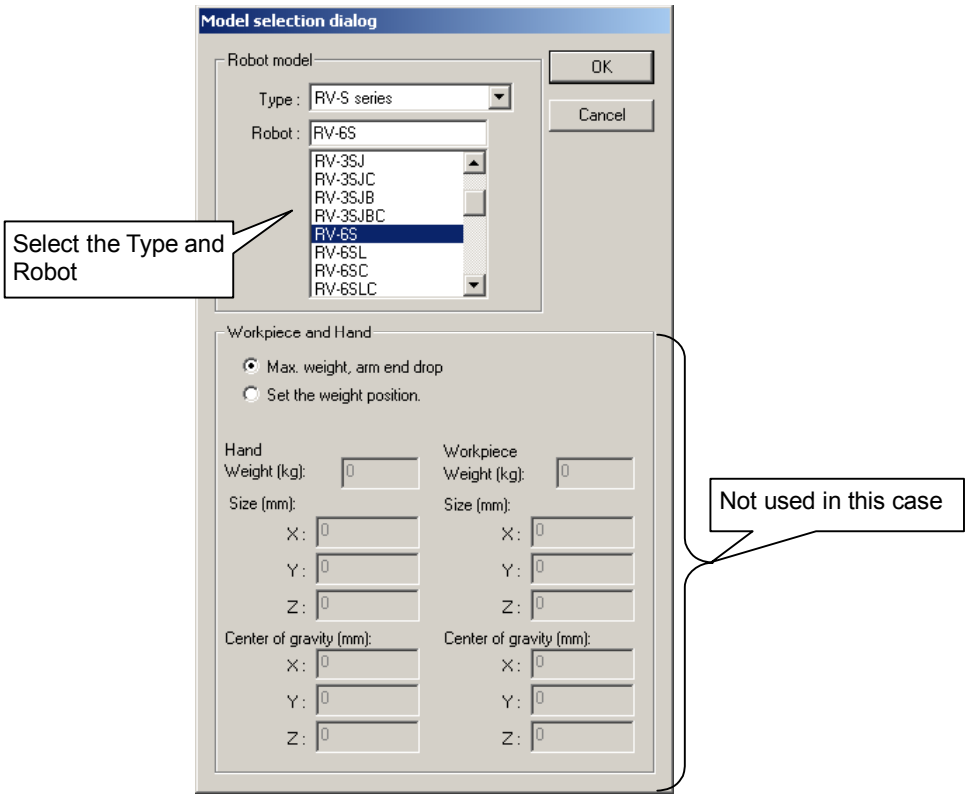
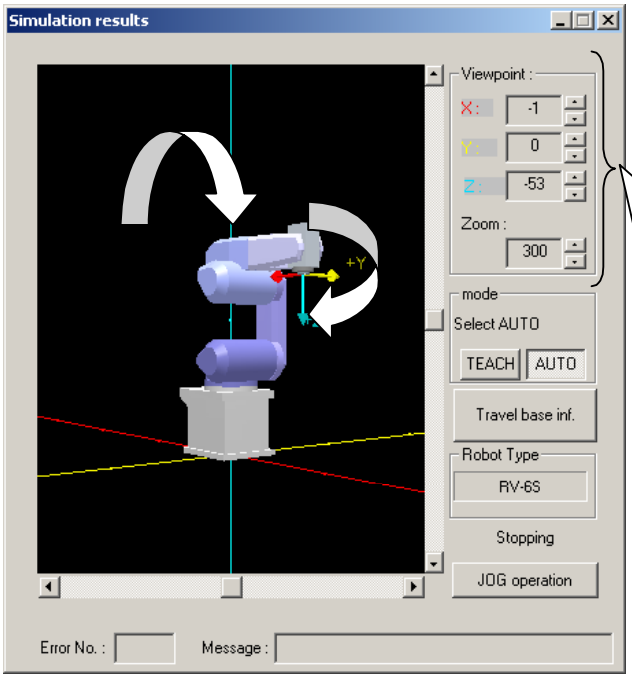


Fig. 4-8 Model and hand/workpiece setting screen

The following type of simulation screen will appear, and simulation of the robot will start. Confirm that the robot moves as written in the program.



Try changing the viewpoint.
The viewpoint can also be changed by the following mouse operations:

- Dragging left button
  left and right → Rotation of Z-axis center
  up and down → Rotation of X-axis center
- Dragging left + right button
  left and right → Rotation of Y-axis center
- Dragging right button
  up, down, left and right → Move
- Dragging left button + [Shift] key
  up and down → Enlargement/reduction

Fig. 4-9 Simulation screen

Did the robot move correctly? If it moved correctly, try changing the position variable value and moving the robot. Refer to the Robot Language Instruction Manual enclosed with the controller for the definitions of the position variables.

⚠ Caution

When not using the RV-6S type robot, change the program position variable values to match the model being used. Then check the movement with simulation, and then check the movement with the actual robot, as explained in the following section.

4.5. Saving the program

After confirming the robot movement with simulation, save the program in the controller with the following procedure. Here, the program will be saved in the controller with the name "100".

Click on [Save As->Robot] under the [File] menu, or click on the  button. A screen for designating the program.
A window for designating program name appears when [Save As -> Robot] is selected.

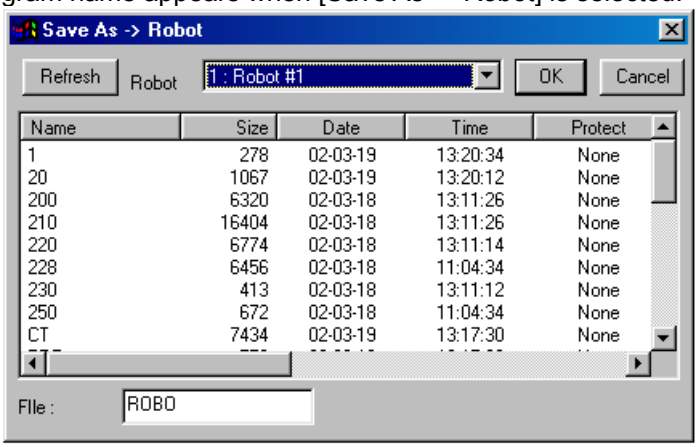


Fig. 4-10 File dialog

When  button is clicked, a dialog shown on the right appears. Select [ROBOT] and click on the [OK] button. (Caution: When saving the program in the personal computer, click on the radio button next to "PC".)

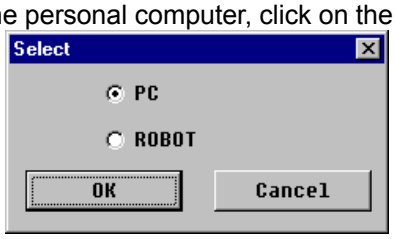


Fig. 4-11 Select a target

Input "100" in the [File Name] area, and then click on the [OK] button.
To save the program in a robot controller other than robot controller 1, select the robot controller you want to save the program to.

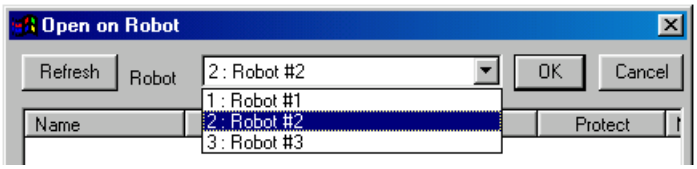


Fig. 4-12 File name and OK button

A dialog showing the save work progression will appear, and the edited program will be saved in the robot controller.

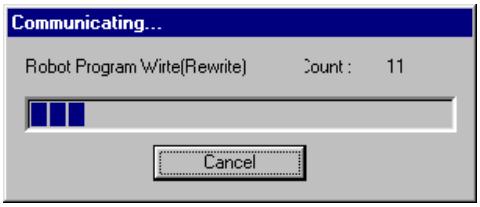


Fig. 4-13 Screen announcing save

4.6. Exiting the editing screen

Click on "Close" under the [File] menu, or click on the [x] button on the editing screen. The editing screen will close. This completes the program editing work.

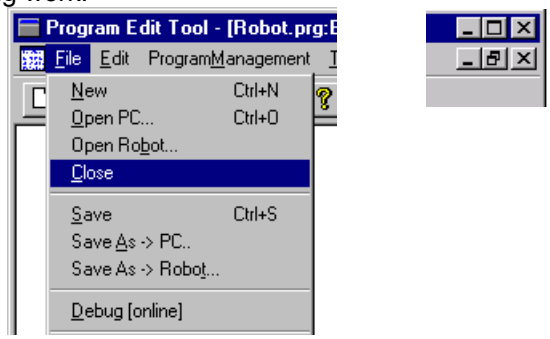


Fig. 4-14 "Close" in menu and Exit button

4.7. Confirming the movement

Try starting the "P100" program with the robot controller's operating panel. Did the program run as anticipated?

Try monitoring the robot movement
When the [Monitoring Tool] button on the Main screen is clicked on, the monitoring tool will start.
Click on [(4) Program Monitor] to start the program monitor.

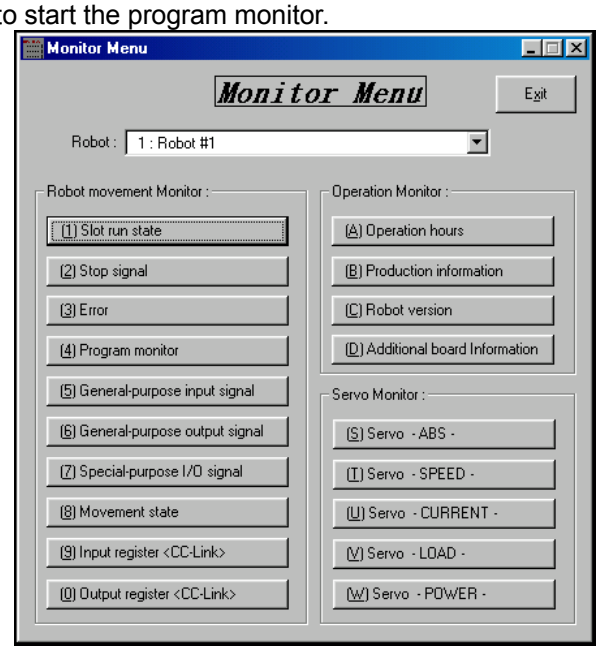


Fig. 4-15 monitor menu

Look at the program monitor and confirm the robot movement and program.

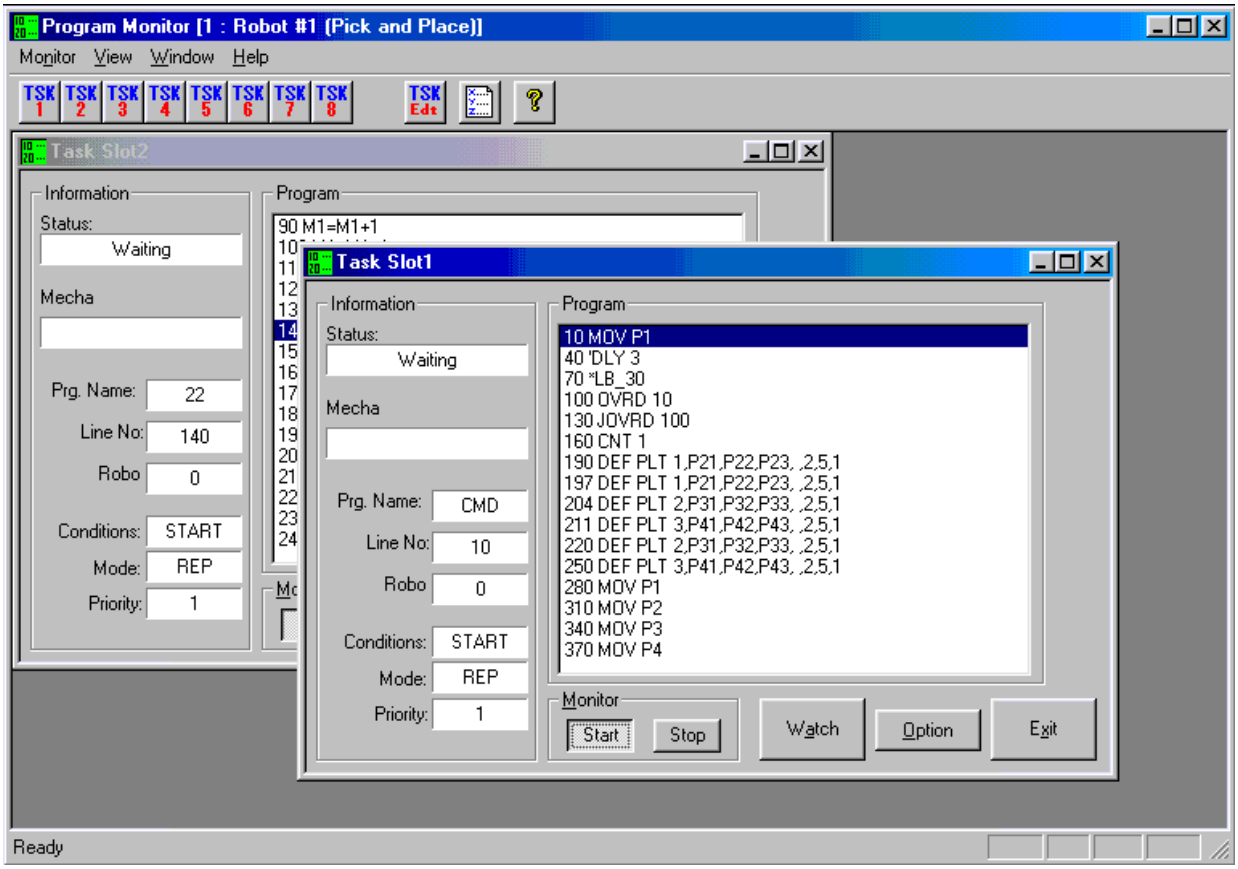


Fig. 4-16 Program monitor

4.8. Exit the operations

Did the robot move correct? Finally, exit this software.

(1) Exit the "RT ToolBox Robot Total Engineering Support Software"

Exit the program editing tool and monitoring tool. Each tool will exit when [Exit] is selected from under the [File] menu.

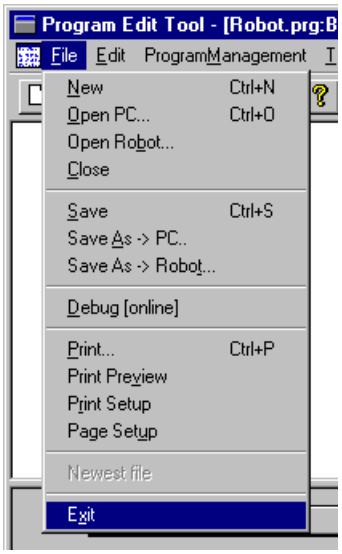


Fig. 4-17 Exiting the application

(2) Exit window

Exit windows by selecting [Shut Down…] -> [Shut down the computer?] -> [OK] under the [Start] button. Do not turn the personal computer off until a message indicating that it is okay to turn the personal computer power OFF appears on the screen. Depending on the personal computer, the power may turn OFF automatically.

5. Program editing tool

The detailed operation methods of this software are explained for each tool in this chapter.

The methods of operating the program editing tool are explained in this section.

With the program editing tool, the robot program is created, the robot movement is debugged, and simulation (only for standard version) is carried out.

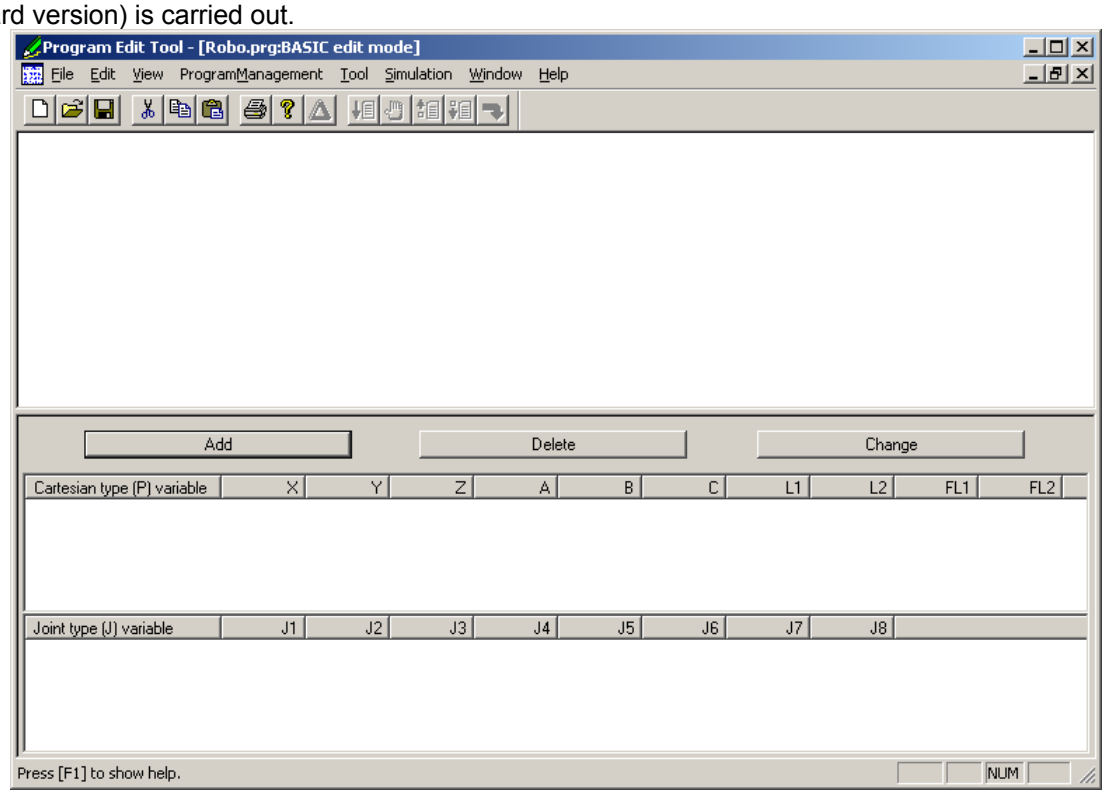


Fig. 5-1 Program editing tool

5.1. Setting the screen

The following settings can be customized with the program editing tool.

(1)	Font	The font used with the program editing tool can be changed.
(2)	Variable display area setting	The display ratio of the "orthogonal coordinate type variables" and the "joint coordinate type variables" on the Position Variable Edit screen can be changed.
(3)	Syntax check setting	Whether to check the syntax, and whether to display messages if there are no syntax errors when saving the program can be set.
(4)	(4) Programming Language	The robot programming language can be changed. The language which can be switched is MELFA-BASIC IV and Movemaster-command. (Ver.B1 or more)
(5)	History	The number of the document used recently displayed on a [File] menu is changed. (Ver.C2 or more)

[Setting method]

Click on the menu "File" - "Close", and close all of the program edit tool programs.
These settings can be made from the "View" menu.

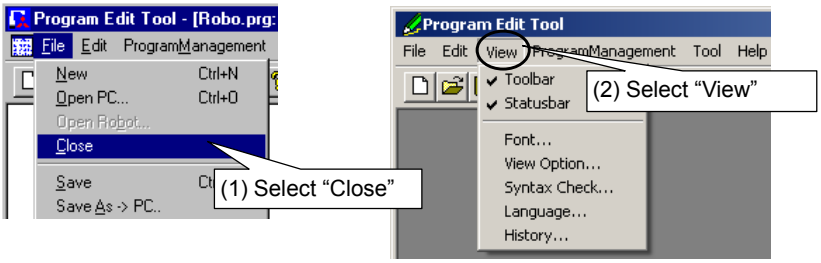


Fig. 5-2 Setting method

5.1.1. Font

The font used with the program editing tool can be changed. Click on the menu "View" - "Font".

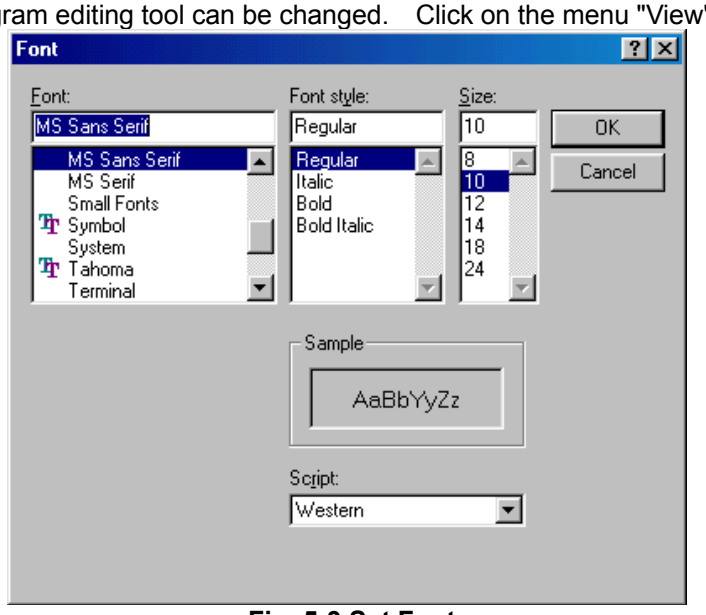


Fig. 5-3 Set Font

5.1.2. Variable display area setting

The display ratio of the "Cartesian type variables" and the "joint type variables" on the Position Variable Edit screen can be changed.

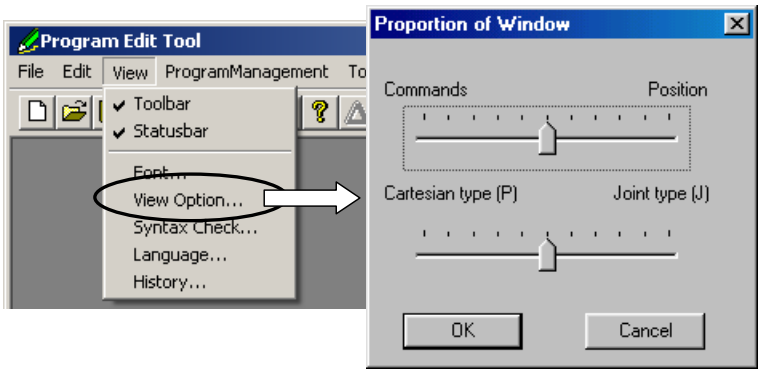


Fig. 5-4 Proportion of Window

5.1.3. Syntax check setting

Whether to check the syntax, and whether to display messages if there are no syntax errors when saving the program can be set.

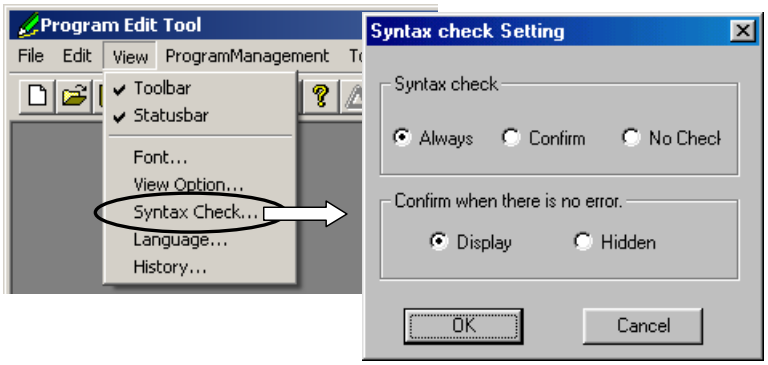


Fig. 5-5 Syntax check setting

When each item is set, the following will occur.

Syntax check	Always	When the edited program is saved, the syntax will always be checked.
	Confirm	A message box confirming whether to check the syntax will appear when the edited program is saved.
	No Check	The syntax will not be checked when the edited program is saved.
Confirmation when there is no error.	Display	If there are no errors in the syntax check, the message "No syntax errors" will appear.
	Hidden	If there are no errors in the syntax check, no message will appear.

5.1.4. Program Language

The robot programming language can be changed. The language which can be changed is as follows.

MELFA-BASIC IV
MOVEMASTER command

This change is possible by this software Ver.**B1** or more.
However, MOVEMASTER command has the limitation in the robot model which can be used.
Check the "Standard Specifications", etc., to confirm that the model in use is compatible with the MOVEMASTER command.

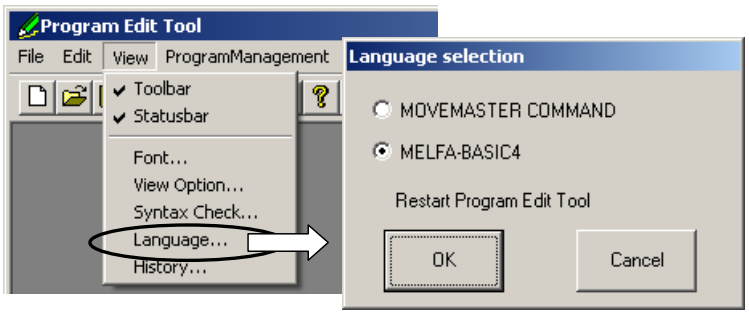


Fig. 5-6 Language selection

If the language to be used has been changed in the Language Settings, end program editing once, and then restart.

⚠ Caution

When MOVEMASTER command is used, the simulation function cannot be used.

5.1.5. History

The number of the document used recently displayed on a [File] menu is changed.
Please input the numerical values from 1 to 16.
This is possible by this software Ver.**C2** or more.

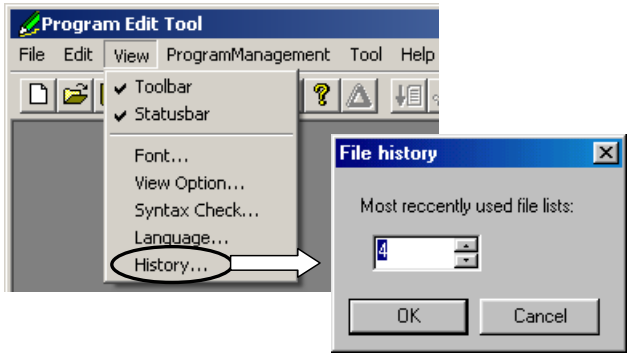


Fig. 5-7 history

In order to confirm change, end program editing once, and then restart.

5.2. Editing screen

The methods of displaying and operating the editing screen are explained.

Select [New] under the [File] menu to display the program editing window.

Fig. 5-8 New

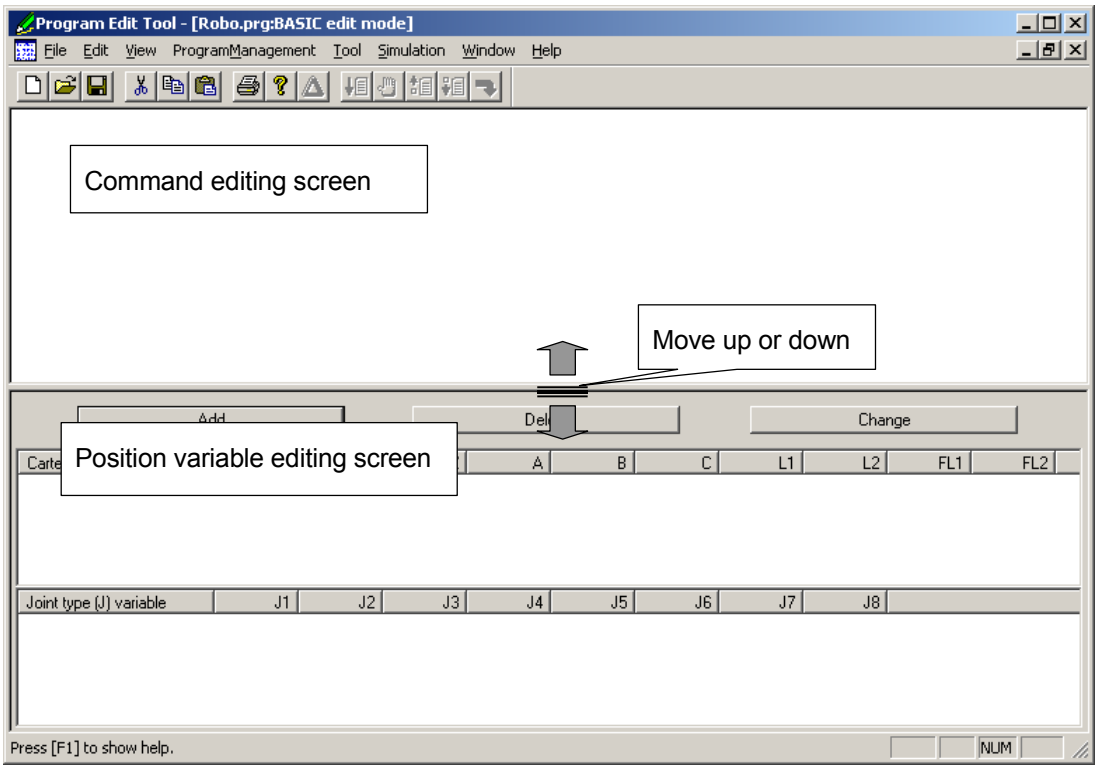


Fig. 5-9 Displaying the program editing window

The upper side is the program command statement editing window, and the lower side is the position variable editing window.

To change the position of the upper/lower screen division, drag the boundary line with the mouse. This is handy for enlarging the command editing screen when there are many command statement lines, etc.

To edit the program on multiple editing windows, select [New Window] under the [Window] menu. This function is handy for viewing both the head and end of the program when editing a program having many lines.

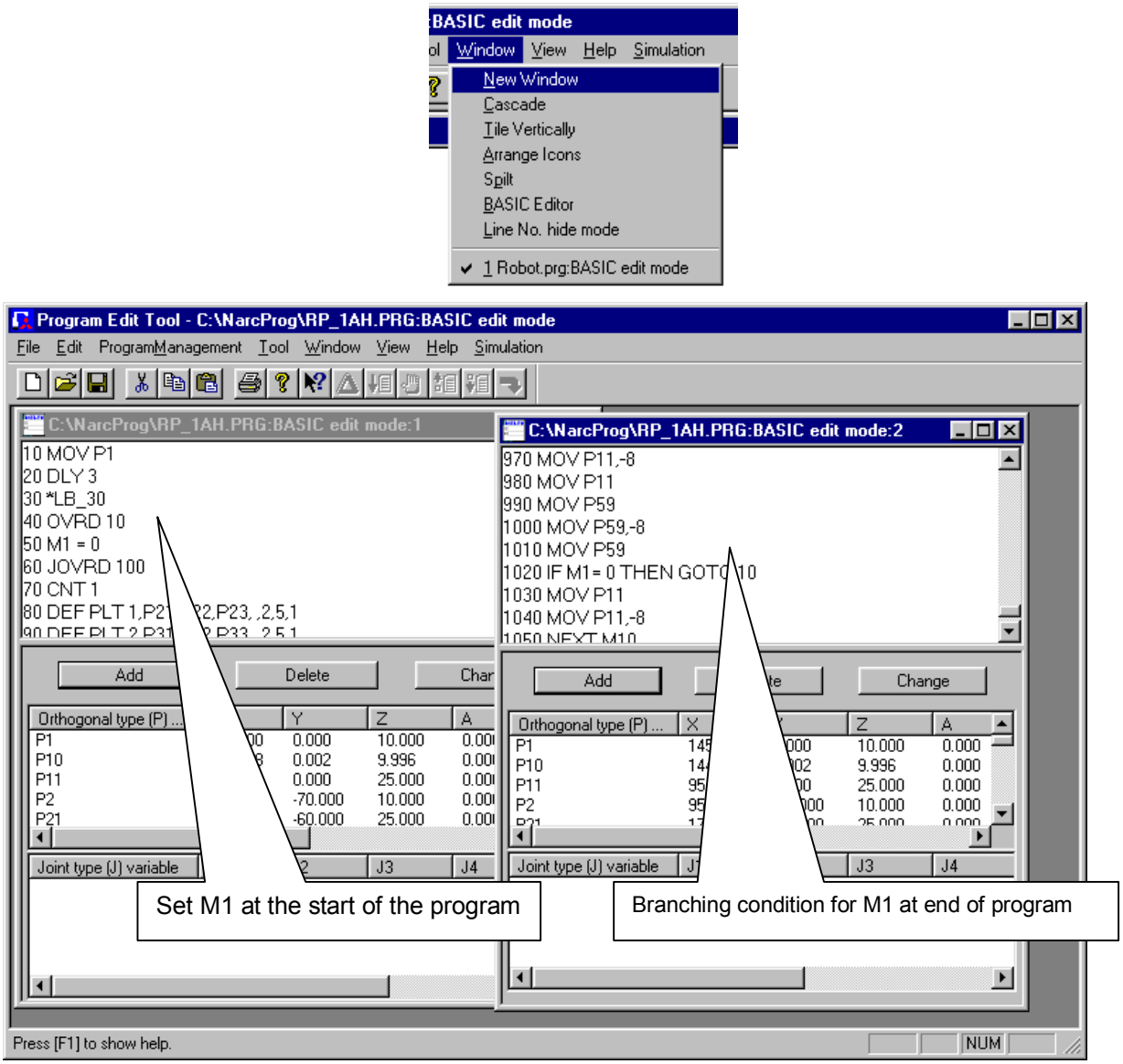


Fig. 5-10 Multiple editing windows

To close the program editing window, select [Close] under the [File] menu.

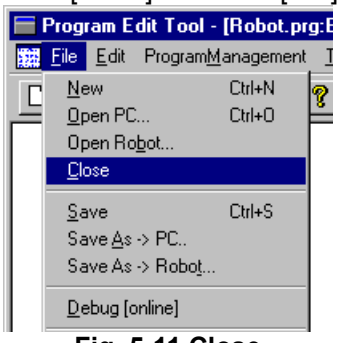


Fig. 5-11 Close

5.3. Editing mode

The program editing tool's editing mode is explained in this section.
The program editing window's editing modes include the "BASIC Editor" for persons familiar with the BASIC language editing tool used with the old controller, and the "Line No. hide mode" for persons familiar with Windows wordprocessing operations.

When the normal program editing window is started up, the "BASIC Editor" is entered. These two editing modes can be changed freely at any time.

5.3.1. BASIC editing mode

This mode shows the robot program line Nos., and is intended for users familiar with the BASIC language editing tool used with the old controller. The robot program can be edited at the required line No. The AUTO function and renumbering function can be used to edit the line No.

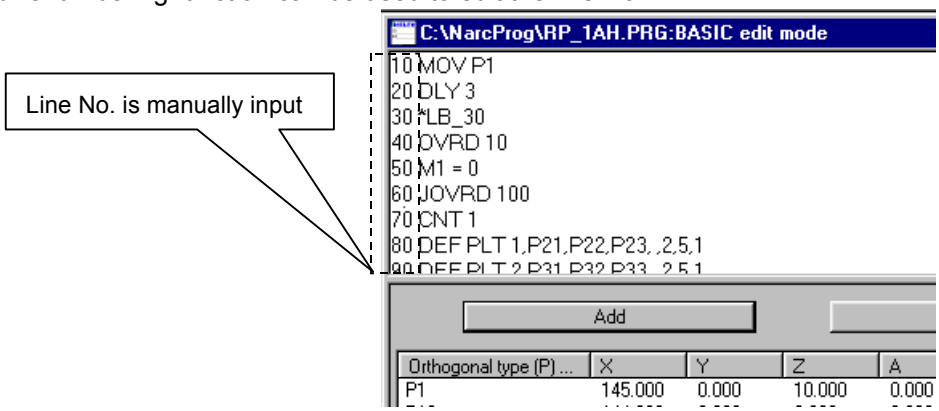


Fig. 5-12 BASIC editing mode screen

5.3.2. Line No. hide mode

This mode does not show the robot program line Nos., and is intended for users familiar with Windows wordprocessing operations. The program commands can be edited without inputting the line No. The stop position is shown on the left edge. When the edited program is saved, the line Nos. are automatically assigned.

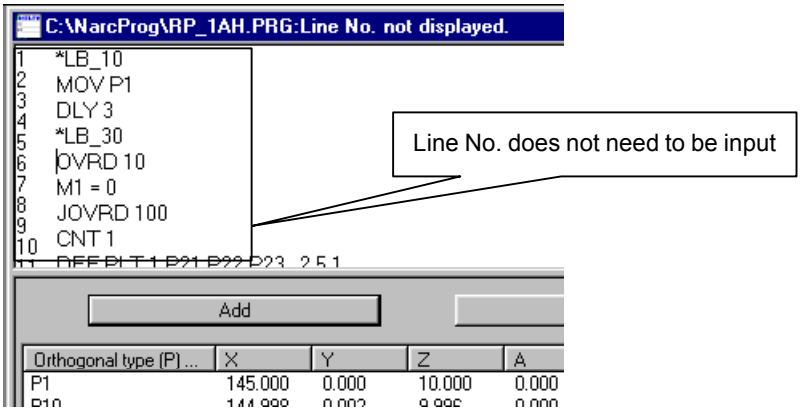


Fig. 5-13 Line No. hide mode

Line No. hide mode cannot be selected Movemaster-Command.

5.3.3. Changing the editing modes

The editing mode can be changed as explained below.

→ When [BASIC Editor] is selected from under the [Window] menu, the currently active editing program window will change to the BASIC editing mode.

→ When [Line No. hide mode] is selected from under the [Window] menu, the currently active editing program window will change to the line No. hide mode. When changing from the BASIC editing mode, the line no. assigned to the program command statement argument will be automatically converted into a label. Note that once the line No. is converted into a label it cannot be returned to a line No.

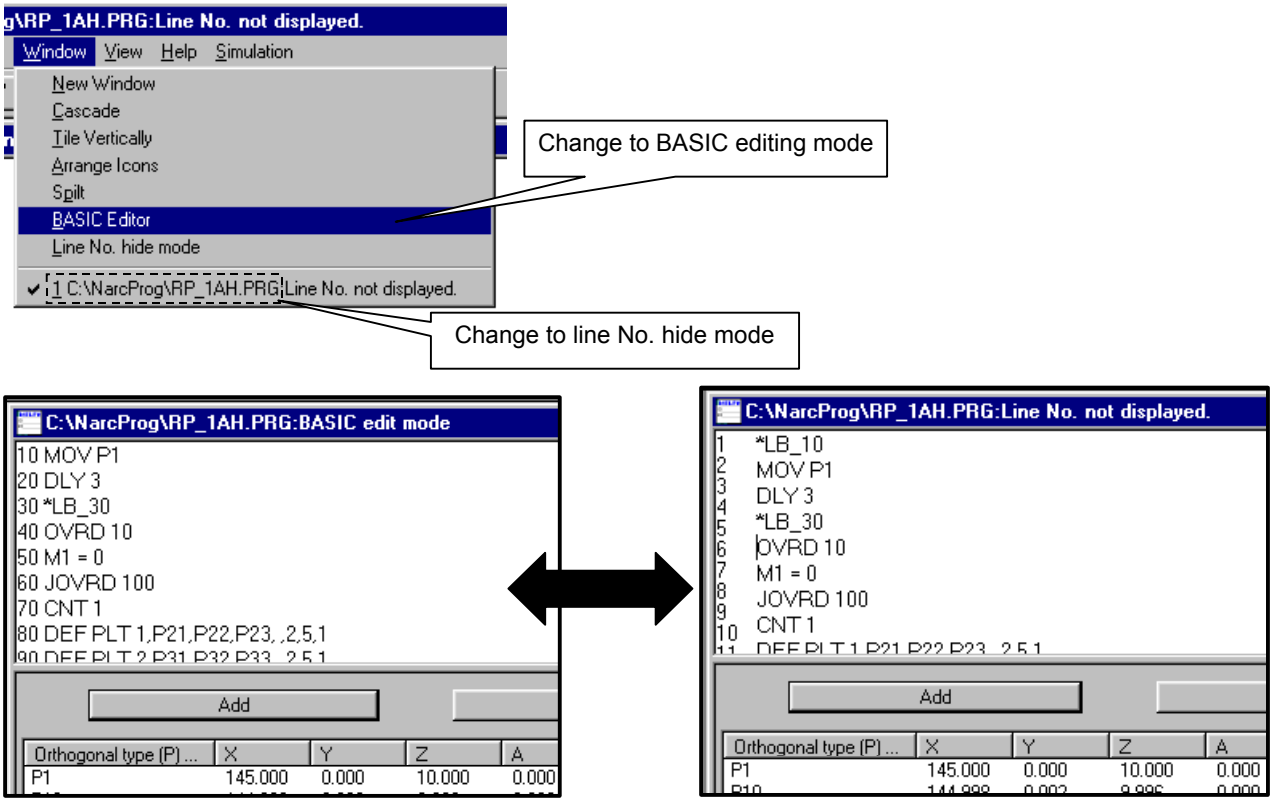


Fig. 5-14 State of mode conversion

5.4. Opening a program

The methods for opening and saving a program are explained in this section.

The operations related to opening, closing and saving an editing program are all carried out from the [File] menu or tool chip (buttons under menu).

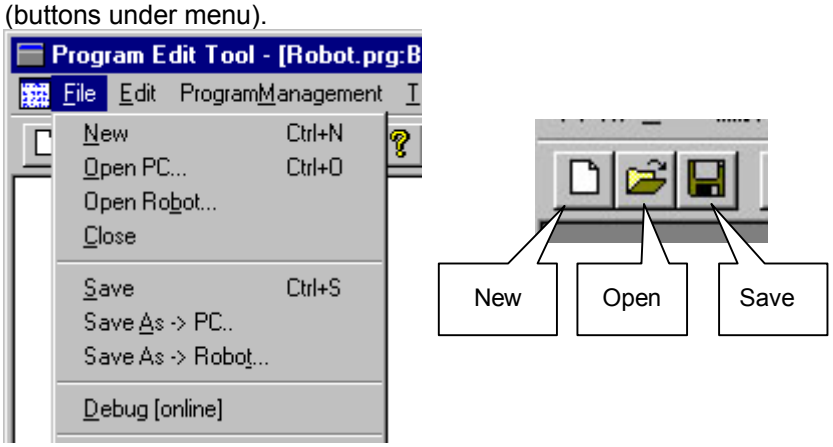


Fig. 5-15 [File] menu and tool chips

The contents of the program changed with editing are not saved unless "Save" is executed. There is no particular limit to the number of program files that can be opened.

5.4.1. Opening programs on a PC

To open a program on a PC, select [Open PC] under the [File] menu. It is also possible to open several files simultaneously by pressing the [Ctrl] key and making selection using the "mouse."

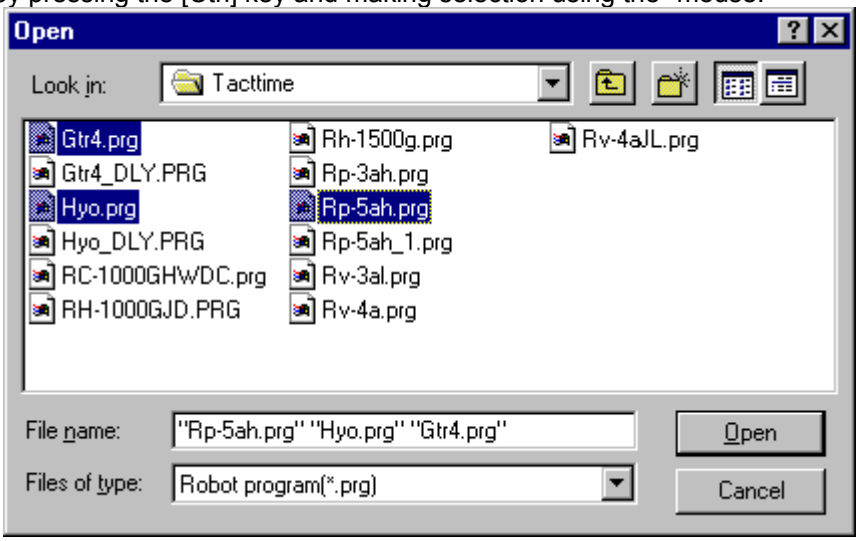


Fig. 5-16 Opening programs on a PC

5.4.2. Opening a program on a robot controller

A program in the controller can be opened with the normal open method and with the debug open method.

From Version **E1** of this software, when reading the program on the robot controller to the personal computer, read items (instruction statements, position variables, program external position variables) can be specified. (However, this function can only be used with Version **H1** or later of the robot controller software.)

For more information about read items, see the next section.

Normal open :

Read the program on the robot controller to the personal computer.

A window shown below appears when [Open Robot] is selected. It is also possible to open several files simultaneously by pressing the [Ctrl] key and making selection using the "mouse."

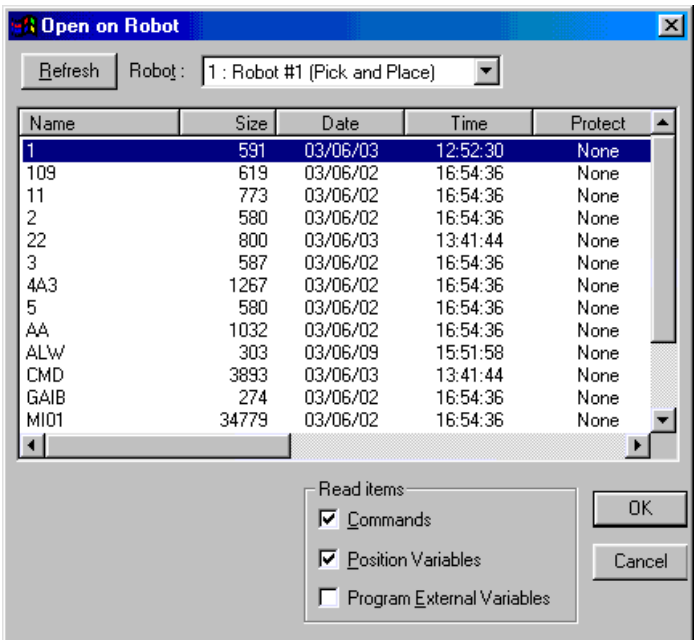


Fig. 5-17 Opening programs on a robot

Updates to the latest information when [Refresh] button is clicked.

Refresh the information on this window when changing a file with teaching box, etc. or when connecting to a different robot controller.

If multiple robot controllers have been connected, the robot controllers can be switched by manipulating the combo box labeled “Robot.”

Debug open :

The contents of the program changed with editing are reflected immediately. The program file contents will be changed, even when "Save" is not executed. Depending on the opened program, the robot can be directly operated (step execution, direct execution). Only one program can be opened, and the editing mode is limited to the BASIC editing mode. To open a program, select [Debug] under the [File] menu.

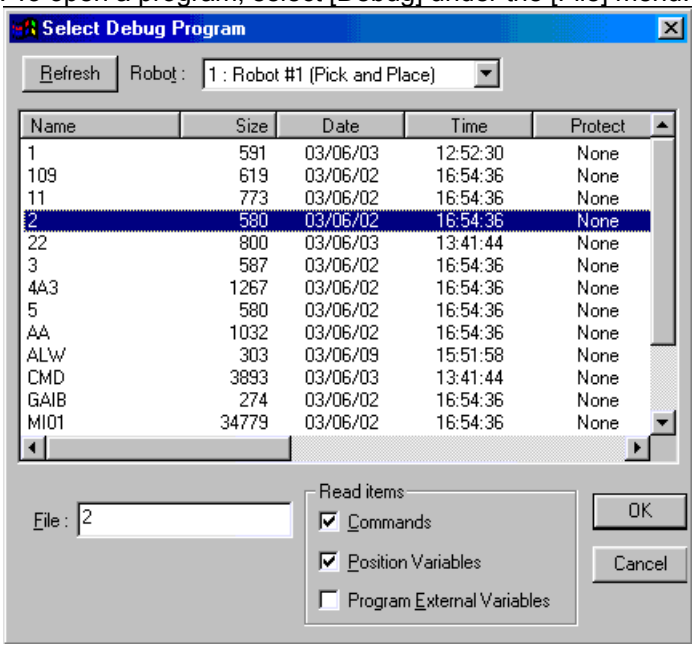


Fig. 5-18 Select debug program

5.4.3. Read items when opening the program on the robot controller

Read items in the robot program can be set by categorizing them into instructions, position variables and program external position variables. (The function for specifying read items can be used with Version **E1** or later of this software and Version **H1** or later of the robot controller software. The function for specifying write items can be used with Version **E1** or later of this software regardless of the version of the robot controller software.)

The initial values of the read items are as shown in "**Fig. 5-19 Read Items**"

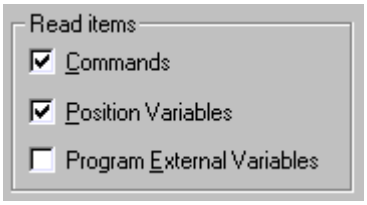


Fig. 5-19 Read Items

"**Table 5-1 Program External Position Variable Read Operation**" shows the operation to read program external position variables. (For more information about program external position variables, refer to the separate volume, "Detailed Guide to Functions and Operation.")

Table 5-1 Program External Position Variable Read Operation

<table>
<tr><th colspan="2" rowspan="2"></th><th colspan="3">Read Item</th><th rowspan="2">Position variable, joint variable (P_01, J_02, etc.) (MOVEMASTER command : 901-999)</th><th rowspan="2">Position array variable, joint array variable (P_100( ), J_102( ), etc.)</th></tr>
<tr><th>Instruction</th><th>Position</th><th>External position variable</th></tr>
<tr><td rowspan="12">Robot controller's software version</td><td rowspan="4">Ver. J1 or later</td><td>☑</td><td>☑</td><td>☑</td><td rowspan="2">Reads only the external position variables (position variables, joint variables) used in instruction statements.</td><td rowspan="2">Reads all elements used in instruction statements. (*1)</td></tr>
<tr><td>☑</td><td>☐</td><td>☑</td></tr>
<tr><td>☐</td><td>☑</td><td>☑</td><td colspan="2" rowspan="2">Reads all external position variables (position variables, joint variables, position array variables, joint array variables).</td></tr>
<tr><td>☐</td><td>☐</td><td>☑</td></tr>
<tr><td rowspan="4">Ver. H1 to H7</td><td>☑</td><td>☑</td><td>☑</td><td colspan="2" rowspan="4">Reads all external position variables (position variables, joint variables, position array variables, joint array variables).</td></tr>
<tr><td>☑</td><td>☐</td><td>☑</td></tr>
<tr><td>☐</td><td>☑</td><td>☑</td></tr>
<tr><td>☐</td><td>☐</td><td>☑</td></tr>
<tr><td>Ver. G9 or earlier</td><td colspan="5">This function cannot be used.</td></tr>
</table>

*1: If only P_100(1) is used in an instruction statement, all of P_100(1) to P_100(10) will be read. However, the number of effective elements depends on the software version of the robot controller in use.

5.5. Closing and saving a program

Select the [Save As -> PC] or [Save As -> Robot] of the [File] menu in order to save an edited program. Then the saving window appears accordingly. Name the file and save it.

To save a program you have edited, select [Save on Personal Computer] or [Save on Robot] from the [File] menu. When the corresponding screen for the selected save destination opens, save the program by assigning a file name.

From Version **E1** of this software, when saving programs on the robot controller, write items (instruction statements, position variables, program external position variables) can be specified.

For more information about write items, see "**5.5.4 Write Items When Saving on the Robot Controller"**

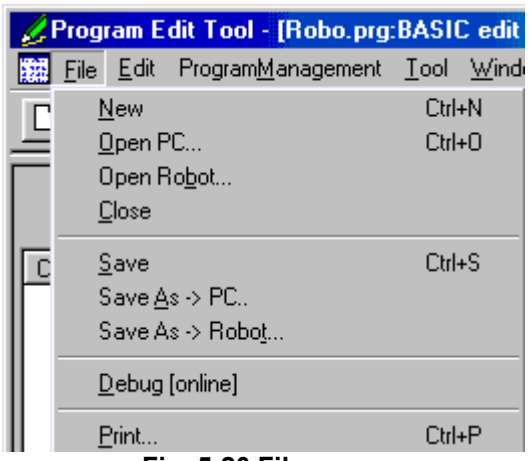


Fig. 5-20 File menu

5.5.1. Save

To save a program you are editing, select [Save] from the [File] menu, or click  .

In Version **E1** or later of this software, write item confirmation (see the figure below) appears. The items checked here are the same as the read items. In any other versions, instruction statements and position variables are saved by overwriting without displaying the write item confirmation.

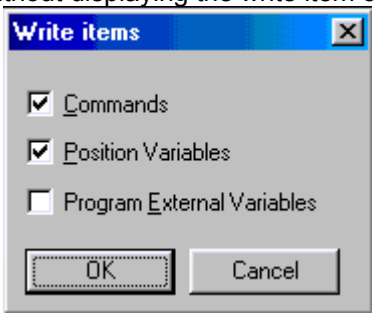


Fig. 5-21 Written item

5.5.2. Save on Personal Computer

To save a program on the personal computer, select [Save on Personal Computer] from the [File] menu.

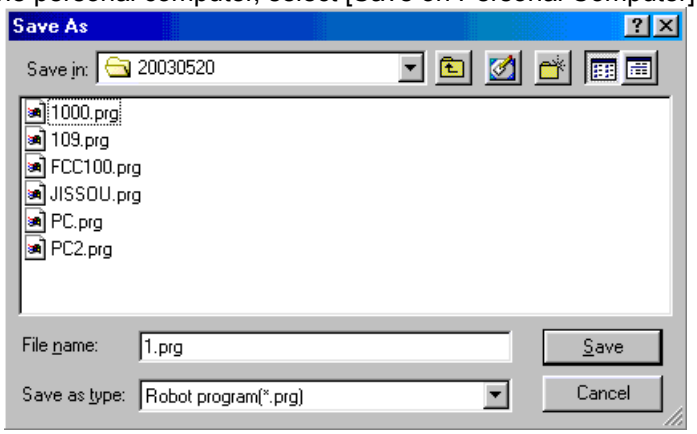


Fig. 5-22 Save on Personal computer

5.5.3. Save on Robot

To save a program on the robot controller, select [Save on Robot] from the [File] menu.

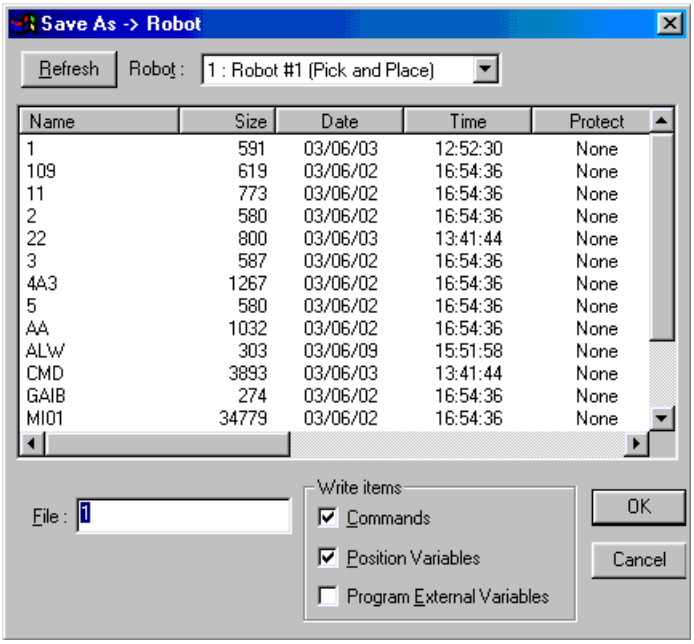


Fig. 5-23 Save on Robot

The write items when saving on the robot controller can be used in Version **E1** or later of this software.

5.5.4. Write Items When Saving on the Robot Controller

When saving a robot program on the robot controller, write items can be set by categorizing them into instructions, position variables and program external position variables. (The function for specifying write items can be used with Version **E1** or later of this software.)

The initial values of the write items are the same as the read items when reading a program. When a new program is created, the initial values are as shown in Figure 5-24, "Write Items."

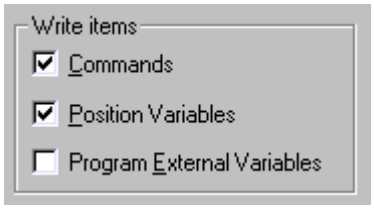


Fig. 5-24 Write Items

The following shows the save operation to the robot controller when only instruction statements and position variables are specified.

<Example> When the following programs will be edited on the robot controller and the personal computer:

<< Program on the robot controller >>

```
10 MOV   P1
20 MOV   P2
30 MOV   P3
40 END
P1=( 400.000,     0.000, 100.000, , , 90.000)(4,0)
P2=(     0.000, 400.000, 150.000, , ,    0.000)(4,0)
P3=(-351.704, -49.369,    22.000, , ,-95.168)(0,0)
P4=( 276.499,-599.066, 264.966, , , 29.170)(0,0)
```

<< Program on the personal computer >>

```
100 MOV   P1
200 MOV   P2
300 MOV   P5          ' <- Change
400 END
P1=( 400.000,     0.000, 100.000, , ,-90.000)(4,0)
P2=(     0.000, 400.000, 150.000, , ,    0.000)(4,0)
P3=(-351.704, -49.369,    22.000, , ,-95.168)(0,0)
P5=( 535.786, 295.021, 102.000, , ,148.420)(0,0)
```

(1) When only instructions are written

Only instruction statements are rewritten. Position variables are not changed.

<< Program on the robot controller >>

```
100 MOV   P1
200 MOV   P2
300 MOV   P5
400 END
P1=( 400.000,     0.000, 100.000,,, 90.000)(4,0)
P2=(     0.000, 400.000, 150.000,,,    0.000)(4,0)
P3=(-351.700, -49.370,    22.000,,,-95.170)(0,0)
P4=( 276.500,-599.070, 264.970,,, 29.170)(0,0)
```

Only instructions are rewritten.

Not changed

(2) Only when position variables are written

<< Program on the robot controller >>

```
10 MOV   P1
20 MOV   P2
30 MOV   P3
40 END
P1=( 400.000,     0.000, 100.000,,,-90.000)(4,0)
P2=(     0.000, 400.000, 150.000,,,    0.000)(4,0)
P3=(-351.700, -49.370,    22.000,,,-95.170)(0,0)
P4=( 276.500,-599.070, 264.970,,, 29.170)(0,0)
P5=( 535.790, 295.020, 102.000,,,148.420)(0,0)
```

Not changed

The position variables on the personal computer are overwritten. However, the position variables that do not exit on the personal computer but exit on the robot controller are left intact (reference).

5.5.5. Precaution for saving program in controller

⚠ Caution

Precautions for saving program in controller

When writing (saving) the robot program in the controller, first the program having the same name from the controller is deleted, and then the new program is written in.

With this, if an error occurs or the communication is canceled while transmitting the program from the personal computer rot the controller, the original program in the controller will be erased.

In this case, the program can be recovered with the following procedures.

【Countermeasure】

* If the program to be transmitted is being edited with the personal computer, remove the cause of the error, and then save again.
* If the program editing has been exited:
  A backup file is created in the folder where the personal computer support software is installed.
  If the folder was not changed during installation, it is
  Version **F1** or later = C:/Program Files/MELSOFT/RT ToolBox E/
  Version **E1** or earler = C:/Program Files/Melfa/.
  The name of this backup file has a Temp added before the name that was to be saved. (Ex.: TempOOO)
  Correct the file name with Explore, etc., and open the file with program editing, and then save the file.

[Correcting the file name]

TempOOO
↓ Delete Temp from TempOOO, and add ".prg" as the extension.
OOO.prg

⚠ Caution

Precautions when using user defined external variables

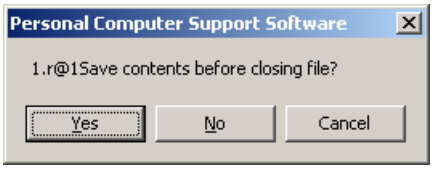
When creating a program using user defined external variables, first define the variables in the base program.

A program using variables that have not been defined in the base program will not be stored in the robot controller. (This will result in the “undefined variables error” when the program is being written to the robot controller).

See the Controller INSTRUCTION MANUAL for more information on the base program and user defined external variables.

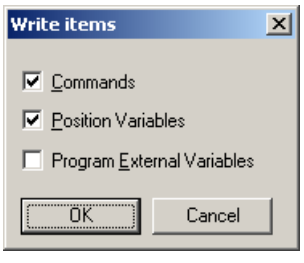
⚠ Caution

If the user edits (changes any one portion of) the program within the robot controller and attempts to close the program without writing to the controller, a message will appear to confirm if the changes need to be written to the controller (see the figure on the right).



Select “Yes” if writing the data to the controller. Select “Cancel” to end the process of closing the program.

However, with version E1 or later, if all of the “Write items” are not selected (see the figure on the right) when saving the program to the controller, the confirmation message mentioned above will always be displayed when closing the program.



5.6. Editing the program

The methods of editing a program are explained in this section.

5.6.1. Program language

The MELFA-BASIC IV, or MOVEMASTER command language is used. Refer to the controller's language instruction manual for details on the command grammar and format, etc.

The following example shows the case when the MELFA-BASIC IV language has been selected.

5.6.2. Registering a program command statement

Input the command statement as shown below.

For BASIC editing mode:

Input the command statement after the line No., and input by pressing the ENTER key.

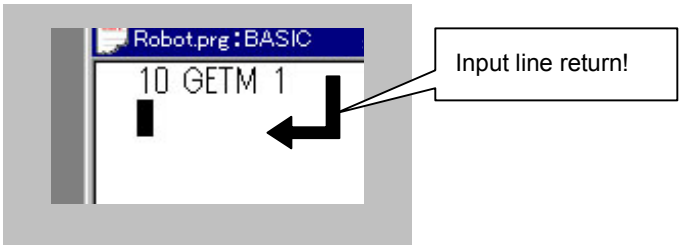


Fig. 5-25 For BASIC editing mode

For line No. hide mode:

Input only the command statement, and input by pressing the ENTER key.

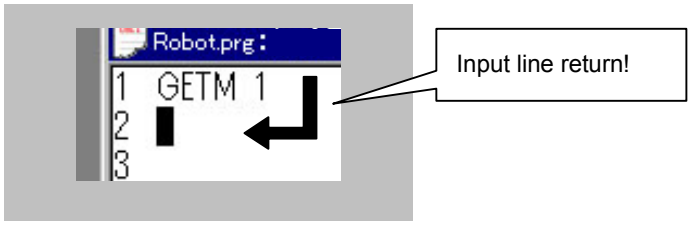


Fig. 5-26 For line No. hide mode

Caution

If the ENTER key is not pressed to input the command statement, it will not be recognized as a robot program.

All characters except comment text and character string data (enclosed by ") are automatically converted into uppercase characters

5.6.3. Deleting a program line

Use the following procedure to delete a designated line No. line from the program.
For BASIC editing mode: Describe only the line No., and then press the ENTER key.

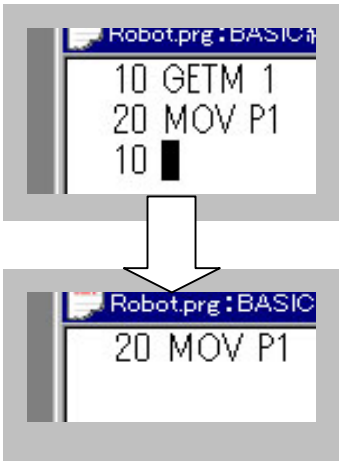


Fig. 5-27 Deleting a program line

For line No. hide mode: Delete the command statement by pressing the Backspace key or Delete key.

5.6.4. Describing a comment statement

To write a comment statement, input " ‘ " at the head of the command statement, and then input the comment character string. (A comment can be input after the command statement.)

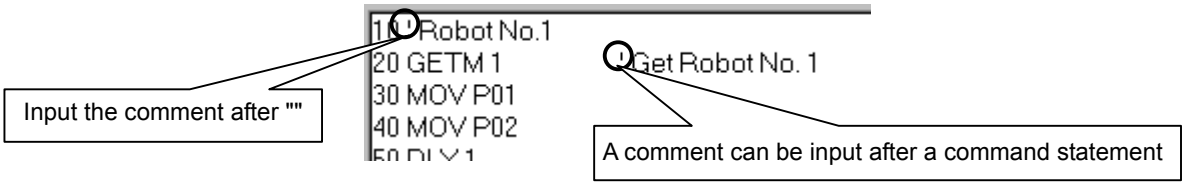


Fig. 5-28 Example of inputting a comment statement

5.6.5. Inputting a position variable (Only for BASIC editing mode)

By inputting a position variable definition following the robot program grammar as shown below, the P type and J type position variable can be input.
(When using the line No. hide mode, input from the position variable editing window.)

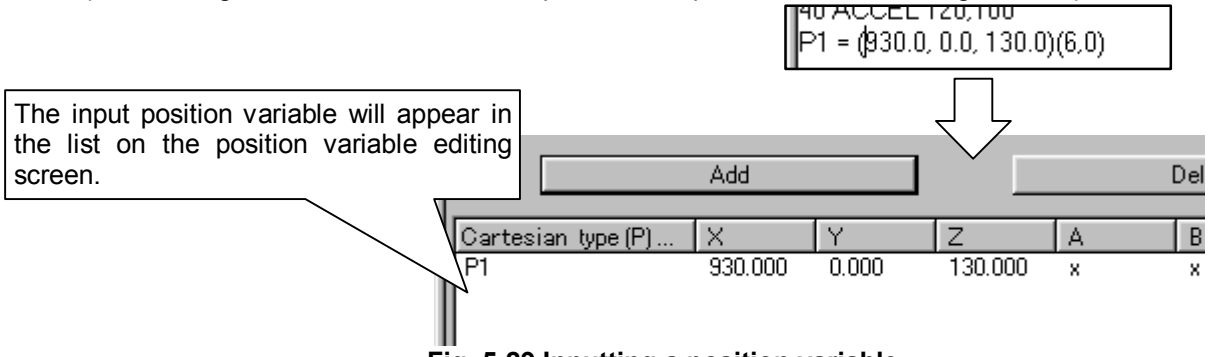


Fig. 5-29 Inputting a position variable

5.7. Editing the position data

The methods of editing the position variables are explained in this section.

The position data is edited on the position data editing screen. The list on the top is for the orthogonal coordinate type variables, and the list on the bottom is for the joint coordinate type variables.

The method to display array variables differs between Version **D2** or earlier and Version **E1** or later of this software.

< Version E1 or later >

The elements of array variables are expanded and then displayed.

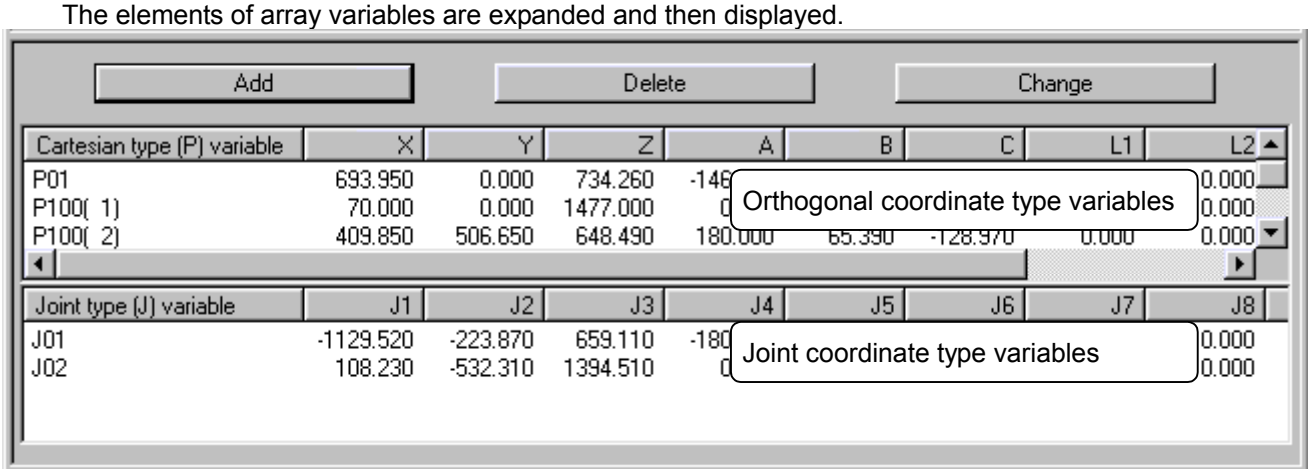


Fig. 5-30 Position variable editing screen (E1 or later)

< Version D2 or earlier >

Only the name of the array variable is displayed.

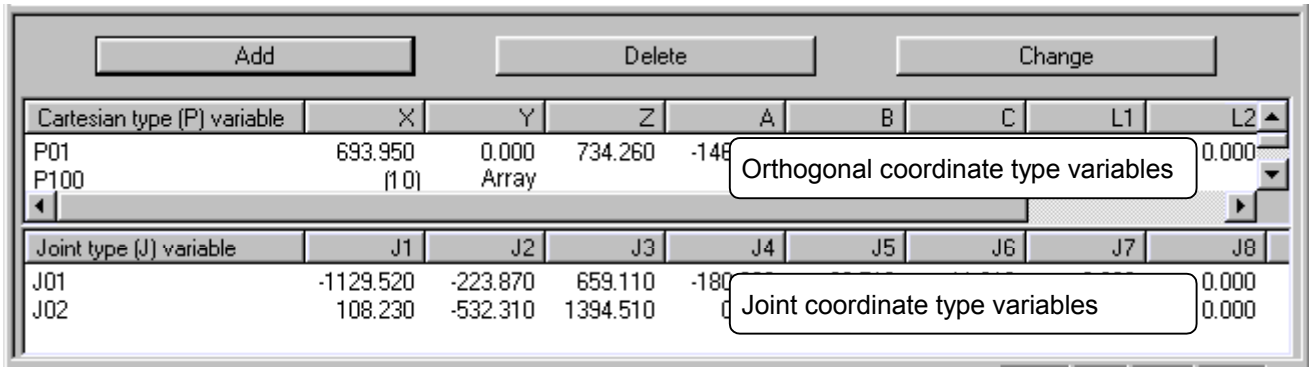


Fig. 5-31 Position variable editing screen (Version D2 or earlier)

5.7.1. Editing the position variable

(1) Adding a position variable

Click on the "Add" button. The following position variable addition dialog will appear. Select the orthogonal coordinate type or joint coordinate type. The element value with a checked box is defined. Input each element value and position variable name, and then click on the [OK] button.

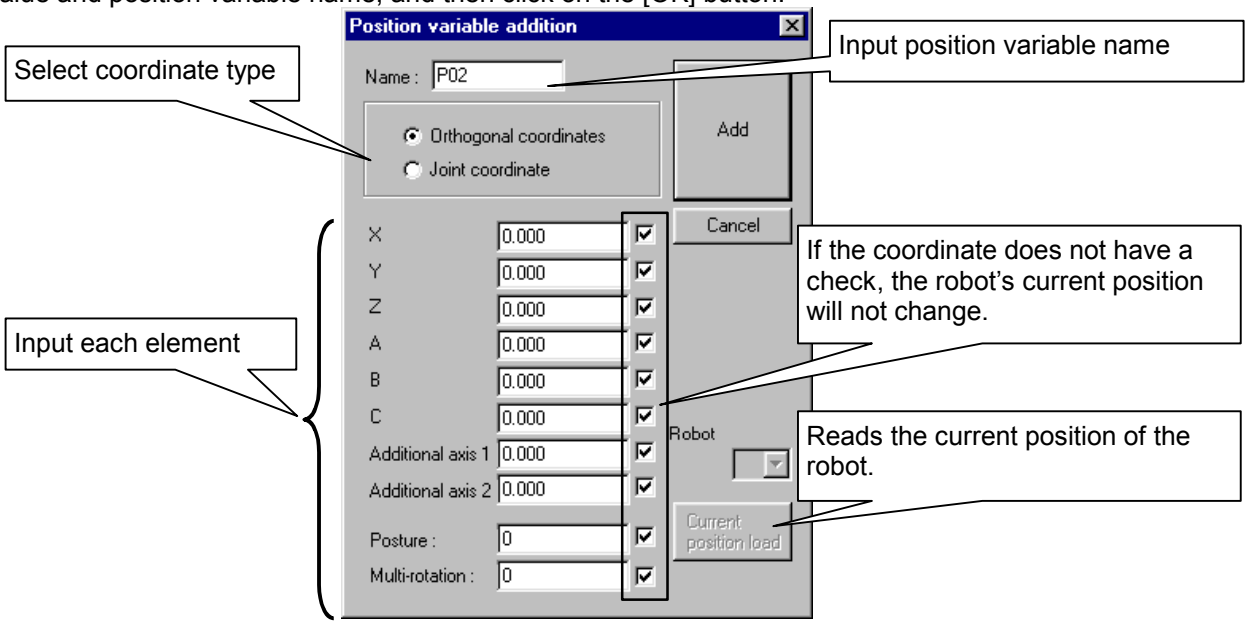


Fig. 5-32 Position variable addition dialog

⚠ Caution

The unit of the element being used differs according to the robot being used. Refer to the instruction manual of the respective robot.

(2) Changing the position variable

Select a variable from the position variable list and click on the "Change" button, or double-click on the position variable to be changed. The following dialog for changing the position variable will appear. The element value with a checked box is defined. Input each value and then press the [Update] button to change the value.

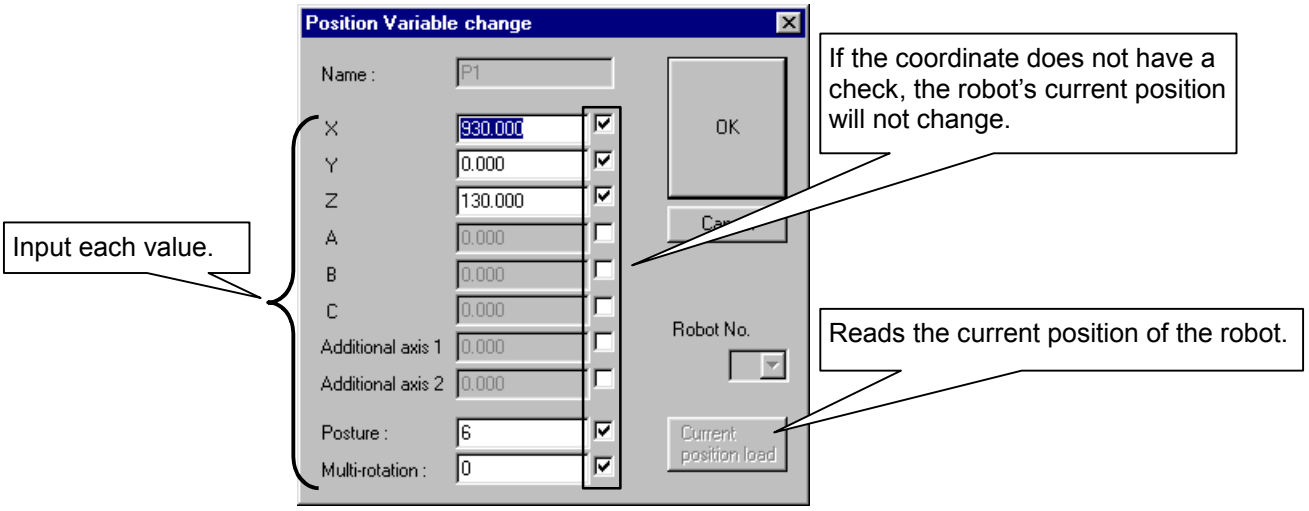


Fig. 5-33 Position variable addition dialog

⚠ Caution

The unit of the element being used differs according to the robot being used. Refer to the instruction manual of the respective robot.)

(3) Deleting a position variable

Select a variable from the position variable list, and click on the [Delete] button. The selected position variable will be deleted.

5.7.2. Editing a position variable array

The methods to display, add, change and delete position array variables differ between Version **D2** or earlier and Version **E1** or later of this software.

(1) Adding position array variables

< Version E1 or later >

Add position array variables and specify an array name and element number for each variable name.
Position array variables that have been added and registered are expanded and then displayed in a list.

When writing to the robot controller, always describe a DIM declaration in an instruction statement. If there is no DIM declaration, an error will occur when writing to the robot controller.

An array declaration is required.
When describing in an instruction statement, array elements will not be automatically added to a position variable area. Add each of the array elements you will be using.

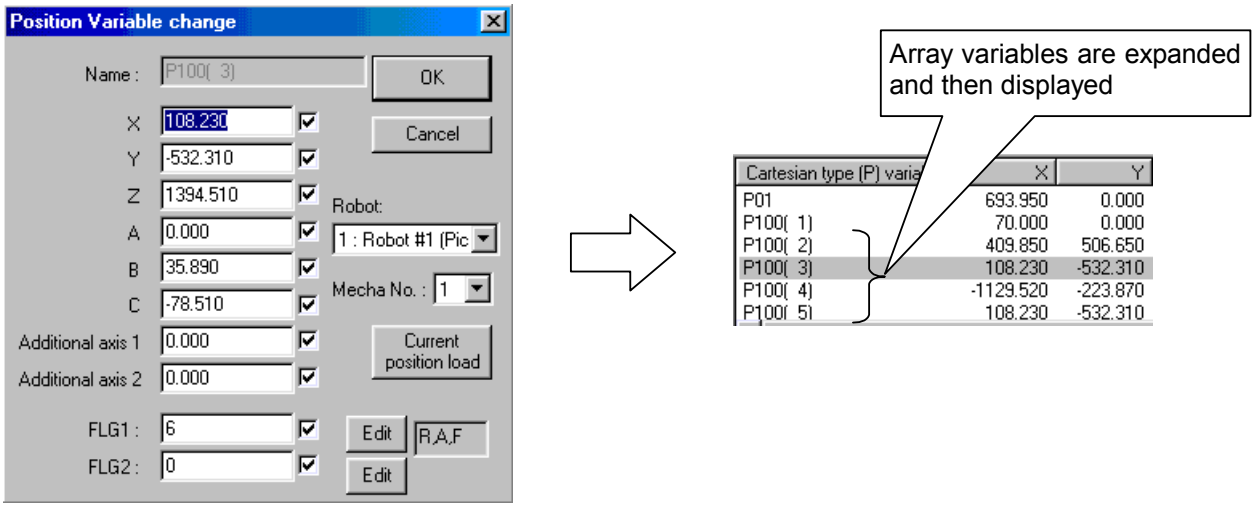


Fig. 5-34 Registering position array variables (Version E1 or later)

< Version D2 or earlier >

To add a position variable array variable, input a DIM command statement that defines the position variable array variable in the command editing window. The name and No. of array elements of the input position array variable will appear in the position variable list.

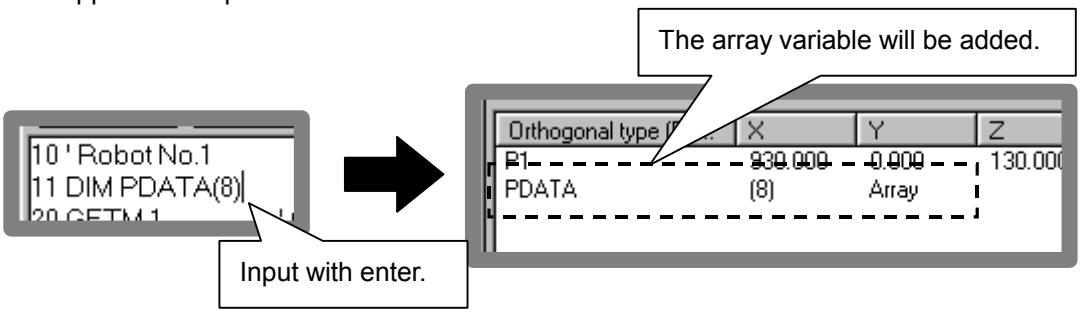


Fig. 5-35 Inputting by editing the command, and adding to the list

(2) Changing the position array variable

< Version E1 or later >

Select an array variable from the position variable list and click the [Change] button, or double-click the position array variable you want to change. The position variable change screen appears.

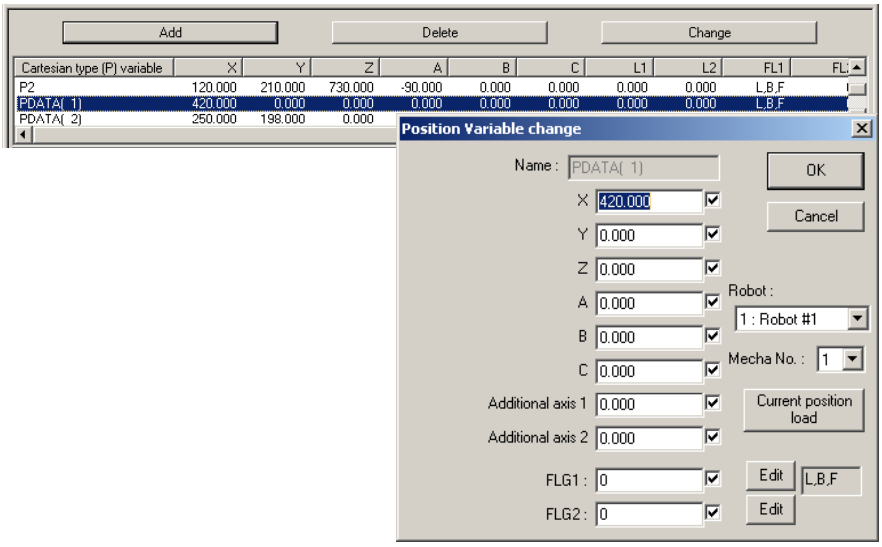


Fig. 5-36 Changing the position array variable (Version E1 or later)

< Version D2 or earlier >

Select the array variable from the position variable list and click on the "Change" button, or double-click on the position array variable to be changed. The following dialog for changing the position variable array will appear.

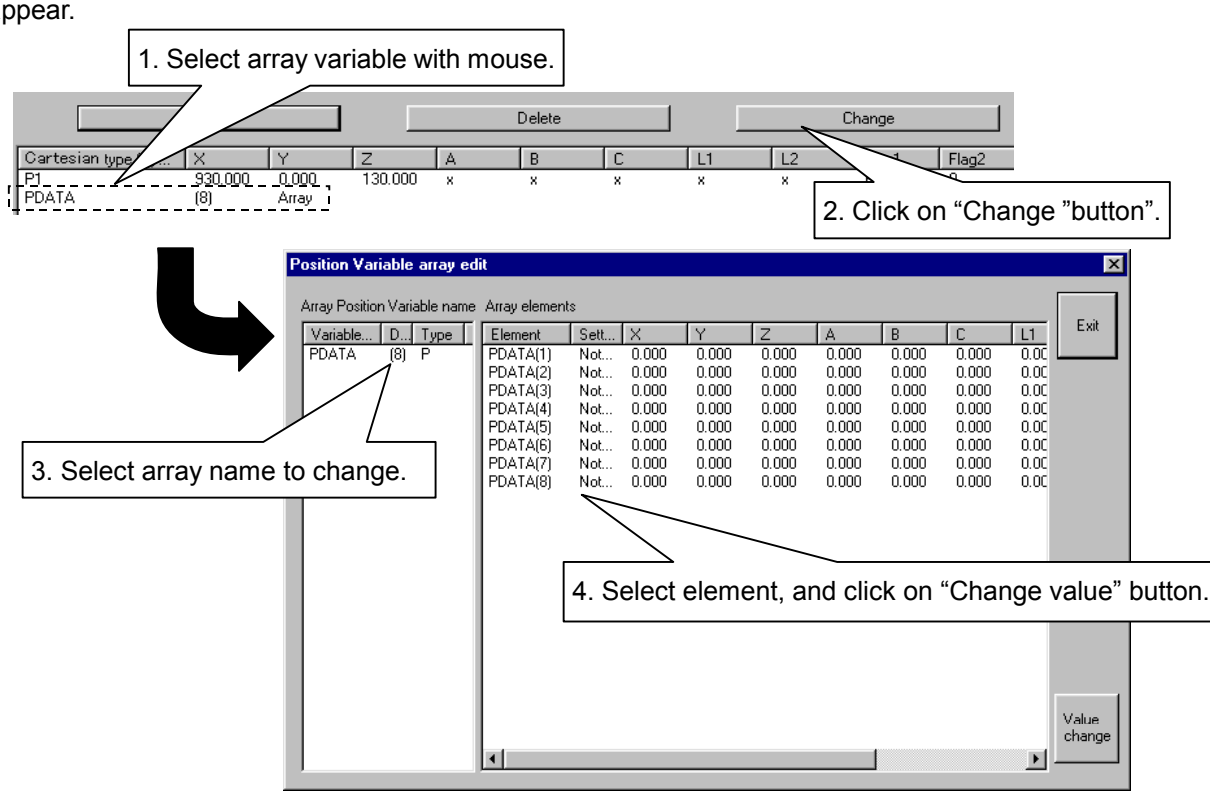


Fig. 5-37 Changing the position variable array element

Select the position variable to be edited from the list on the left, and then select the element to be changed from the array element list on the right. Then, click on the "Change value" button, or double-click on the position array variable to be changed. A position variable change dialog will appear in the same manner as for the normal position variable.

(3) Deleting a position array variable

> ***To delete position array variables, delete the "DIM" declaration in an instruction statement.***
>
> Even if position variables have been deleted in this software, when a program in which a "DIM" declaration is described is written into the robot controller, these array position variables will remain as component 0.

< Version E1 or later >

Select the array variable from the position variable list, and click on the "Delete" button. Only element of selected array variable will be deleted.

Cartesian type (P) variable	X	Y	Z	A	B	C	L1	L2
P01	693.950	0.000	734.260	-146.640	45.770	-137.420	0.000	0.000
P100(1)	70.000	0.000	1477.000	0.000	0.000	0.000	0.000	0.000
P100(2)	409.850	506.650	648.490	180.000	65.390	-128.970	0.000	0.000
P100(3)	108.230	-532.310	1394.510	0.000	35.890	-78.510	0.000	0.000
P100(4)	-1129.520	-223.870	659.110	-180.000	88.510	11.210	0.000	0.000
P100(5)	108.230	-532.310	1394.510	0.000	35.890	-78.510	0.000	0.000

Fig. 5-38 Deleting a position array variable (Version E1 or later)

< Version D2 or earlier >

Select the array variable from the position variable list, and click on the "Delete" button. All elements of the selected array variable will be deleted.

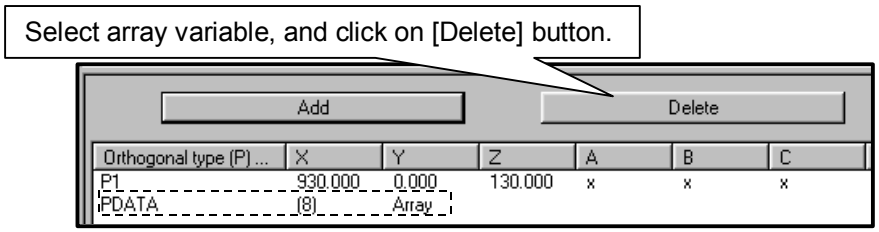


Fig. 5-39 Deleting a position array variable(Versin D2 or earlier)

(4) Copying and pasting the position array variables

If a variable is selected from the position variable list and right-clicked with the mouse, the menu is displayed. If "Copy" is selected from the menu, the contents of the variable are copied into the clipboard. If the mouse is right-clicked and "Paste" is selected on the desired position edit screen, the variable can be pasted on another edit screen.

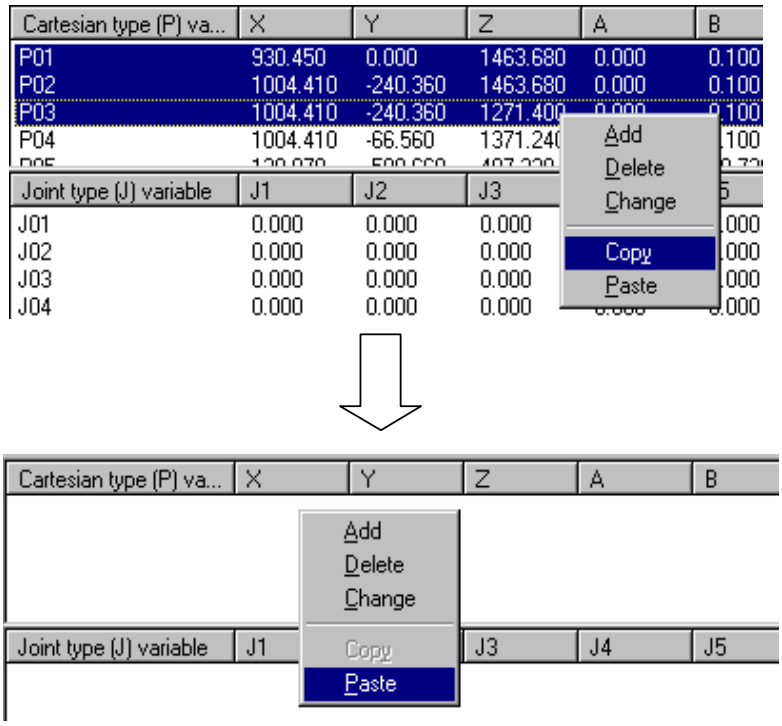


Fig. 5-40 Copying and pasting the position array variables

If the same variable name is found, the overwrite confirmation dialog is displayed. Select whether to overwrite or copy after changing the name.

Fig. 5-41 Confirming of Position variable paste

⚠ Caution

The operation when copying position array variables differs between Version **D2** or earlier and Version **E1** or later of this software.

< Version E1 or later >

Position array variables can be copied for each element. They can be copied even if the definition (DIM instruction) of position array variables has not been described, but an error will occur if there is no DIM declaration when writing to the robot controller.

The confirmation to overwrite position array variables is also performed.

< Version D2 or earlier >

The array variables can be copied, however, it is necessary to define the array variables of the position variables by the DIM command on the command edit window in advance.

Please note that this software does not display the message of the overwrite confirmation when the array position variable is overwritten.

5.8. Editing auxiliary functions

The editing auxiliary functions, helpful for editing commands, are explained in this section.

The editing auxiliary functions such as copy, cut, insert, search, replace and jump can be used from the [Edit] menu and [Tool] menu.

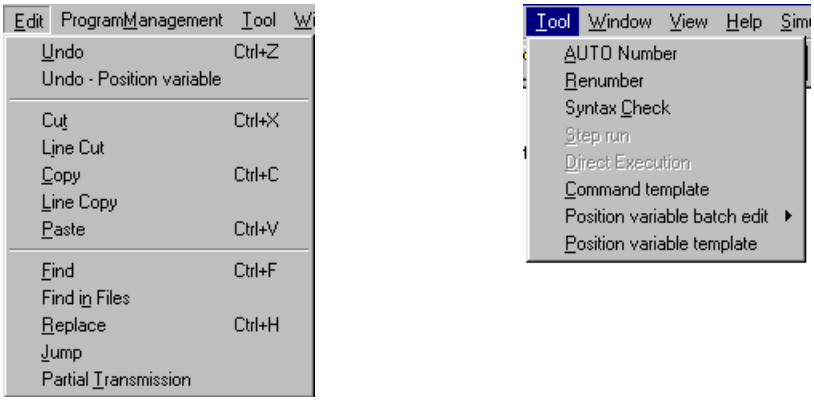


Fig. 5-42 Edit and Tool menus

5.8.1. Copy

The character string selected with the mouse is copied. When a range over several lines is selected with the BASIC editing mode, line copy will be executed.

To copy, select [Copy] under the [Edit] menu.

By using the paste function described later, the copied character string can be pasted into another section of the program.

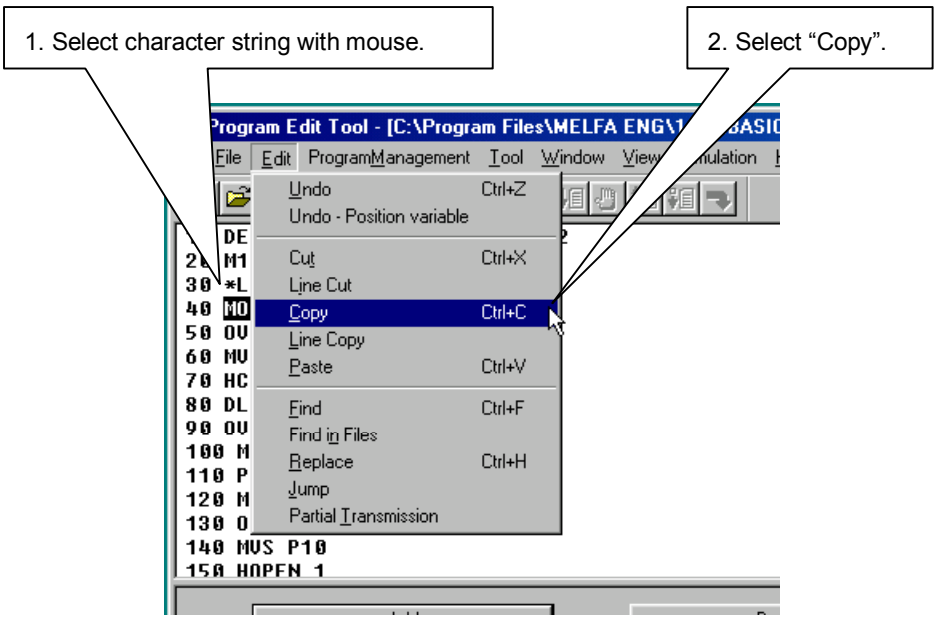


Fig. 5-43 Copy

5.8.2. Line copy (Only BASIC editing mode)

The lines containing the selected range are copied.

To carry out line copy, select [Line Copy] under the [Edit] menu.

By using the paste function described later, the copied character string can be pasted into another section of the program.

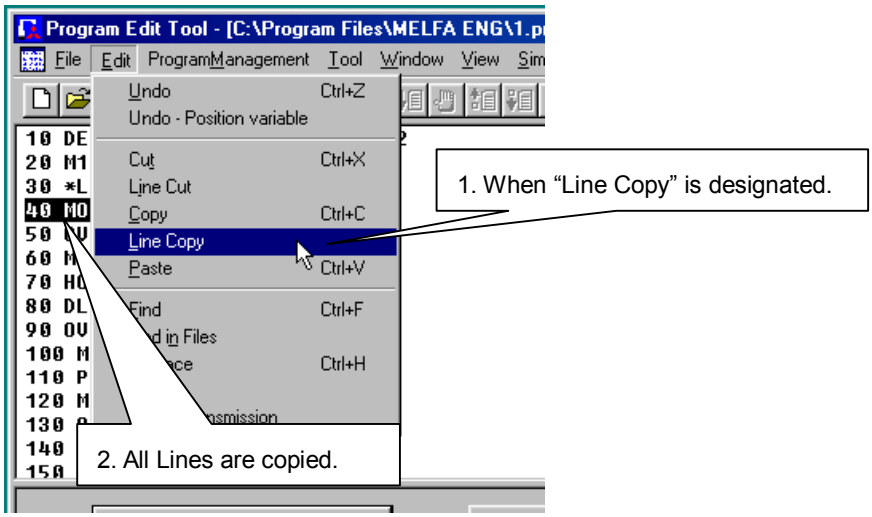


Fig. 5-44 State of line copy

5.8.3. Cut

The character string selected with the mouse is cut. When a range over several lines is selected with the BASIC editing mode, line cut will be executed.

To cut, select [Cut] under the [Edit] menu.

By using the paste function described later, the cut character string can be pasted into another section of the program.

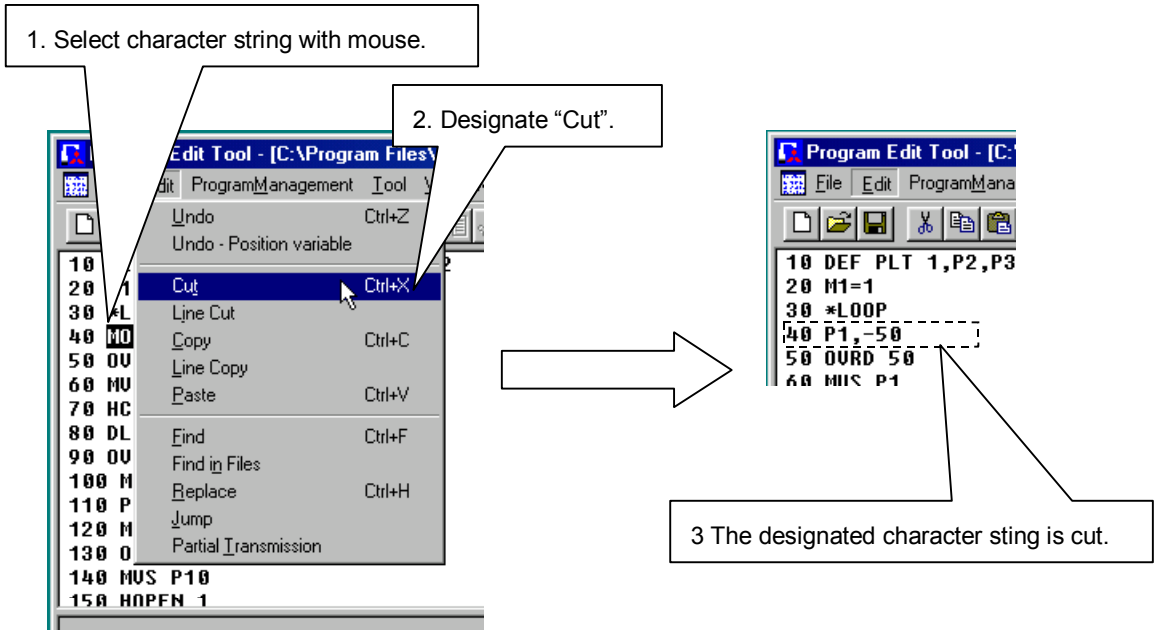


Fig. 5-45 Cut

5.8.4. Line cut (Only BASIC editing mode)

The lines containing the selected range are cut.

To carry out line cut, select [Line Cut] under the [Edit] menu.

By using the paste function described later, the cut character string can be pasted into another section of the program.

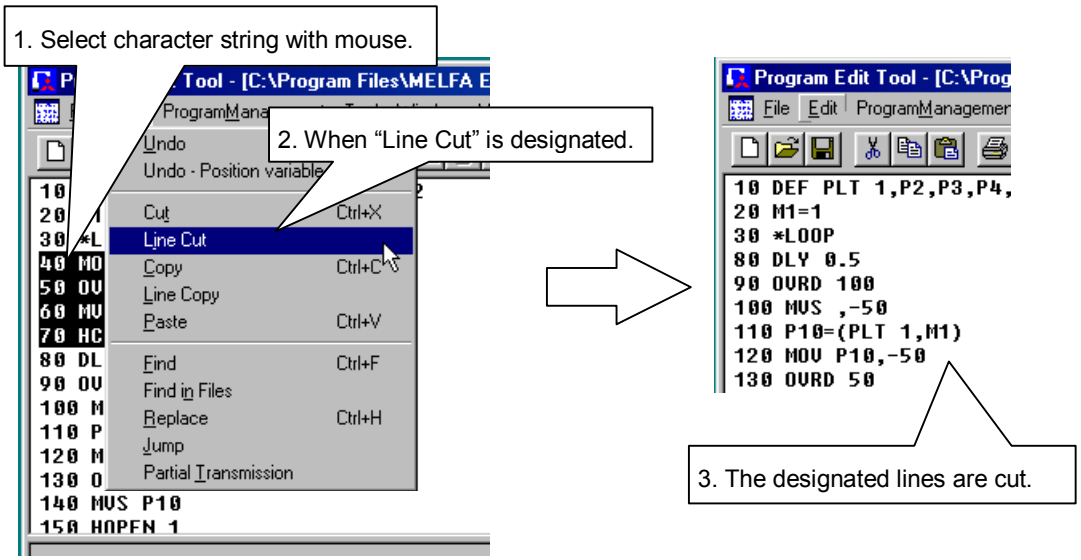


Fig. 5-46 Line Cut

5.8.5. Paste

The character string or line that has been copied or cut is pasted into the selected range. When line paste is carried out, the line Nos. are automatically reassigned so that the lines fit into the paste range. (Only in BASIC editing mode)

To carry out paste, select [Paste] under the [Edit] menu.

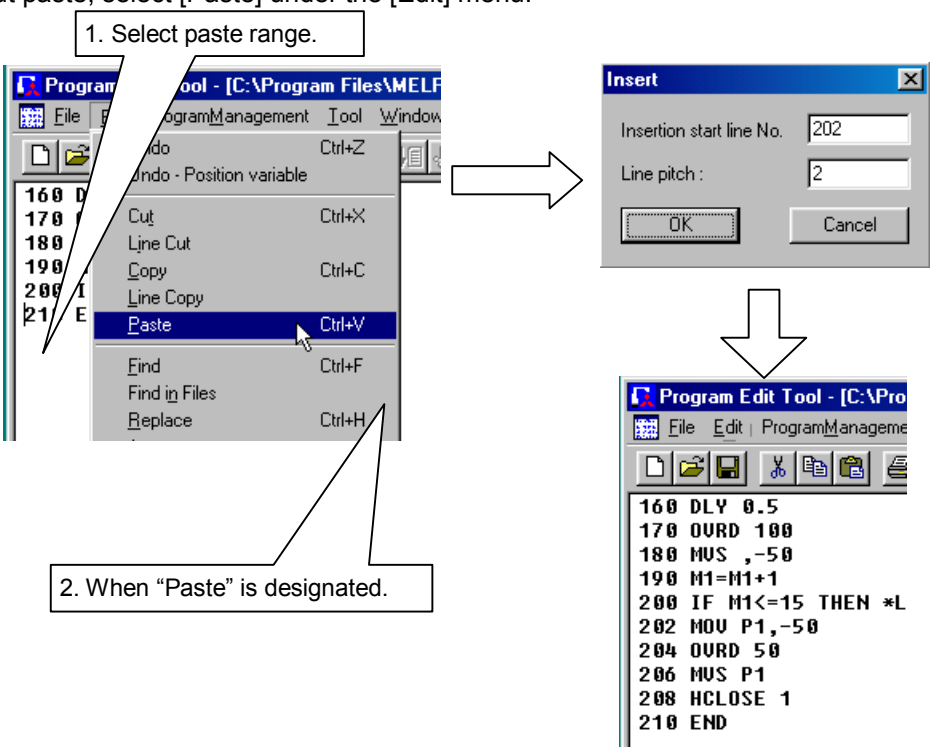


Fig. 5-47 Paste dialog and state of pasting

5.8.6. Search

The designated character string is searched for. The search range can also be designated.
Select [Search] under the [Edit] menu to display the Search screen.

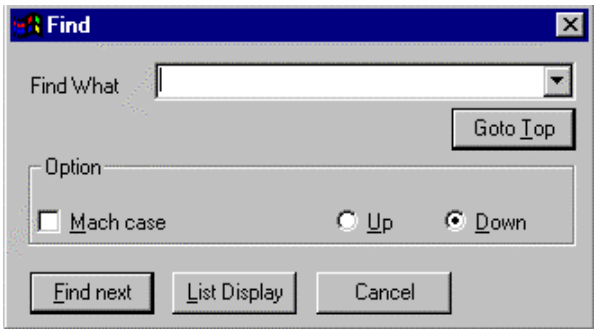


Fig. 5-48 Search dialog

[Search Next] : Each time this button is clicked on, the next character string will be searched for.
[List display] : The results of searching the designated range will appear in the list.

If the list display is clicked, the window is enlarged automatically. By double-clicking the search result, or clicking [Jump] after selecting, the list moves to the corresponding command line.

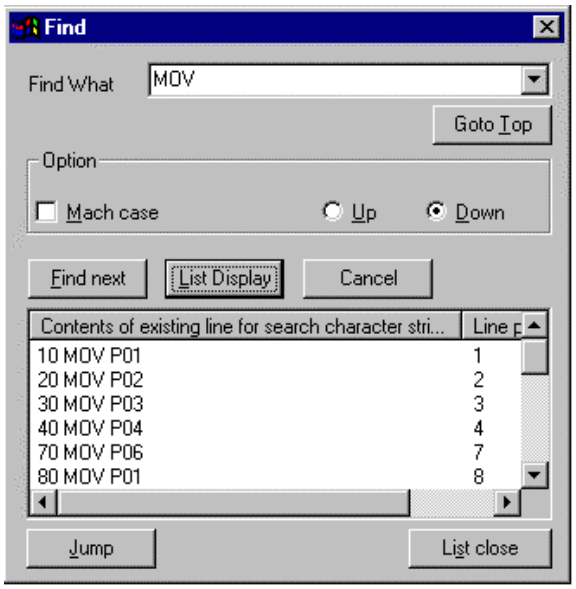


Fig. 5-49 Search result list display

5.8.7. Find In Files

The specified character string is searched from files. (This function corresponds after a version **C2**.)
To display the [Find In Files] screen, select [Find In Files] from the [Edit] menu.
The same screen can also be displayed by clicking the [Find In Files] button in Program Manager.

The targets of searching from robot controller are only the robot programs.
And the searching from robot controller takes time for a while, because of communicating with it.

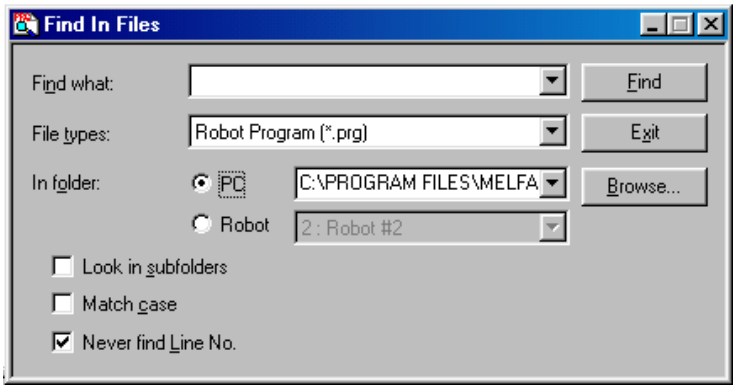


Fig. 5-50 Find In Files dialog

[Never find Line No.] : Checking this does not search line numbers from robot programs at all.

When a search is started, a window displaying search results appears. The result is displayed as follows.

C: :/Program Files/MELSOFT/RT ToolBox E/1.prg(4): 40 MOV P1,-50

File name — Line number from the top — Contents

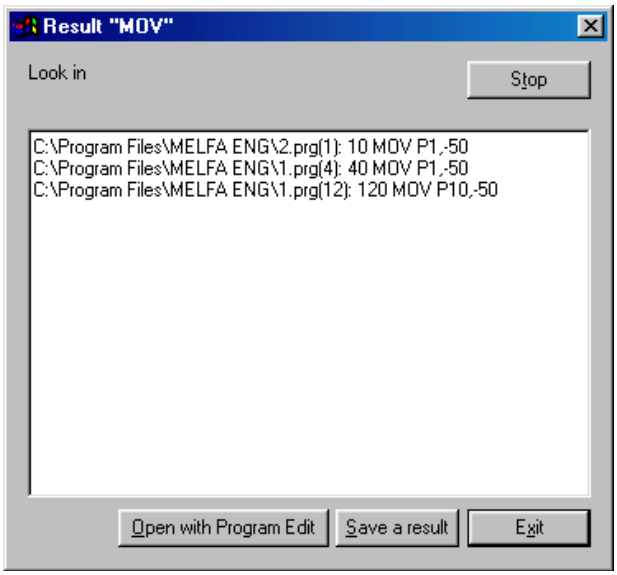


Fig. 5-51 Search result list display

[Stop] : Aborts the search.
[Open with Program Edit] : Opens the program displayed on the line, which has been selected from the search result list, using the Program Edit tool.
Any of the displayed programs can also be opened using the Program Edit tool by double-clicking the desired line.
[Save a result] : Saves the search result list in a file.

Once the search is completed, the [Open with Program Edit] button and the [Save a result] button can be performed.

5.8.8. Replace

The designated character string is replaced. The replacement range can also be designated.
Select [Replace] under the [Edit] menu to display the Replace screen.

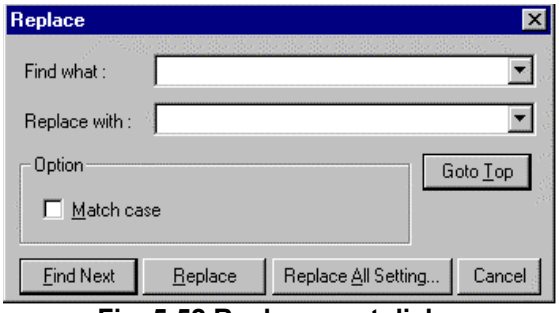


Fig. 5-52 Replacement dialog

[Search Next] : Each time this button is clicked on, the next replacement target character string will be searched for.

[Replace Next] : Each time this button is clicked on, the next replacement target character string will be replaced.

[Replace All Setting] : If this button is clicked, the items for designating the range are displayed in order to replace all of the designated character string.

[Replace All Setting] can be used to replace the designated character string by designating the replacement range.

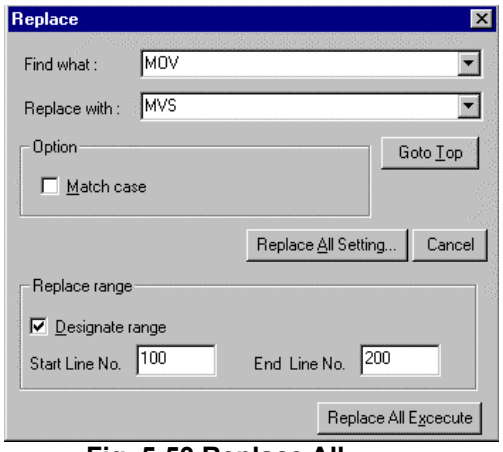


Fig. 5-53 Replace All

⚠ Caution

Cautions for replacement work

- Do not change numeric values in PC support software prior to version C1.

Do not change numeric values in PC support software prior to version C1.
If numbers are replaced, the line Nos. will also be replaced, and the program contents will change.
(For example, if 40 is replaced with 30, the same command as line No. 40 will be overwritten on line No. 30.)
If numbers are inadvertently replaced, carry out [Undo] under the [Edit] menu before carrying out any other operation.

5.8.9. Jump

The program jumps to the designated label, line No. (BASIC editing No.) or step position (line No. hide mode). To carry out jumping, select [Jump] under the [Edit] menu.

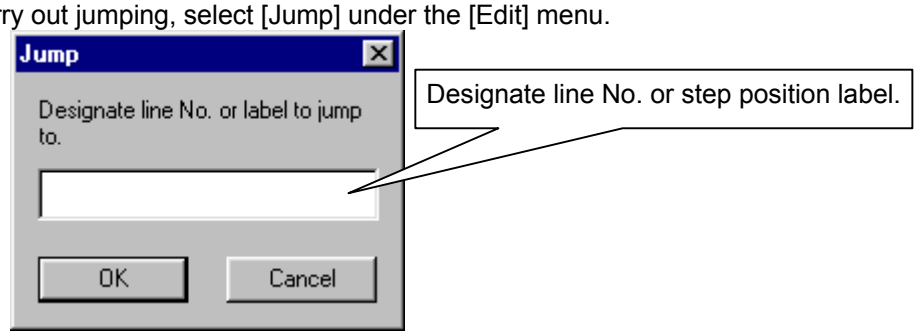


Fig. 5-54 Jump

5.8.10. Partial Transmission

The selected program line is written into the robot controller.

This is convenient to reflect the contents of modification in which only a portion of the program was modified in the robot controller. However, exercise caution since only the selected portion will be written.

After selecting the line to be written into the robot controller, select [Partial Transmission] in the [Edit] menu.

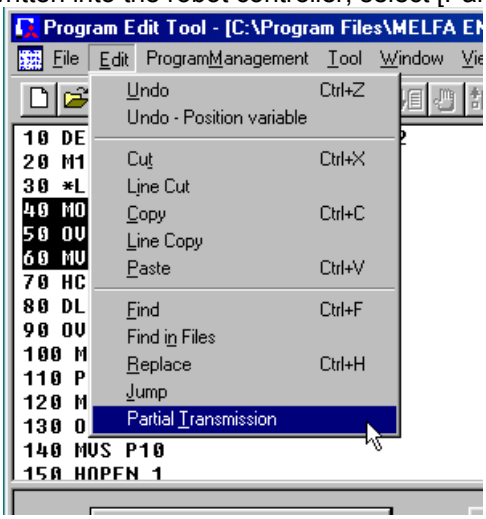


Fig. 5-55 Partical transmission

5.8.11. Automatic numbering (Only BASIC editing mode)

This function automatically displays the next line No. each time the Enter key is pressed. The start line No. and line pitch can be designated with the setting dialog.

The setting dialog will appear when [AUTO Number] is selected under the [Tool] menu.

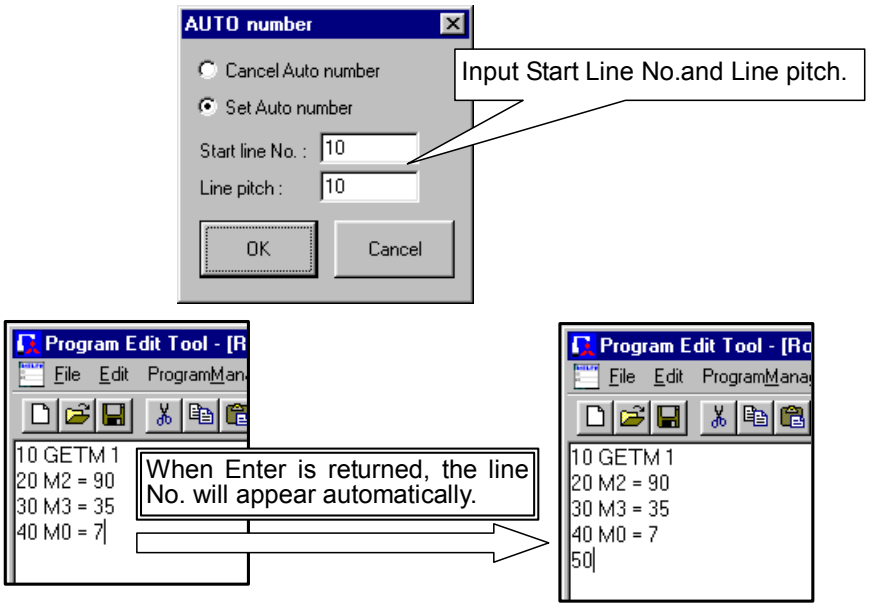


Fig. 5-56 State of setting dialog and editing screen

5.8.12. Assigning line Nos.

The line Nos. can be assigned in a batch within a designated range. The start/end line No. , new start line No. and line pitch can be designated with the setting dialog.

Renumbering is possible by displaying the renumber setting dialog with [Renumber] under the [Tool] menu.

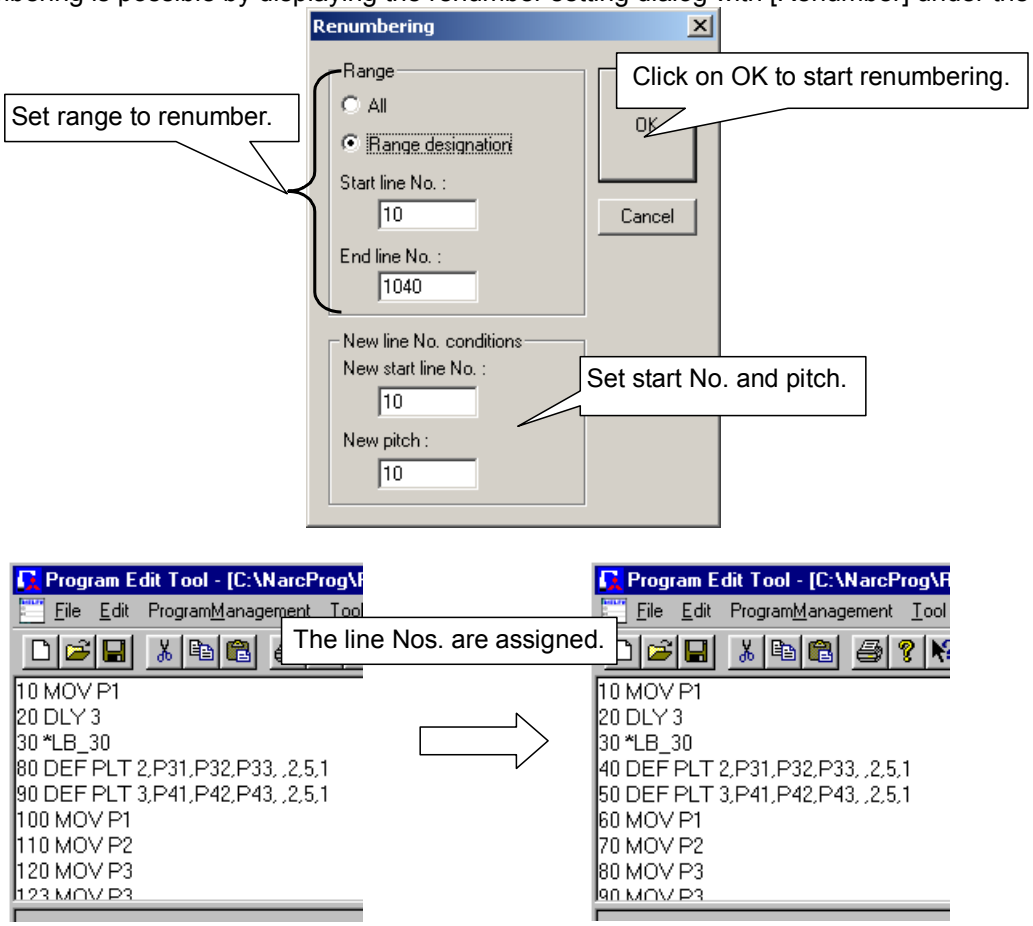


Fig. 5-57 State of setting dialog and renumbering operation results

5.8.13. Command template

The MELFA BASIC IV language command list is displayed. When a command in the list is selected and the [Insert] button is clicked on, or when the command is double-clicked on, the command can be inserted into the program command editing screen. Displays per command type and searching of commands with character strings are possible.

Display the command template screen by selecting [Command template] under the [Tool] menu.

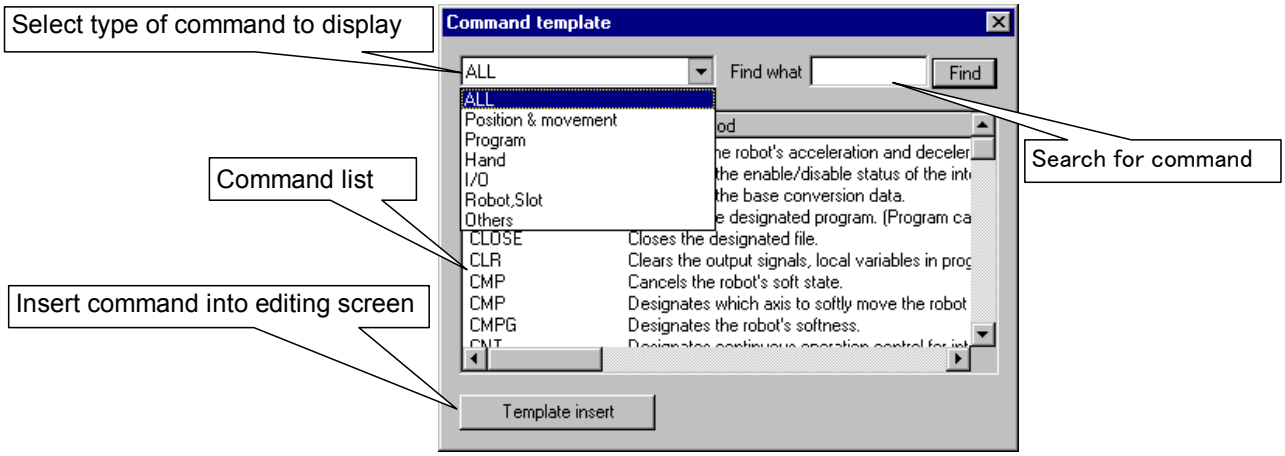


Fig. 5-58 Image of command template

5.8.14. Position variable template

Position variables used frequently regardless of the program can be stocked. When a position variable in the list is selected and the [Insert] button is clicked on, or when the variable is double-clicked on, the position variable on the template can be additionally inserted into the program being edited.

Display the position variable template screen by selecting [Position variable template] under the [Tool] menu.

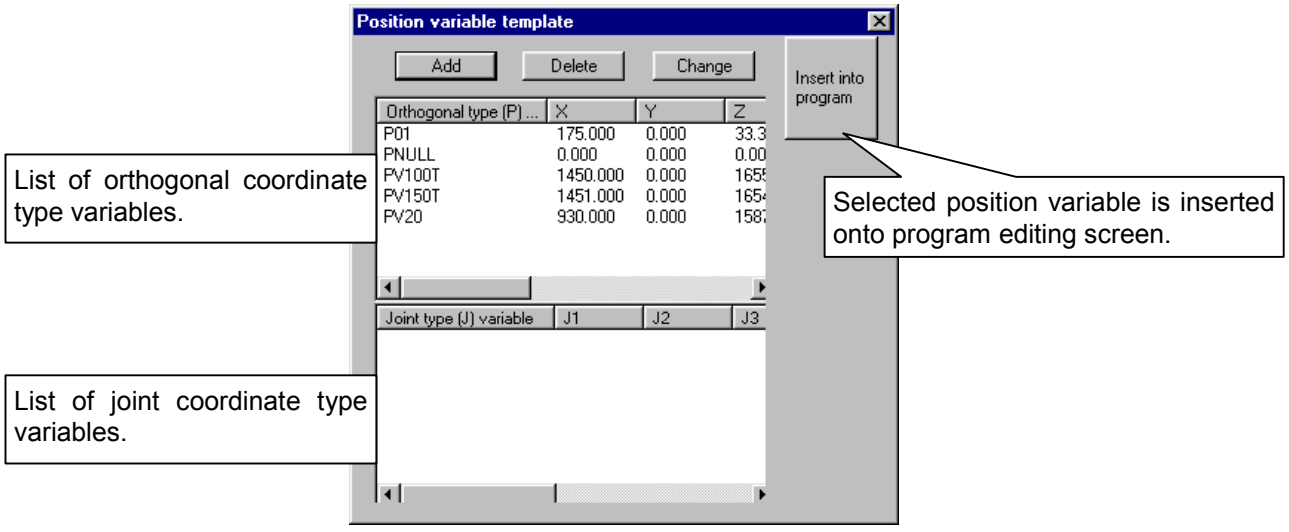


Fig. 5-59 Position variable template

The position variables registered on the position variable template are saved even after the program editing tool is exit.

5.8.15. Position variable batch change

The position variables in the program being edited can be changed as a batch, or the values can be added as a batch. For example, 100 can be added to the X elements of P1, P2, P3 and P4 as shown below.

Display the batch change screen by selecting [Position variable batch edit] under the [Tool] menu.

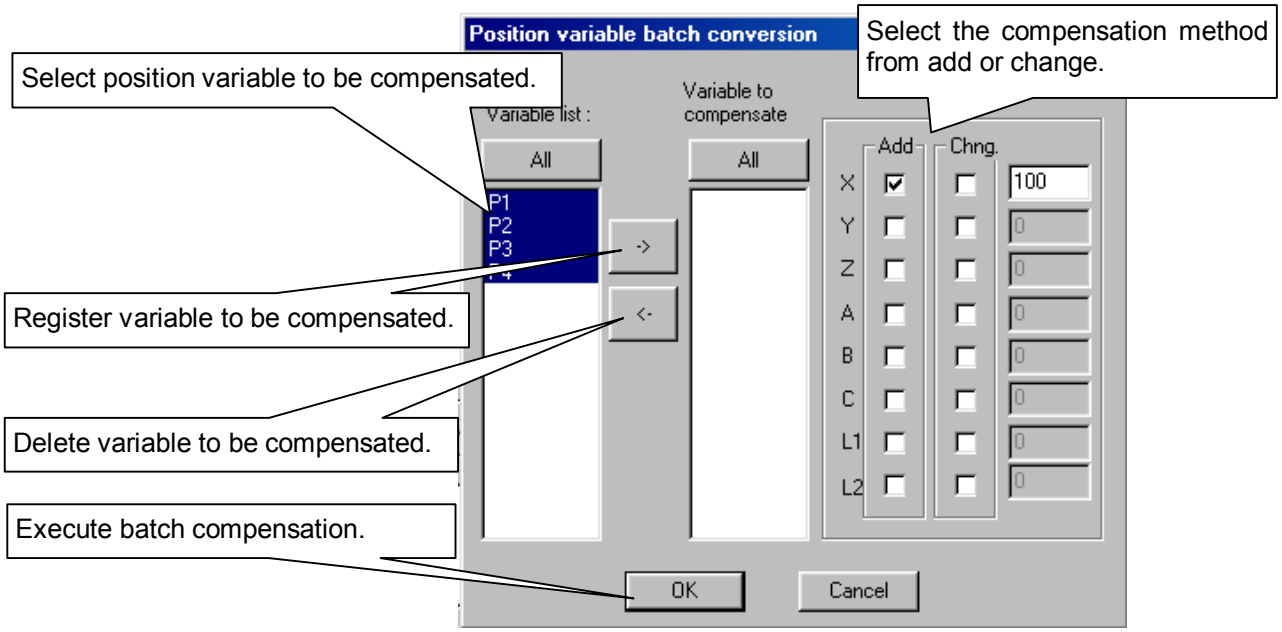


Fig. 5-60 Image of position variable template

5.8.16. Program conversion

The Robot Programming supporter for E/EN/M1 and M2 series (hereafter "old PC support S/W") and the support softwares for the new personal computer (hereafter "new S/W") differ in the configuration of position data. Therefore, the program prepared by using the old PC support S/W cannot be used as it is in the new S/W.

The program conversion converts the position data as well as the instructions (DJ, MP, and PD instructions of the Move Master command) related to the position data so that the robot programs created and saved by the old PC support S/W can be used with this new S/W.

5.9. Syntax check

This function checks whether the edited robot program is grammatically correct. Use this before writing the program into the controller. If there is any error in the grammar, the error section and the details of the error will be displayed.

To use the grammar check, select [Grammar Check] under the [Tool] menu.

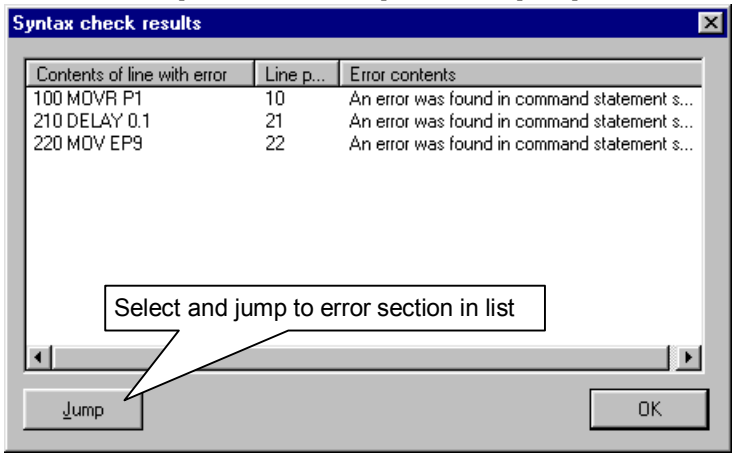


Fig. 5-61 Display of grammar check results

5.10. Debugging a program

The program can be directly debugged while editing the program and moving the robot. It is also possible to confirm which line of the program is being executed while the robot is moving. Either step execution or direct execution can be used.

5.10.1. Open the program

To debug the program, select [Debug] under the [File] menu, and open the program.
The editing screen for the program opened with will appear.

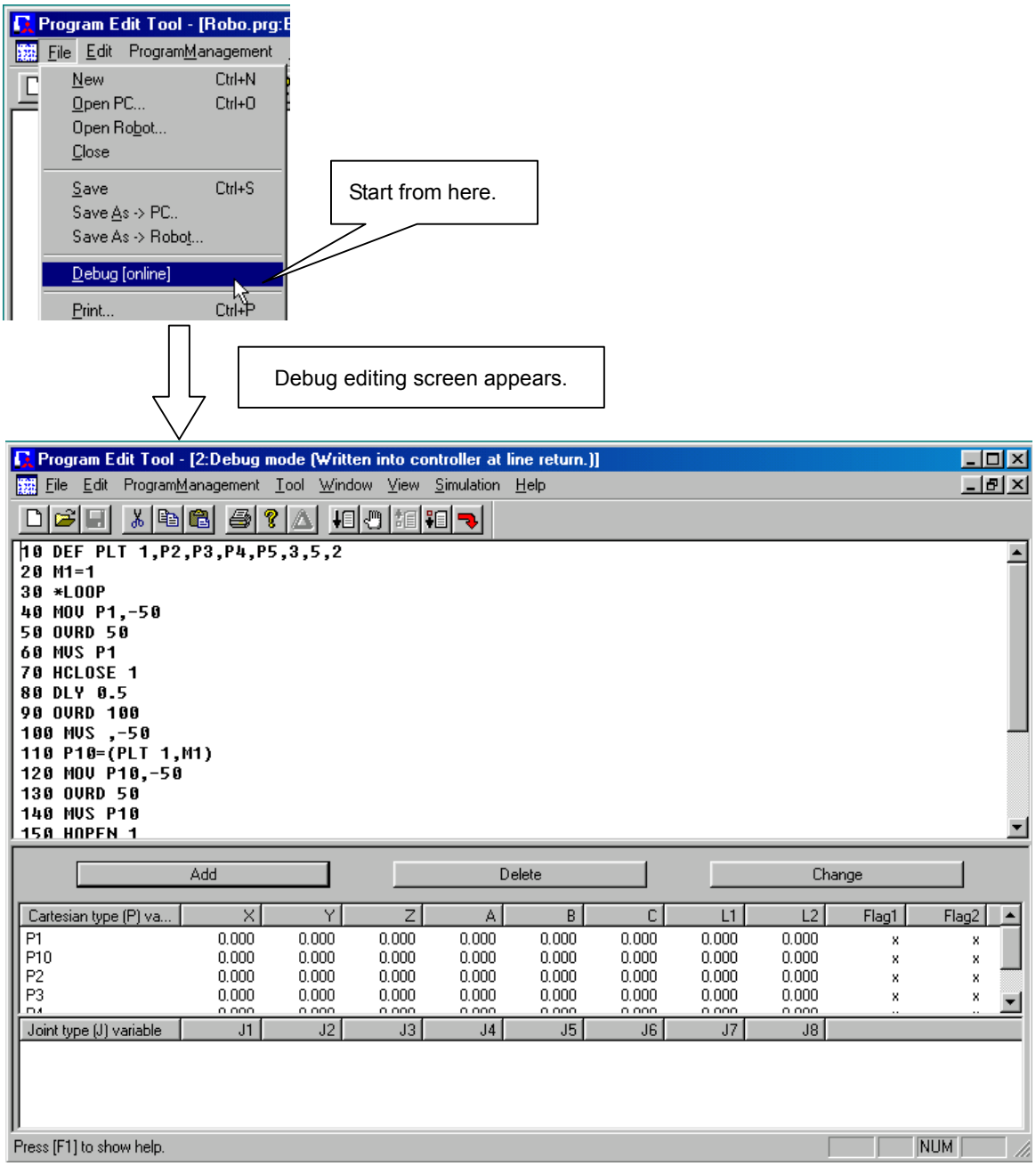


Fig. 5-62 Debugging a program

5.10.2. Step execution

The program opened with debug can be confirmed by moving one line at a time.
The following dialog will appear when [Step Execution] is selected from the [Tool] menu.

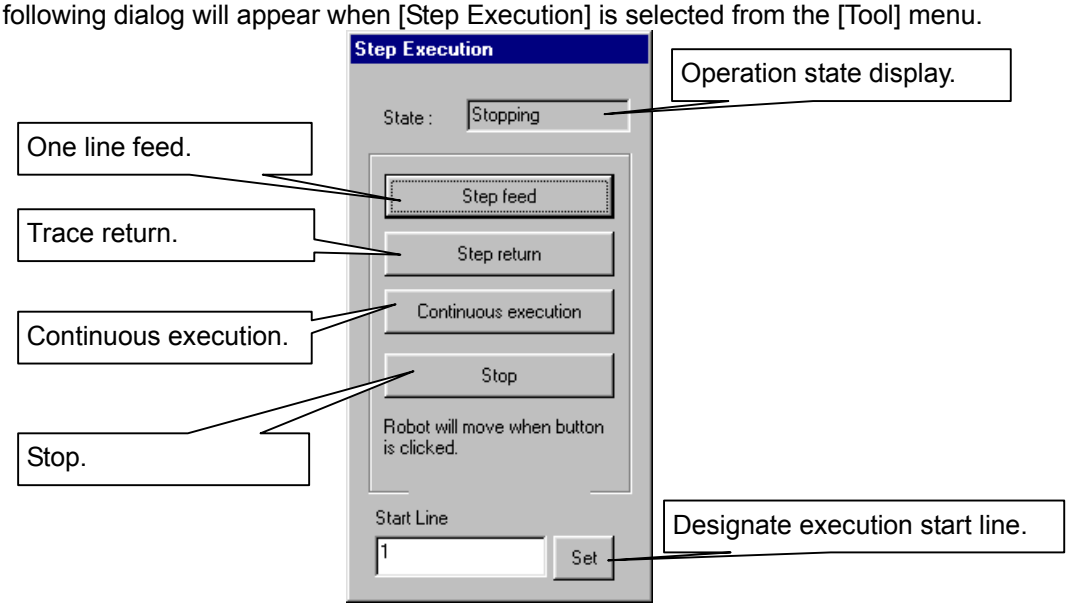


Fig. 5-63 Step execution

[Step feed] : The program is executed one step at a time.
[Continuous execution] : The robot program is continuously executed.
[Set] : Set the program execution start line No.

⚠ Caution

When step execution is carried out, the robot may move at the max. speed, so take special care to safety. Never enter the work area when carrying out step execution.

The line currently being executed is highlighted on the editing screen.

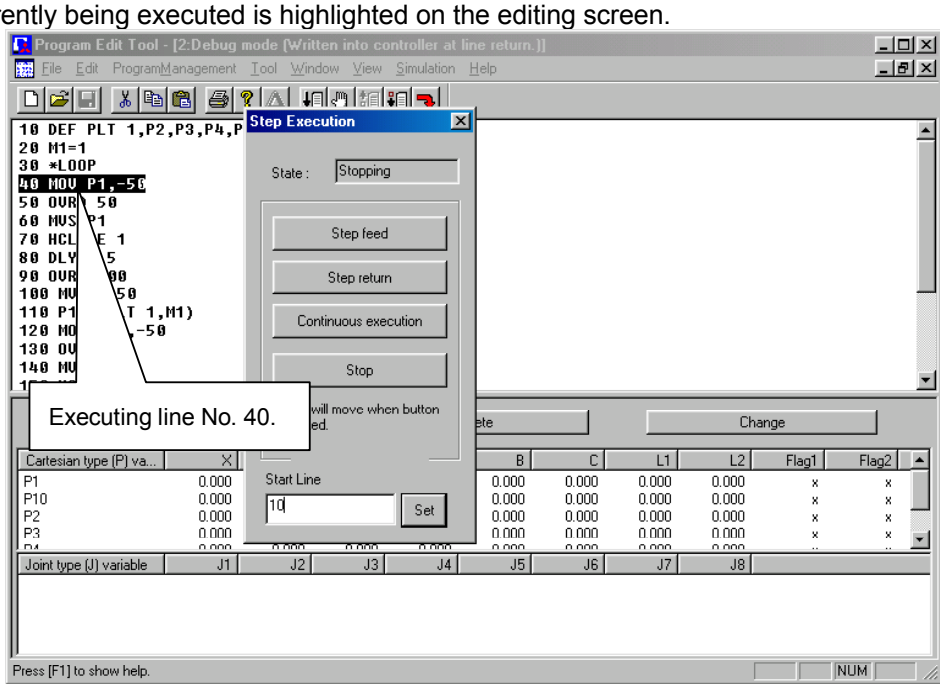


Fig. 5-64 The line currently being executed

5.10.3. Direct execution

The robot can be directly moved by inputting a command statement.
The following dialog will appear when [Direct Execution] is selected from the [Tool] menu.

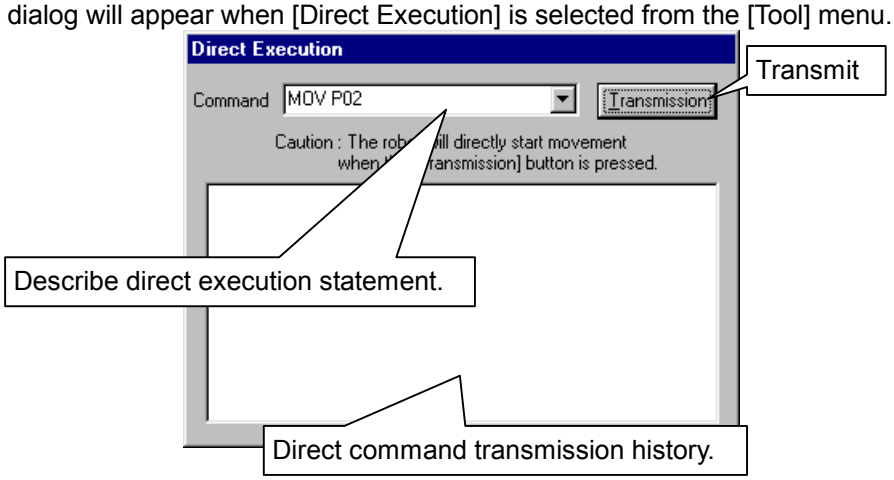


Fig. 5-65 Direct execution

⚠ Caution

When direct execution is carried out, the robot may move at the max. speed, so take special care to safety. Never enter the work area when carrying out direct execution.

5.11. Program Management

The program files can be copied, moved, deleted, renamed, protected and the contents compared.
The Program Manager can be used from the [Program Management] menu.

Fig. 5-66 Program management

Caution

The targets of any operations in this function are the Robot Program files.

5.11.1. List

The lists of the program files are displayed. For programs in the controller, the "Name", "Size", "Date", "Time", as well as the "Protect information", "No. of lines", "No. of position variables", "Latest cycle time", "Average cycle time", "Operation time", "No. of cycles" and "Comment" are displayed.

* As for the programs in the personal computer and in the controller, when even the contents are the same, the program sizes are different.

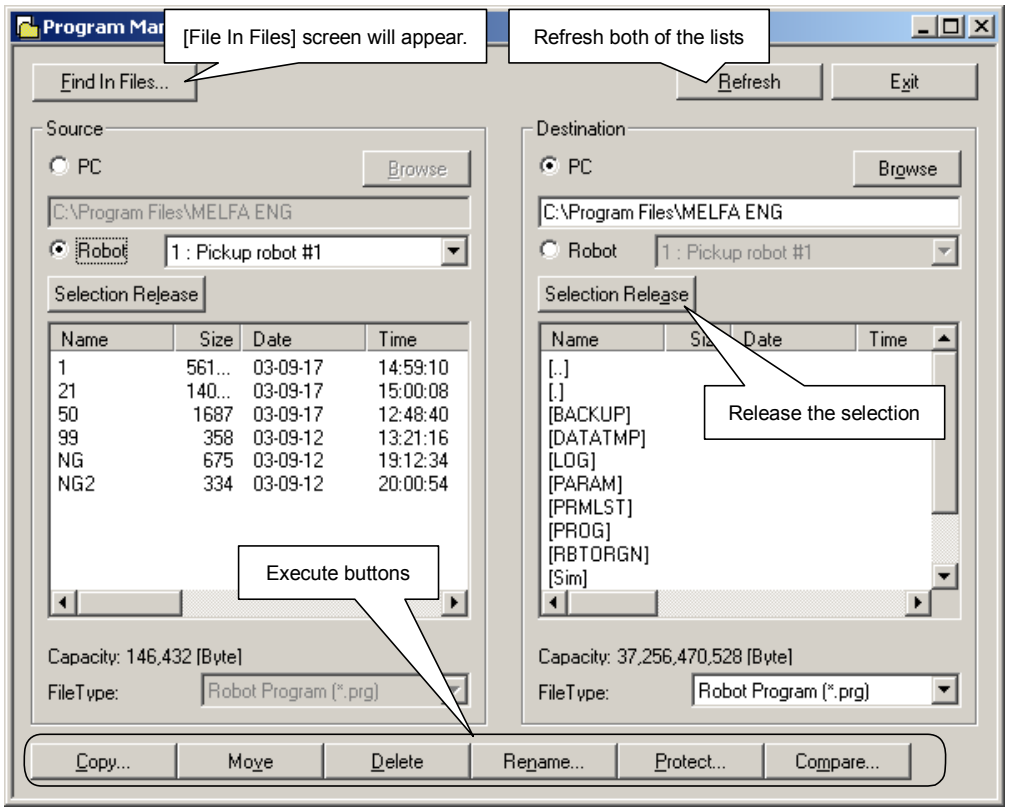


Fig. 5-67 Program list

Double-click on a program name in the lists, Program Edit Tool is started up and that program can be edited.

But only programs in the robot controller or " *.prg " files in the personal computer can be edited. Note that the another files are Opened, then Program Edit Tool cannot behave regularly.

According to the operation, the multiple files can be operated. Selecting the multiple files, click on the files in the lists by the mouse with pressing the [shift] key or the [Ctrl] key. Releasing the selected files in the lists, click on the [Selection Release] button above each lists.

Version **E1** or later of this software supports the display of available capacity.

Click on the [Browse] button and select folder at the [Browse for Folder] dialog, and the folder in the personal computer can be selected.

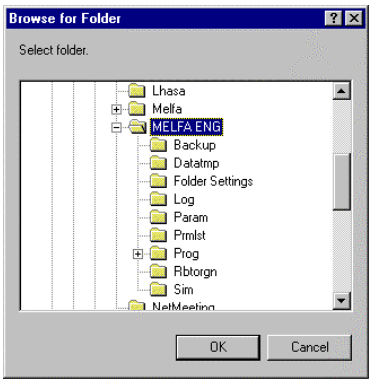


Fig. 5-68 Browse for Folder dialog screen

5.11.2. Copy

The program files are copied. Copying of the entire program file or only the command statements or only the position variables is possible.

Select the transmission source program names from the list at the left, and designate the transmission destination folder on the right side. The multiple transmission source programs can be selected at the same time, but for copying with changing its name, only one program must be selected. Copying is executed when the [Copy] button is clicked on and [Setup for COPY] dialog is set.

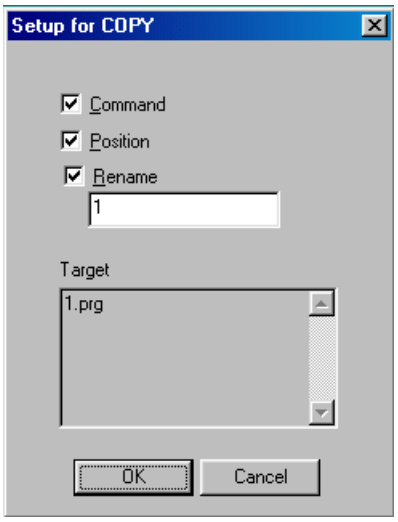


Fig. 5-69 Setup for COPY dialog screen

5.11.3. Movement

The program files can be moved.

Select the transmission source program names from the list at the left, and designate the transmission destination folder on the right side. The multiple programs can be selected at the same time. Movement is executed when the [Move] button is clicked on.

5.11.4. Delete

The program files can be deleted. Note that once the program files are deleted, they cannot be recovered.

Select the names of the programs to be deleted from the lists. The multiple programs can be selected at the same time. The programs can be selected at the both lists. Delete is executed when the [Delete] button is clicked on.

5.11.5. Rename

A program file name is renamed.

Select the name of the only one program to be renamed from the lists. The program can be selected at the both lists. Rename is executed when the [Rename] button is clicked on and a new file name is set at the [Setup for RENAME] dialog.

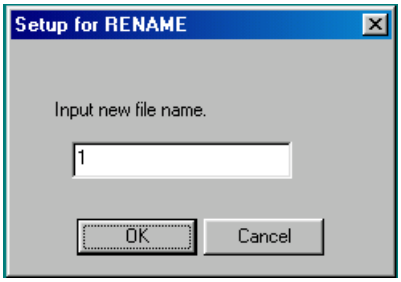


Fig. 5-70 Setup for RENAME dialog screen

5.11.6. Protect

The program files in the controller can be protected. The entire program file can be protected, or just the command statements or position variables can be protected.

Select the names of the programs to be protected from the lists. The multiple programs can be selected at the same time. The programs can be selected at the both lists. Protect is executed when the [Protect] button is clicked on and [Setup for PROTECT] dialog is set.

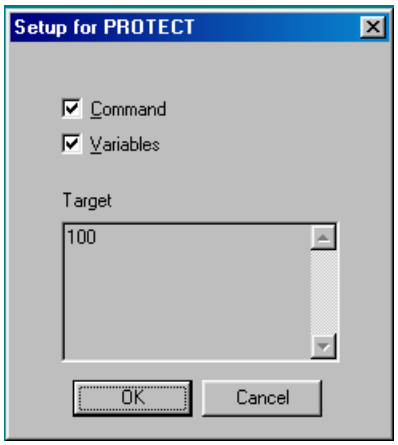


Fig. 5-71 Setup for PROTECT dialog screen

5.11.7. Comparison

The program files can be compared. Comparison of only the command statements or only the position variables is possible. Select the names of the programs to be compared from the left and right lists. A dialog displaying the corresponding comparison results will appear when the [Compare] button is clicked on and [Setup for COMPARE] dialog is set.

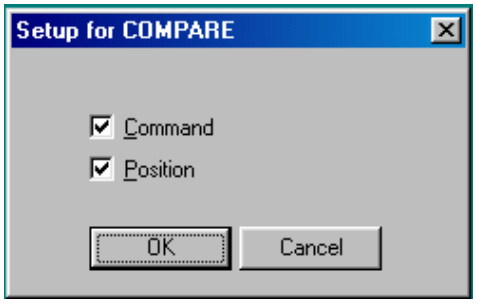


Fig. 5-72 Setup for COMPARE dialog screen

When both files are the same, the result dialog display nothing.

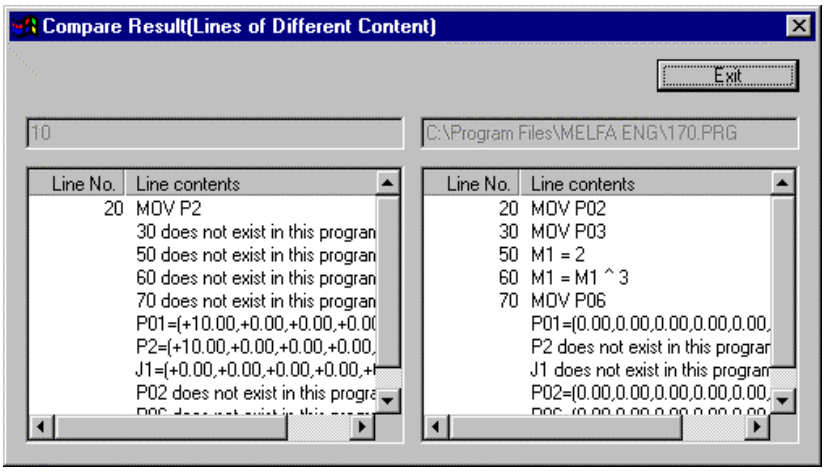


Fig. 5-73 Display of comparison results

6. Monitoring tools

With the monitoring tools, all of the information in the currently connected robot controller can be constantly displayed.

6.1. Starting

Select the "Monitoring tool" from the "**RT ToolBox** Robot Total Engineering Support Software" menu. The "Monitor menu" shown below will appear.

After selecting the robot you wan to monitor, click an item with the mouse. The monitor window for each robot appears. (Robot selection is supported in **D1** version or later.)

The selected robot controller is displayed in each monitor window title.

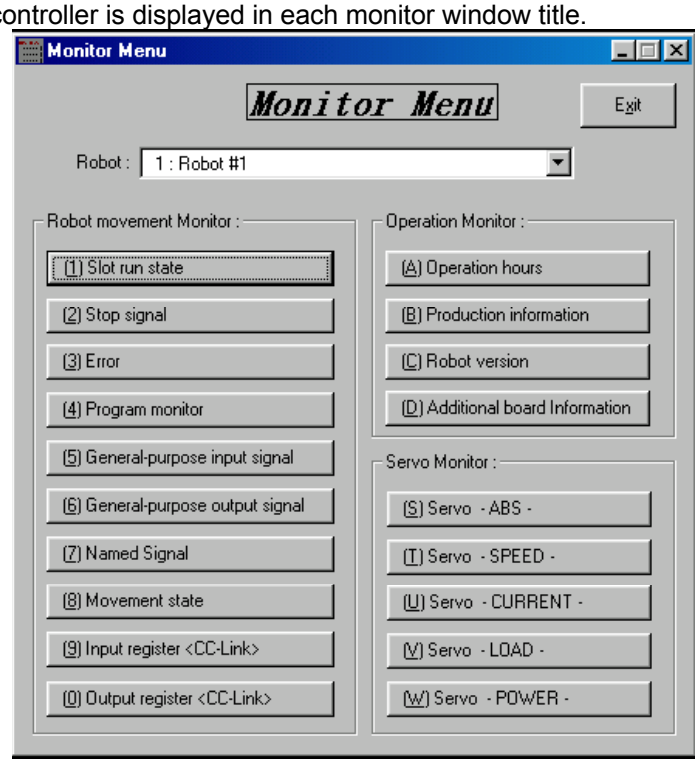


Fig. 6-1 Monitor menu

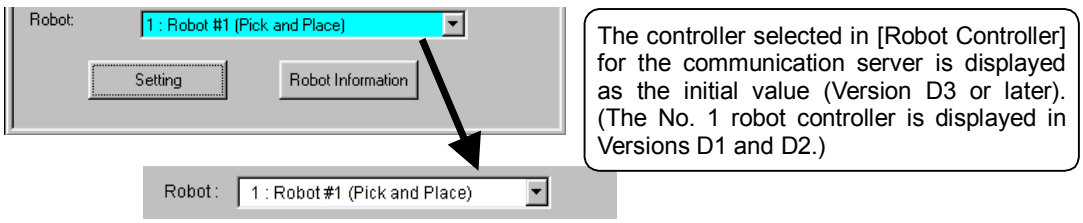


Fig. 6-2 The controller selected for the communication server

⚠ Caution

Constant communication is established with the robot controller while each monitoring tool is started. Close any unnecessary windows to reduce the communication load.

6.2. Outline of each function and starting methods

(1) Outline of each function

Each monitor function is explained briefly in this section. The monitor functions are largely classified into the following three groups.

1. Robot movement monitor ..... Items related to robot movement are monitored.
2. Operation monitor ..... Items related to the robot's operation are monitored.
3. Servo monitor ..... The robot's servo system information is monitored.

	Monitor name	Explanation
Robot movement monitor	Slot run state	The operation state of each slot can be confirmed.
	Stop signal	The stop signal input into the robot controller can be confirmed.
	Error	The currently occurring error can be confirmed. The history of the errors that have occurred can be confirmed.
	Program monitor	The program execution line set for each slot, the contents of the variable used in the program, and the robot current position, etc., can be confirmed.
	General-purpose input signal	The state of the signal input from an external device to the robot controller can be confirmed.
	General-purpose output signal	The state of a signal output from the robot controller to an external device can be confirmed. The signal can also be output forcibly.
	Named signal	The status can be checked by naming the status of the dedicated I/O signal that has been set in the robot controller, as well as each bit or within the range of 32 bits of the general-purpose signal. The signals are set via parameter setting (maintenance tool).
	Movement State	The current position information and hand open/close state of each connected mechanism can be confirmed.
	Input register	The input registers in the CC-Link function can be monitored and pseudo-input.
	Output register	The output registers in the CC-Link function can be monitored and forcibly output.
Operation monitor	Operating time	The robot operation time (power ON, etc.) can be confirmed.
	Production information	The operating time of the program in the robot controller and the No. of program cycles can be confirmed.
	Robot version	The robot controller version can be confirmed.
	Option card information	Information on the option card mounted on the robot controller can be referred to.
Servo monitor	Servo monitor position, speed, current, load, power	The servo system information can be monitored.

(2) Operation method

Mouse operation : Click on the button for the item to be displayed from the Monitor menu.
Keyboard operation : While holding down the [Alt] key, press the alphanumeric character displayed at the left of the button.

(Example: Press the [4] key while holding down the [Alt] key to display the program monitor. Hereinafter, expressed as [Alt] + [4].)

6.3. Exit the monitor menu

Click on the "Exit (X)" button on the screen to quit the monitor menu.
Press [Alt] + [X] to exit using the keyboard.

6.4. Each monitor function

Each monitor function is explained in this section.

6.4.1. Robot movement monitor

6.4.1.1. Slot Run State

The state of the slots in the robot controller can be monitored.
The No. of displayed slots is determined with the parameters.

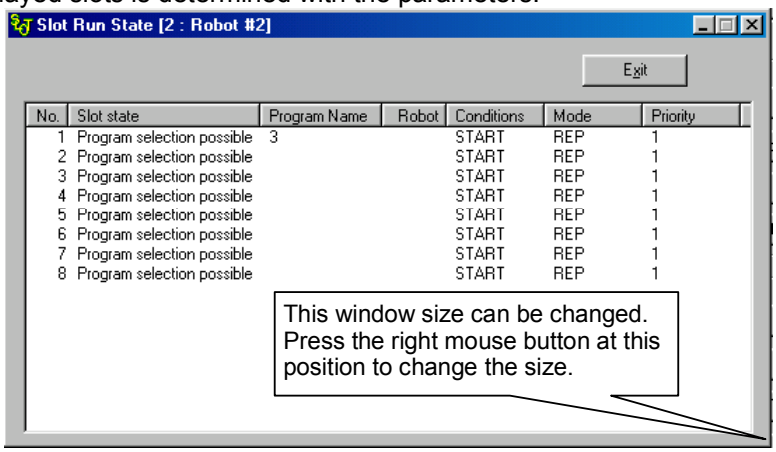


Fig. 6-3 Slot Run State

6.4.1.2. Stop Signals

The state of the stop signal (stop, emergency stop) input into the robot controller can be referred to.

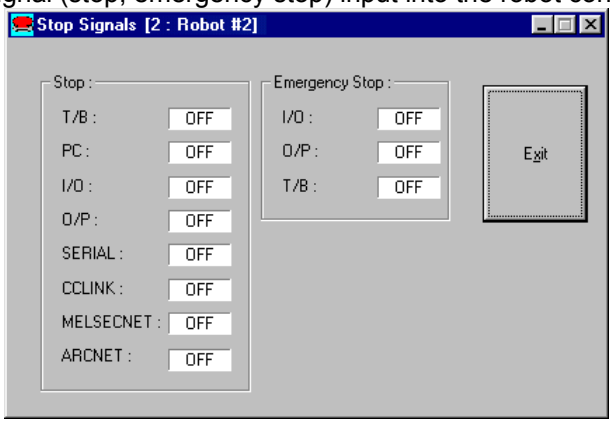


Fig. 6-4 Stop Signals

6.4.1.3. Error

The errors currently occurring in the robot controller are displayed.

(1) Currently occurring errors

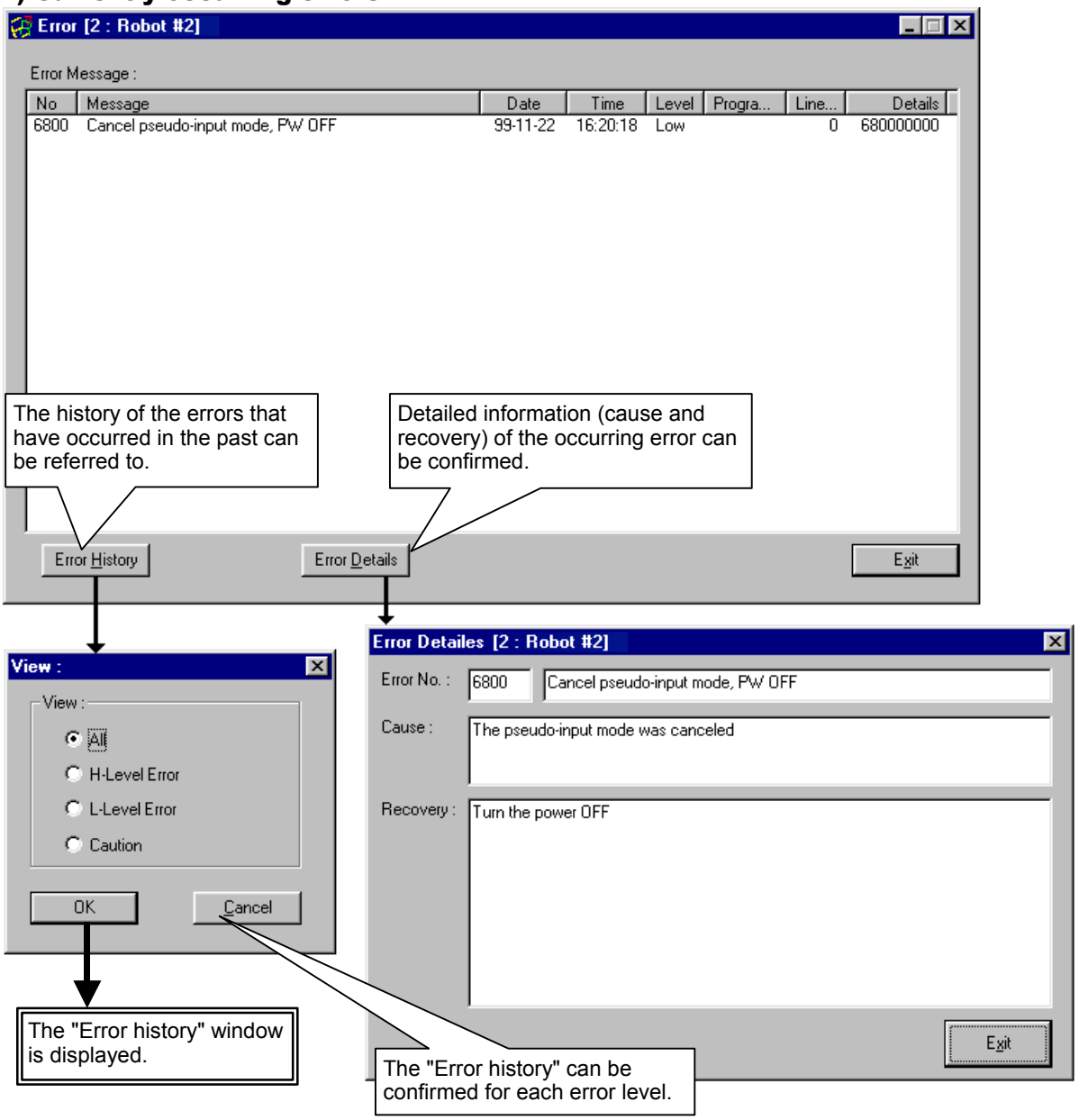


Fig. 6-5 Currently occurring errors and Error Detailes

(2) Error history

The history of errors that have occurred in the past can be referred to.
This display is not shown at all times. To update the information, press the "Update" button.

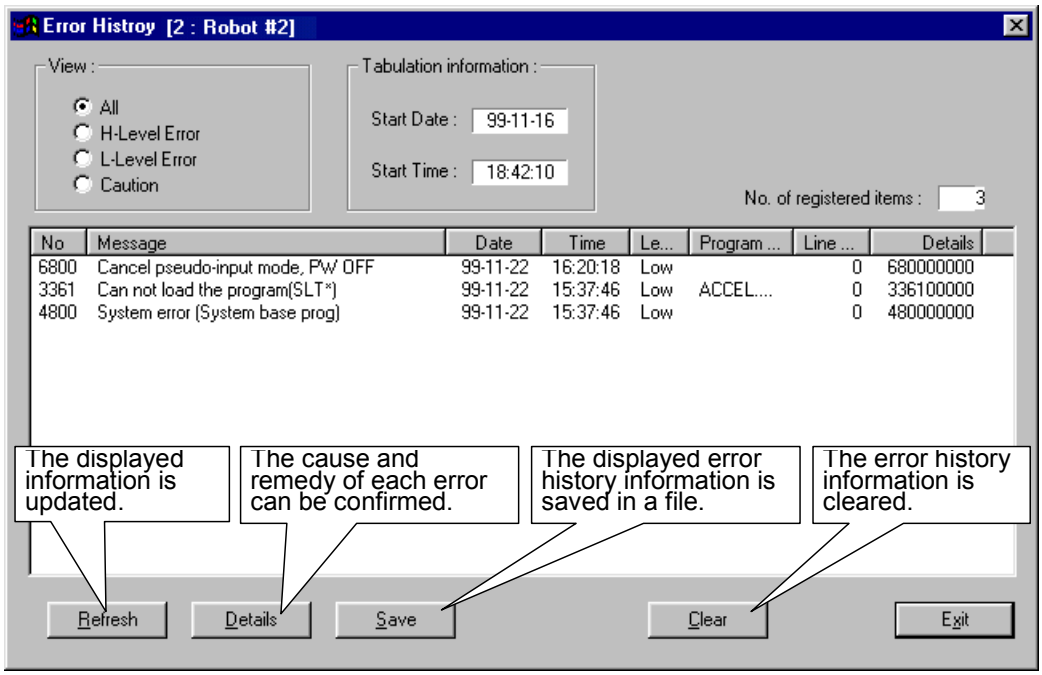


Fig. 6-6 Error history

6.4.1.4. Program monitor

Information of the running program can be monitored.

(1) Program monitor

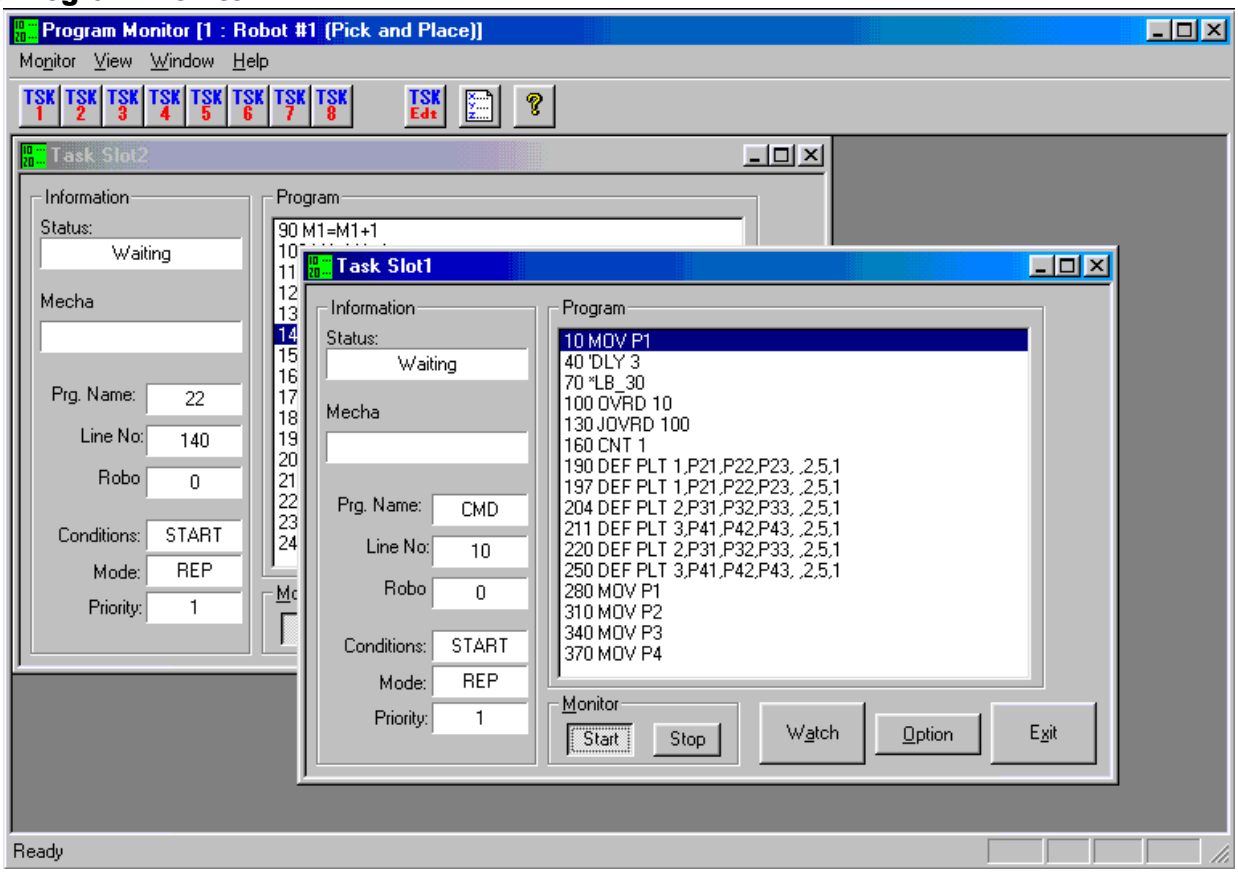


Fig. 6-7 Program monitor

[Variable] : The value of the variables in the running program can be referred to. The variable to be displayed can be selected.

[Watch] : The constant display window for the variables used in the running program is displayed.

[Option] : The No. of execution lines of the program being executed can be changed.

As the program monitor uses a large amount of information, when monitoring the variables with "Watch", the update of the display data may be delayed from the actual information.

When only the variables are to be monitored, press the monitor [Start] and [Stop] buttons on this screen, stop the display program monitor, and then watch.

(2) Current/target position monitor

The current/target position monitor can monitor the current robot position and the target robot position while the robot is operating. The position information is displayed in the orthogonal coordinate system and joint coordinate system.

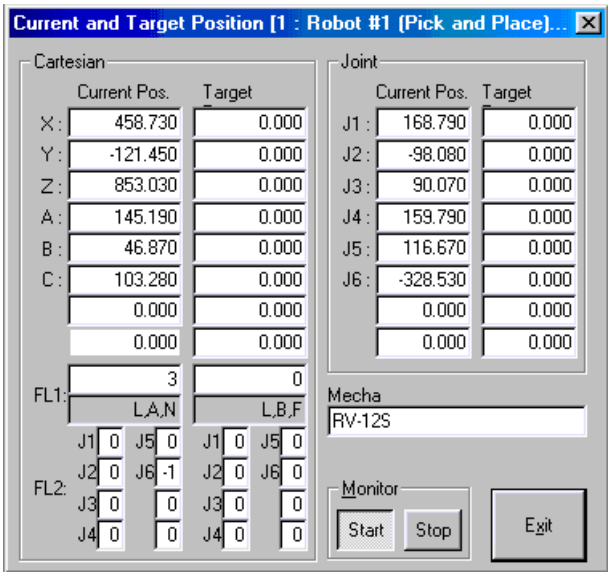


Fig. 6-8 Current/target position monitor

To display this screen, press the button under the toolbar, or select [Monitor] and then [Open Current/Target Position Screen] from the menu.

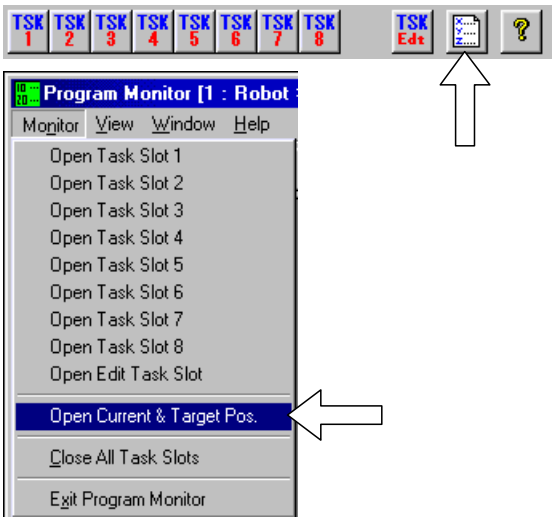


Fig. 6-9 Open Current & Target Pos.

(3) Watch monitor

With the watch monitor, the variables to be constantly displayed can be selected.

When the [Watch] button is clicked on, the watch monitor window and a window for selecting the variables to be displayed will appear.

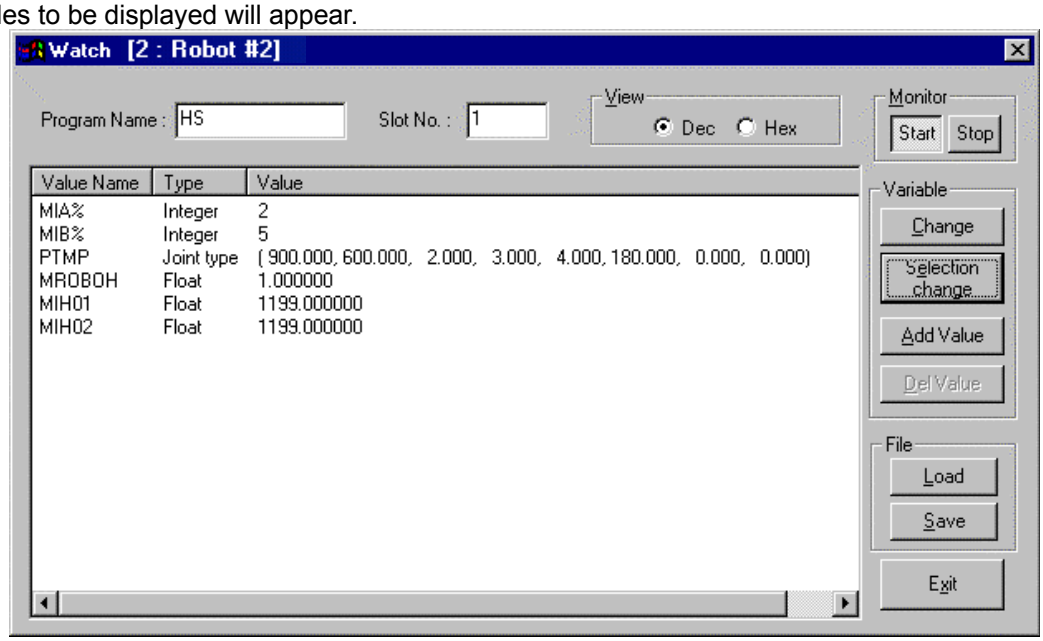


Fig. 6-10 Watch monitor

[Selection change] The watched variable can be selected from the variable list used by the program.

When [Selection change] button is clicked, the screen like the right is displayed. [Add] button is clicked after the variable watched on this screen is selected, and the variable monitored to [Displayed Variables] is selected. If the watched variable is selected, [OK] button is clicked.

The variable which is not displayed here can be specified by the [Add Value].

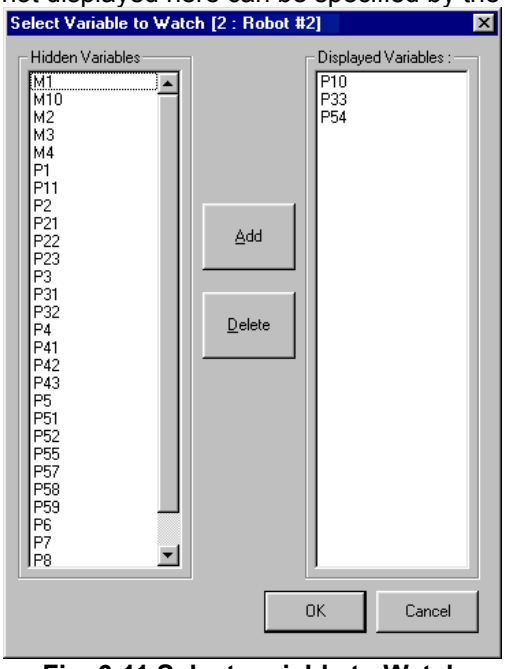


Fig. 6-11 Select variable to Watch

[Add Variable] The variables to be monitored can be designated.
Input the variable in Variable Name, select the variable type, and then click on the [OK] button.

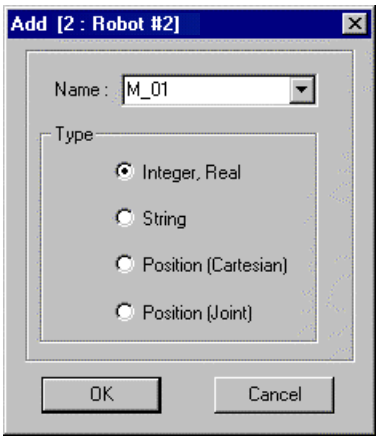
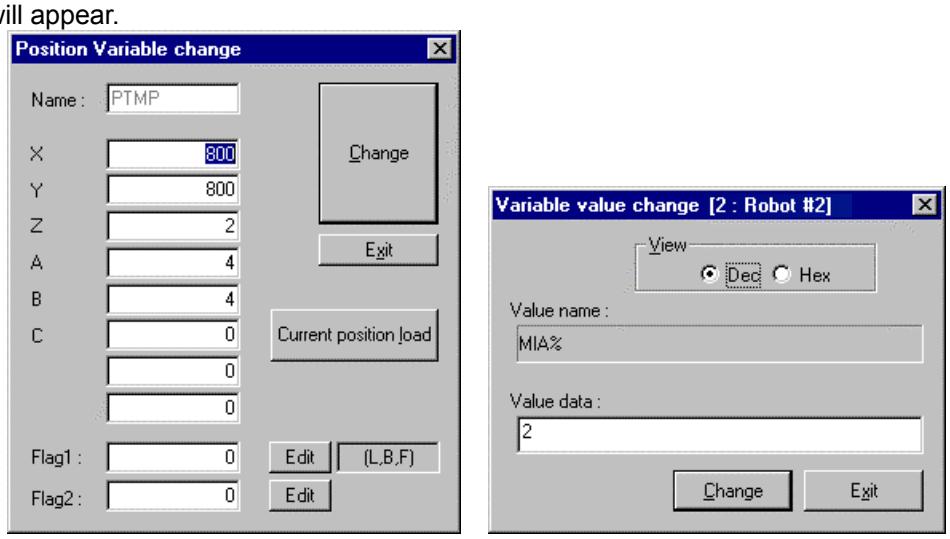


Fig. 6-12 Add

[Change] The value of the variable being watched now is changed. Variable identifier to which the value is changed is clicked double or [Change] button is clicked while selected. Variable value change window is displayed.

notes) Please note that the movement of the robot might change by the change enough when you change the value.

When the variable name is selected and the [Value Change] button is clicked on, the window for making changes will appear.



(Location) (Integer, Float, String)

Fig. 6-13 Variable change

Please click [Change] button after changing the value. However, Please note that the movement of the robot might change by the change enough when you change the value.

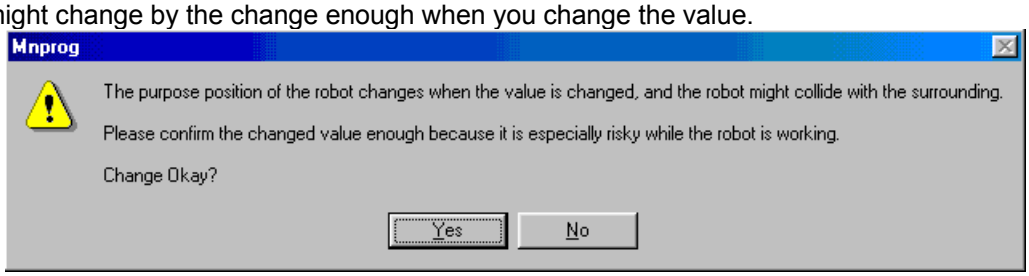


Fig. 6-14 Warning

[Load]/[Save] The list of the variable monitored by Watch is preserved in the file or the monitored variable can be read from the file. (This function corresponds from Ver.C1.)

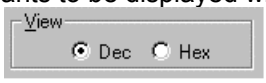
Variable name, the type, and the value being watched now can be saved in the file by clicking [Save] button.

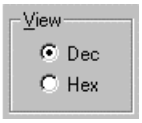
Variable name and the variable type are read from the saved file when [Load] button is clicked, and it is possible to add [Watch] as a monitored variable.

About the hexadecimal number display

The variable displayed with "Varialble List" and "Watch" can be switched to the hexadecimal number/the decimal number.

Please select the type which wants to be displayed with "View" on each screen.





Please refer to the following for the variable which can be displayed by the hexadecimal number.

Integer	The displayed variable can be switched to the hexadecimal number/the decimal number.
Float	When it is 0 below the decimal point, it is possible to switch to the hexadecimal number/the decimal number. However, the value is the one within the range of -9999999-9999999.
String	The hexadecimal number is not displayed.
Location	The hexadecimal number is not displayed.

As for the value displayed by the hexadecimal number, &H is added to the head of the value. (This function corresponds from Ver.C1.)

6.4.1.5. General-purpose input signals

The status of the signals input into the robot controller can be monitored.

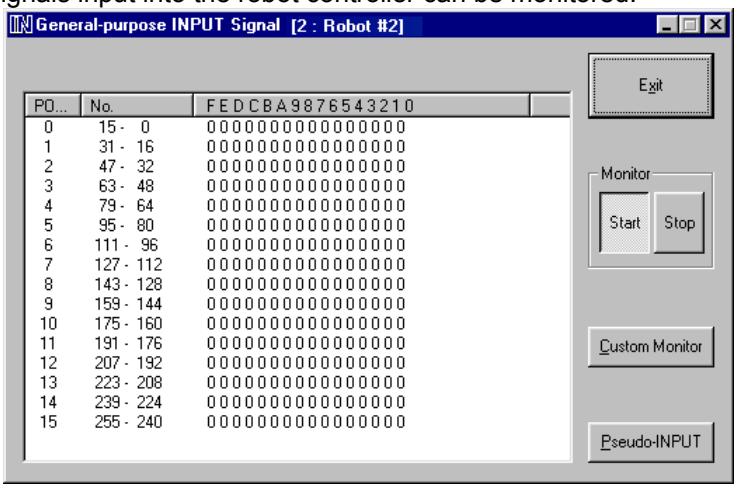


Fig. 6-15 General purpose INPUT Signals

When the [Pseudo-input] button is clicked on, the robot controller will enter the "pseudo-input mode", and the following window will appear.

Caution

To cancel the pseudo-input mode, the robot controller power must be turned ON again.

General-purpose monitor

With the general-purpose monitor, monitoring can be carried out by designating the head signal No. and number of signals to display.

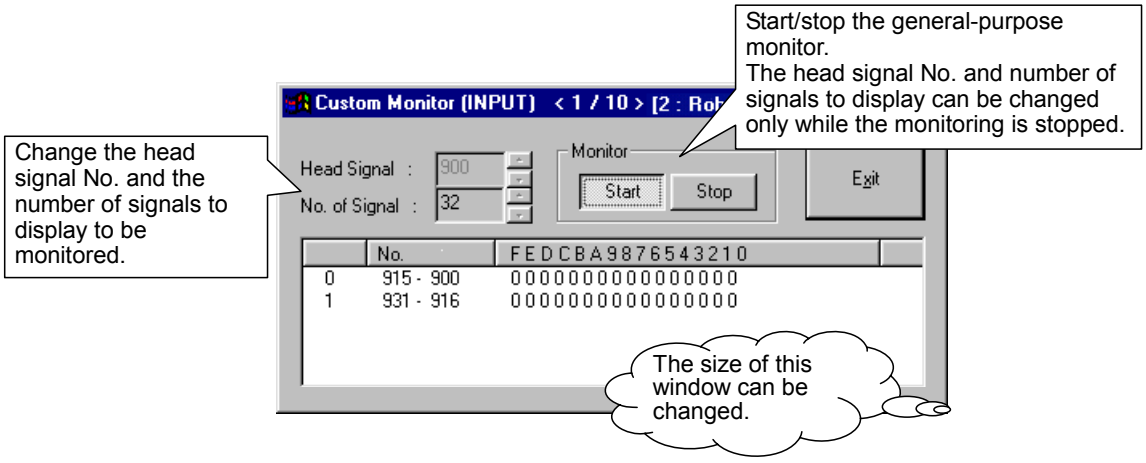


Fig. 6-16 Custom monitor(INPUT)

pseudo-input

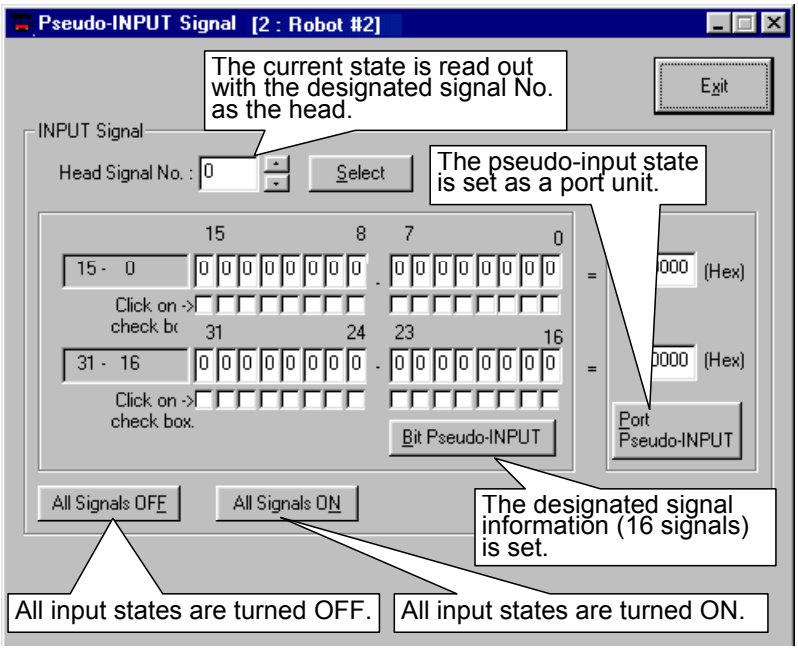


Fig. 6-17 Pseudo-input

In the pseudo-input mode, the state input from the following window is interpreted as the input signal instead of the robot controller general-purpose input signals.

1. First the signal to be pseudo-input signal is read.
   16 signals can be set simultaneously. Input the head No. of the signal to be read, and then click on the "Select" button.
2. The input state of the 16 signals is displayed with the designated signal at the head. Set the pseudo-input state, and then click on the "Pseudo-input setting" button.
3. 16 signals from the No. designated as the head can be forcibly output as a hexadecimal.
   Input the hexadecimal value, and then click on the "Port pseudo-input" button.

   The pseudo-input mode is canceled when this button is closed.

6.4.1.6. General-purpose output signal

The state of the signals output from the robot controller can be confirmed.

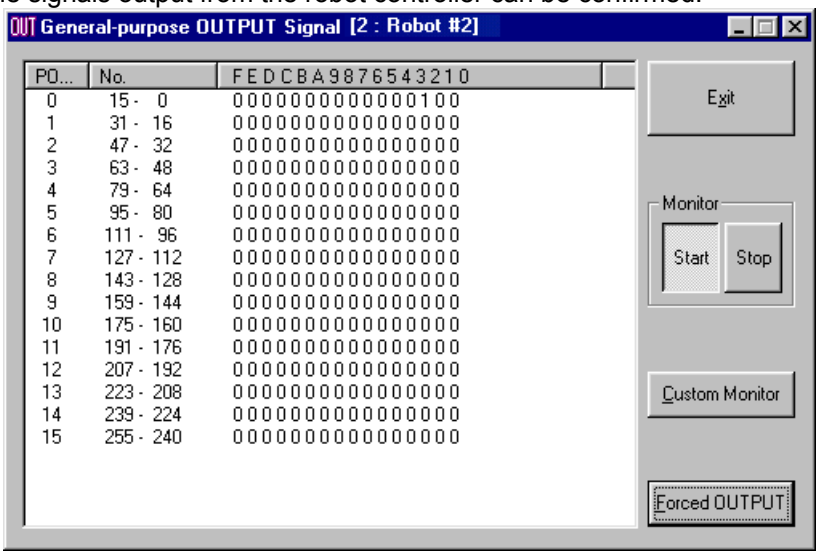


Fig. 6-18 General-purpose output signals

General-purpose monitor

With the general-purpose monitor, monitoring can be carried out by designating the head signal No. and number of signals to display.

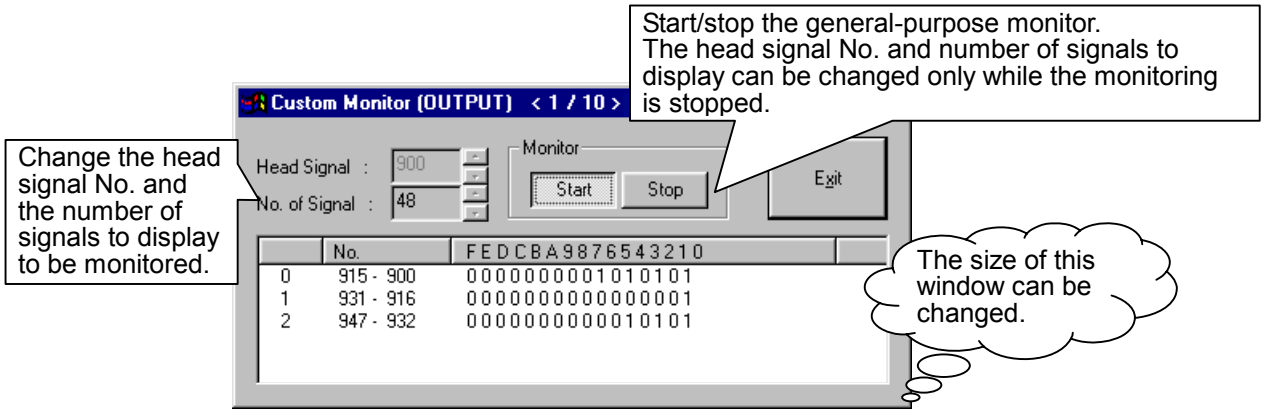


Fig. 6-19 Custom monitor(OUTPUT)

Forced output

The robot controller's general-purpose signals can be forcibly output.
Click on the "Forced output" button. A window for forcibly outputting the signal will appear.

1. First, read out the signal to be forcibly output.
   16 signals can be output simultaneously. Input the head No. of the signal to be read, and then click on the "Read" button.

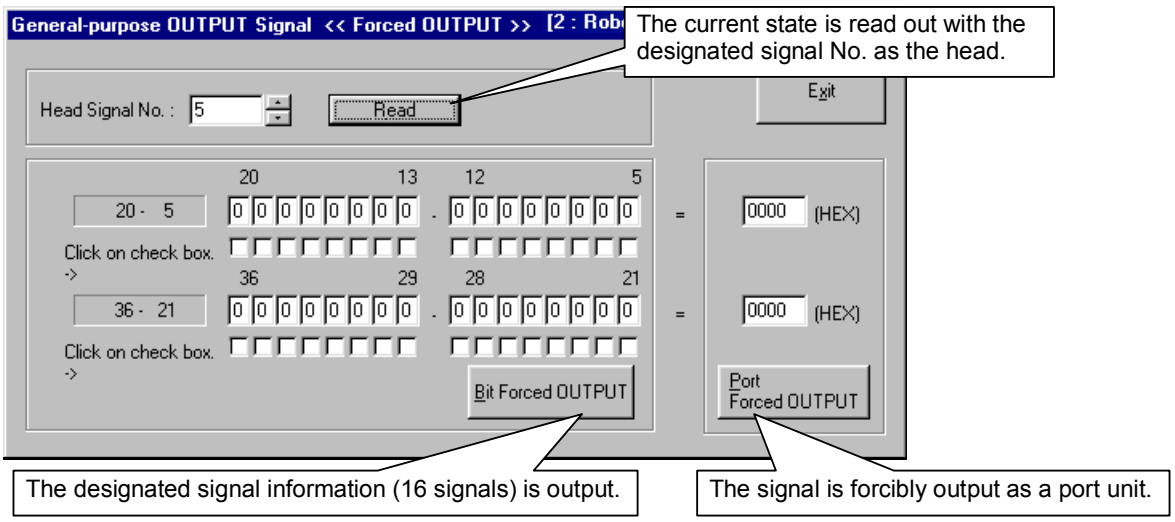


Fig. 6-20 Forced output

2. The output state of the 16 signals is displayed with the designated signal at the head. Set the output state, and then click on the "Forced output" button.
3. 16 signals from the No. designated as the head can be forcibly output as a hexadecimal. Input the hexadecimal value, and then click on the "Port output" button.

⚠ Caution

- The signal Nos. assigned (used) with the dedicated output signal cannot be forcibly output.
- Forced output is possible in the [TEACH], [AUTO (OP)] and [AUTO (EXT.)] states, but if even one program is running, output is not possible. (Excluding the ALWAYS program.)

6.4.1.7. Named signal

The status can be checked by naming the status of the dedicated I/O signal that has been set in the robot controller, as well as each bit or within the range of 32 bits of the general-purpose signal. The signal file in the robot controller is loaded at startup. If, however, it is not found, the previously used file is loaded.

The signals are set via parameter setting (maintenance tool).

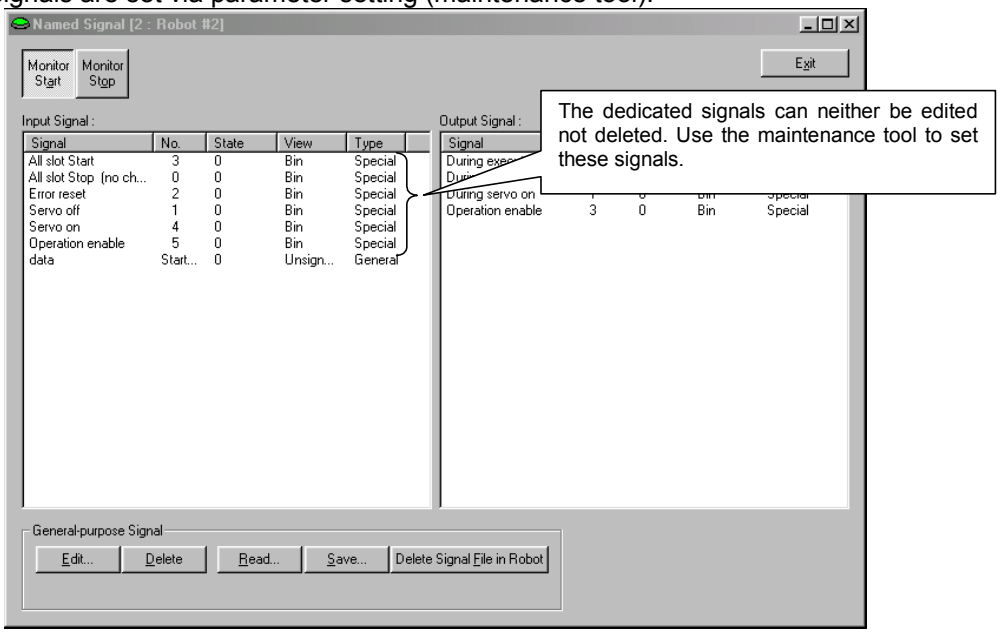


Fig. 6-21 Named Signals

[Edit]/[Delete]

The I/O signals you want to monitor can be added or edited. Enter the range of the signals you want to monitor in the Start No. and End No. boxes, and name it. If the signal you want to monitor is one bit, enter only the start No. For multiple bits, enter the numbers so that the start No. is smaller than the end No. (If reversed, an error will occur.) Binary, decimal or hexadecimal notation can be selected as the display method. For decimal notation, signed display using the most significant bit as a signed bit can also be performed.

Once the entry is finished, click the [Add]/[Change] button. If the [Add] button is clicked when a signal name is being selected, it is inserted to the selected line. If a signal name is not being selected, it is added at the end of the list.

You can delete unwanted signal names from the list by selecting them and clicking the [Delete] button.

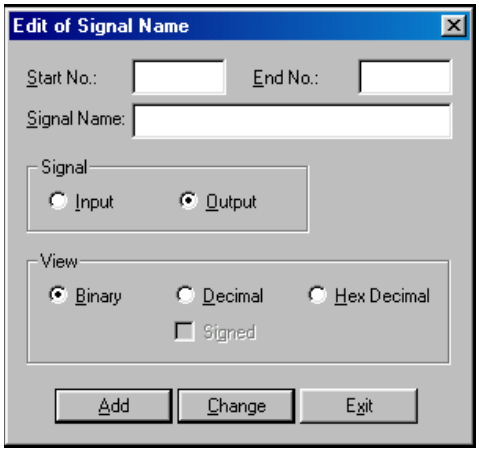


Fig. 6-22 Edit of Signal Name

[Load]/[Save]

The edited result can be saved on or loaded to a personal computer or robot controller. Specify the save destination/load destination and click the [OK] button. If the save destination is a personal computer, a file name can be specified. However, if the save destination is a robot controller, the result will be overwritten on the previous information.

6.4.1.8. Movement State

With the operation confirmation, the robot's movement range, current position and hand open/close state, etc., can be confirmed.

* "Robot Monitor" robot 3D monitor function in the "Movement State" is compatible only with the standard version (STD).

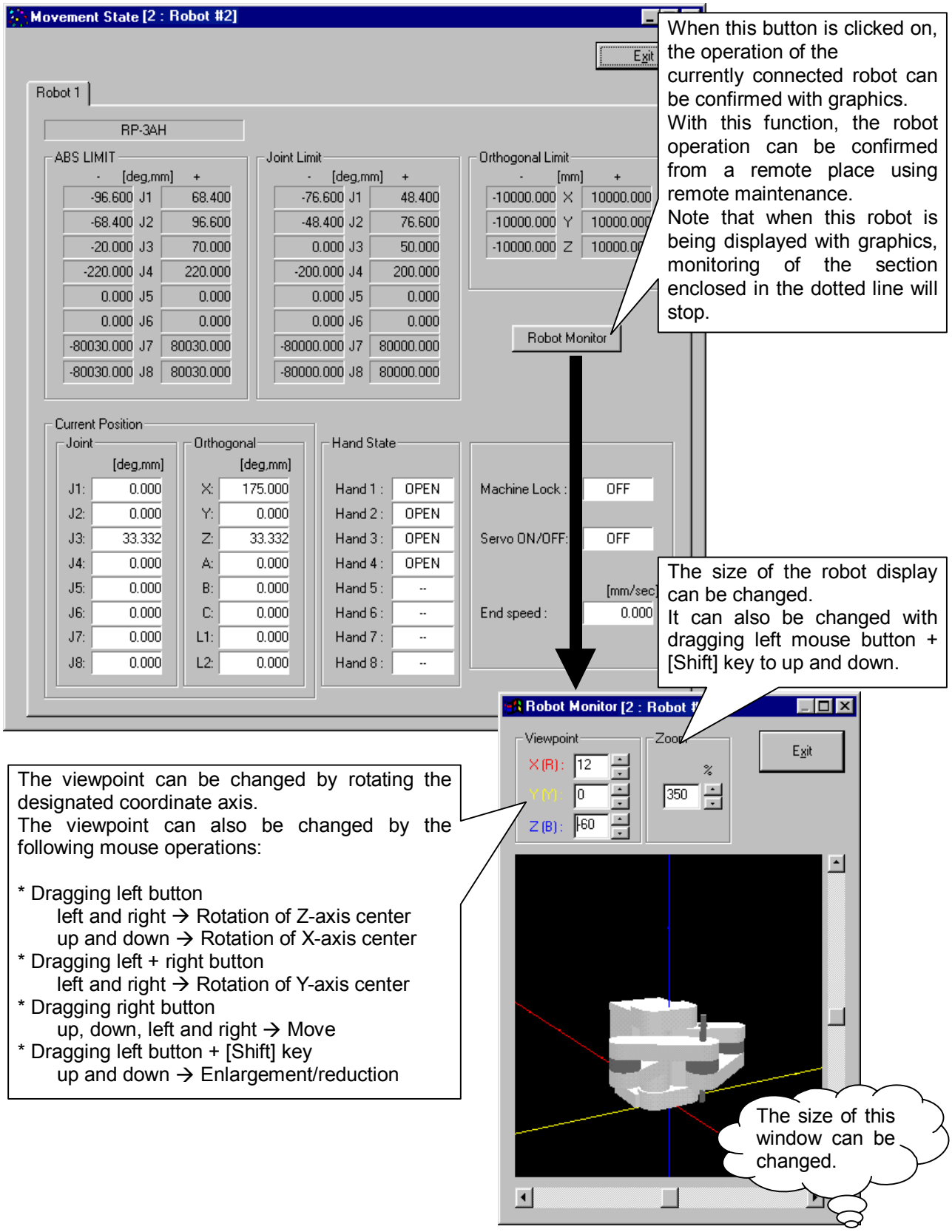


Fig. 6-23 Movement State

6.4.1.9. Input register

This screen cannot be referred to if the CC-Link option card is not mounted on the robot controller.

The values of the CC-Link function input registers can be monitored.

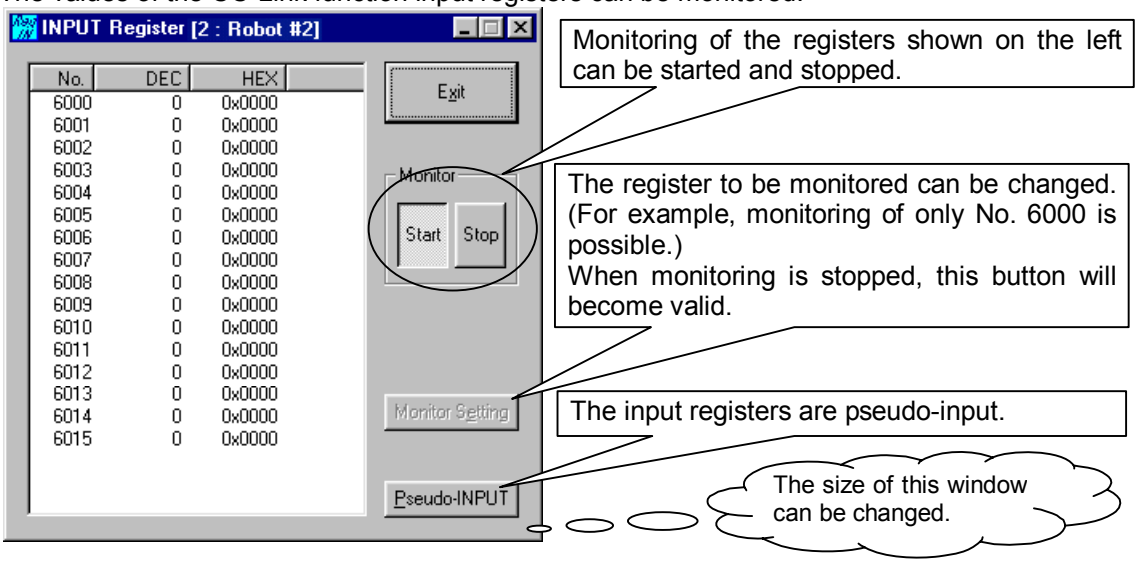


Fig. 6-24 Input register

Monitor setting

When “Stop” is selected for the monitor state, the “Monitor Setting” button will be a validated.

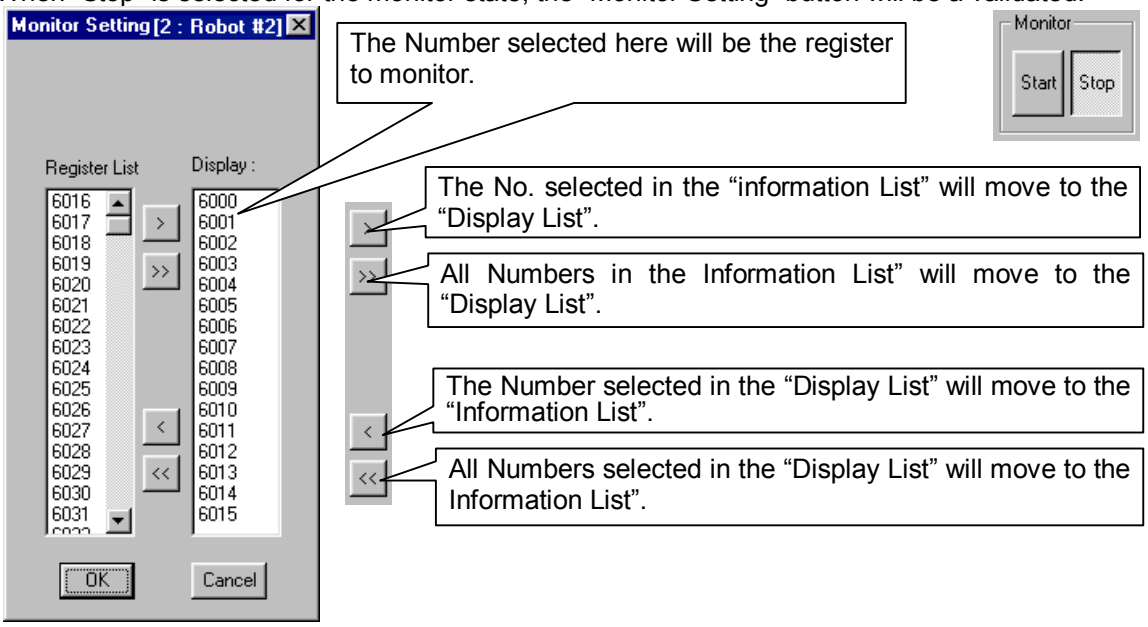


Fig. 6-25 Monitor setting

Caution

When a large amount of information is monitored, the communication size with the robot controller will increase, and it may take time to update the information. It is recommended to monitor only the required registers with the monitor setting.

Pseudo-input

With the pseudo-input mode, the values input from the following window will be interpreted as the input register values instead of the registers input from an external source.

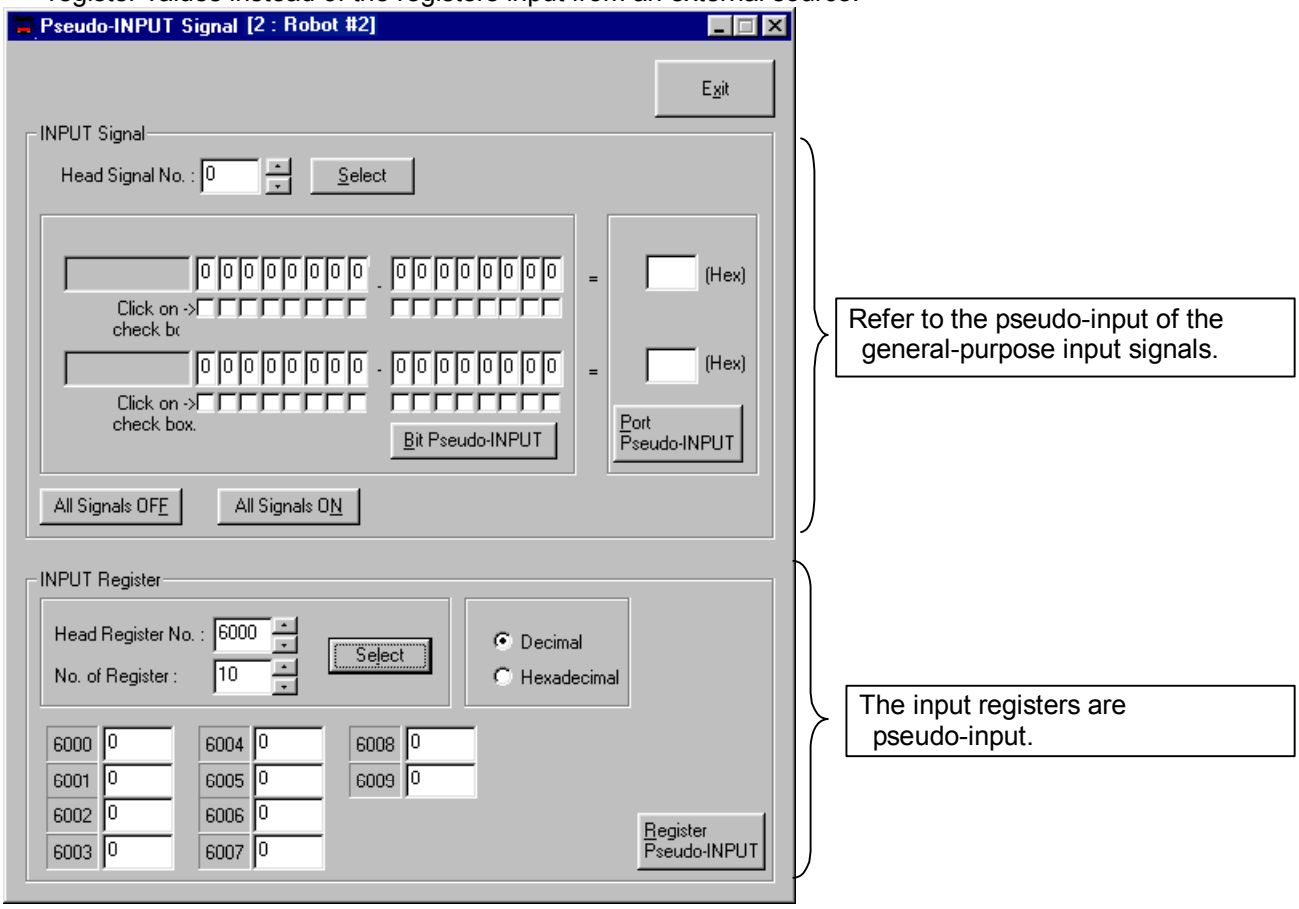


Fig. 6-26 Pseudo-input (Signals & Register)

<Operation methods>

1) First, read out the registers to be pseudo-input. Up to 16 sequential registers can be set simultaneously. Input the head No. of the register to be read and the number of registers to read, and then click on the "Select" button.
2) The values of the designated number of registers will appear with the designated register at the head.
3) Set the register value, and click on the "Register Pseudo-Input" button.

The pseudo-input mode is canceled when this window is closed.

6.4.1.10. Output register

This screen cannot be referred to if the CC-Link option card is not mounted on the robot controller.

The values of the CC-Link function input registers can be monitored.

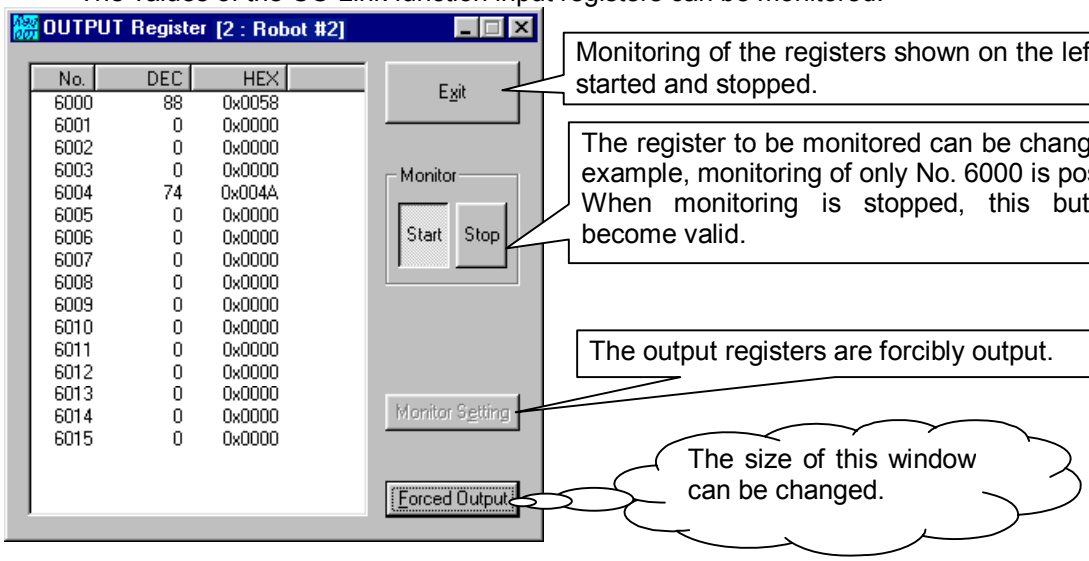


Fig. 6-27 OUTPUT Register

Monitor setting

When “Stop” is selected for the monitor state, the “Monitor Setting” button will be a validated.

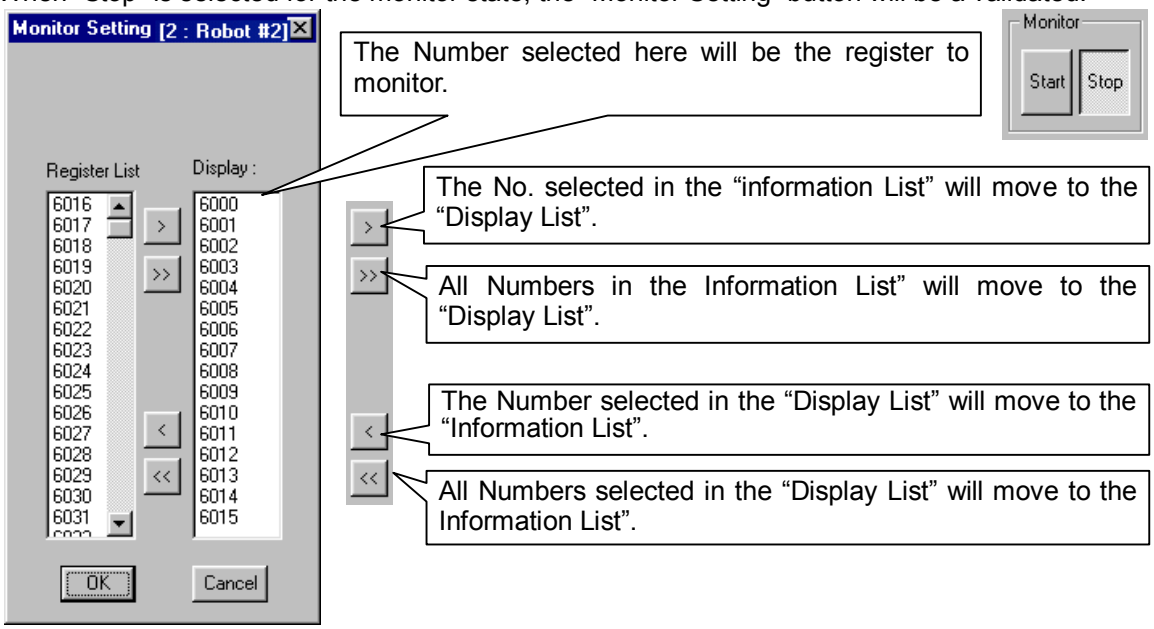


Fig. 6-28 Monitor setting

⚠ Caution

When a large amount of information is monitored, the communication size with the robot controller will increase, and it may take time to update the information. It is recommended to monitor only the required registers with the monitor setting.

Forced output

The registers can be forcibly output.

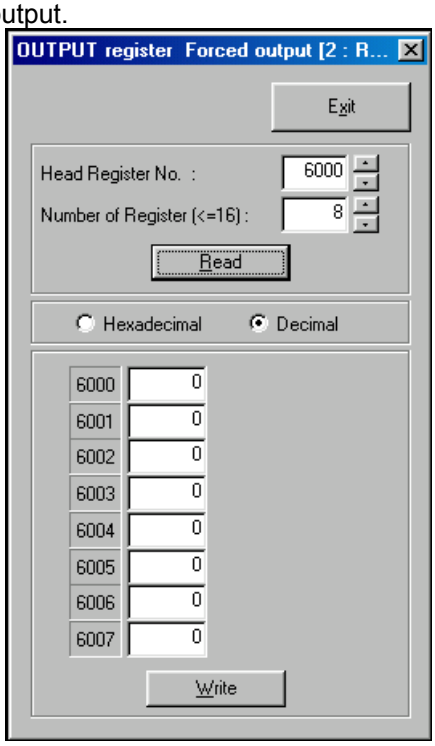


Fig. 6-29 Forced output(Register)

<Operation methods>

1) First, read out the registers to be forcibly output. Up to 16 sequential register can be output simultaneously.
   Input the head No. of the register to be read and the number of registers to read, and then click on the "Read" button.
2) The designated number of registers will appear with the designated register at the head. Set the value, and click on the "Forced Output" button.

6.4.2. Operation monitor

6.4.2.1. Operating time accumulation

The robot operating time, and battery usage time, etc., can be confirmed.

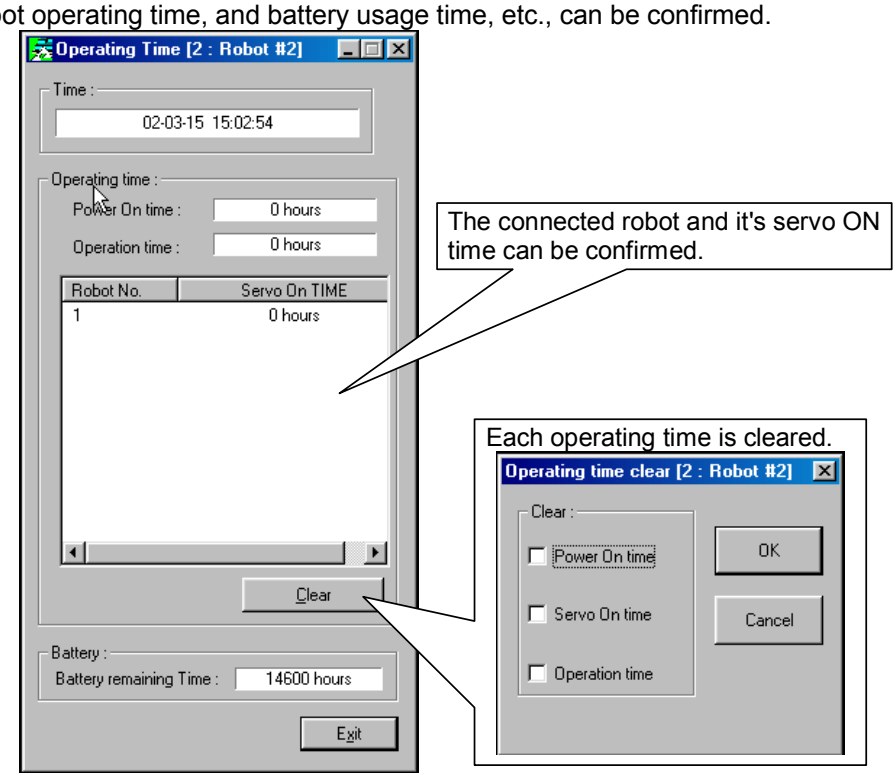


Fig. 6-30 Operating time accumulation

6.4.2.2. Production information

The latest cycle, operation time, No. of cycles and average cycle time for each program in the robot controller can be confirmed.

The production information is not constantly displayed. Click on the "Update" time as necessary.

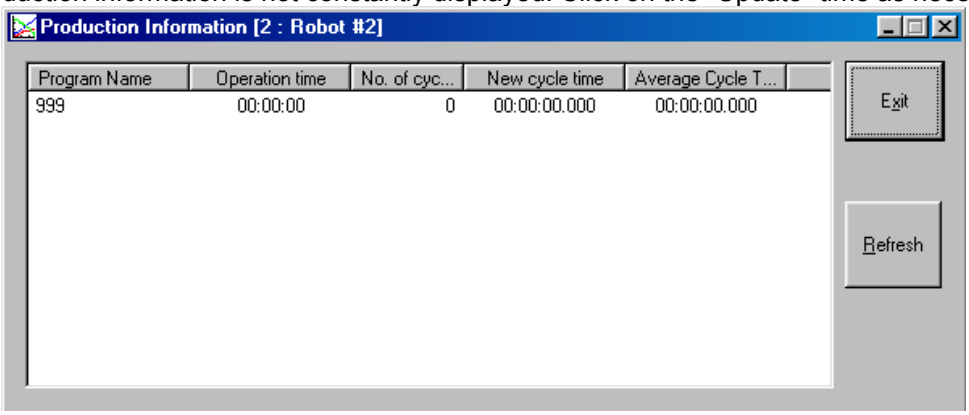


Fig. 6-31 Production information

6.4.2.3. Robot version

The robot controller version can be confirmed.

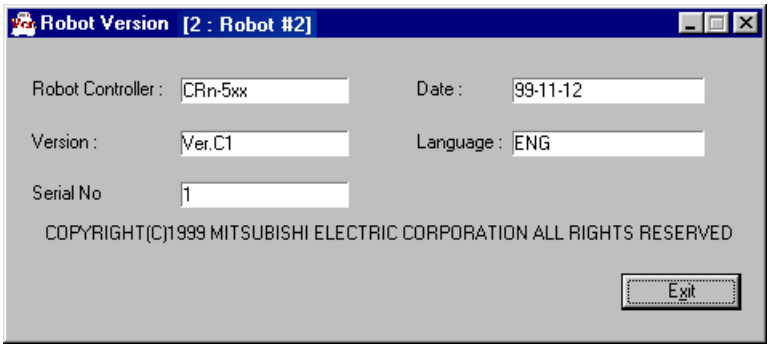


Fig. 6-32 Robot version

6.4.2.4. Additional Board Information

Information on the option card mounted on the robot controller can be confirmed.

Note that this screen cannot be referred to if robot controller is not provided with a slot for mounting the option card.

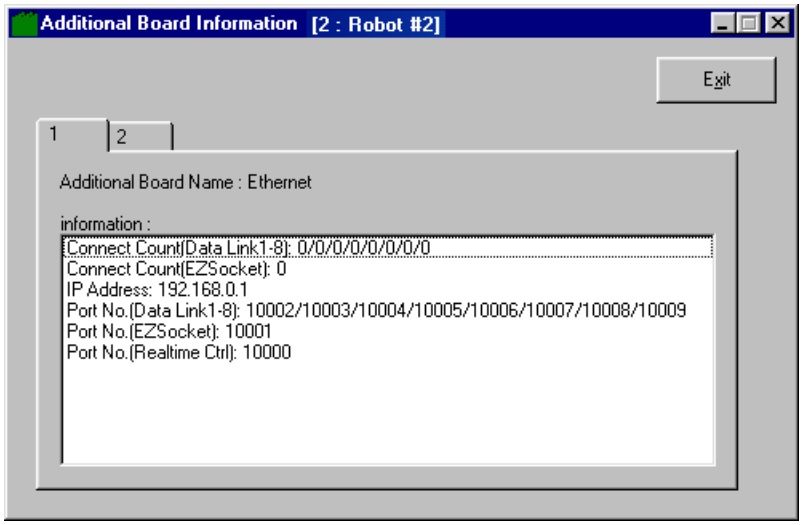


Fig. 6-33 Additional board information

6.4.3. Servo monitor

The servo system is monitored.

6.4.3.1. Position (ABS)

The state of the currently connected robot encoder can be monitored.

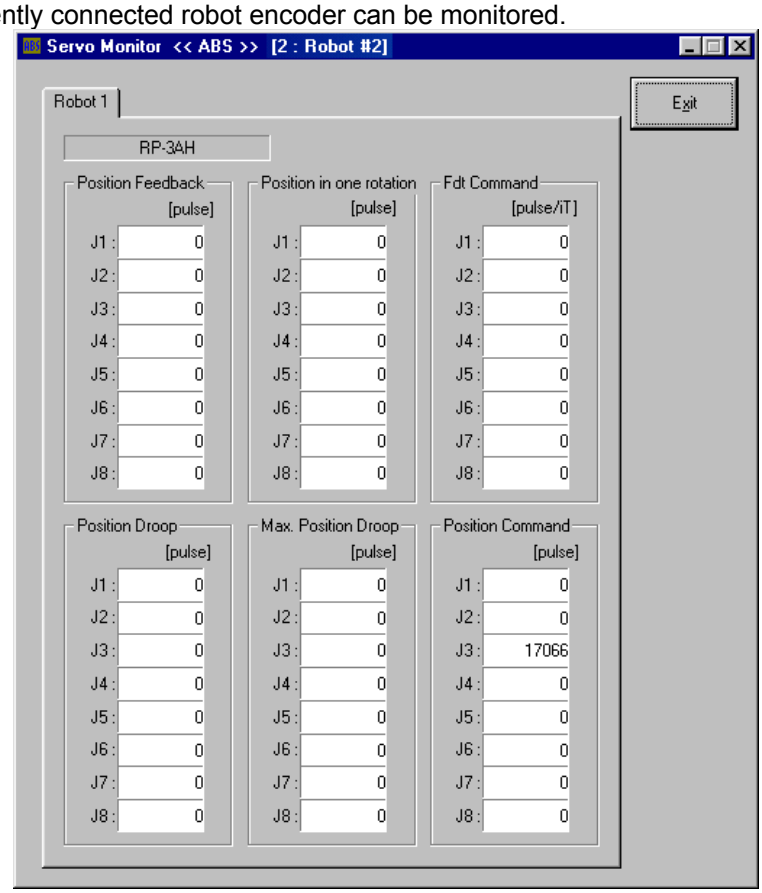


Fig. 6-34 Servo monitor --- Position(ABS) ---

6.4.3.2. Speed

The motor speed, etc., of each robot axis can be monitored.

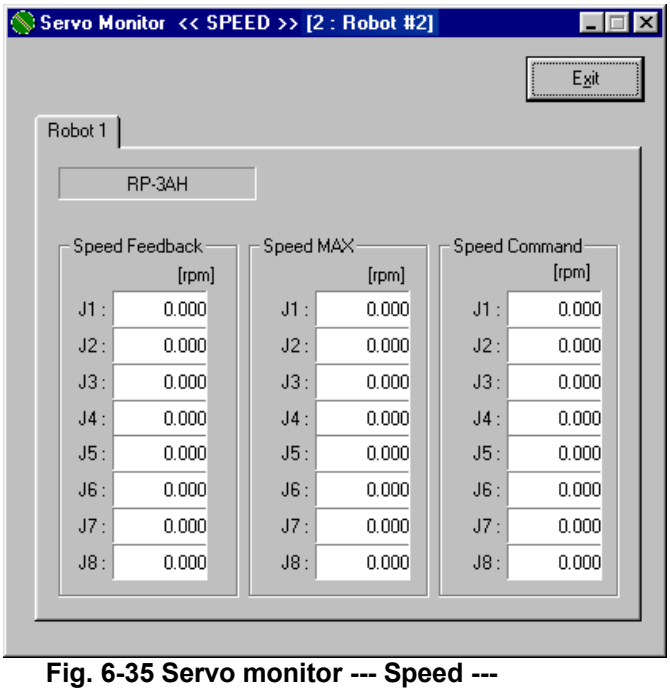


Fig. 6-35 Servo monitor --- Speed ---

6.4.3.3. Current

The current state of each robot axis can be monitored.

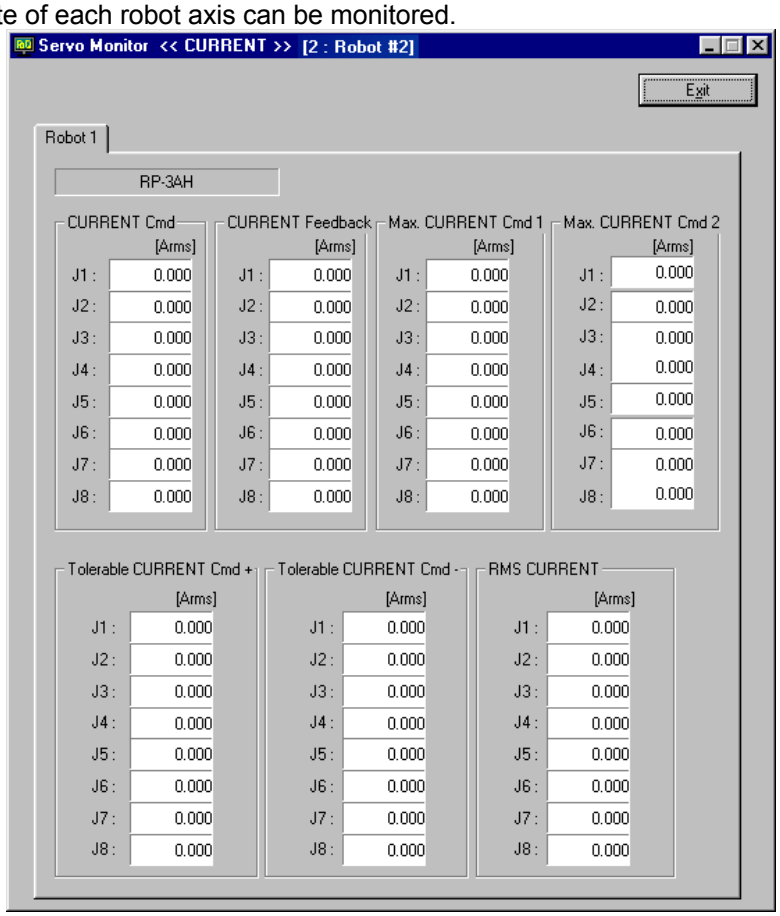


Fig. 6-36 Servo monitor --- Current ---

6.4.3.4. Load

The load state of each robot axis can be monitored.

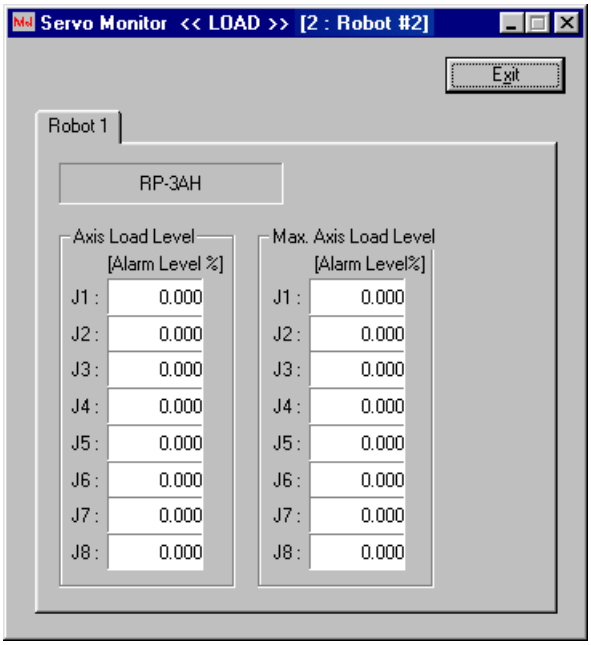


Fig. 6-37 Servo monitor --- Load ---

6.4.3.5. Power

The power state of the robot's main circuit can be monitored.

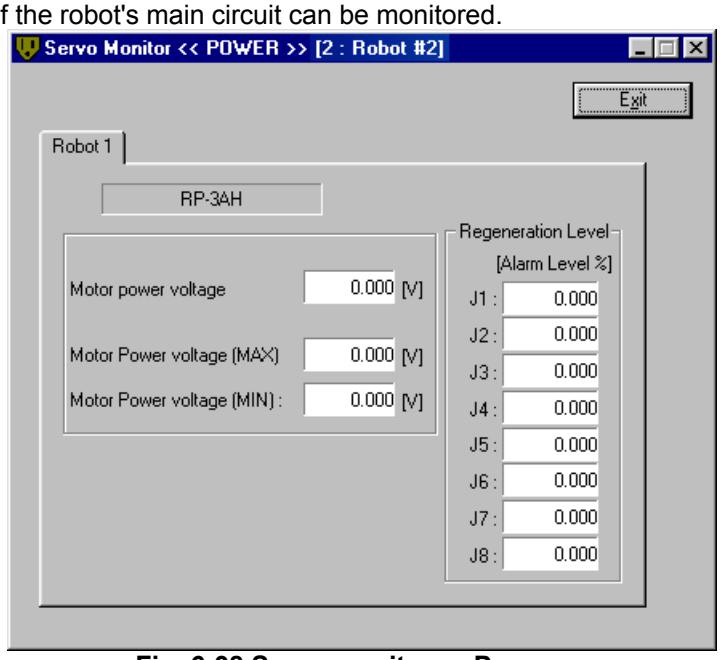


Fig. 6-38 Servo monitor --- Power ---

7. Parameter editing tool

The parameter edit tool can be used to reference and rewrite the parameter information set in the robot controller.

7.1. Starting of Parameter editing tool

Select [Parameters] from the menu. [Edit Parameters] shown below appears.
At this point, a connection will be automatically made to the robot controller set on the communication server.

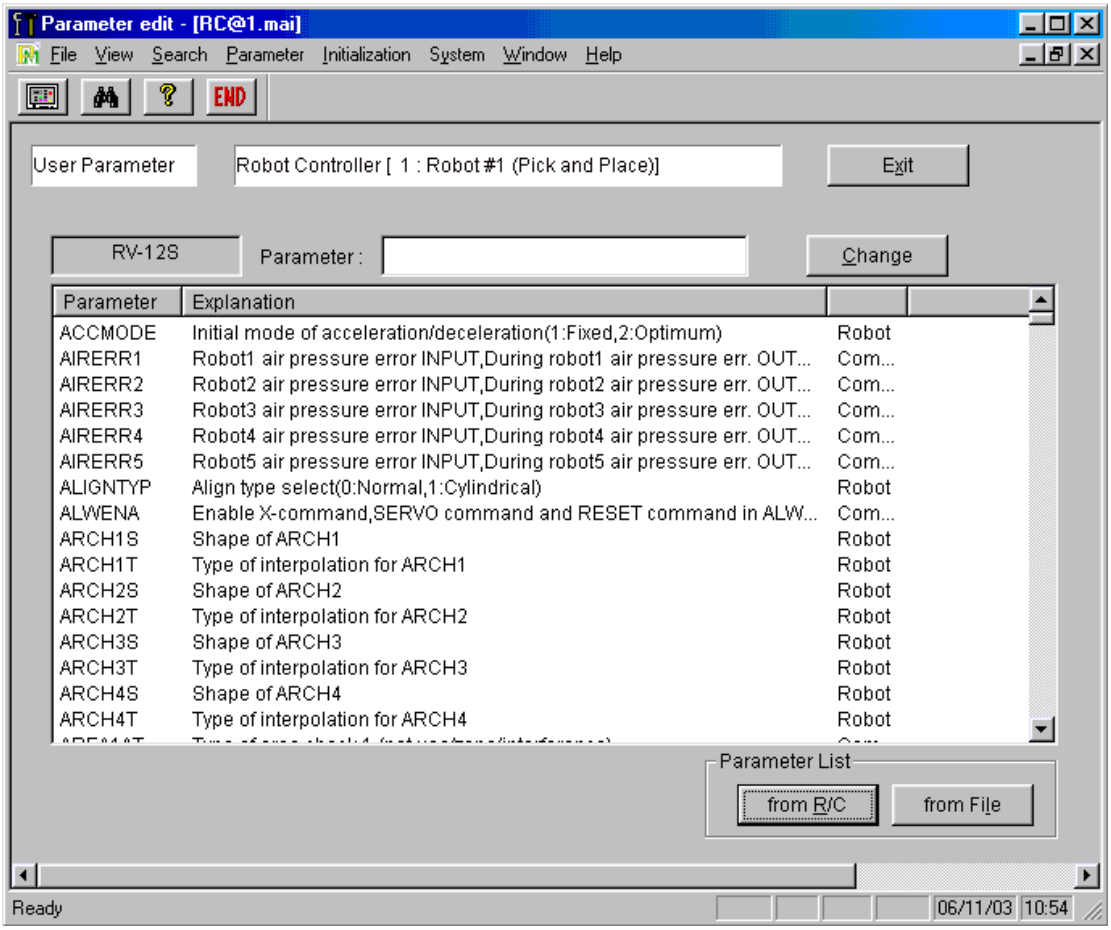


Fig. 7-1 Parameter editing tool (E1 or later)

The parameter edit screen differs depending on the number of machines being connected and the version of this software. If multiple machines are being connected or Version **D2** or earlier is in use, the parameters are displayed for each machine as shown in the figure below

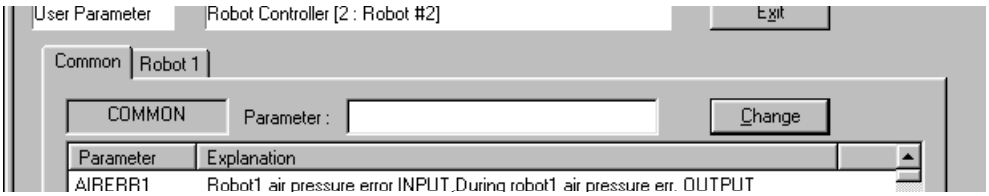


Fig. 7-2

If the power to the robot controller specified on the communication server is not on or it is not connected correctly when starting the parameter edit tool, the "Select Read Destination" screen appears. In this case or to change the parameters of the robot controllers other than the robot controller specified on the communication server, see Section **"7.2 Selecting the Read Destination"**

7.2. Selecting the Read Destination

The Select Read Destination screen can be displayed by one of the following operations:

1. Choose [Select Read Destination] from the [File] menu.
2. Click  from the tool chip.
3. When unable to communicate with the robot controller specified on the communication server (power not on, not connected correctly, etc.)

Fig. 7-3 Select target

To connect with a robot controller and perform the maintenance of the parameters in the robot controller, select [Robot Controller]. To edit the parameter information that has been downloaded to a personal computer, select [File]. If a robot controller has been selected as the load destination, select the robot controller you want to connect.

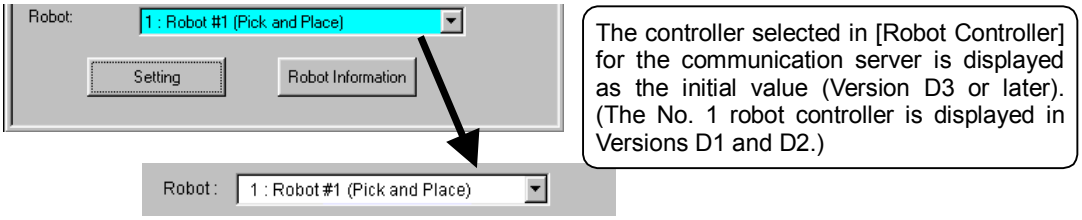


Fig. 7-4 The controller selected for the communication server

7.2.1. Selecting a robot controller

If you have selected a robot controller as the read destination, select the robot controller you are connecting, and then click the [Select] button.

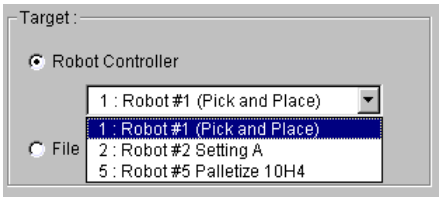


Fig. 7-5 Selecting a robot controller

The parameter edit screen for the robot controller you have selected appears.

7.2.2. Selecting files

The information that can be edited here includes batch backed-up data or backed-up parameters. If [File] is selected, the window for selecting the parameter information you will be editing appears.

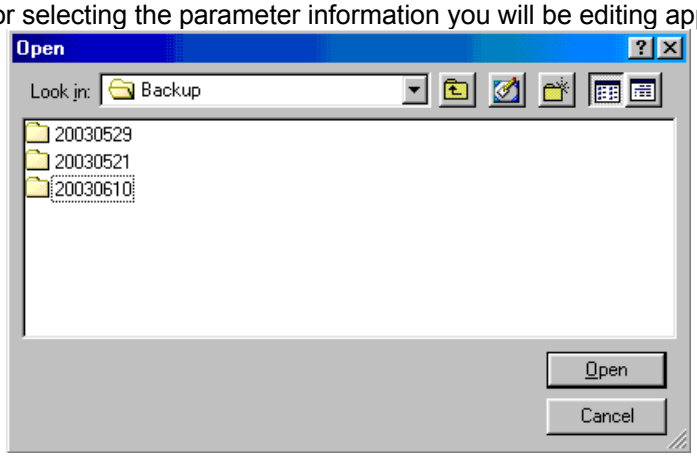


Fig. 7-6 Selecting files

Here, double-click the folder containing the parameter information. You can now edit the parameter information in the folder you selected.

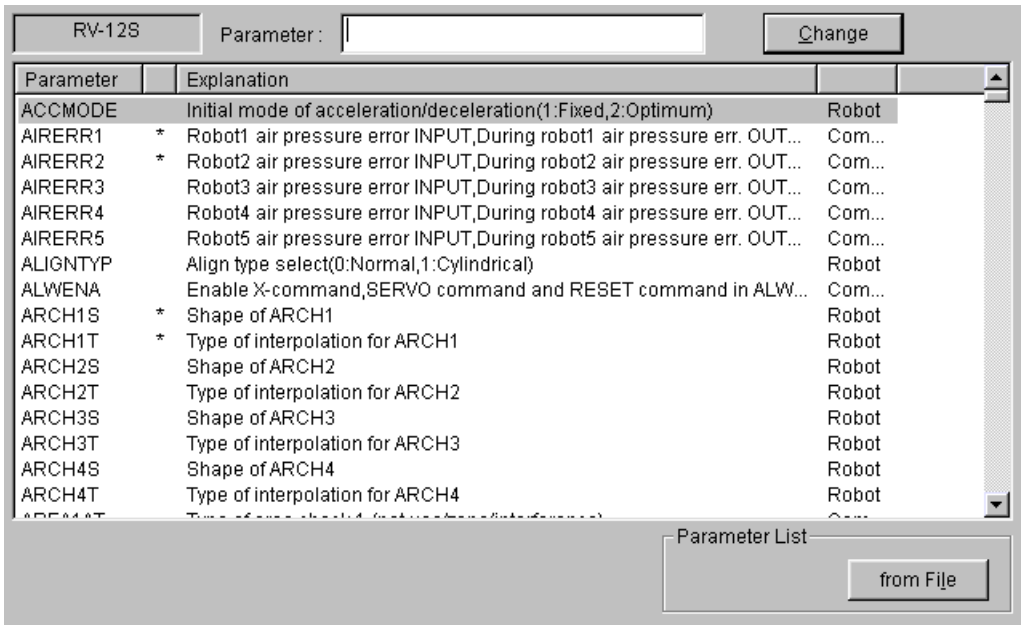


Fig. 7-7 The parameter information in the selected folder

7.3. Downloading the parameter list (Controller -> PC)

Fig. 7-8 Confirmation

This window will appear in the following cases.

1. When there is no parameter list information in the personal computer.
2. When the parameter list used in the robot controller is newer than the parameter list already stored in the personal computer.

* Although it will take approx. five minutes to download the parameter list information, using the latest parameter information is recommended.

【Reference Values】 When Version **J1** of the robot controller software and Version **E1** of this software are connected

When using RS-232C (9600 baud rate) : 4 min. 30 sec.
When using RS-232C (19200 baud rate) : 2 min. 30 sec.
When using Ethernet : 24 sec.

If the parameter list information is not read out correctly, the following type of window will appear.

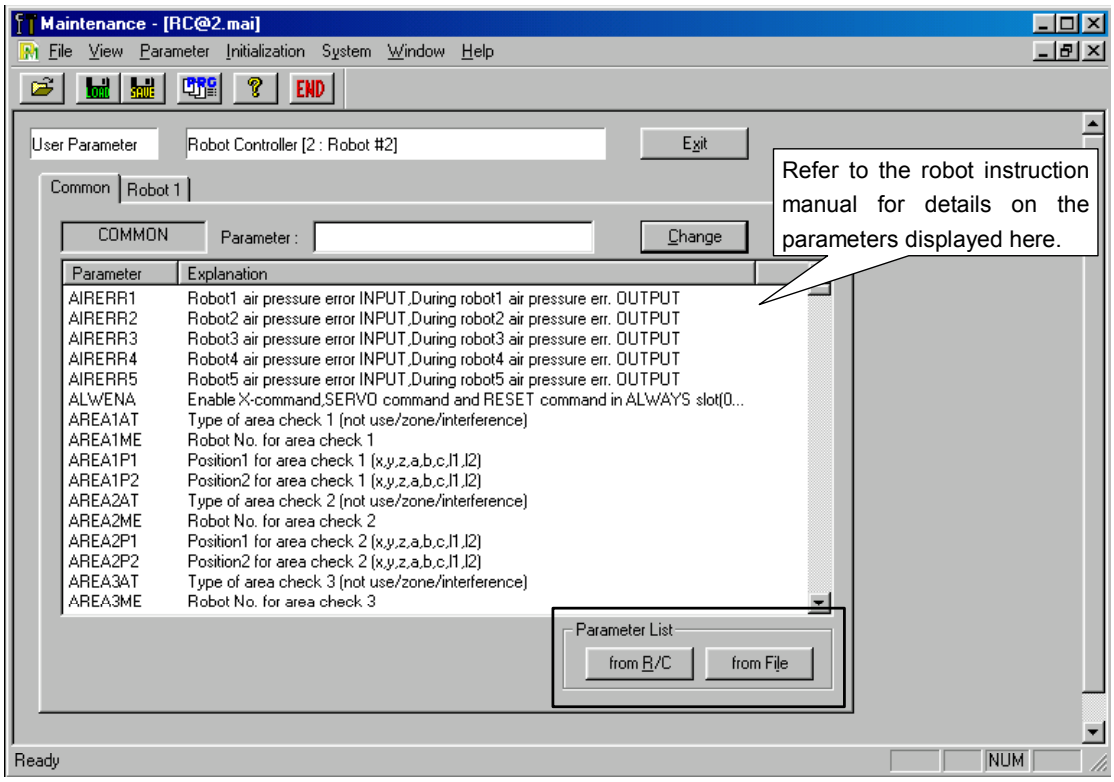


Fig. 7-9 Parameter List

The parameter list can be read from the robot controller or from the personal computer using these buttons.

Reading the parameter list

[From R/C] : The parameter list is read from the robot controller.
[From File] : The parameter list written in the personal computer is read.

7.4. Changing the parameters

Click on a parameter displayed in the list, or input the parameter name, and then click on the "Change" button.

The designated parameter information in the robot controller or personal computer will appear.

After confirming the parameter, the parameter information in the robot controller can be rewritten by clicking on the "Write" button. (When editing the parameter information saved in the personal computer, the "Write" button will change to an "OK" button.)

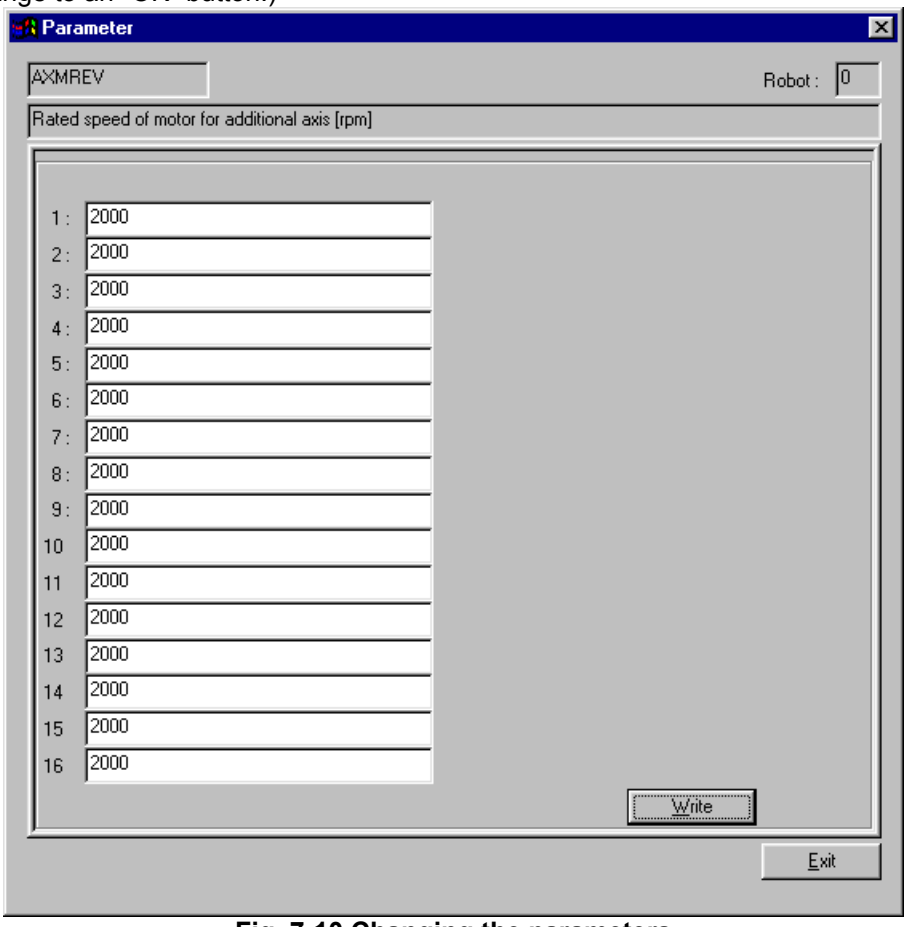


Fig. 7-10 Changing the parameters

There are some parameters that cannot be edited. In this case, the "Write" button operation will be disabled.

⚠ Caution

Use upper case letters when naming the programs in alphabetic characters.

Lower case alphabetic characters can be used in this parameter setting.

Use upper case letters when naming the programs in alphabetic characters for the parameters of the base program (PRGUSR) or slot table (SLT*), etc. All of the program names within the robot controller will be expressed in upper case letters.

If lower case letters are used, the programs will not be properly recognized.

⚠ Caution

To validate the rewritten parameter information in the robot controller, the robot controller power must be turned ON again.

Operating Modes of the Robot Controller When Writing Parameters

Software version of robot controller	Writable mode switch
Version J1 or later	Parameters can be written in any of Teach, Auto(OP) and Auto(Ext) modes. However, parameters cannot be written while any program with other than the startup condition of ALWAYS has been started. In such a case, stop the program, and then write parameters.
H7 or earlier	Parameters can be written only in Teach mode.

7.6. Parameter menu

With this tool, parameter panels grouped as windows for each function are prepared. Select the name of the parameter to be referred to with "Parameter setting" on the menu.

Fig. 7-11 Paramter menu

⚠ Caution

The language (MELFA-BASIC IV/MOVEMASTER command) to be used by the controller can be changed with the "Robot Language" parameter. Note that the robot models that can use the MOVEMASTER commands are limited. Refer to the Standard Specifications for the model in use to confirm whether the commands can be used.

7.6.1. Motion Limit Parameter

Set the operating range of the robot

.

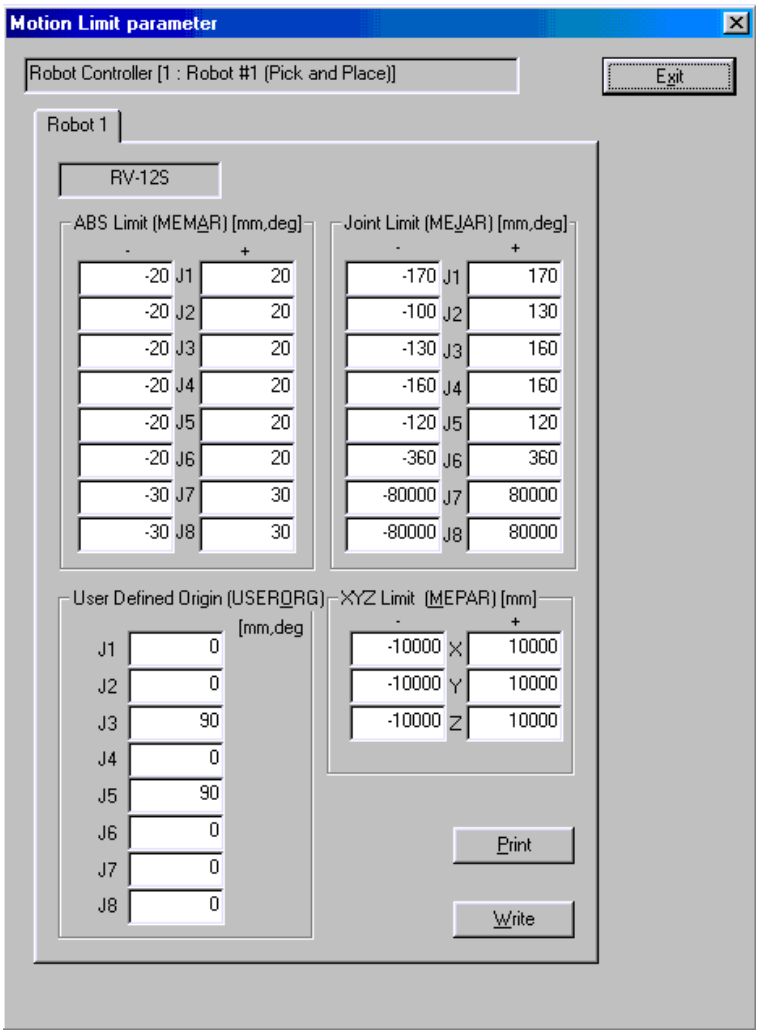


Fig. 7-12 Motion Limit parameter

7.6.2. JOG Parameter

Set the speeds of joint jog and orthogonal jog.

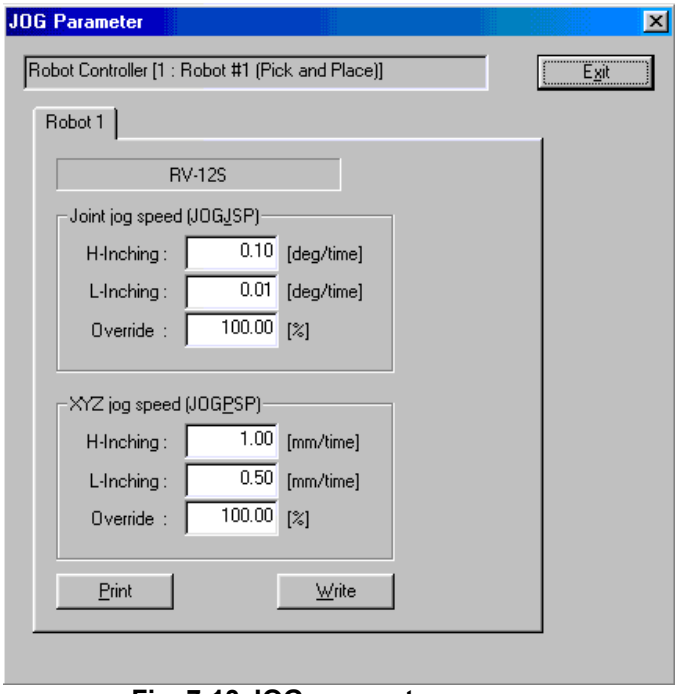


Fig. 7-13 JOG parameter

7.6.3. Hand Parameter

Set the type of the hand (single solenoid/double solenoid, etc.) and work holding/non-holding when HOPEN* (open hand) and HCLOSE* (close hand) are executed.

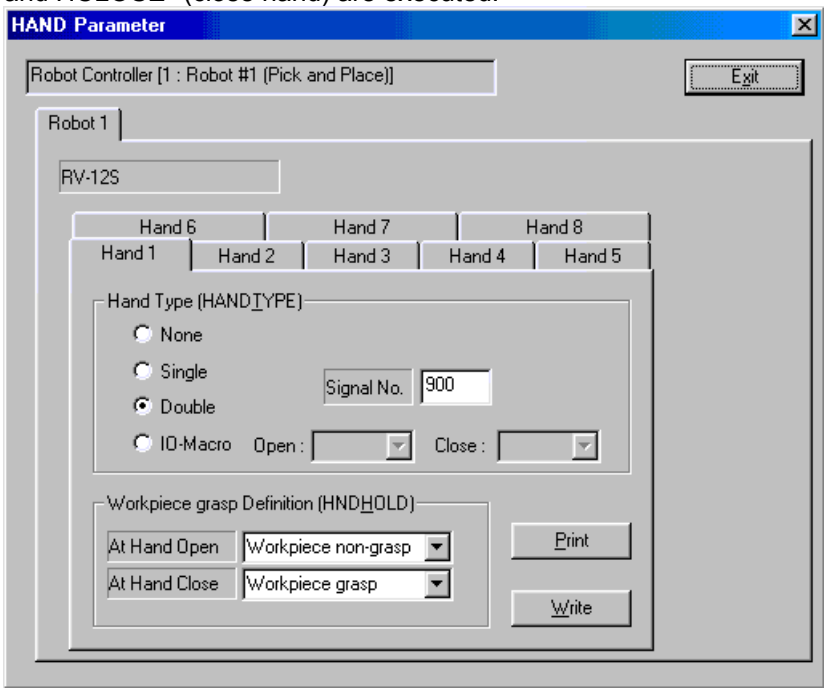


Fig. 7-14 Hand parameter

7.6.4. Workpiece and Hand Weight

Set the hand conditions and work conditions.

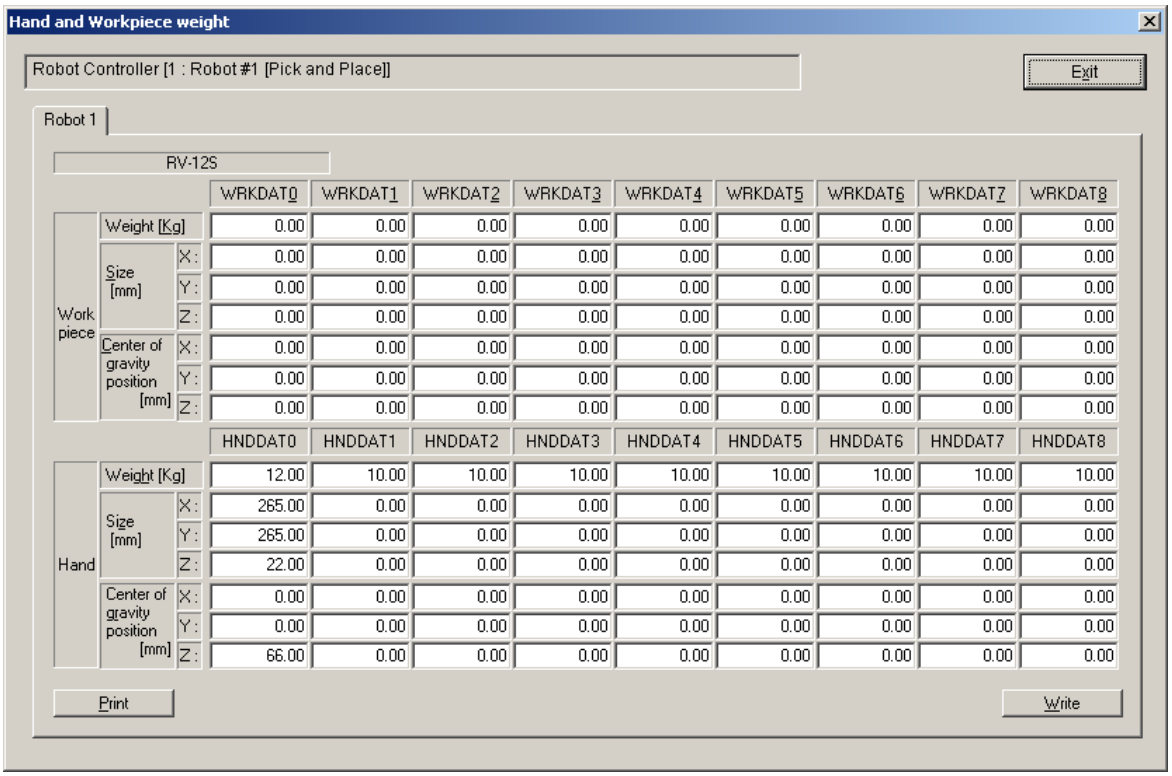


Fig. 7-15 Workpiece and Hand weight

WRKDAT0 and HNDDAT0 might not be able to set according to the kind of the connected robot. In that case, the row of WRKDAT0 and HNDDAT0 cannot be input.

7.6.5. Tool

Set the standard tool coordinates and standard base coordinates

This screen is different according to the software version of the controller who connects it.

(1) Robot controller Ver. H7 or earlier

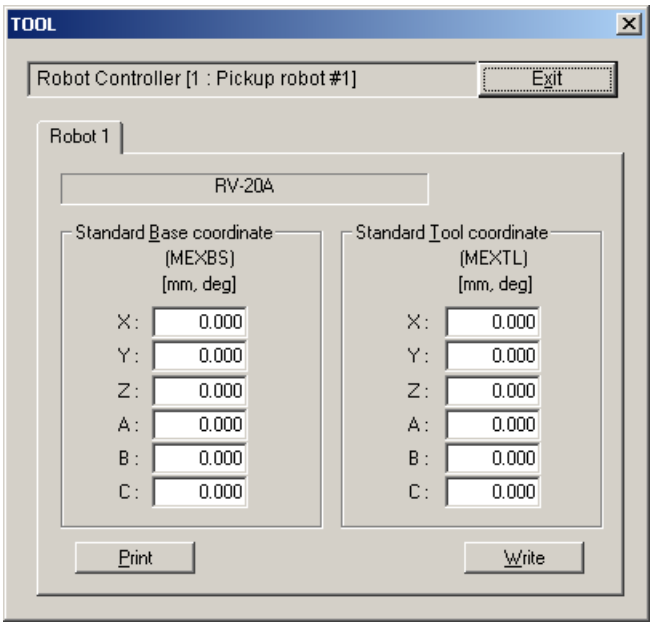


Fig. 7-16 Tool (Robot controller Ver. H7 or earlier)

(2) Robot controller Ver. J1 or later, and Robot which cannot use “Position repair tool”

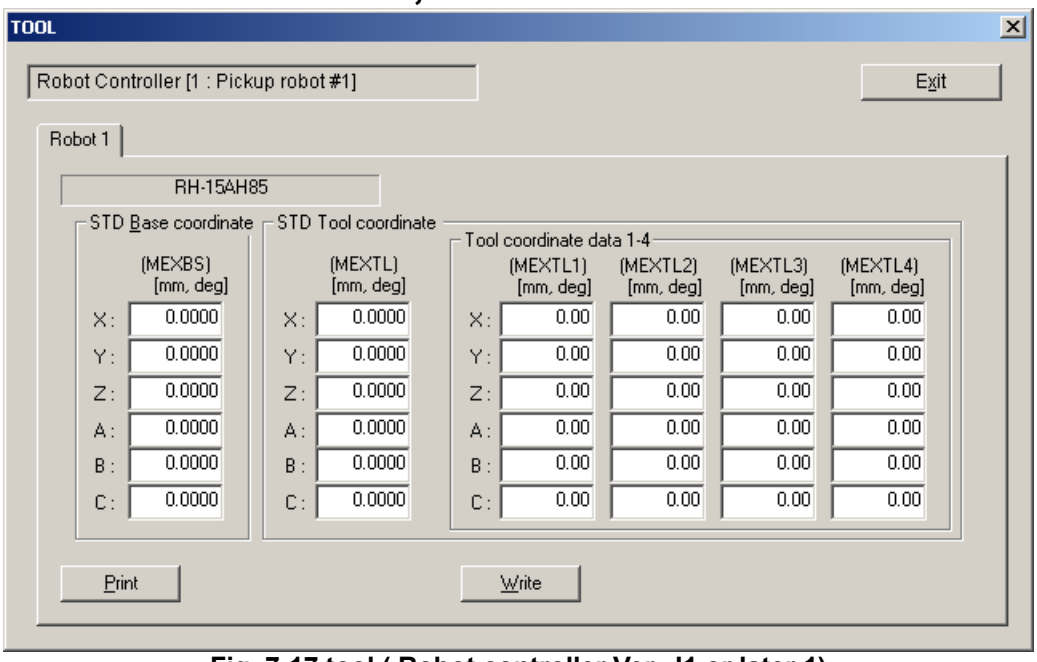


Fig. 7-17 tool (Robot controller Ver. J1 or later 1)

(3) Robot controller Ver. J1 or later, and Robot which can use “Position repair tool”

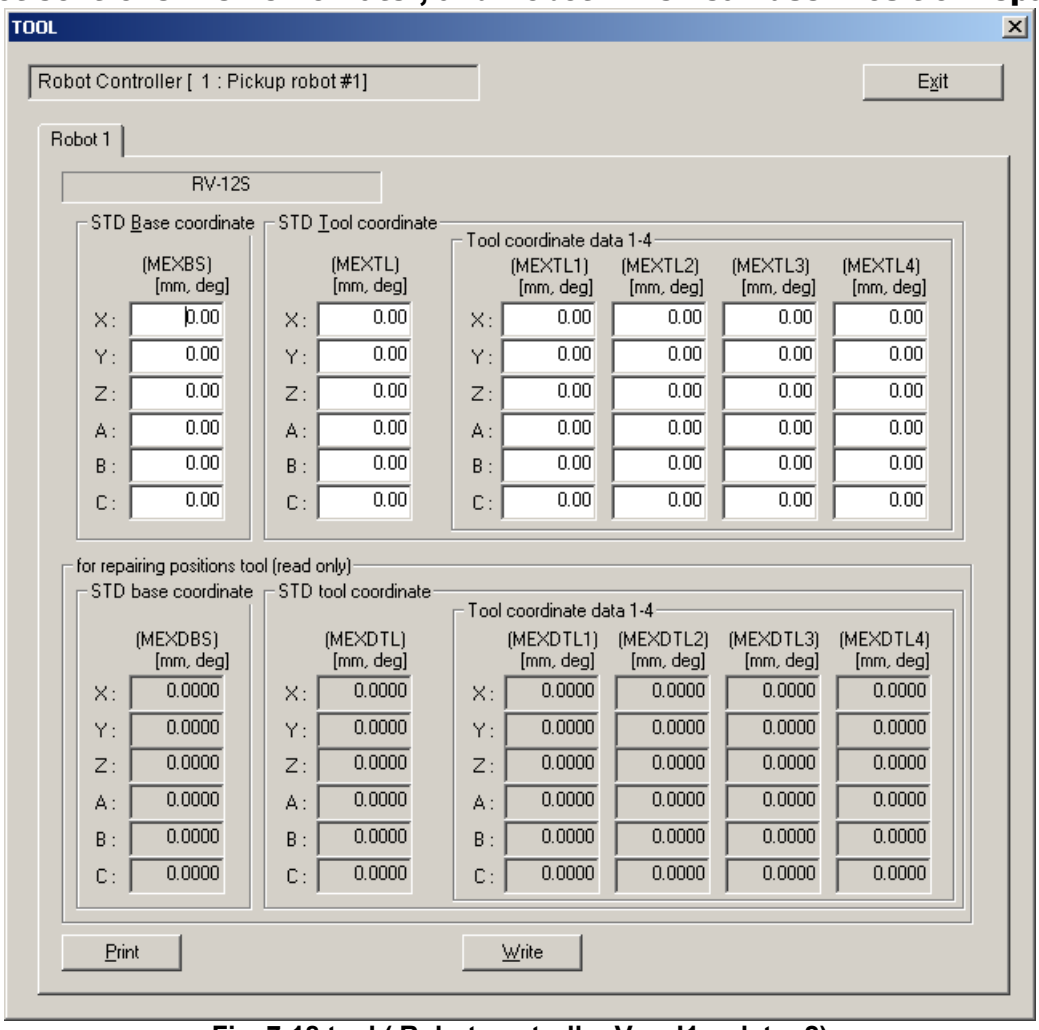


Fig. 7-18 tool (Robot controller Ver. J1 or later 2)

Please refer to **“12. Position repair”** for the robot which can use **"Position repair tool".**

7.6.6. Slot Table

Set the operating conditions of each task slot during multi-task operation.

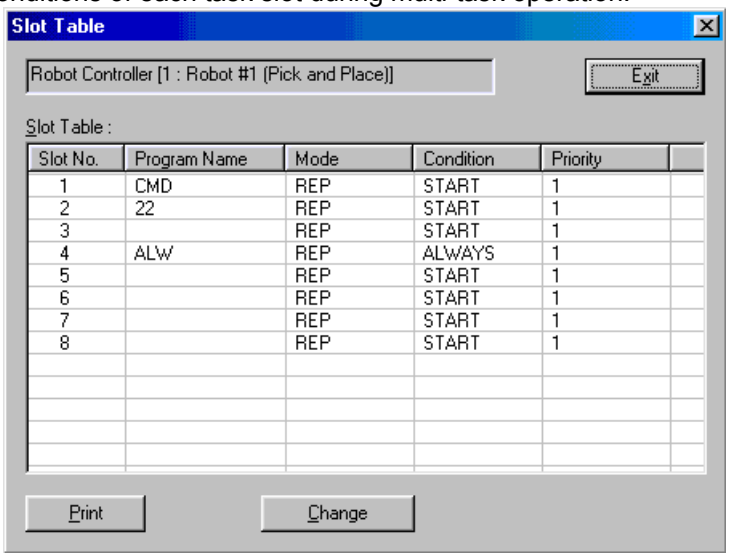


Fig. 7-19 Slot Table

Select the task slot number you are changing and click the [Modify] button. When the modification window appears, set the program name, operating conditions, startup conditions and task priority, and then click [Write].

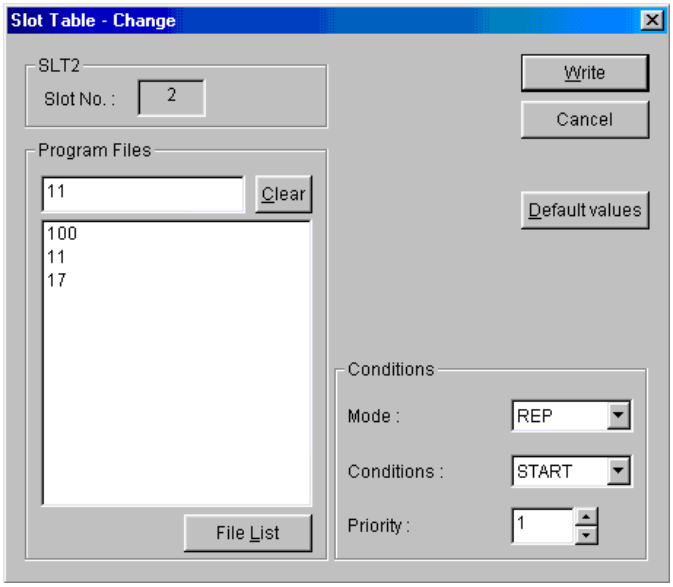


Fig. 7-20 Slot Table – Change

When the [Revert to Initial Values] button is clicked, the following confirmation screen appears

Fig. 7-21 Initialization confirmation

7.6.7. OUTPUT Signals Reset pattern

Set the operation when resetting the general-purpose output signals such as the CLR instruction and dedicated input (OUTRESET).

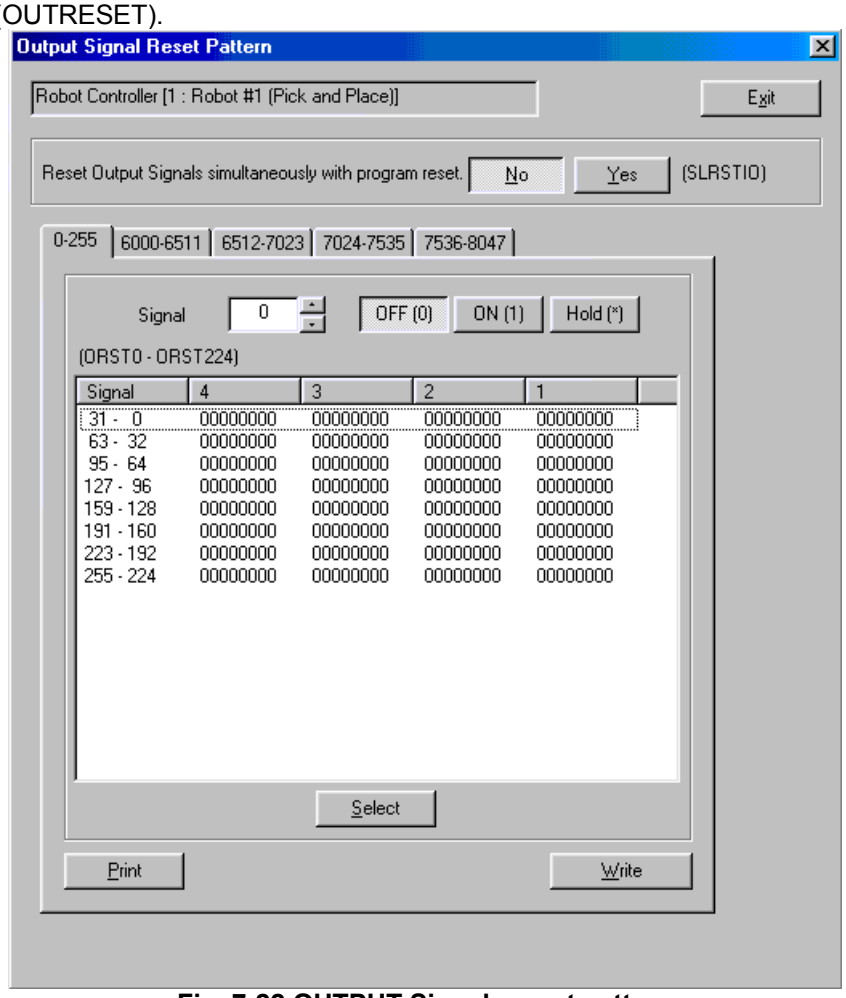


Fig. 7-22 OUTPUT Signals reset pattern

Set a signal number, and then select one of [OFF]/[ON]/[Hold]. The value of the signal having the specified number displayed in the list changes.

Also, selecting a signal group (for example, "32-0") and then clicking the [Select] button changes 32 signals at once.

After confirming the signal number and settings of each signal, click the [Write] button

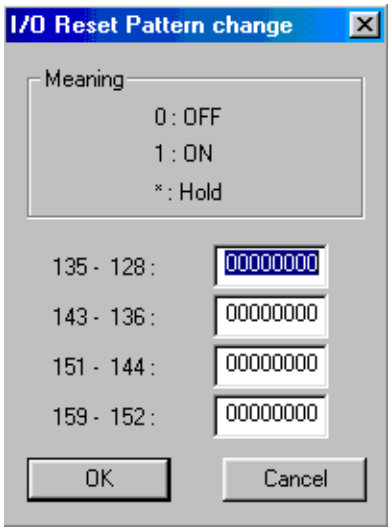


Fig. 7-23 Change

7.6.8. Special-purpose I/O Signals assignment

Assign signal numbers to functions in order to perform the remote operations to execute and stop robot programs, and display/operate the execution progress information and servo power supply status, etc.

(1) General

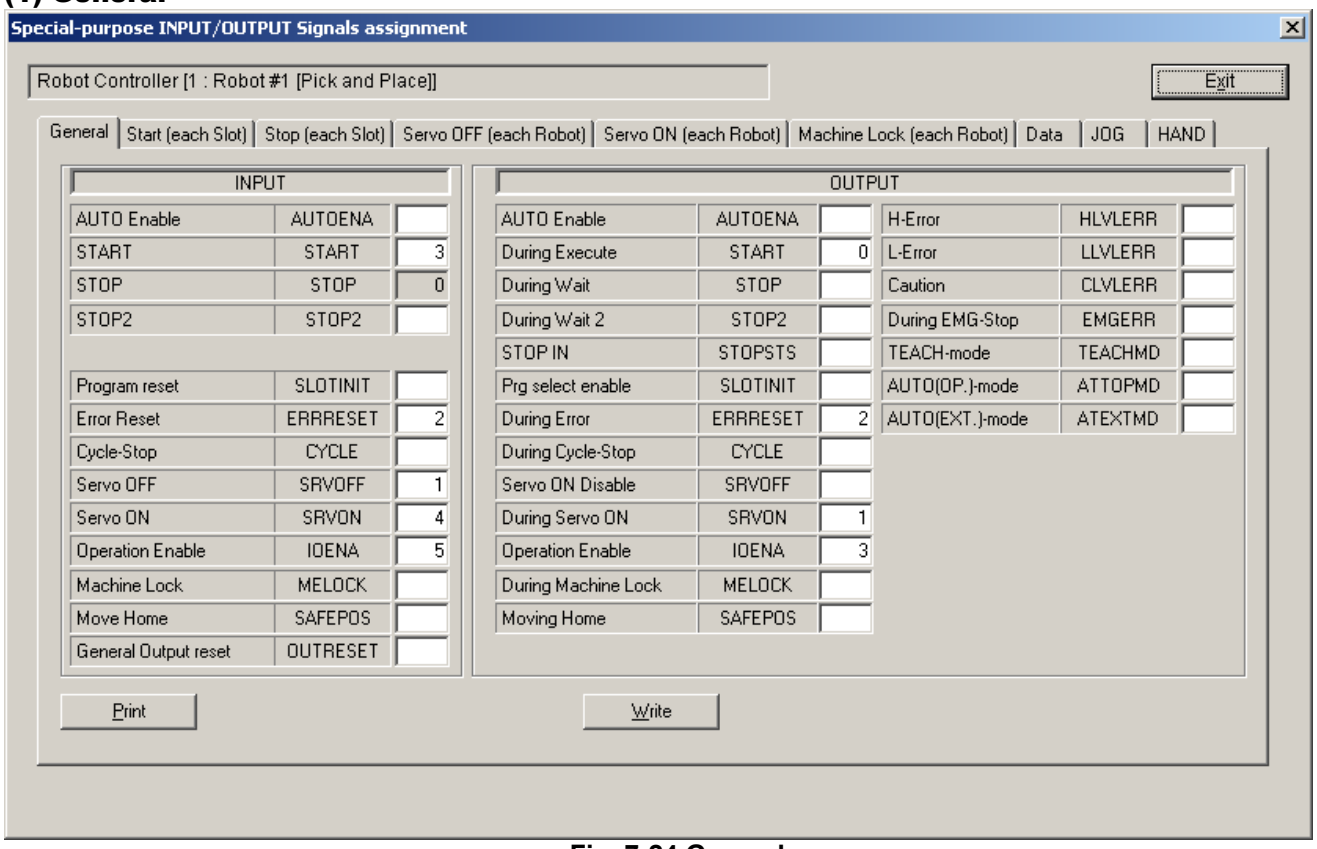


Fig. 7-24 General

(2) Start(each Slot)

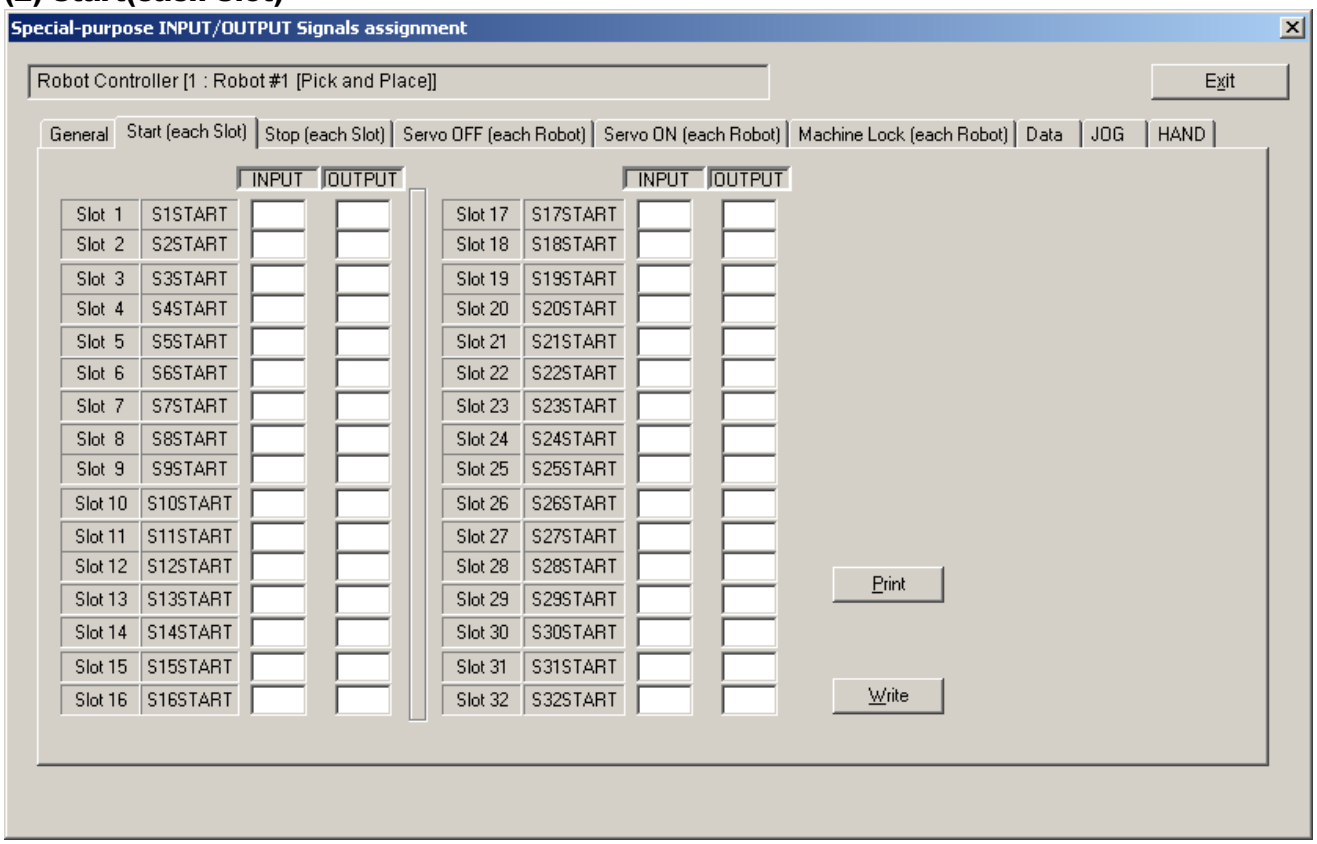


Fig. 7-25 Start(each Slot)

(3) Stop(each Slot)

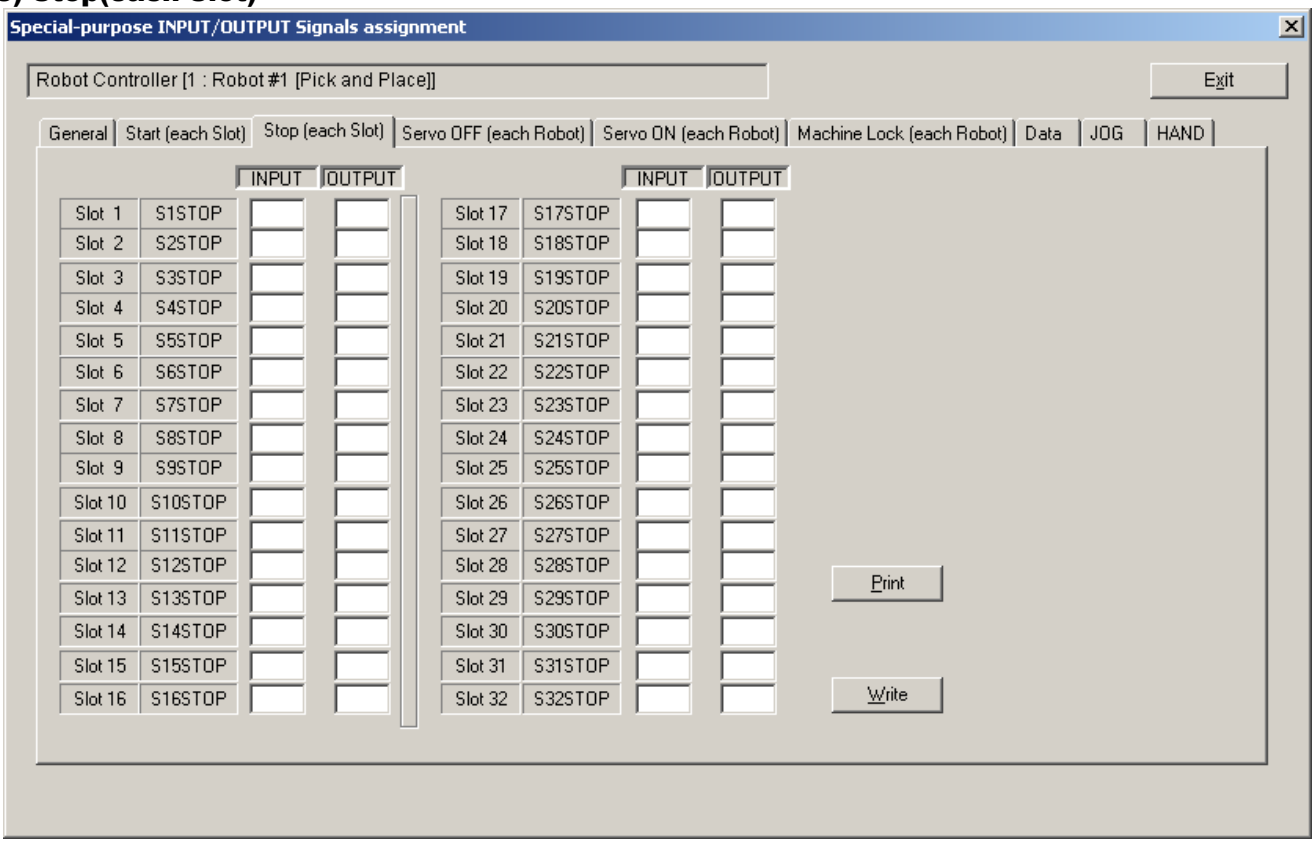


Fig. 7-26 Stop (each Slot)

(4) Servo OFF(each Robot)

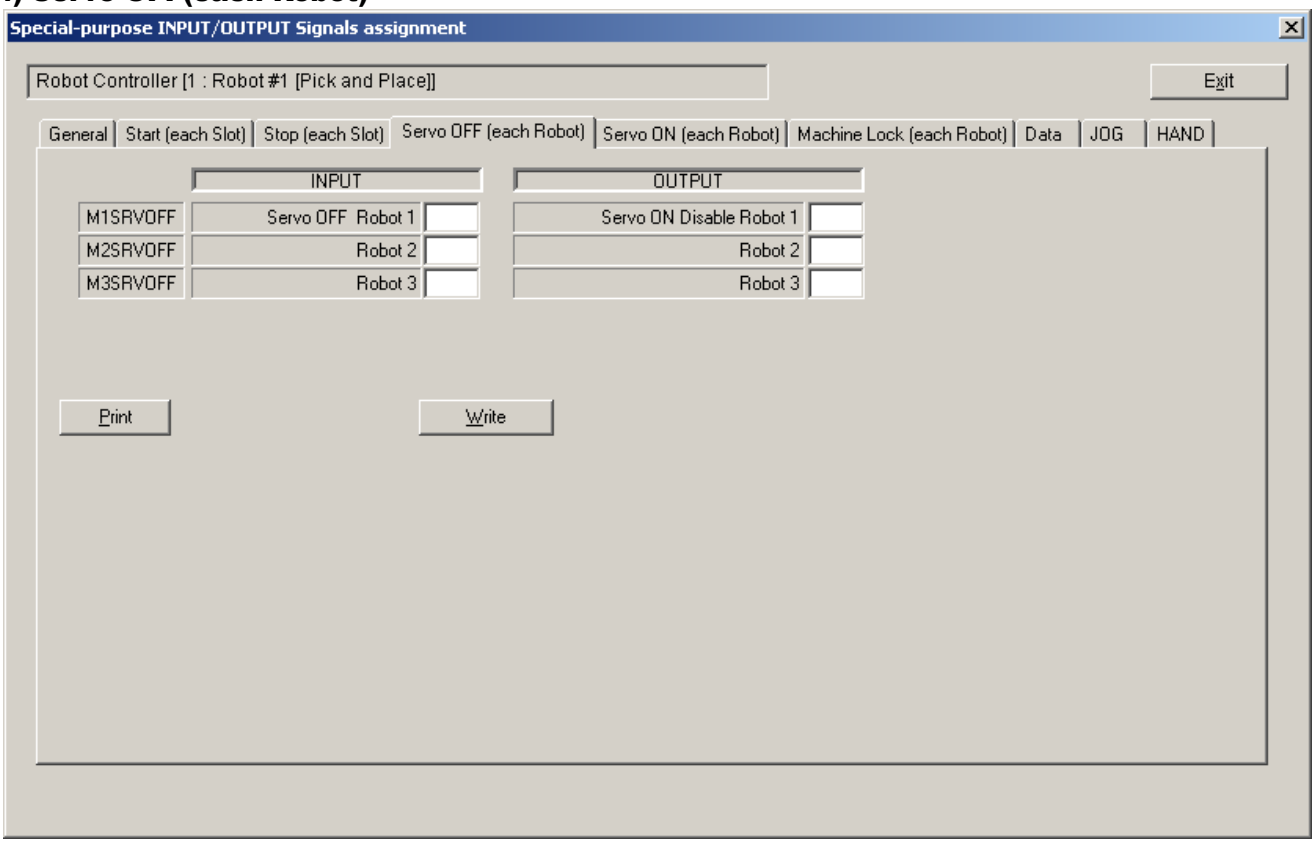


Fig. 7-27 Servo OFF (each Robot)

(5) Servo ON (each Robot)

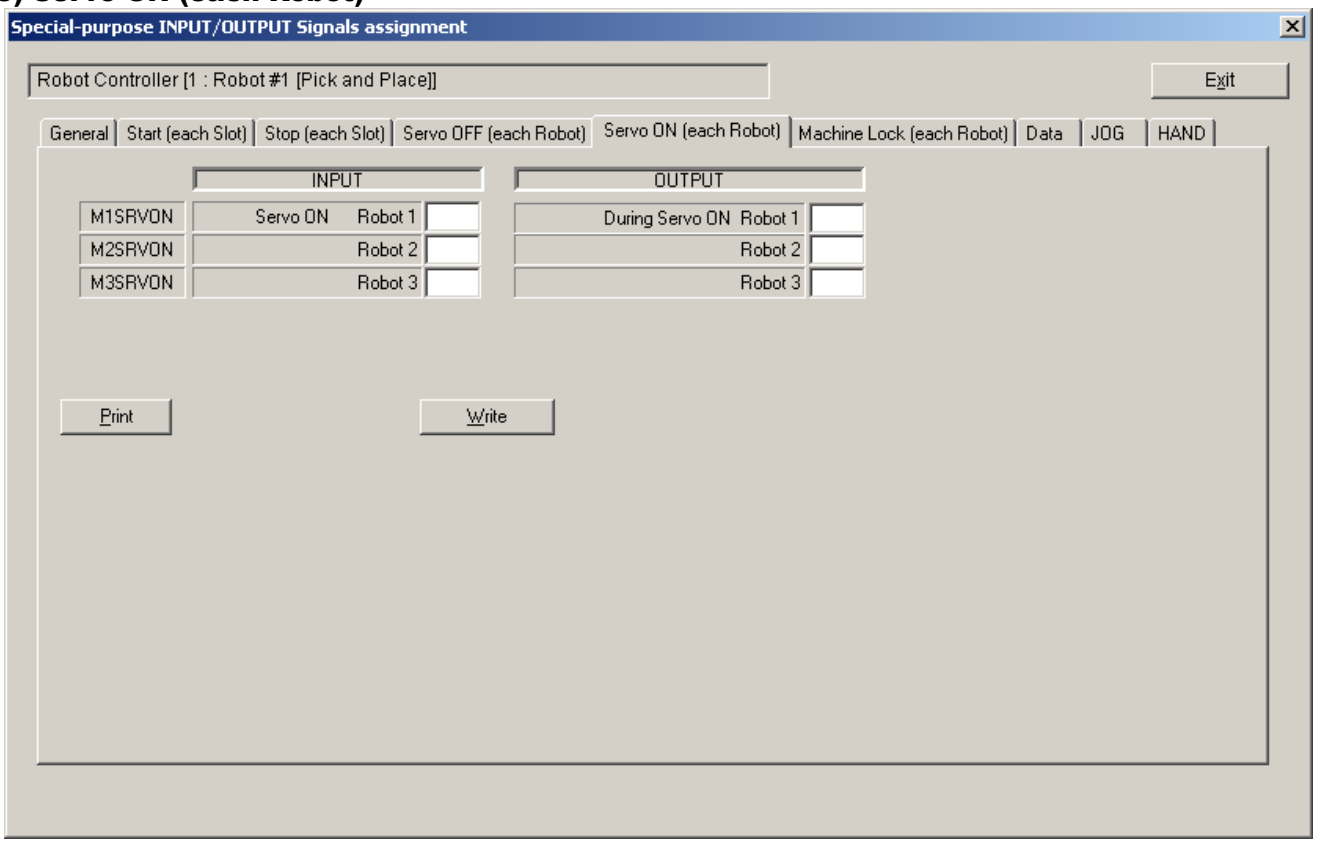


Fig. 7-28 Servo ON (each Robot)

(6) Machine Lock (each Robot)

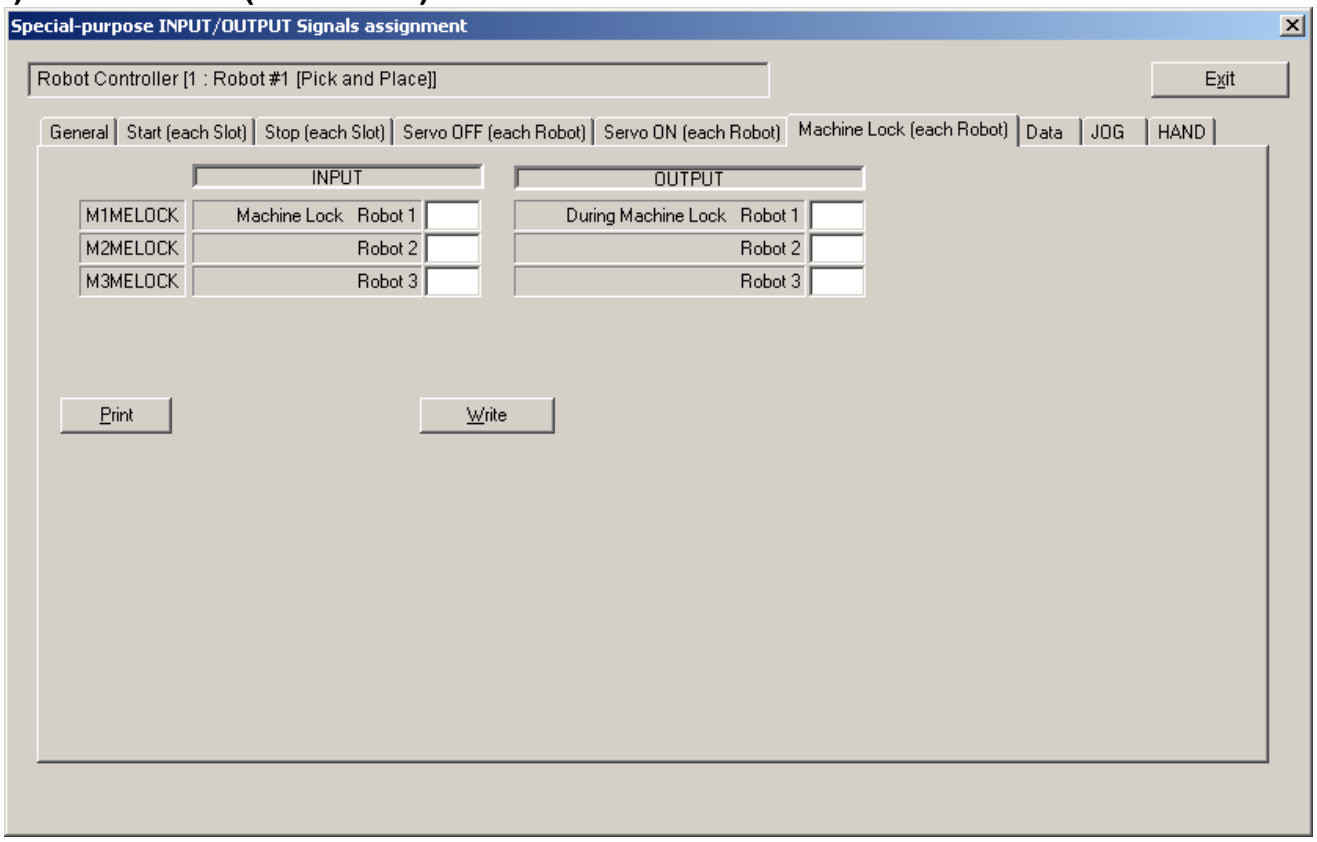


Fig. 7-29 Machine Lock (each Robot)

(7) Data

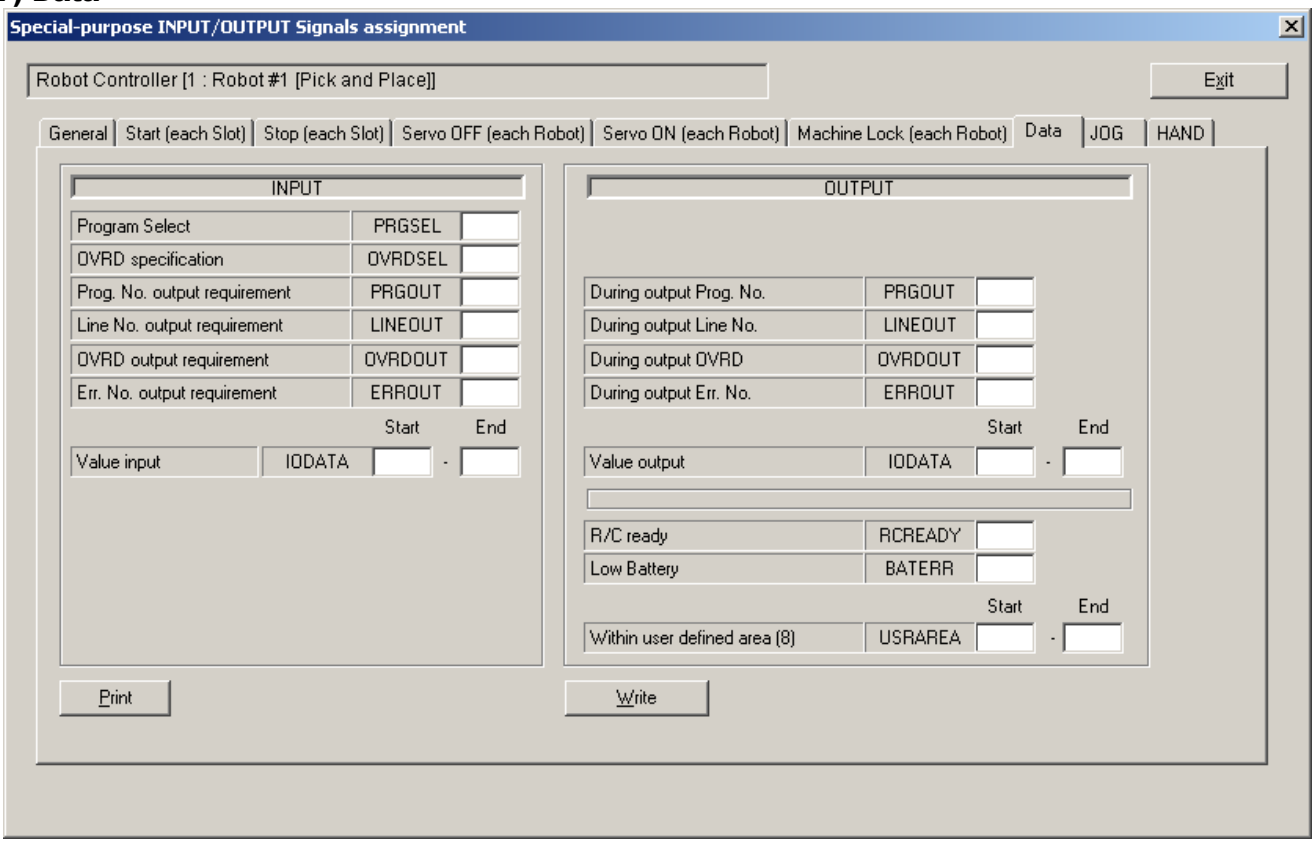


Fig. 7-30 Data

(8) JOG

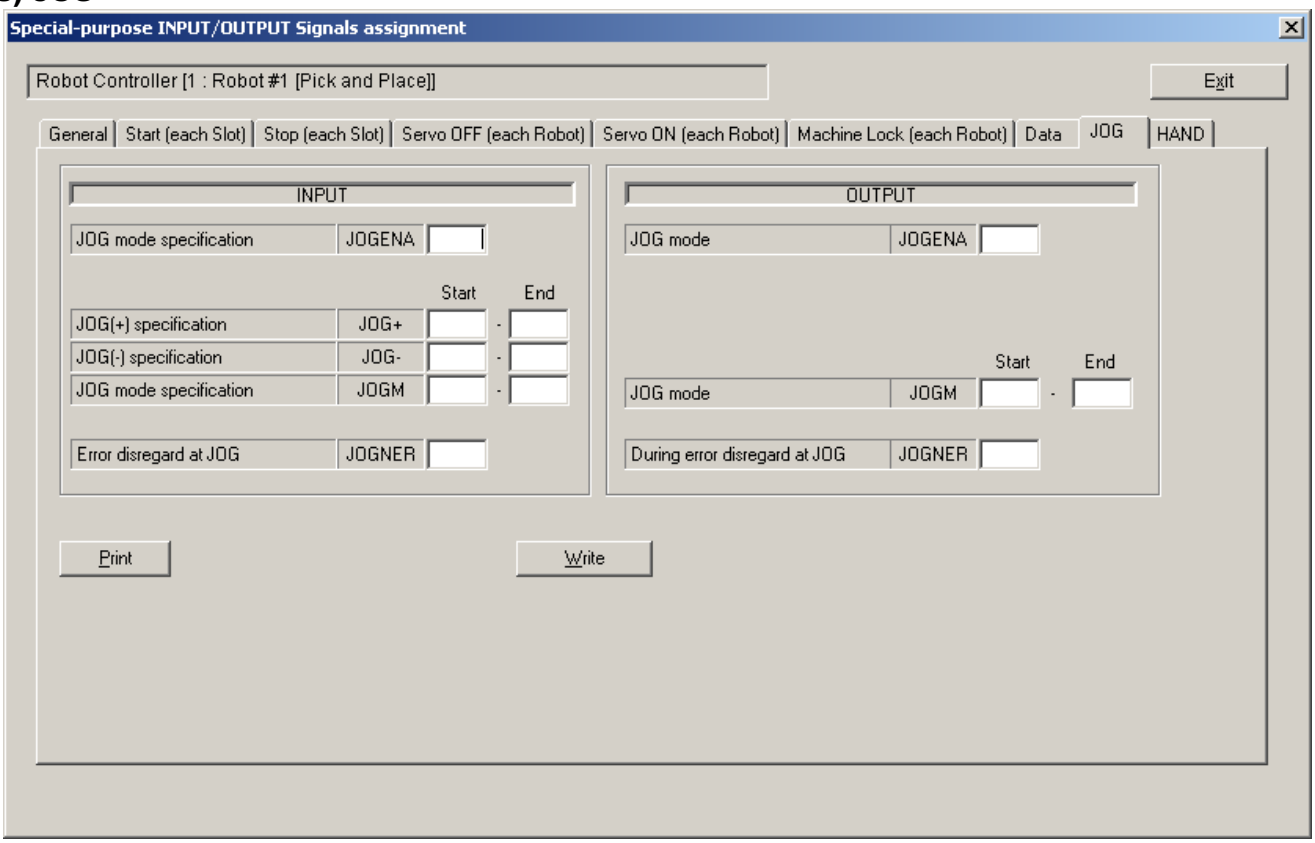


Fig. 7-31 JOG

JOGNER(JOG command INPUT signal, During JOG OUTPUT signal) can be used with Version **J2** or later of the robot controller software.

(9) HAND

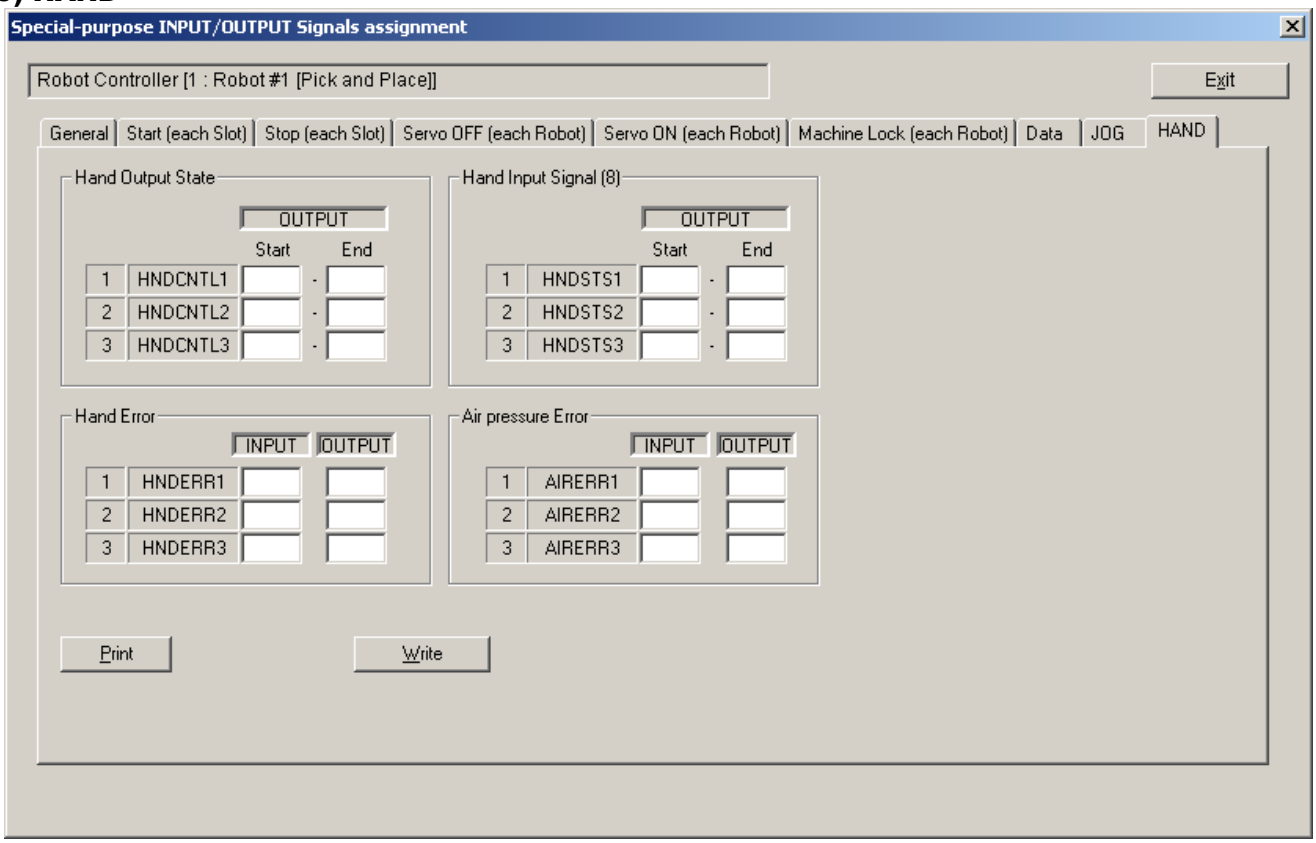
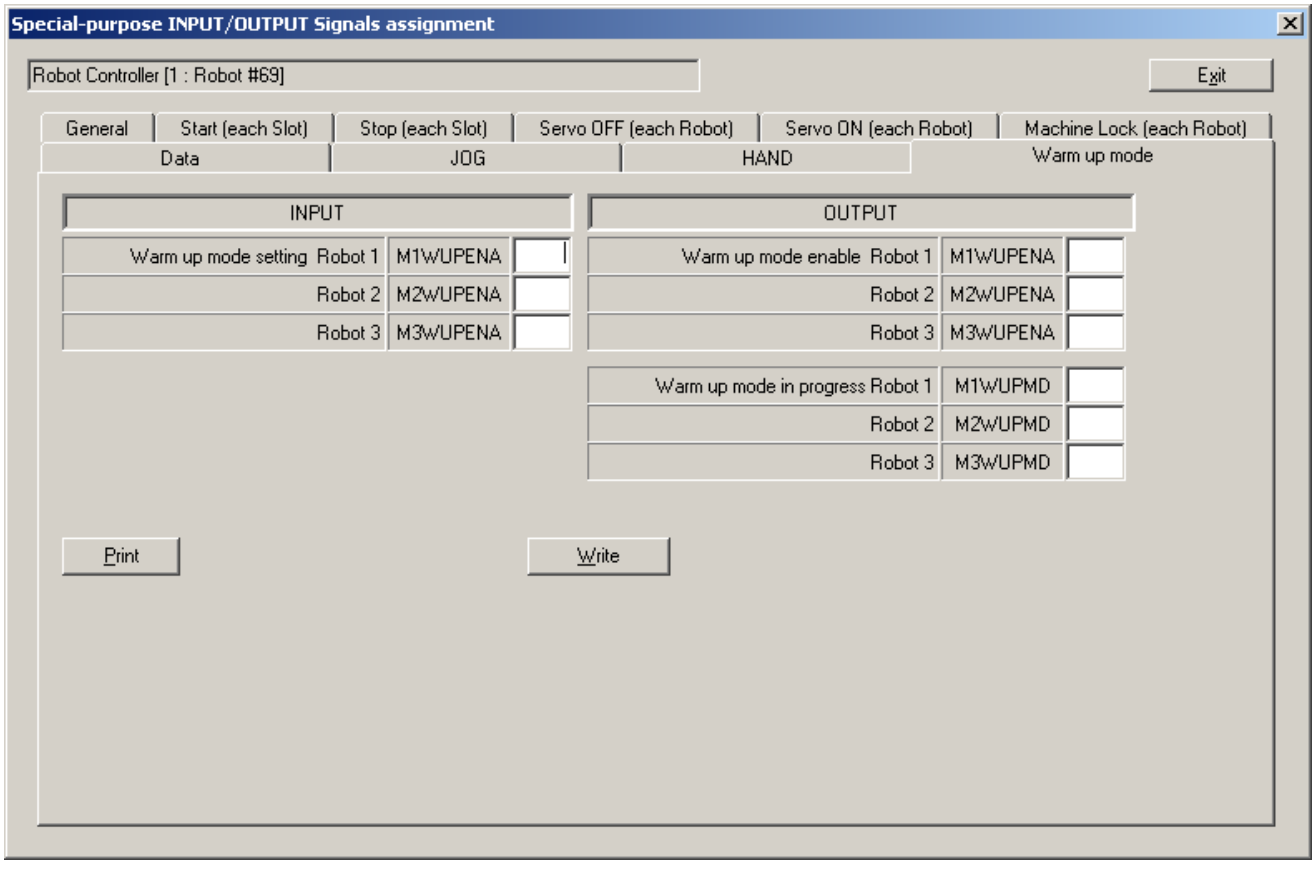


Fig. 7-32 HAND

(10) Warm up mode

This function can be used with Version **F1** or later of this software.
However, note Version **J8** or later of the robot controller software.



7.6.9. Communication Parameter

Set up the communication environment of the RS-232C interface located at the front of the robot controller.

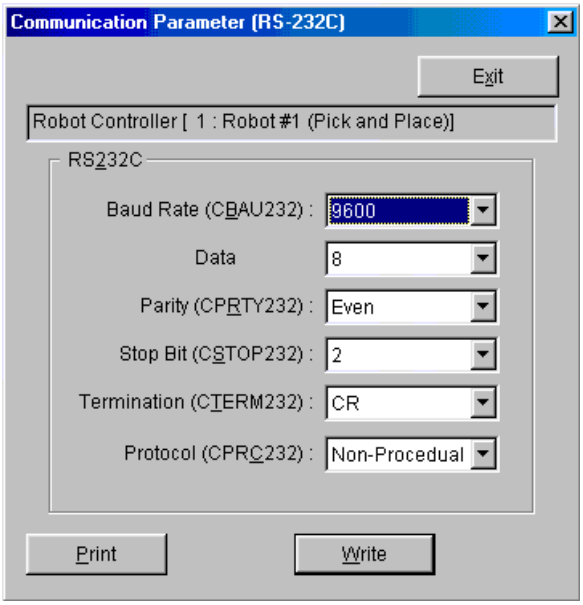


Fig. 7-33 Communiaction Parameter (RS-232C)

7.6.10. Zone

Specify the area (rectangular) defined by two orthogonal coordinate points.

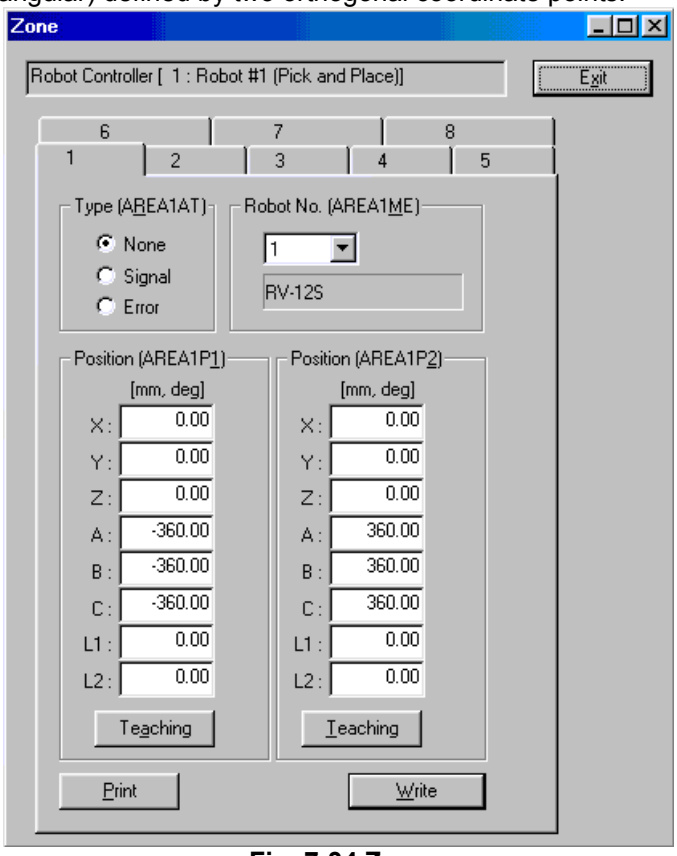


Fig. 7-34 Zone

7.6.11. Free Plane Limit

Set the overrun limit used on free planes.

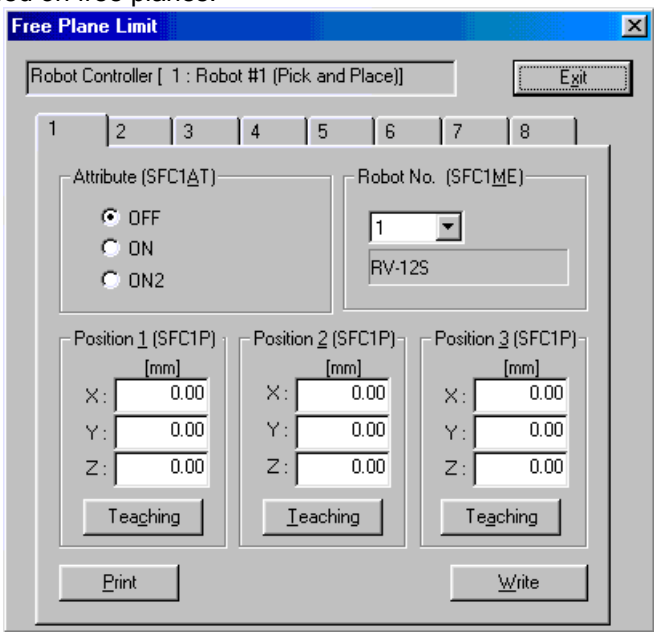


Fig. 7-35 Free Plane Limit

7.6.12. Home position

Set the position of the escape point.

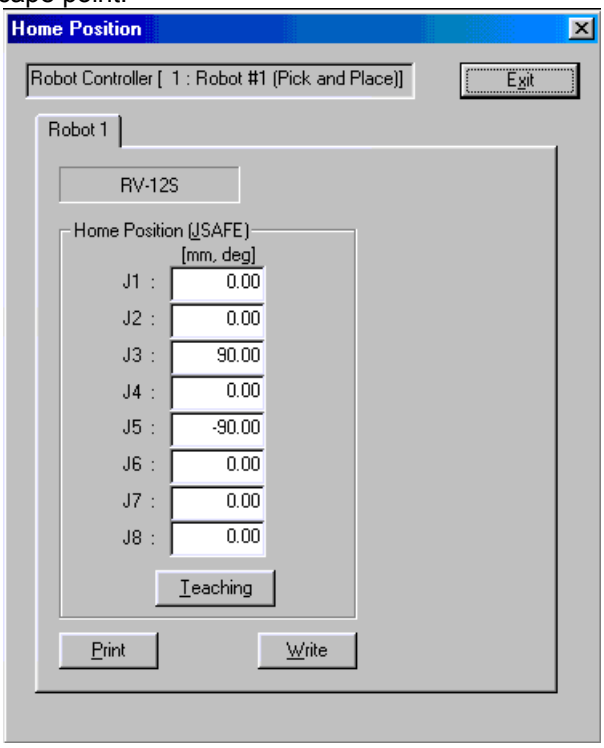


Fig. 7-36 Home position

7.6.13. Program Language

Set the position of the escape point.

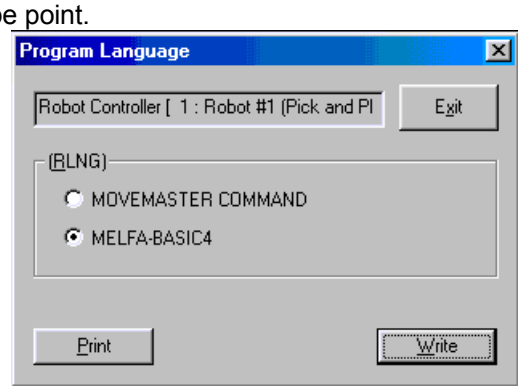


Fig. 7-37 Program Language

⚠ Caution

The language (MELFA-BASIC IV/MOVEMASTER command) to be used by the controller can be changed with the "Robot Language" parameter. Note that the robot models that can use the MOVEMASTER commands are limited. Refer to the Standard Specifications for the model in use to confirm whether the commands can be used.

7.7. Search

Strings can be searched from the parameter list being displayed. This function is supported from Version **E1** of this software.

Select [Search String] from the [Search] menu.

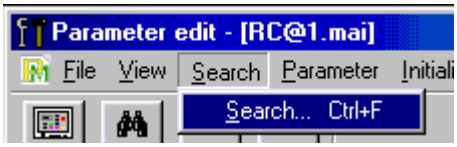


Fig. 7-38 Serach menu

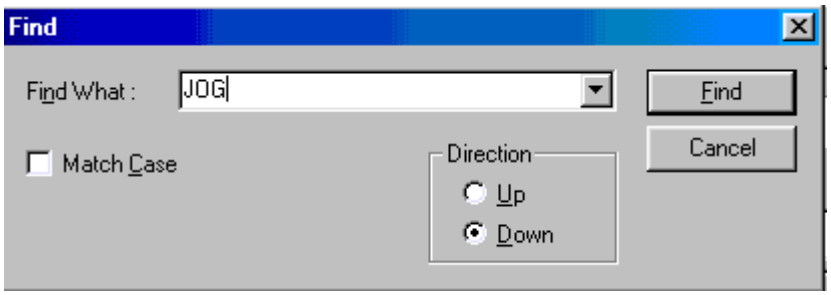


Fig. 7-39 Search window

Enter the string you want to search in the search string field, and click [Search Next]. The specified string is searched from the current cursor position in the parameter list to the direction specified in [Search Direction].

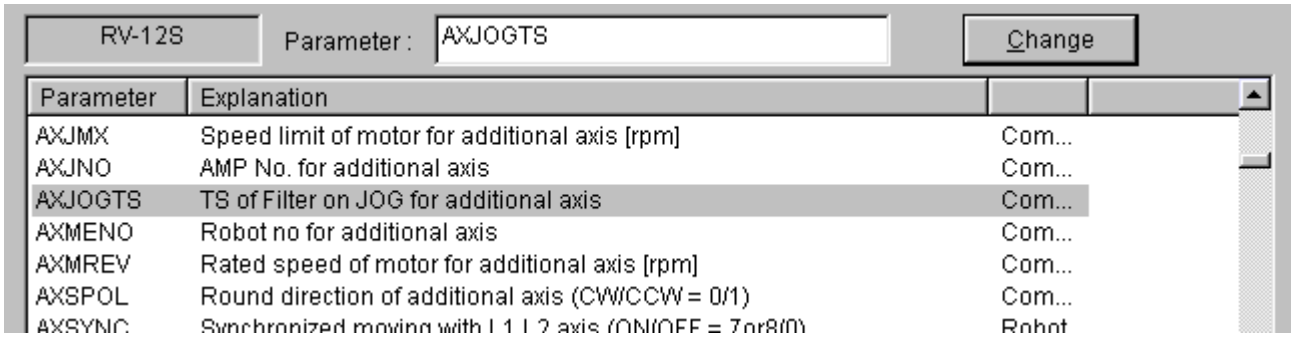


Fig. 7-40 Result

7.8. Initialization

7.8.1. Initializing the battery remaining time

The robot controller battery's remaining time can be initialized. This function is used when replacing the battery.

Select "Initialize" - "Battery remaining time" from the menu.

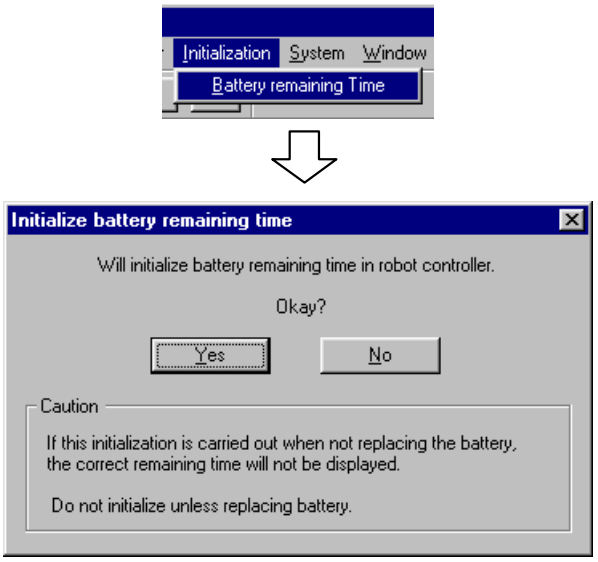


Fig. 7-41 Initializing the battery remaining time

⚠ Caution

If the battery remaining time is initialized when not replacing the battery, the correct remaining time will not be displayed.

7.9. System information

The system information can be used to save the robot origin data into a file and to transfer the information in the file to the robot controller.

Two types of origin data handling are described in this section, however, the file save format is different in each type. To write the saved information to the robot controller, use the same file save format.

7.9.1. Robot origin data

Caution

Controller modes available during the origin data read/write

The controller modes (TEACH/AUTO (Op.)/AUTO (Ext.)) available for the origin data read/write are different depending on the controller and the version of this software. See the table on the following page for further details.

Select "System" - "Robot origin data" from the menu.

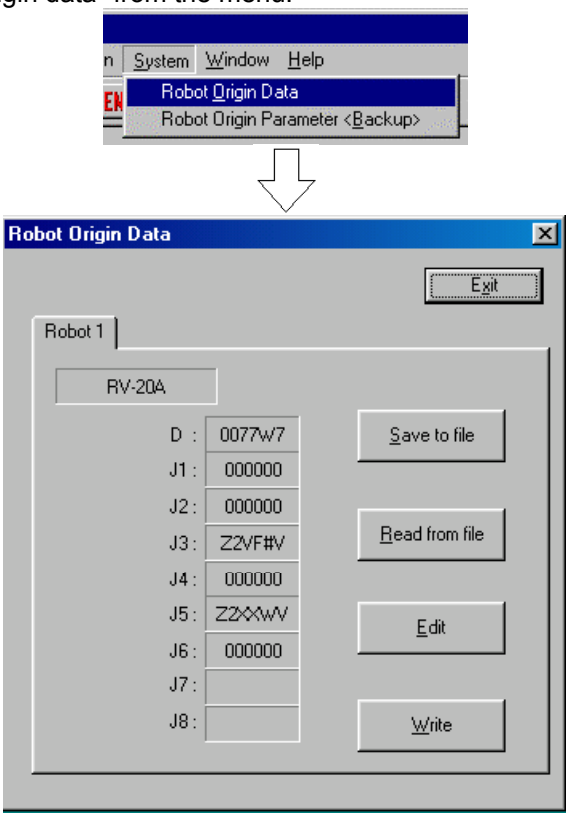


Fig. 7-42 Robot Origin Data

[Save to file] : Can save the displayed origin data in a file.
[Read from file] : Reads the origin data saved in a file, and displays it on the screen.
[Edit] : Can edit the origin data that is being displayed on the screen.
[Write] : Writes the origin data that is being displayed on the screen into the robot controller.

Memo

DJNT (origin position error) parameters

DJNT represents the origin position error. If the origin position is corrected using the Position Repair Support Tool, a value will be given to this DJNT. (If the Position Repair Support Tool is not used to correct the origin position, all elements will be set to 0. Note, however, that RV-4A will be given a default value.)
Since DJNT is not available to the general user, values cannot be changed directly by the users.

DJNT parameter display

The DJNT parameters are displayed with version E1 or later of this software.
Note, however, that they may not be displayed depending on the connected robot (such as the robots that are not compatible with the position repair support function).

** Operating Modes of the Robot Controller When Writing Robot Origin Data*

When writing the origin data of the robot using this software, the restrictions on the operating modes of the robot controller as listed in the tables below apply, depending on the version of this software and the version of the robot controller software. Refer to the table below.

(1) When reading

		Robot controller		
		Ver. J1 or later	Ver. G9 to Ver. H7	Ver. G8 or earlier
This software	Ver. E1 or later	Can read in all modes: **Auto(OP)** mode **Auto(Ext)** mode **Teach** mode	Can read only in **Auto(Ext)** mode (Cannot read in any other modes)	
	Ver. C2 to Ver. D2			
	Ver. C1 or earlier			

(2) When writing

		Robot controller		
		Ver. J1 or later	Ver. G9 to Ver. H7	Ver. G8 or earlier
This software	Ver. E1 or later	**Auto(OP)** mode **Auto(Ext)** mode Teach mode	**Auto(Ext)** mode **Teach** mode	**Teach** mode
	Ver. C2 to Ver. D2	**Auto(Ext)** mode **Teach** mode		
	Ver. C1 or earlier	Origin data cannot be written by this software.		

7.9.2. Robot Origin Parameter <Backup>

[Robot Origin Parameter <Backup>] can be used to back up the parameters that comprise the robot origin data. If the robot origin data has additional axes, use this function to back up the origin data.

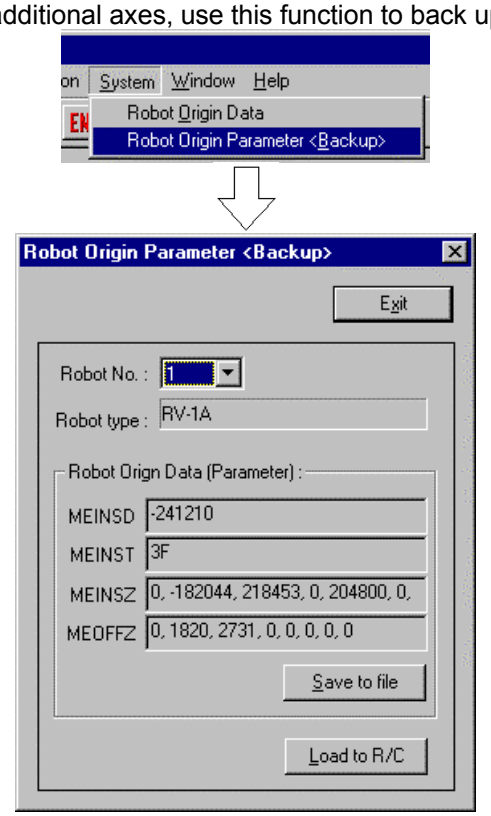


Fig. 7-43 Robot Origin Parameter

[Save to file] : Can save the contents of the parameters for the origin (displayed parameters) loaded from the robot controller in a file.

[Load to R/C] : Can transfer the parameters for the origin saved in a file to the robot controller. To transfer the parameters for the origin to the robot controller, set the mode to the [TEACH] mode.

7.10. Power Reset of the Robot Controller (Version E1 or later)

To make modified parameters effective, it is necessary to power on the robot controller again. The power reset of the robot controller can be performed from the personal computer in Version **E1** or later of this software.

However, note that this function can be used with Version **J1** or later of the robot controller software.

(1) When Setting Parameters

After setting parameters, the power reset confirmation screen appears. To immediately reset the power, select [Yes]. To set more parameters, set all the necessary parameters first, and then select [Yes].

Fig. 7-44 Confirmation1

(2) Power Reset Operation from the Menu

Select [R/C Power Reset] from the [File] menu to reset the power to the robot controller.

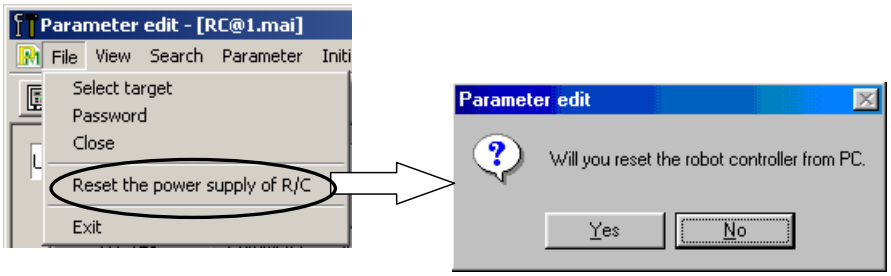


Fig. 7-45 Power reset operation from the menu

7.11. Password

"Password" is used by the Mitsubishi service personnel to change the robot's system information. Unconditionally select "No password" here.

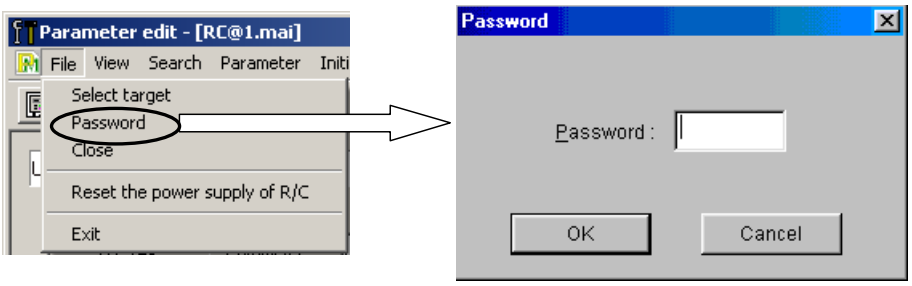


Fig. 7-46 Password

7.12. Print of Parameter

The parameter values in the robot controller can be printed.
With the print function, the parameter values can be output to the printer or saved in a file.
This function is supported in **C1** or later version of this software.

7.12.1. Print out

The **[Print]** button is displayed on the HAND Parameter screen or the Parameters screen that is displayed via the parameter setting menu.

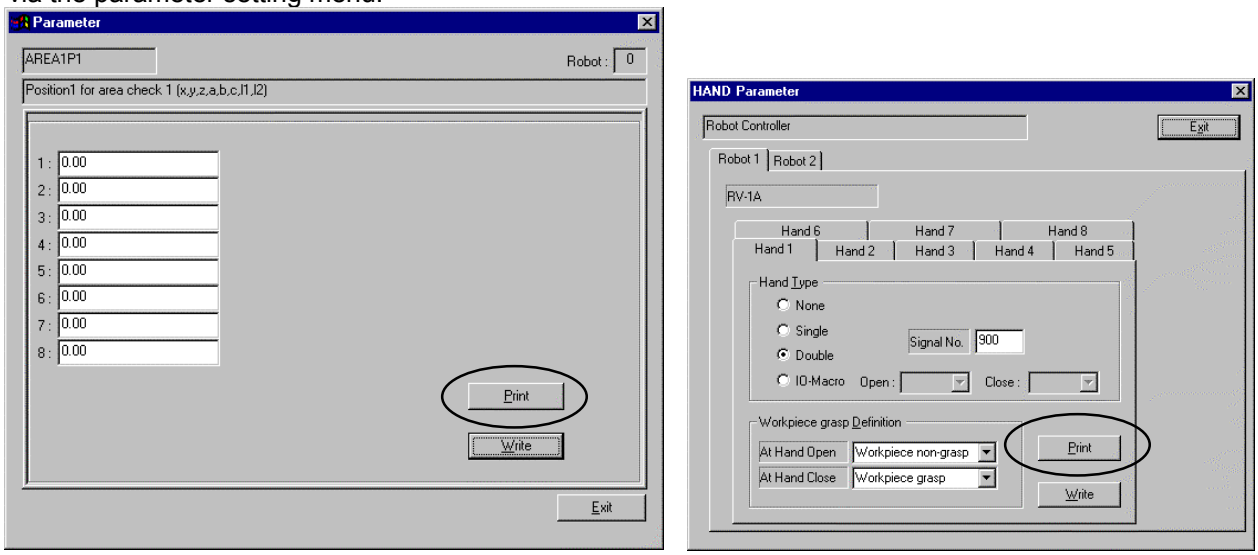


Fig. 7-47 Print button

If the **[Print]** button is clicked, the Print screen is displayed.

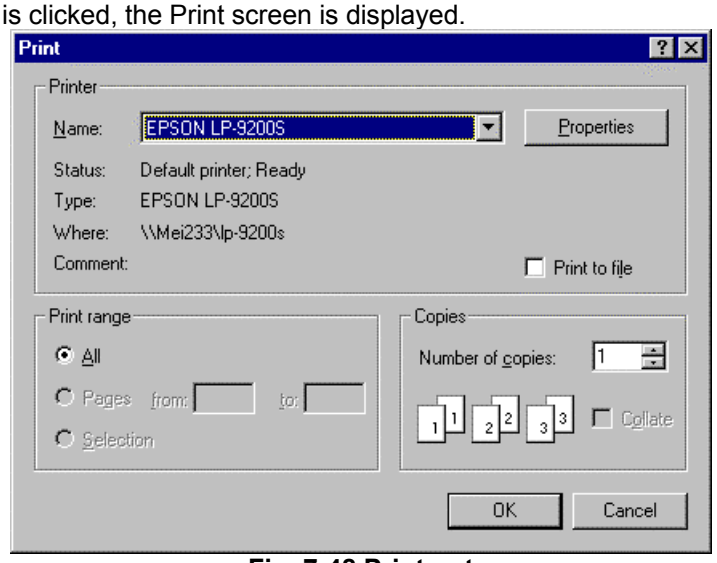


Fig. 7-48 Print out

Confirm the printer to print, and then click the [OK] button. The parameter information that is currently being displayed is output to the designated printer.

7.12.2. Print to file

If a printer is not connected to the PC, the loaded information can be output to a file. Check [Print to file] on the Print screen above, and then click the [OK] button. At this time, the file is saved in the text format so that it can be read by a general text editor (MemoPad, WordPad, etc.)

7.13. Exit the Parameter editing tool

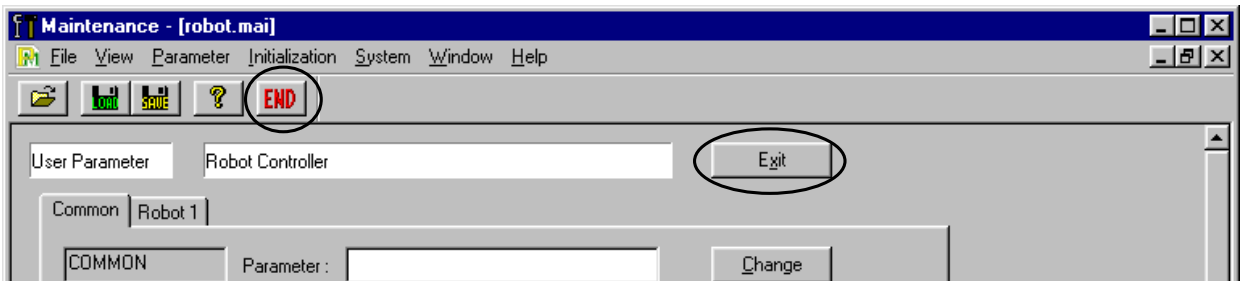


Fig. 7-49 Exiting the Paramter editing tool

Click on the [Exit] button on the screen or click on the "End" button on the tool bar.

8. Backup/Restore

The information on the robot controller can be backed up to the personal computer, or the backup information saved on the personal computer can be restored to the robot controller.

Backup (Robot → Personal computer)	Saves the backup data on the robot controller to the personal computer.
Restore (Personal computer → Robot)	Transfers the backup data saved on the personal computer to the robot controller.

8.1. Starting

Select [Backup/Restore] from the menu. The following "Backup/Restore" window appears.

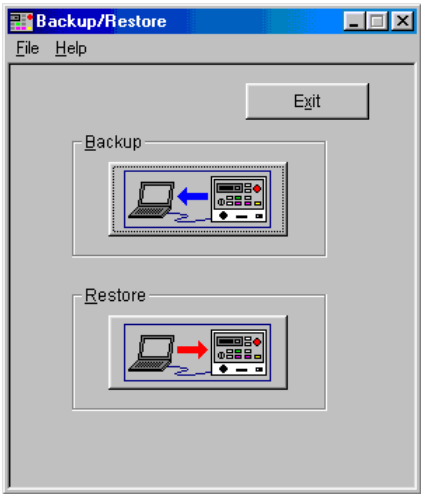


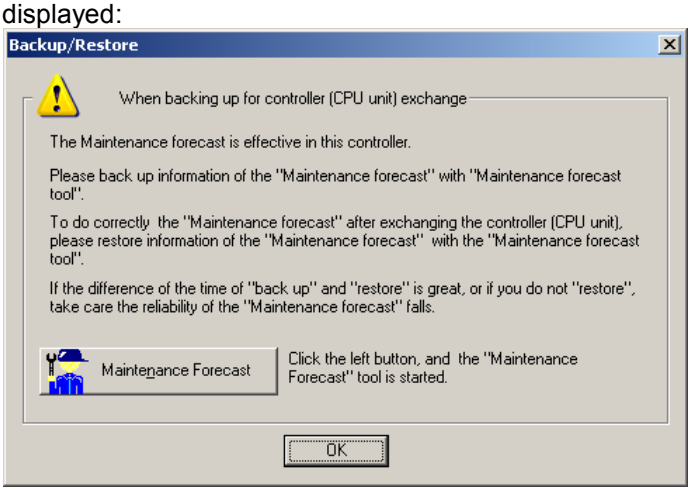
Fig. 8-1 Backup/Restore

⚠ Caution

Precautions when executing a backup/restore operation during the replacement of a controller (CPU) that supports Maintenance Forecast

When executing a backup/restore operation during the replacement of a controller (CPU) that supports Maintenance Forecast, also perform the backup/restore operation using the Maintenance Forecast tool.

After a backup operation is performed on a controller that supports Maintenance Forecast, the following message is displayed:



* Maintenance Forecast is supported in the controller's software version J1 or later, and version E1 or later of this software.

8.2. Backup (Robot -> PC)

Save the information on the robot controller to a file on the personal computer.
Click the [Backup] button. The following window appears. Select the robot controller you are backing up.

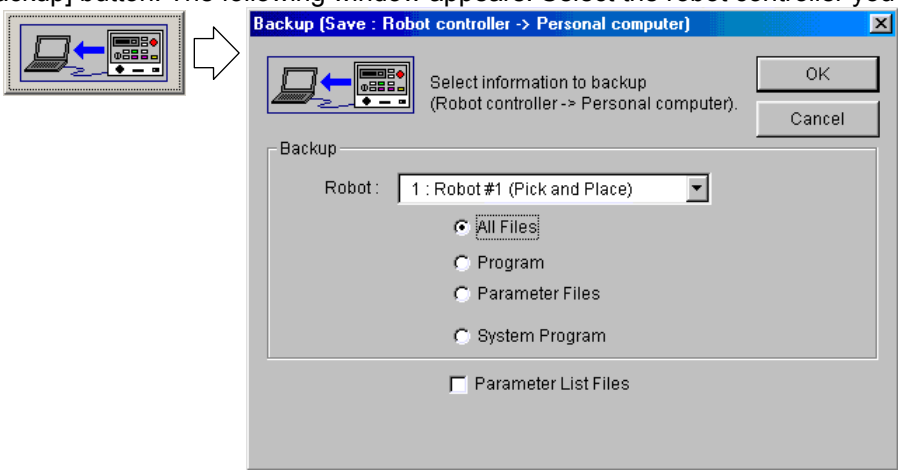
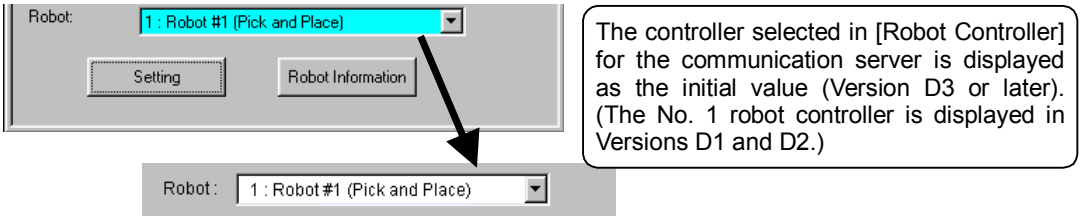


Fig. 8-2 Backup



The controller selected in [Robot Controller] for the communication server is displayed as the initial value (Version D3 or later). (The No. 1 robot controller is displayed in Versions D1 and D2.)

Fig. 8-3 The controller selected for the communication server

<< Backup >>

All Files : Saves all files (robot program, parameter files, etc.) in the robot controller into the designated folder.
Program : Saves the robot program file into the designated folder.
Parameter Files : Saves the parameter files into the designated folder.
System Program: Saves the system base program file into the designated folder.

Note that this Save (Robot → Personal computer) is intended to back up the robot controller, so the program cannot be edited using the program editing tool.

[Parameter List Files] This is used to edit the parameter information saved by backup in offline mode, and is not required for backup. If this is not checked, the time required to save all files will be shortened.

BKUP.SYS and MECHA.SYS files are automatically created in the designated folder. These files contain the saved mechanical information of the robot controller and describe the save format. If these files are deleted or overwritten, please note that offline data editing and data transfer to the robot controller cannot be performed.

Precaution for Backup

When backing up the values of the robot (system) status variables and the values of the program external variables, reset the power to the robot controller first, and then perform a backup operation.

8.3. Restore (PC -> Robot)

The backup data saved in the personal computer is transmitted to the robot controller.
Select the robot controller at the transfer destination.

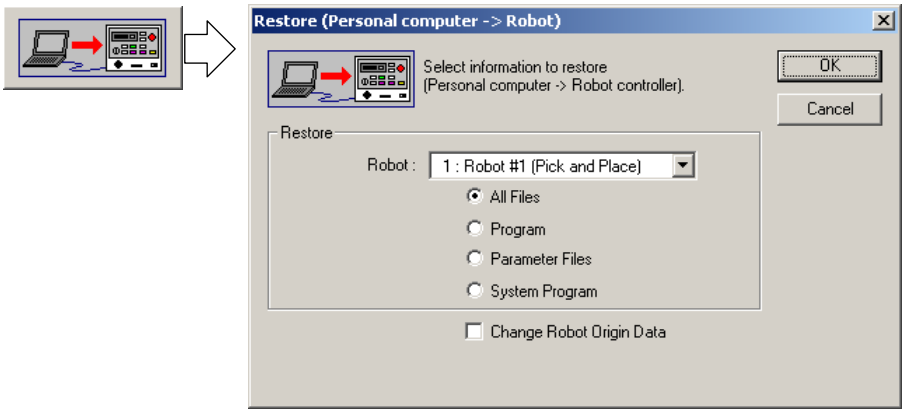


Fig. 8-4 Restore

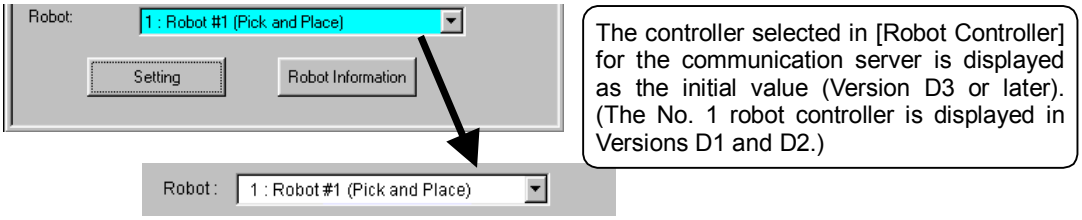


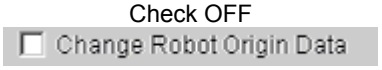
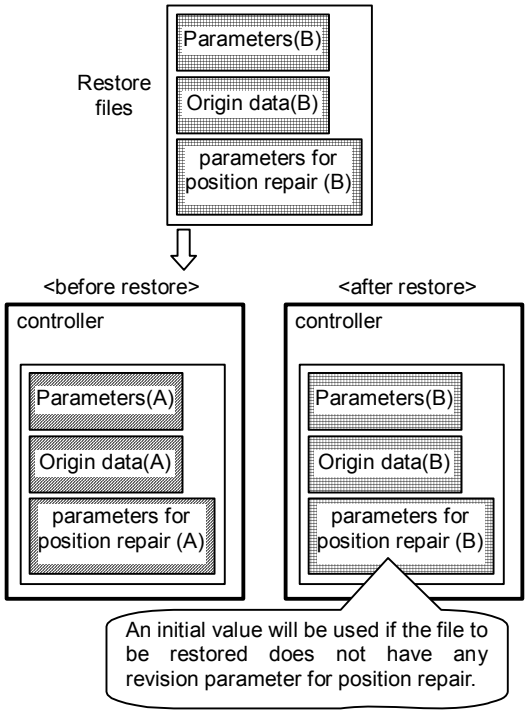
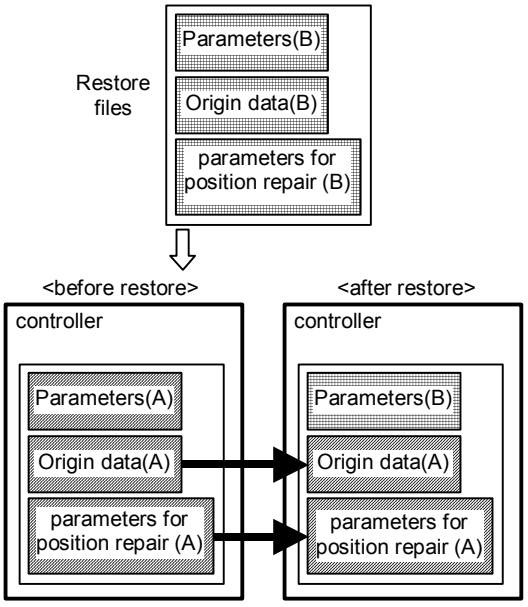
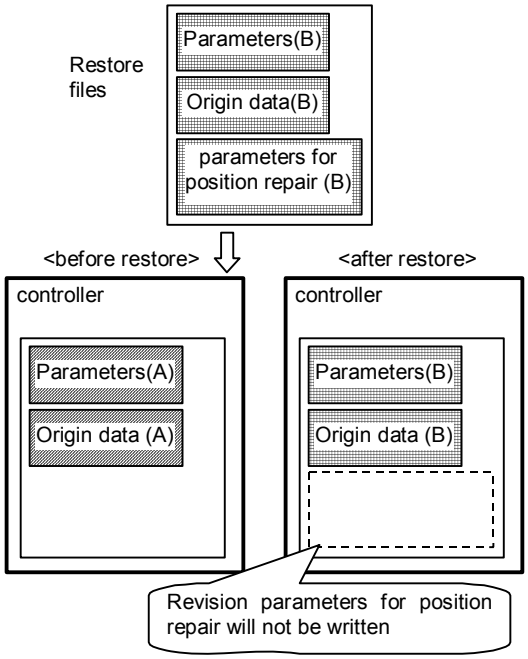
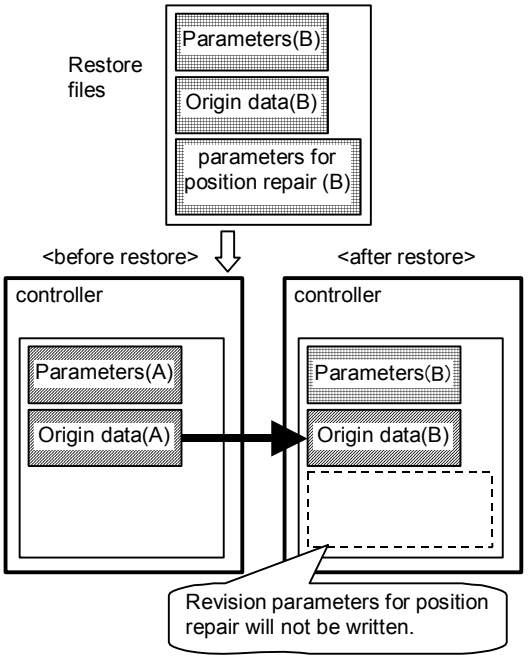
Fig. 8-5 The controller selected for the communication server

<< Restore >>

All Files : Transfers all files (except BKUP.SYS and MECHA.SYS) in the designated folder to the robot controller after all information in the robot controller is cleared (initialized).
Program : Transfers the robot program file in the designated folder to the robot controller.
Parameter Files : Transfers the parameter file in the designated folder to the robot controller.
System Program: Transfers the system base program file in the designated folder to the robot controller.

[Change Robot Origin Data] Valid only when [All Files] or [Parameter Files] is selected under [Backup].

If checked : Replaces the origin information in the robot controller with the contents of the mechanical parameter file to be transferred.
If not checked : Loads the origin information from the robot controller, transfers the information in the designated folder, and then returns the origin information that has been loaded to the robot controller.

<table>
<tr><th>Backup files
controller</th><th>Check ON
  </th><th>Check OFF
  </th></tr>
<tr><td>Ver. J2 or later</td><td> 
Transfers a backed up file as is. The origin data is replaced.</td><td> 
A backed up file is transferred. However, as for the origin data and the parameters for recovering positions, the information inside the controller is retained.</td></tr>
<tr><td>Ver. H7 or earlier</td><td> 
Transfers a backed up file as is. The origin data is replaced.</td><td> 
A backed up file is transferred. However, as for the origin data, the information inside the controller is retained.</td></tr>
</table>

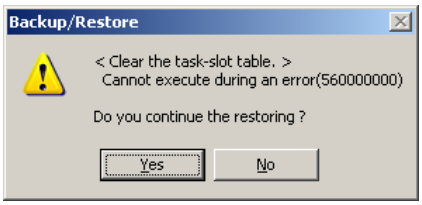
(*"Position Repair" is supported in version **E1** or later of this software.)

If communication is cancelled during a series of load processing, please note that the origin data may have been changed.

Caution

Precaution for Restore

When a program is running or the ALWAYS program is set up

Ver. **E1** or later	If a batch restoration or a program restoration is executed when the program is being started, the program will automatically be stopped. At this time, if there is an error in the controller, the program in operation cannot be stopped, and the message shown on the right will be displayed.  Although a restoration process can be executed even in such a case, the program currently selected or the program that is started by ALWAYS cannot be re-written. If it is possible to remove the cause of the error, reset the error and execute the restoration process again.
Ver. **D2** or earlier	Be sure to stop the program.

8.4. Power Reset of the Robot Controller (Version E1 or later)

To make the restored information effective, it is necessary to power on the robot controller again. The power reset of the robot controller can be performed from the personal computer in Version **E1** or later of this software.

However, note that this function can be used with Version **J1** or later of the robot controller software.

(1) Restore

After restoring, the power reset conformation screen appears. To immediately reset the power, select [Yes].

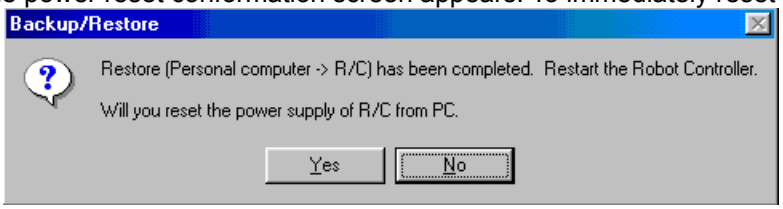


Fig. 8-6 Confirmation of Power reset

(2) menu

Selecting [R/C Power Reset] from the [File] menu can reset the power to the robot controller.

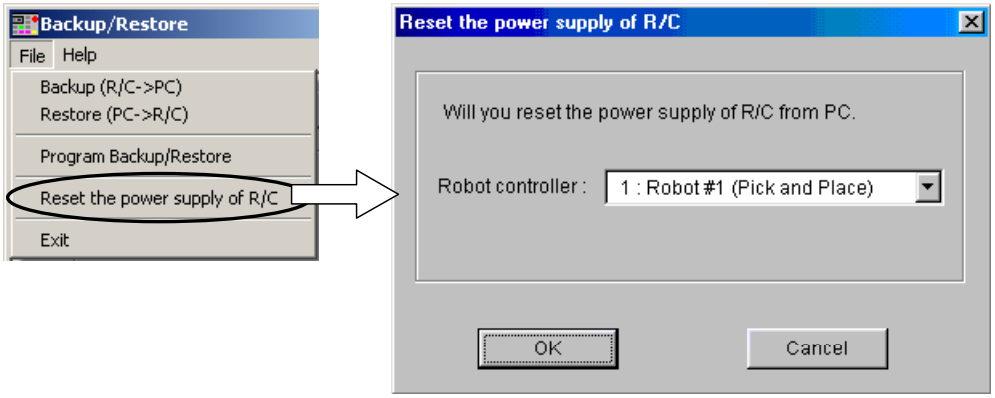


Fig. 8-7 Operation by menu

8.5. Program Backup

Several robot programs are copied between the R/C and personal computer.
The robot programs copied to the personal computer can be edited with this software.

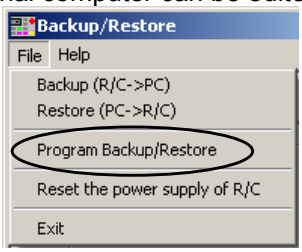


Fig. 8-8 Program backup/Restore menu

Select [File] - [Program Backup].
The Program Backup window will open.

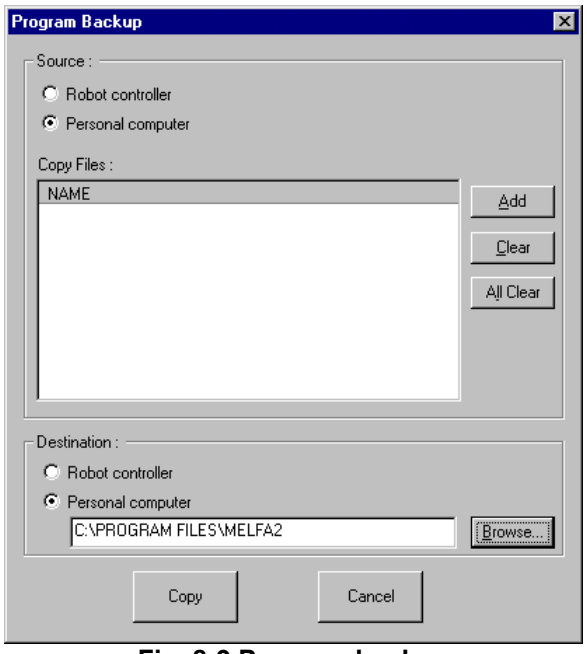


Fig. 8-9 Program backup

Using the [Add] button, set the file to be copied into the copy source area.
The file selected as the copy source can be canceled by selecting with the [Clear] button.
After selecting the copy destination, click on the [Copy] button.

9. Remote maintenance

The data of a robot at a remote location can be monitored and serviced over a telephone line.

Prepare a personal computer with modem and telephone line at the robot side and at the remote location. Connect each personal computer with the following method.

9.1. Starting of Remote maintenance

Click on the "Remote maintenance" button on the main screen. The remote maintenance tool will start, and the following type of dialog will appear.

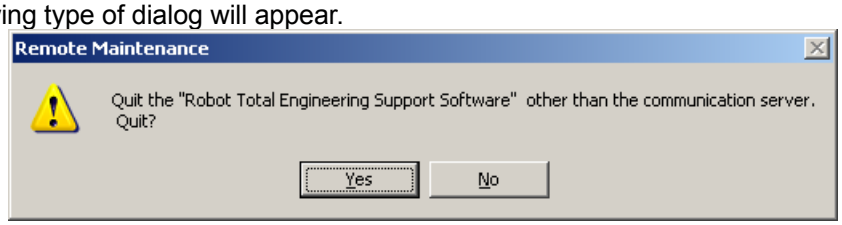


Fig. 9-1 Confirmation

If the program editing tool, monitoring tool or maintenance tool is running, exit the tool, and then click on the "OK" button. The following main screen will appear.

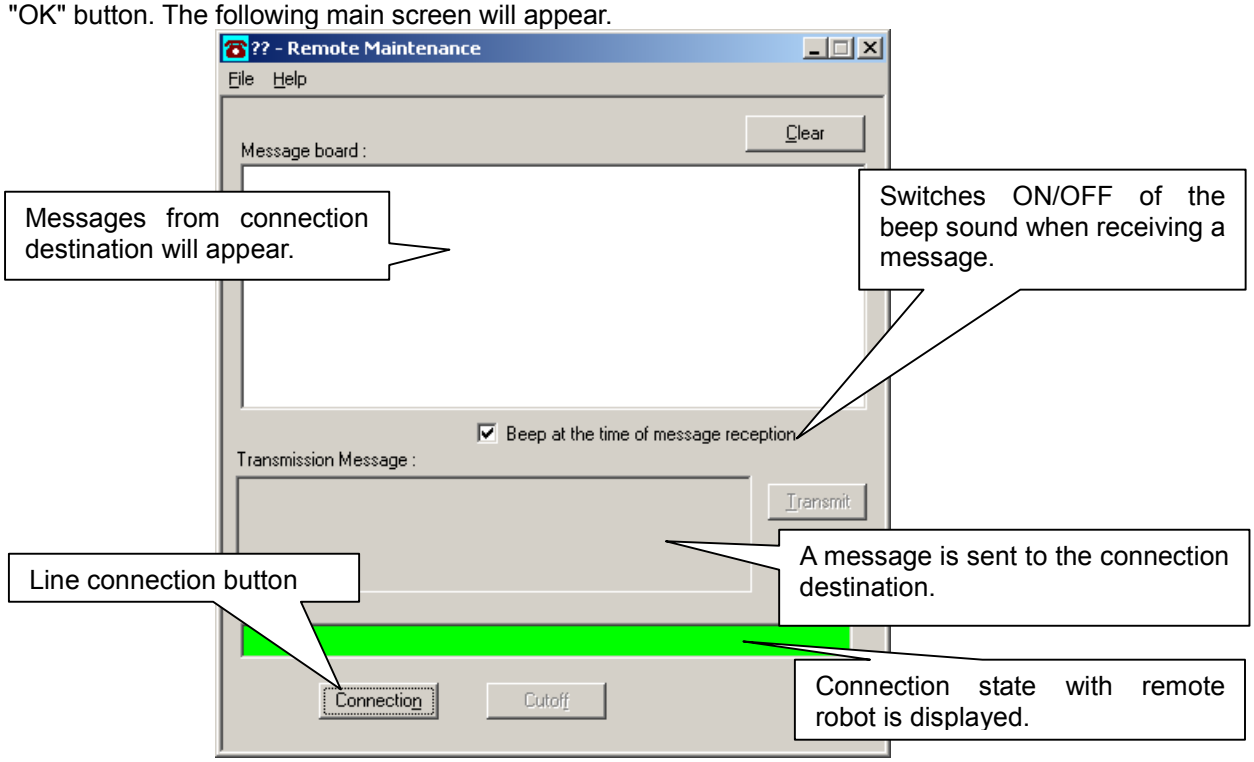


Fig. 9-2 Remote Maintenance

9.2. Connecting with the remote robot

Click on the "Line connection" button.

The following line setting screen will appear. Input the telephone No., and type of modem being used, and then click on the "Start" button. The remote connection different type of letters.

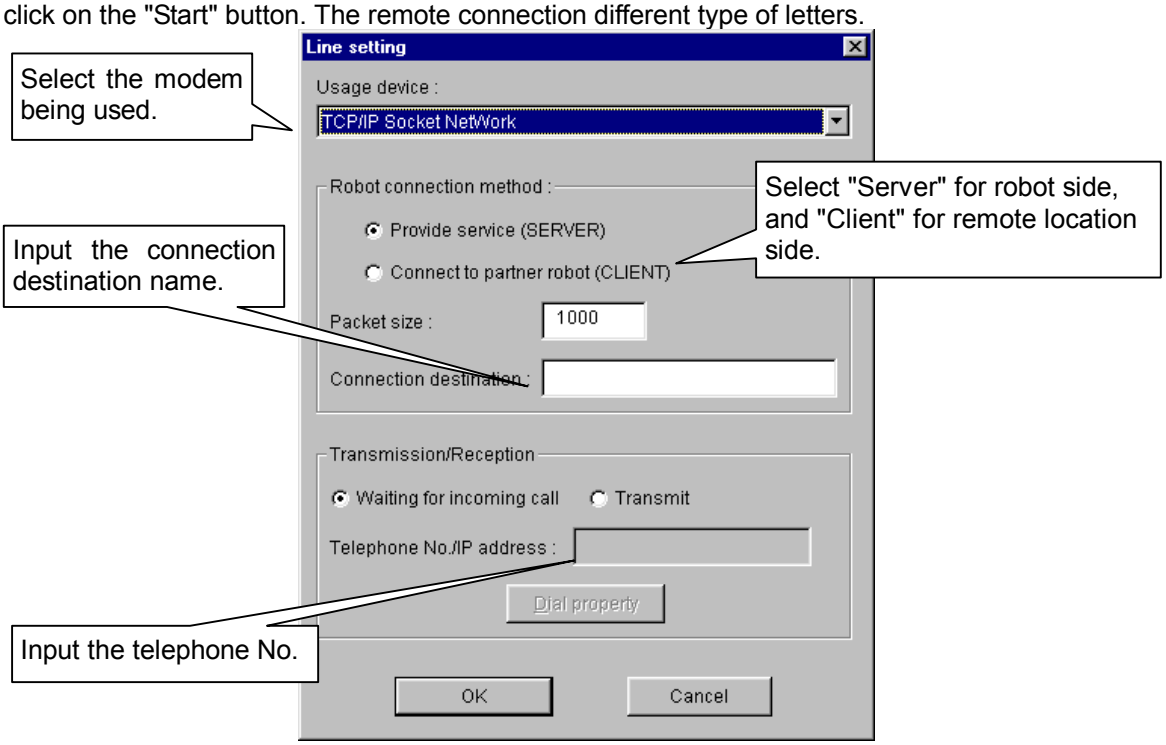


Fig. 9-3 Line setting

Caution

If the personal computer being used is connected to an intranet, connection with LAN instead of a telephone line is possible.

The following screen will appear when the "Dial property" button is clicked on. The details regarding the telephone being used can be set. Take special care to the dialing method (tone (push line) or pulse (dial line)).

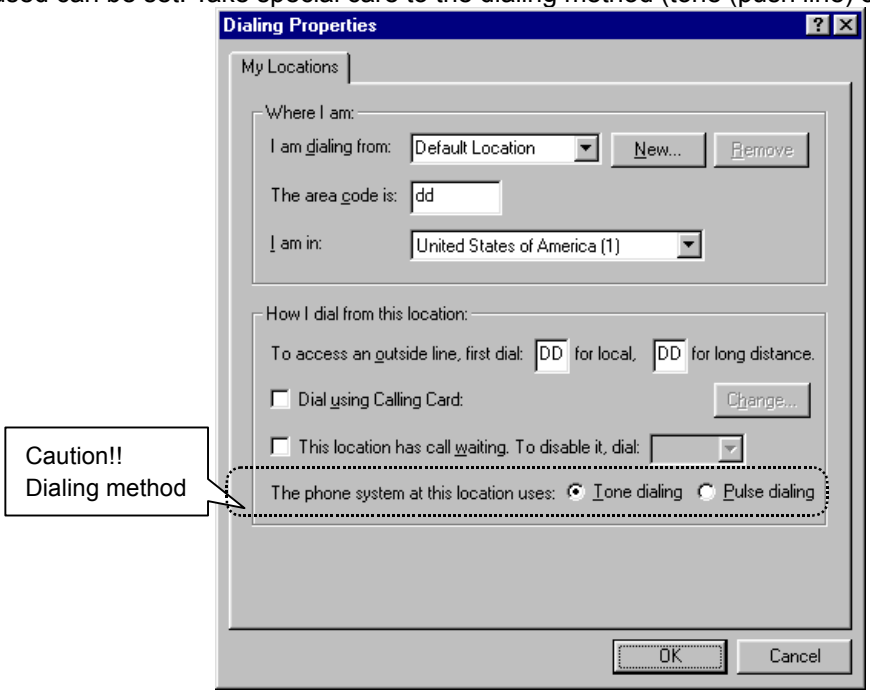


Fig. 9-4 Dialing properties

10. Simulation (Only for standard installation)

The simulation methods are explained in this section.

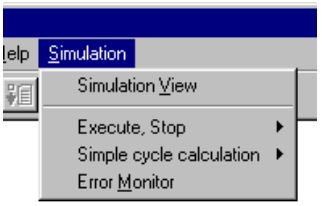
Caution

The simulation function is compatible only with the "standard version".
Note that the simulation function also cannot be used when the MOVEMASTER commands are selected with the "standard version".

Caution

The Robot might occur error of a speed limit over so on though operation speed quickens when the "simulation condition" is set to [High-speed].
In that case, the error might not occur if the "simulation condition" is set to [High-accuracy] again.

The robot program's operation can be simulated using the program editing tool. The simulation function can be used with the [Simulation] menu.



Simulation View : Simulation screen display.
Execute, Stop : Simulation execute/stop switch.
Simple cycle calculation : Calculates cycle.
Error Monitor : Error display.

Fig. 10-1 Simulation menu

10.1. Simulating operation

10.1.1. Start of Simulating operation

The program being edited (only when always open) can be simulated. The types of simulation are the same as the robot controller, and include [Automatic operation], [Step execution] and [Direct execution].

To simulate the operation, select one of the following from the [Simulation] menu [Execute/stop].

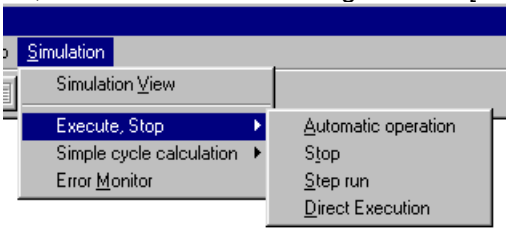


Fig. 10-2 [Simulation] [Execution/stop] submenu

[Automatic operation]
[Step execution]
[Direct execution]

The following "Model selection" dialog will appear, so select the model and then click on the "OK" button.

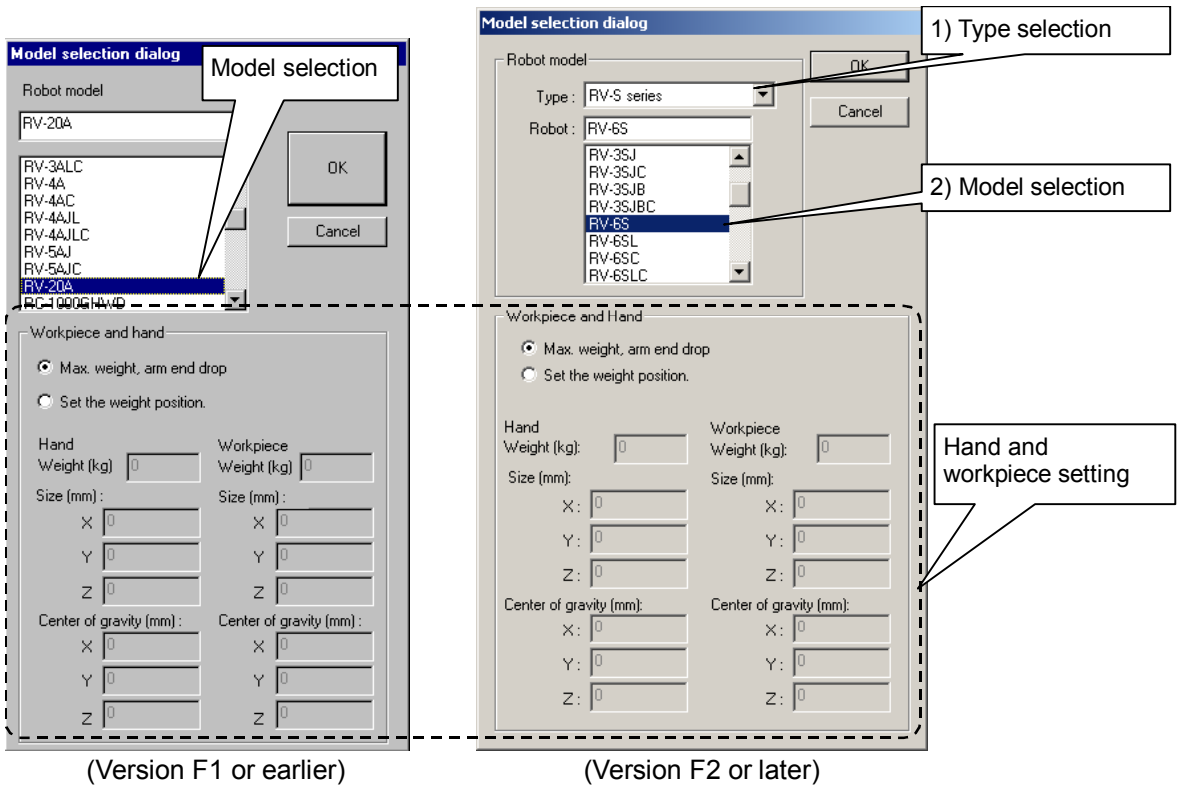


Fig. 10-3 Model selection dialog

The following "Simulation results" view panel will appear, and the state of the simulation of the program currently being edited will appear.

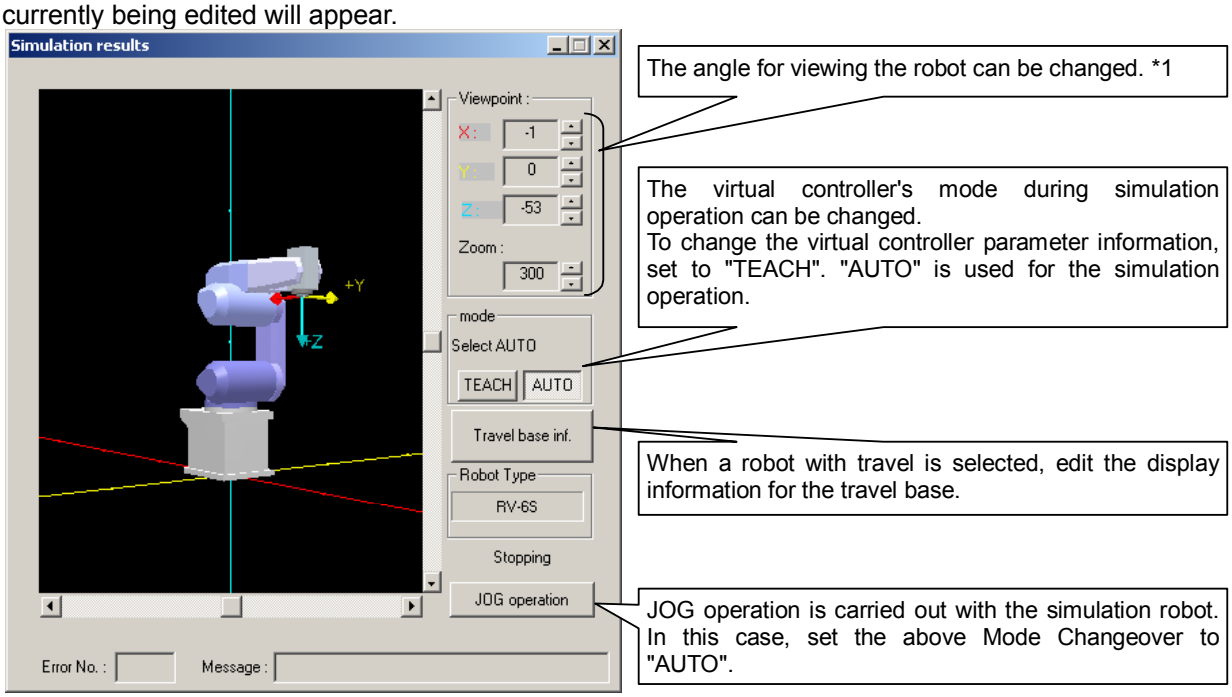


Fig. 10-4 Simulation panel

*1 The viewpoint can also be changed by the following mouse operations.

Viewpoint of changing	Mouse operations on the graphic
Rotation	Dragging left button to left and right → Rotation of Z-axis center up and down → Rotation of X-axis center Dragging left + right button to left and right → Rotation of Y-axis center
Move	Dragging right button to up, down, left and right → Move
Enlargement/reduction	Dragging left button + [Shift] key to up and down → Enlargement/reduction

⚠ Caution

Communication with the robot controller is not possible while the simulation panel is opened. To communicate with the robot controller, close the simulation panel ([Simulation] menu -> Simulation view).

[Travel Base Display Information]

When a robot with travel is selected, edit the display information for the travel base. The display information is changed here.

To change the robot's movement range, select "Yes (Y)". The parameter values will change. Note that program editing must be restarted to validate these parameters.

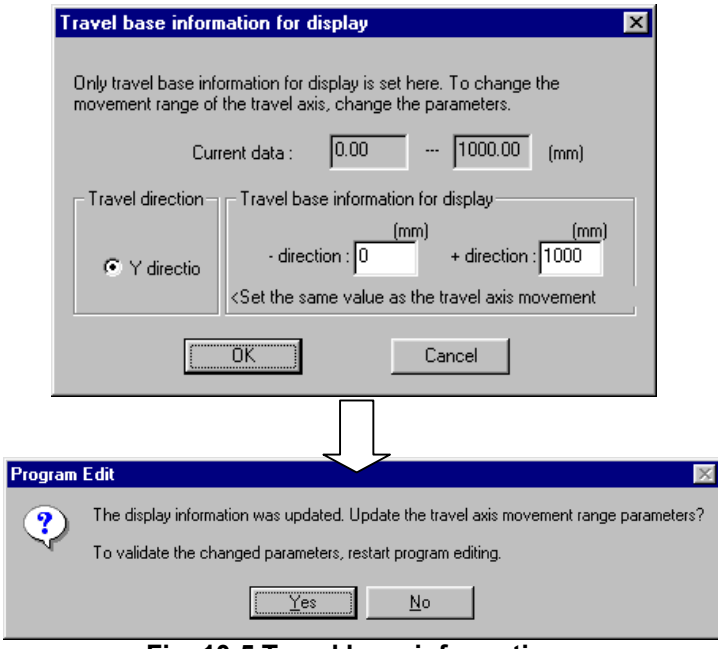


Fig. 10-5 Travel base information

10.1.2. Automatic operation

The same operation as the controller's automatic operation takes place.
To stop, select [Stop] from the [Simulation] menu → [Execute/stop].

10.1.3. Direct execution

The robot can be directly operated by inputting command statements without line Nos.
When [Simulation] menu → [Execute/stop] → Direct execution
is selected, the following type of dialog for direct execution will appear.

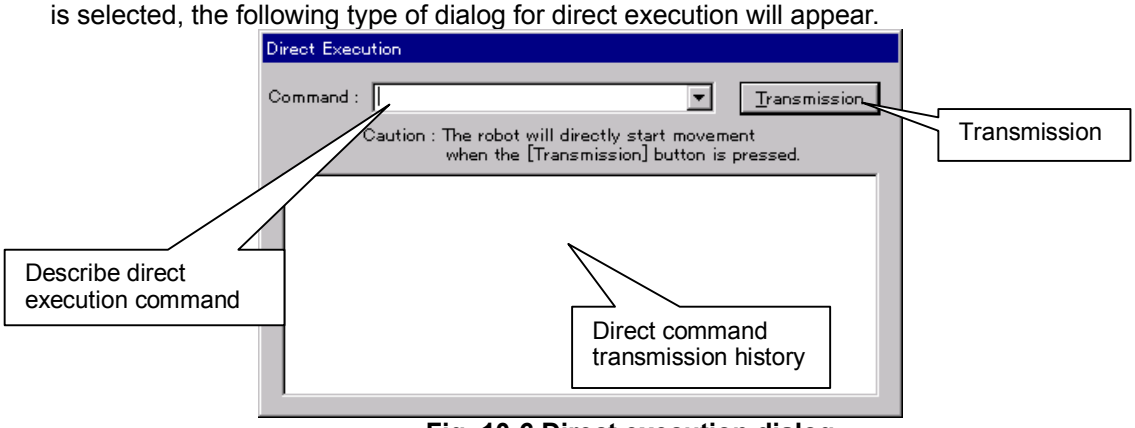
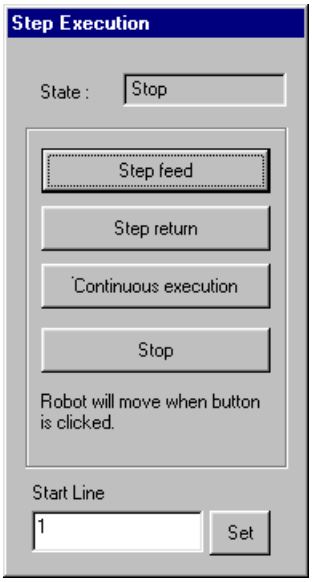


Fig. 10-6 Direct execution dialog

10.1.4. Step execution

The robot program can be executed line by line.

When [Simulation] menu → [Execute/stop] → Step execution is selected, the following type of dialog for step execution will appear. During the step execution, the line being executed is highlighted on the program editing screen.



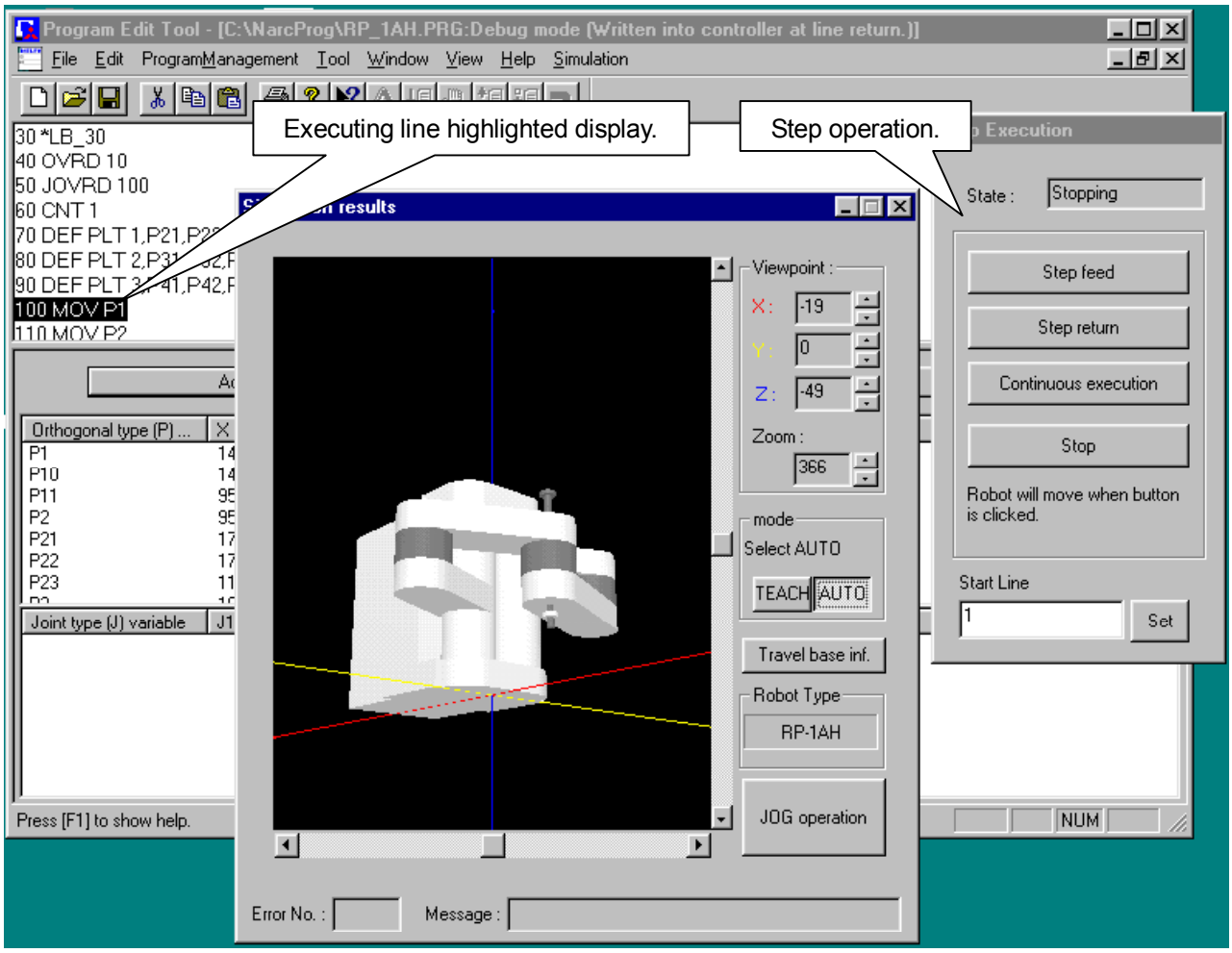


Fig. 10-7 Step execution dialog and highlighted editing screen

10.2. Cycle time calculation

*** Quit all other applications before calculating the tact time. ***

⚠ Caution

Attention when cycle time of robot which uses the collision detection function or the maintenance forecast.

When the collision detection function is made effective, or the information gathering level of the Maintenance forecast is raised, the cycle time of the robot is postponed. But, in this software, even if they are changed, cycle time is not influenced

When the collision detection function is made effective, or the information gathering level of the Maintenance forecast is raised, please note that the cycle time of the robot is postponed from the tact time measurement result of this software by about 3-10%

The tact time can be calculated with two methods using this software.

(1) Calculate the tact time from the created robot program.

(2) Designate the robot movement's start point and end points, and calculate the movement tact time.

Each calculation method is described below.

10.2.1. Cycle time calculation conditions

Tact time(Cycle time) calculation

The robot's movement tact time can be calculated with this software using the simulation function.

Note that the calculated tact time will differ according to the performance of the personal computer used and the load state, and will not completely match the actual robot movement time (tact time).

Use this function as a guide for considering the tact time.

The results of the tact time calculated with this software will have an error of approx. +/-3% under the following conditions compared to the actual robot movement time (tact time).

Tact time calculation conditions

(1) Do not start any application other than this software's "Program Edit" function.
The tact time calculation by this software has sections processed in the background of the personal computer. For example, if an application such as a Word document that carries out automatic save is started and running, this software's background process will take longer and the correct tact time may not be calculated. (The tact time will increase.)
Quit all other applications before calculating the tact time with this software.

(2) There must be no general-purpose signal input waiting in the program.
Invalidate any signal input waiting, etc., before calculating the tact time.
When considering the tact time of this type of program, add the approximate input waiting time to the calculation results.

Precautions for using this software

When calculating the tact time using this software's simulation function, the tact time may not be correctly calculated depending on the specifications of the personal computer being used or the robot's drawing posture.

Use under the following conditions to calculate the tact time.

Quit all applications other than this software when calculating the tact time.

1. Recommended personal computer specifications

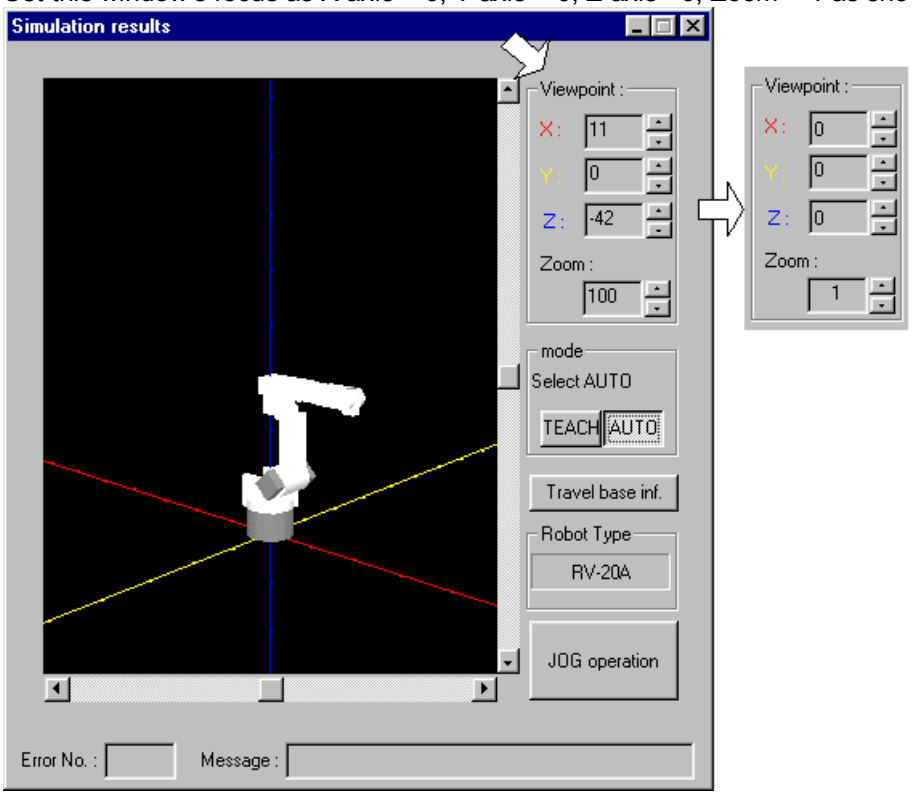
CPU over 233MHz

Memory over 128MByte

2. When using recommended specification personal computer

The following type of "Simulation Results" will appear when the tact time is calculated.

Set this window's focus as X axis = 0, Y axis = 0, Z axis =0, Zoom = 1 as shown below.



This function does not need to be changed when using Windows NT.

3. When using non-recommended specification personal computer

Iconize the "Simulation Results" window. The operation methods are shown below.

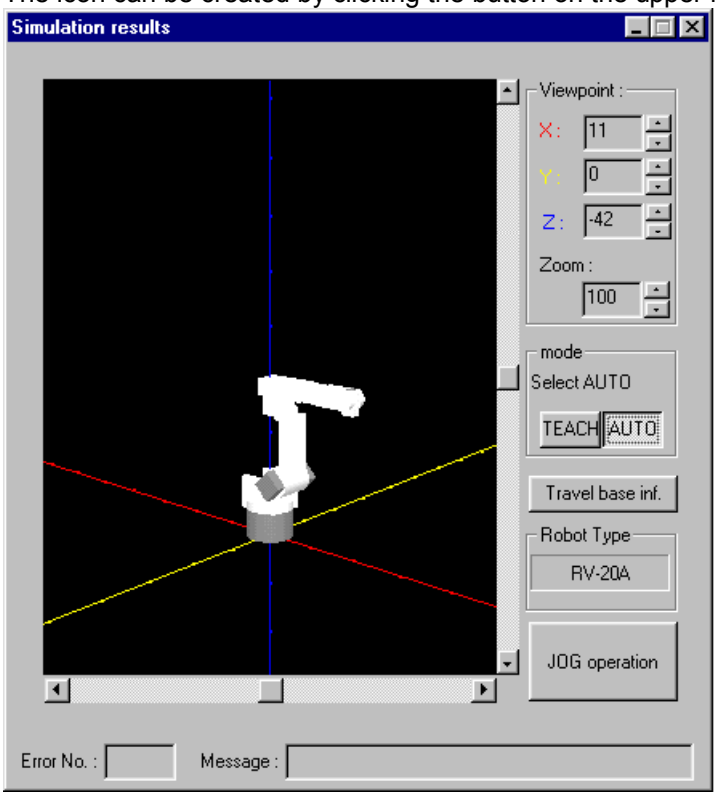
The drawing posture does not need to be changed when the window is iconized and the tact time is calculated.

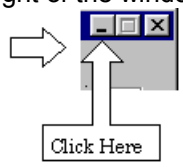
[Operation methods]

(1) Open the robot program for which the tact time is to be calculated.

(2) Open "Simulation View" under the menu "Simulation", and select the robot model.
At this time, always set the conditions to "**High Accuracy**".

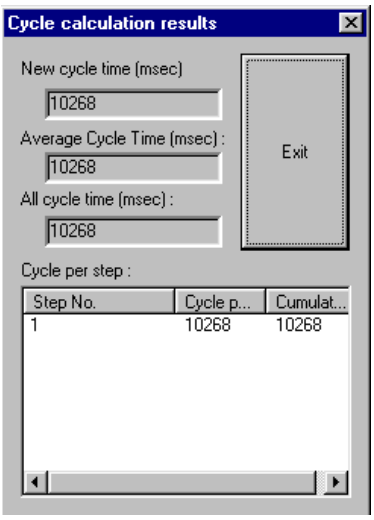
(3) The "Simulation Results" window will open. Iconize this window.
The icon can be created by clicking the button on the upper right of the window.





(4) Select the execution section for which the tact time is to be calculated, and calculate the tact time by selecting "Simulation" - "Simple Tact Calculation" - "Tact Calculation". Refer to section "5.5.2 Calculating the Tact Time" for details on calculating the tact time.

(5) Do not return the "Simulation Results" window to the original size while calculating the tact time.
When the tact time has been calculated, the "Tact Calculation Results" window as shown on the right will open.



Note: In some cases, this "Tact Calculation Results" window may be hidden behind a different window. In this case, press the [Alt] key on the keyboard, or click on the **"Tact Calculation Results"** icon displayed on the task bar.
This completes the calculation of the tact time.

10.2.2. Calculating the tact time from the robot program

The tact time of a designated range of the robot program can be calculated. Note that the following limits will apply.

Note: Observe the following points when calculating the tact time from the robot program.

1. The tact time for a program that falls into an infinite loop cannot be correctly calculated.
   Confirm that the robot program does not fall into an infinite loop with a FOR statement or GOTO statement.
2. The tact time cannot be calculated for a program having signal input waiting, etc. Invalidate any signal input waiting, etc., before calculating the tact time.
3. With the PC support software prior to version C1, a program containing an END statement cannot calculate the tact time.

For example, the tact time cannot be calculated for the following types of programs.

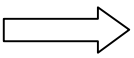
(The sections of the program highlighted in black are set so that the tact time can be calculated.)

```
10 …
:  :
100 MOV P01
110 MOV P02
120 MOV P03
130 GOTO 10
140 END
```

When the GOTO statement's jump destination is not selected

```
10 MOV P00
:  :
100 GOSUB *SUB1
110 END
120  :
200 *SUB1
210 MOV P01
220 RETURN
```

When the subroutine's jump destination is not selected



```
10 GOTO 120
20 '
30 *SUB1
40 MOV P01
50 RETURN
60 '
120 *START
130 MOV P02
140 MOV P03
150 GOSUB *SUB1
160 END
```

[Operation methods]

1) Open the robot program.
2) Select the execution section for which the tact time is to be calculated.
The section can be selected by dragging with the mouse.

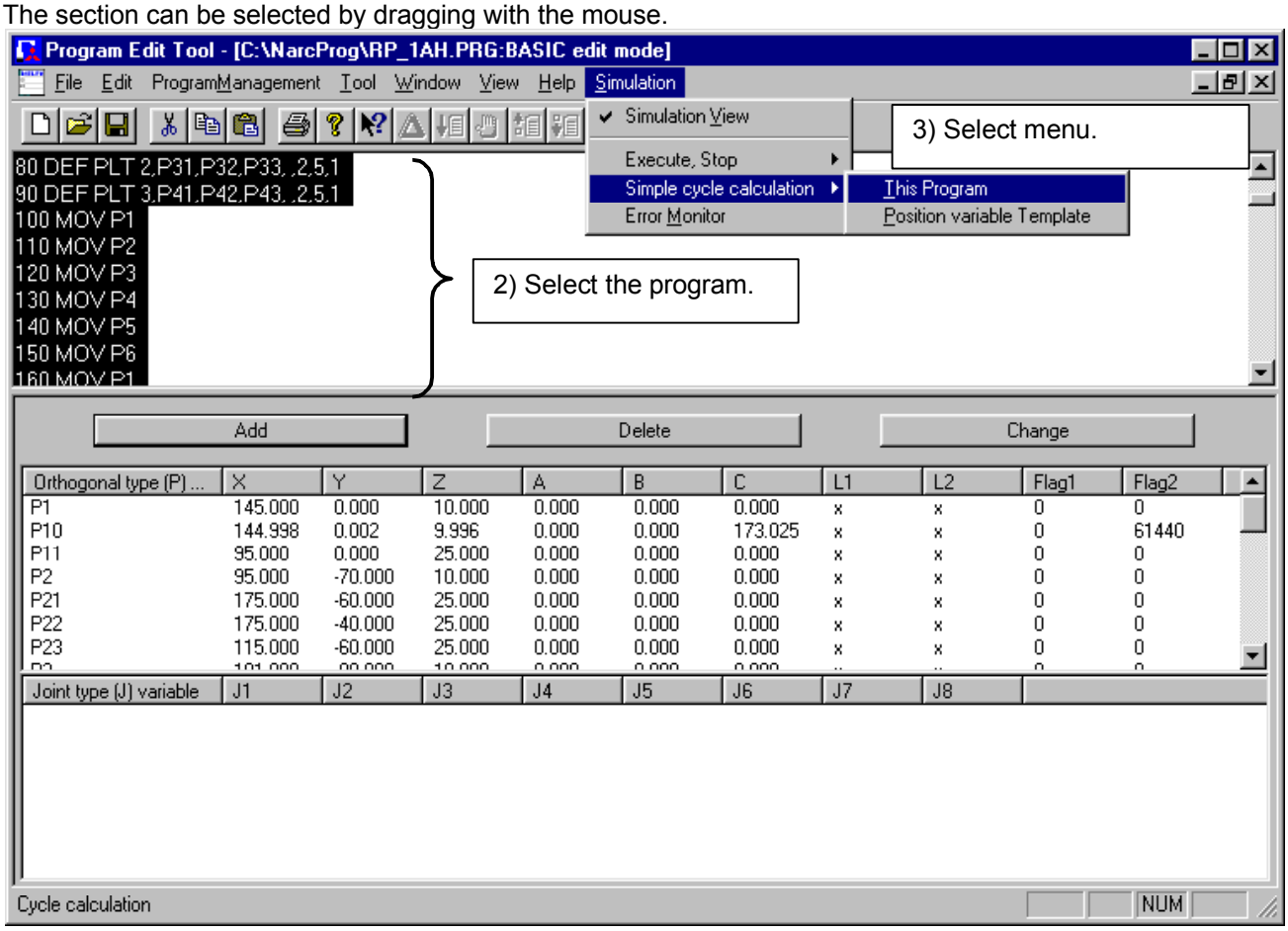


Fig. 10-8 Select the program

3) Select the menu "Simulation" - "Simple Cycle Calculation" - "Cycle Calculation".
4) The Cycle Calculation Range Confirmation window will appear. After confirming the range, click on [Execute].

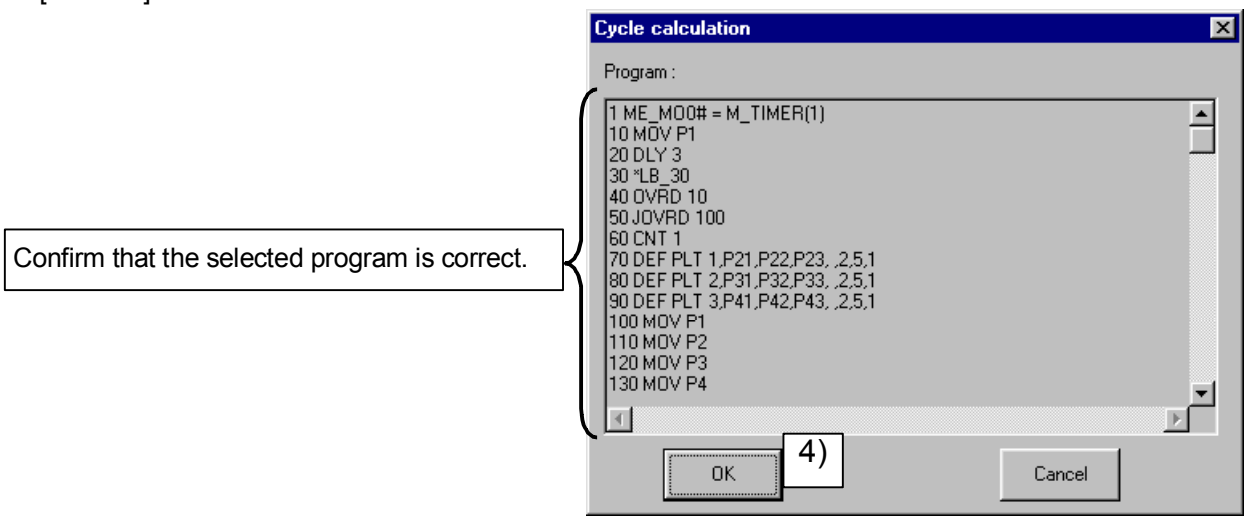


Fig. 10-9 Confirm the selected program

5) If the Simulation Viewer is not opened, the robot model selection window will appear. Select the robot model, and then click on [OK].
6) When the Simulation Condition Setting window appears, click on [High-accuracy].

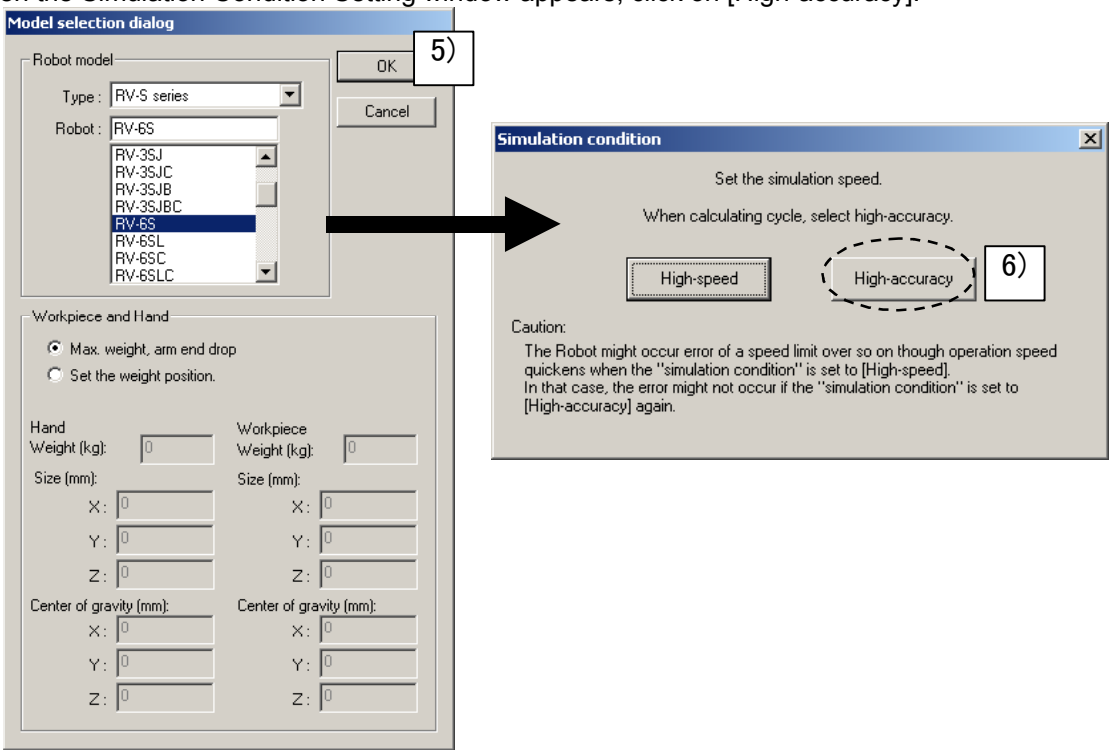


Fig. 10-10 Model selection and Simulation condition setting

7) The robot movement will appear on the Simulation Viewer, and the tact calculation process will start.
8) When the tact calculation is completed, a window showing the tact calculation results will appear.

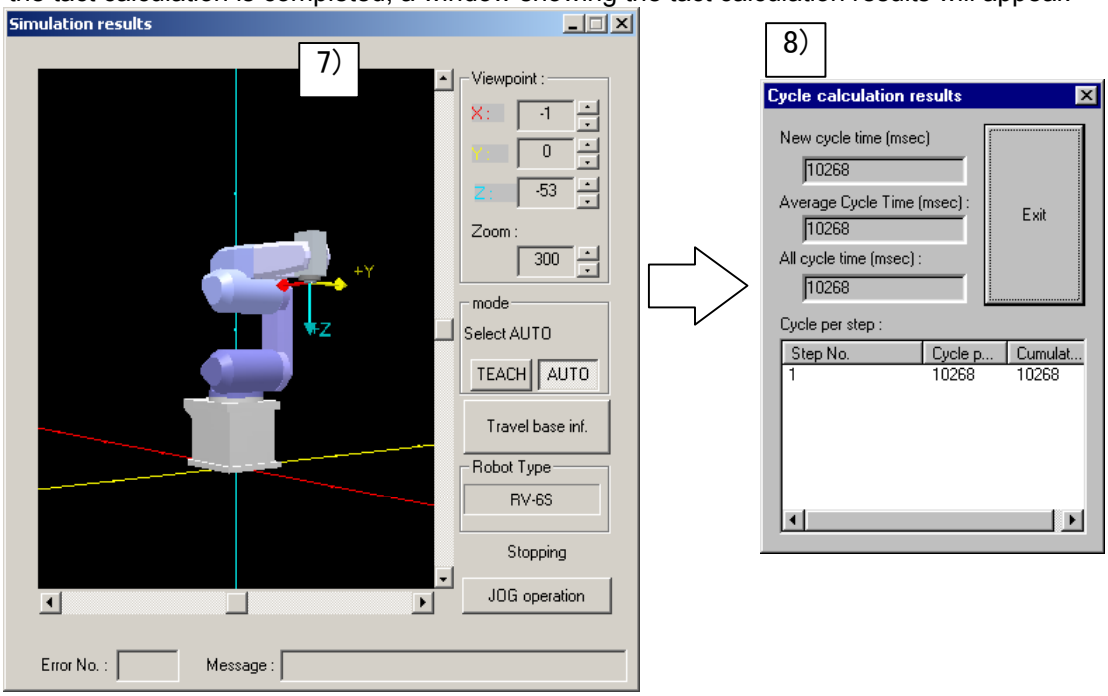


Fig. 10-11 Simulation and cycle calculation result

10.2.3. Calculation by designating the robot movement transit point.

Even without describing a robot program, the robot operation cycle time can be calculated by designating the robot movement transit point.

1). To calculate the cycle, select [Simulation] menu → [Simple cycle calculation]. The following general operation setting dialog will appear

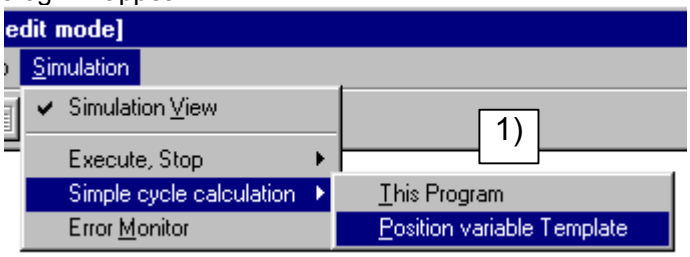


Fig. 10-12 Movement transit point

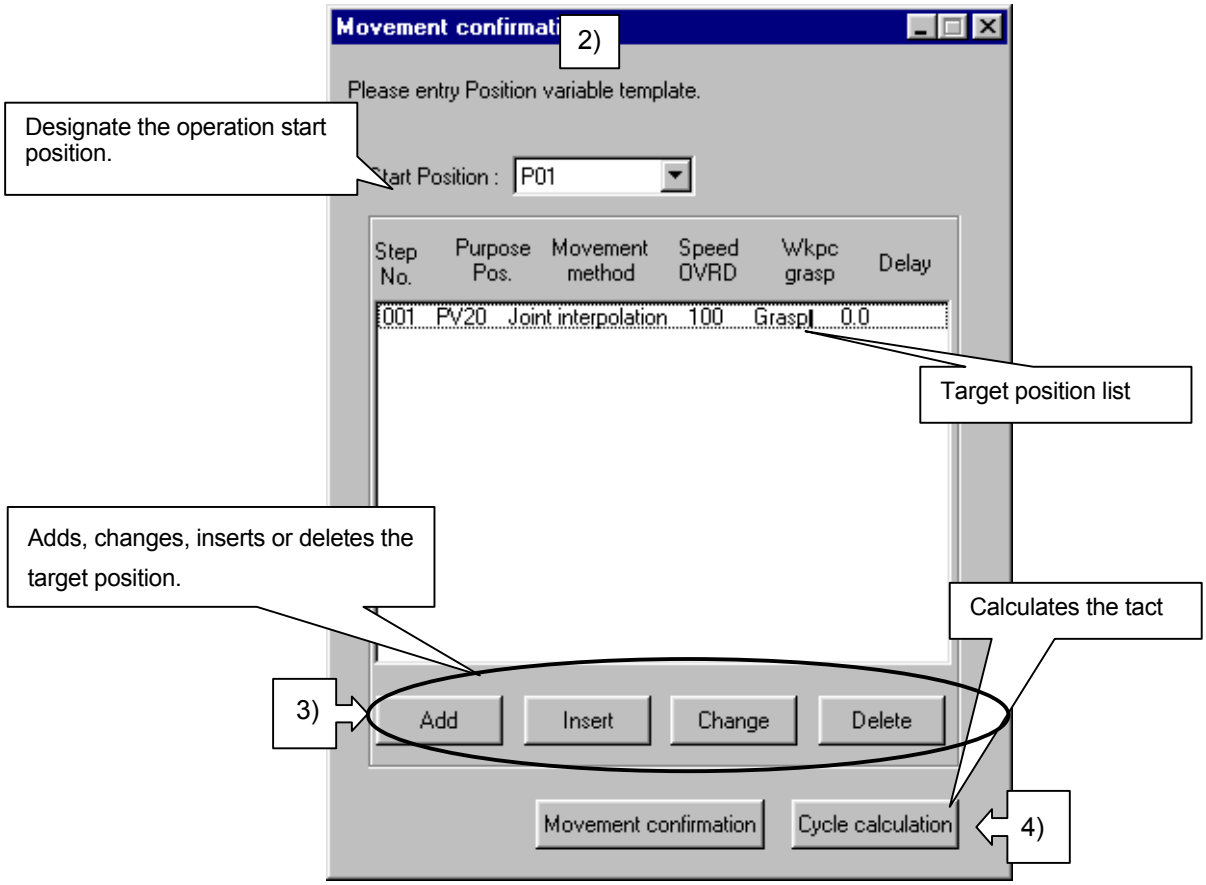


Fig. 10-13 General operation dialog

2) Calculate the tact with the following procedure.

Select the robot operation start point from the [Start position]. The position variables registered in the position variable template (displayed with [Tool] menu → [Position variable template]) can be selected.

3) When the [Add] button is clicked on, the target position addition dialog shown below will appear. Set the target point with this dialog. The position variables registered in the position variable template (displayed with [Tool] menu → [Position variable template]) can be selected.

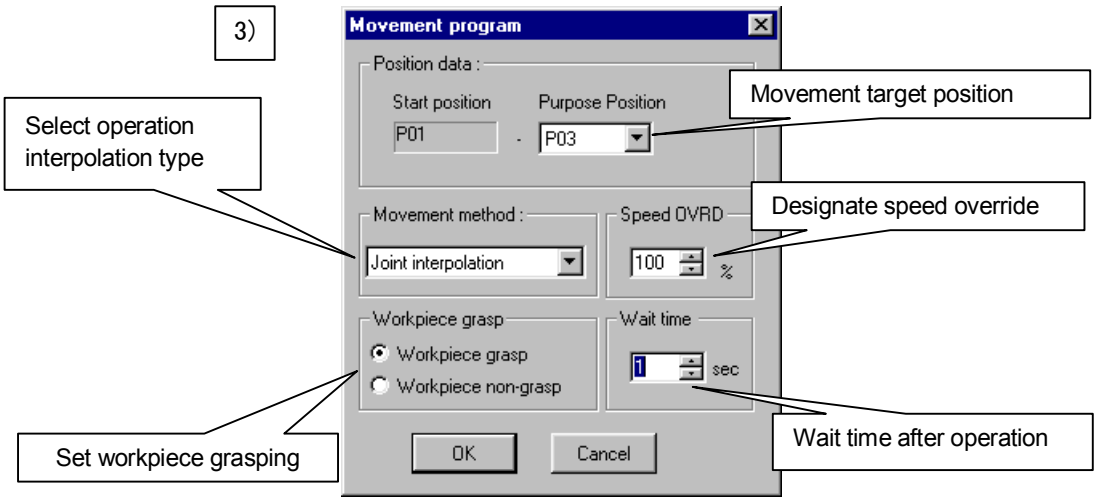


Fig. 10-14 Transit point setting dialog

4) Select the added transit point from the list, and then click on the [Movement confirmation] button to comfirm the movement. And click on the [Cycle calculate] button to know the cycle time.
5) The simulation view will open, the robot operation state will appear, and the cycle time will appear when the operation is completed.

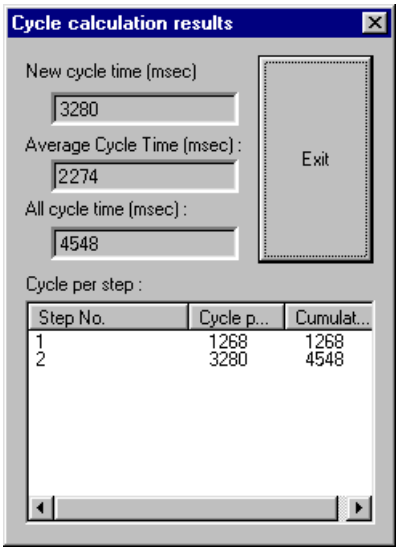


Fig. 10-15 Cycle calculation results

10.3. Editing the position variables with the simulation robot

The position variables can be edited by moving the simulation robot, and reading in the position variables from the simulation robot's posture. Use the following procedure.

Start up the simulation screen by selecting [Simulation view] from the [Simulation] menu.

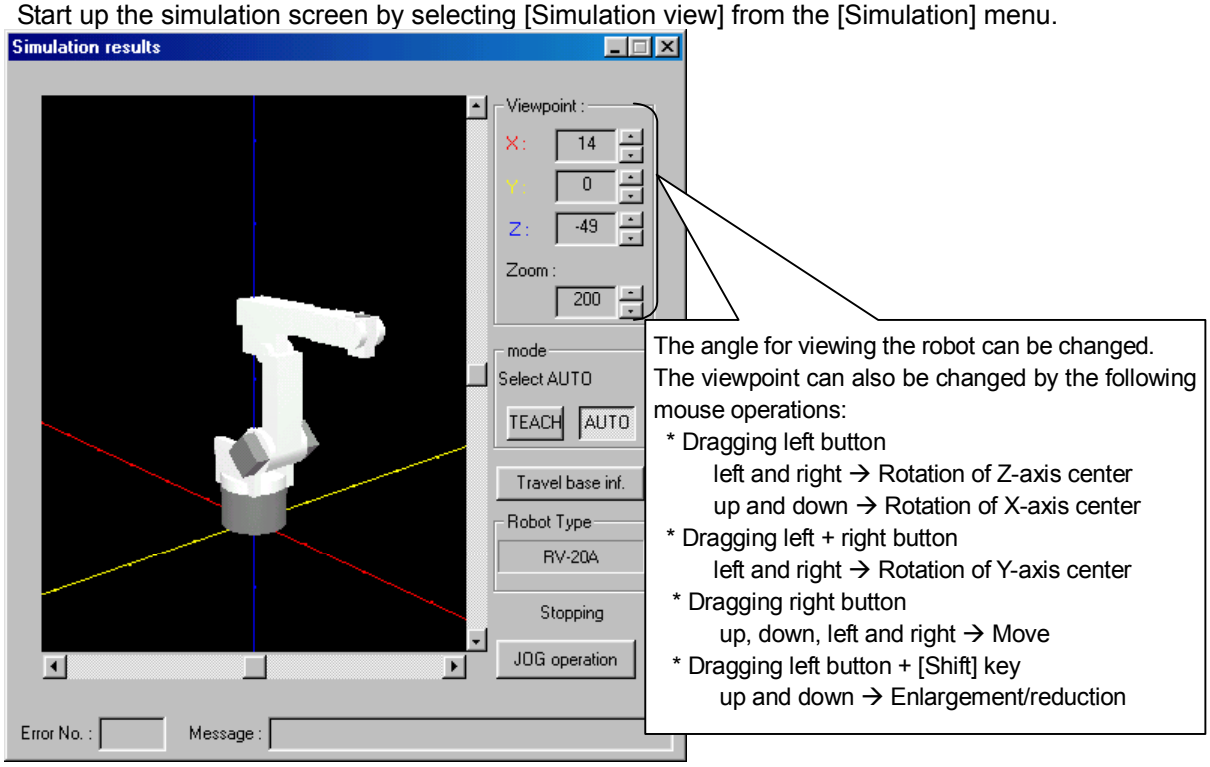


Fig. 10-16 Simulation panel

When the [JOG operation] button is clicked on, the following JOG operation dialog will appear. The simulation view robot can be operated with this dialog. Operate the simulation robot and set the robot to the required posture.

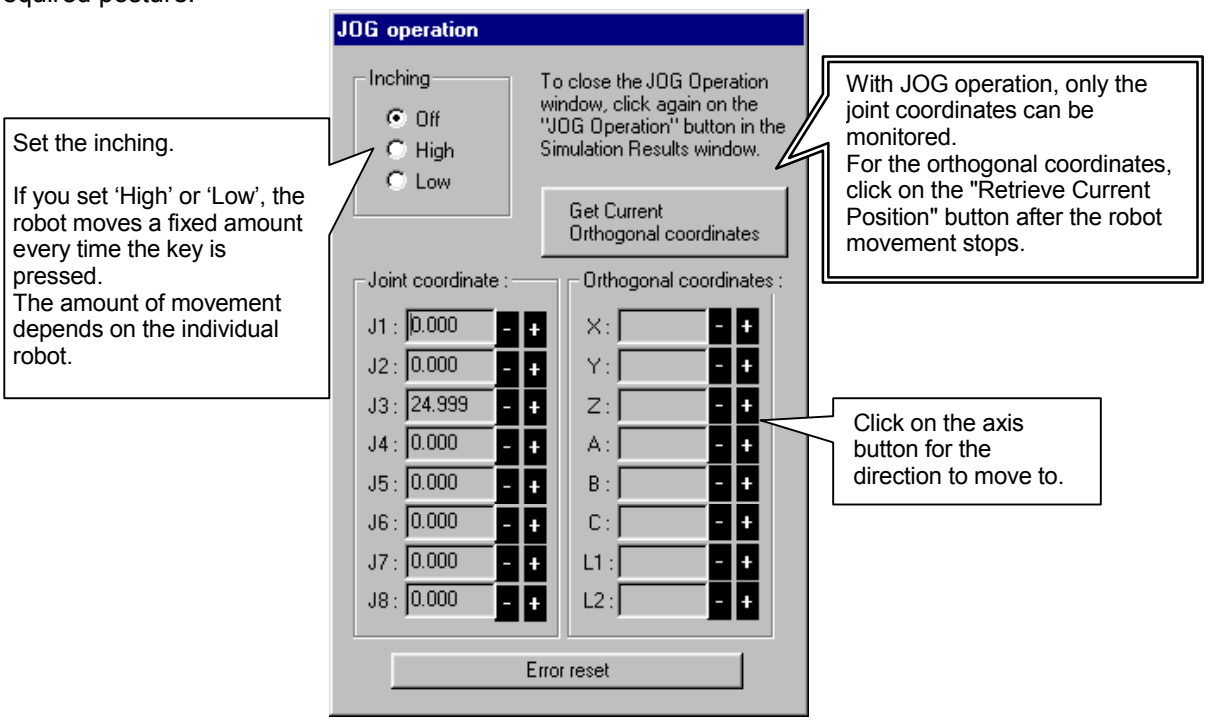


Fig. 10-17 JOG operation dialog

Select the position variable to be edited from the program position variable editing screen being edited, and then click on the [Change] button. To newly add a position variable, click on the [Add] button.

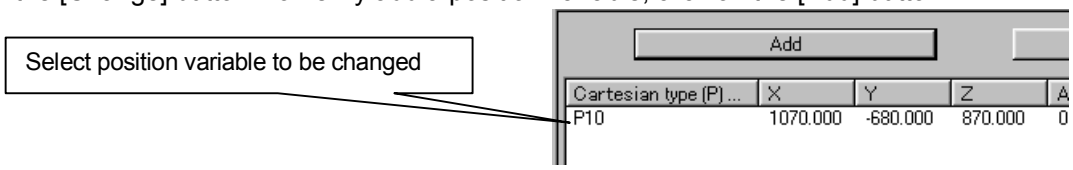


Fig. 10-18 Position editing screen

The current position of the simulation robot will be read in when the [Current position read] button on the position variable change and add dialog is clicked on.

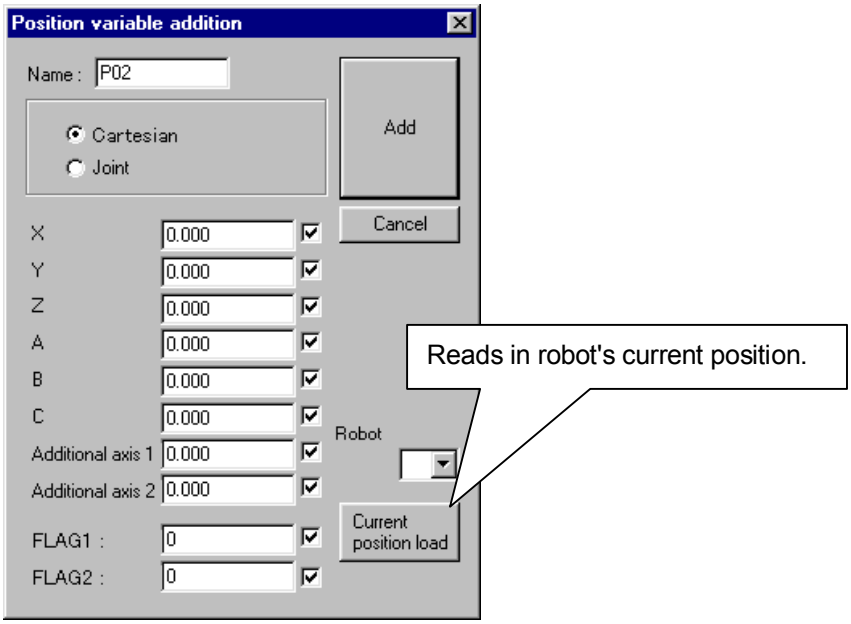


Fig. 10-19 Position variable change dialog

11.Program conversion

The "Robot programming supporter" for E/EN/M1 and M2 series (hereafter "old PC support S/W") and this software (hereafter "new S/W") differ in the configuration of position data. Therefore, the program prepared by using the old PC support S/W cannot be used as it is in the new S/W.

The program conversion converts the position data as well as the instructions (DJ, MP, and PD instructions of the Move Master command) related to the position data so that the robot programs created and saved by the old PC support S/W can be used with this new S/W.

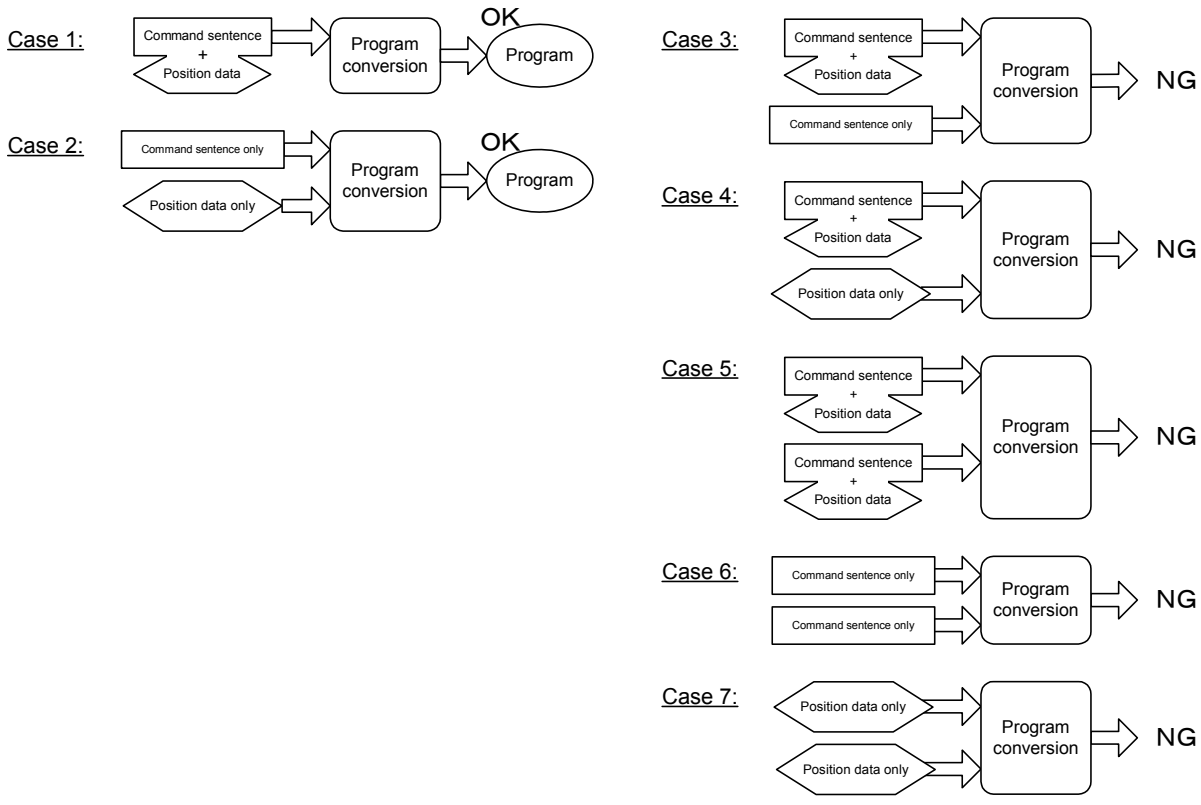
11.1. Precautions

Make sure to read through the items of caution given below before carrying out program conversion.

Note 1: The program conversion converts the position data as well as the instructions (DJ, MP, and PD instructions of the Move Master command) related to the position data. It is not possible to convert automatically from MELFA-BASIC III data to MELFA-BASIC IV data. Be sure to make grammatical check using the new S/W before using the program saved by the old PC support S/W.

Note 2: The program for M1/M2 prepared by using the old PC support S/W has the base rotated 90º. When using the program for M1/M2, convert M1/M2 program into EN program using the old PC support S/W before carrying out the program conversion.

Note 3: In the case of the old PC support S/W, the data can be saved separately such as command sentence only, position data only or command sentence and position data. In this program conversion, it is possible to convert the file of command sentence only and the file of position data only to one program. The other combinations can not be made.



11.2. Start-up

There are two methods to start up.

(1) Start up from MENU

Click on the [Program Converter] button using the MENU of the MELFA Personal Computer support software.

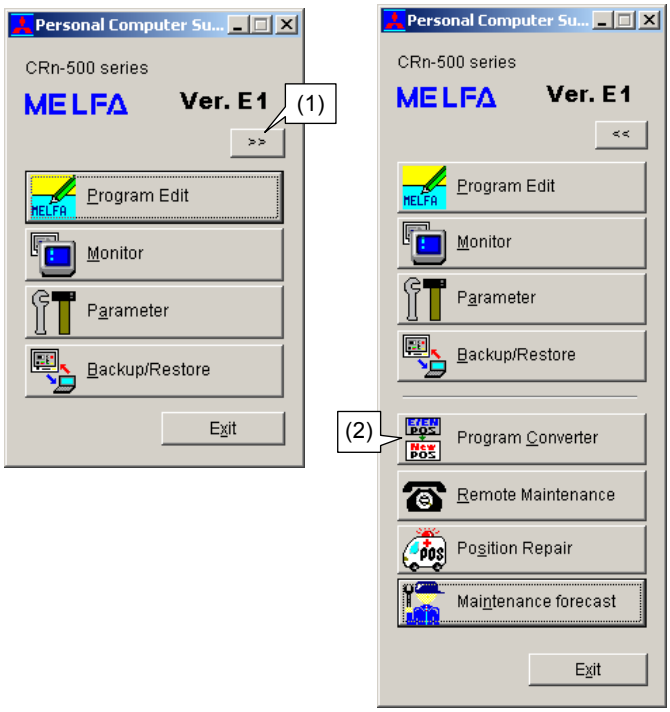


Fig. 11-1 main menu

(2) Start up from PROGRAM EDIT

Click on the [Program converter] in the [Tool] menu of the 'Program Edit Tool - [Robot.prg: BASIC edit mode]' window.

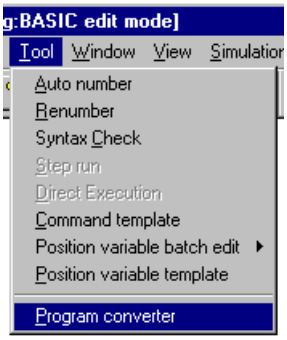


Fig. 11-2 [Tool] menu of the Program edit tool

11.3. Operation methods

(1) Select the number of axes of the robot. Make sure to select the correct number of axes, since the position data structure of the old PC support S/W differs according to the number of robot axes.

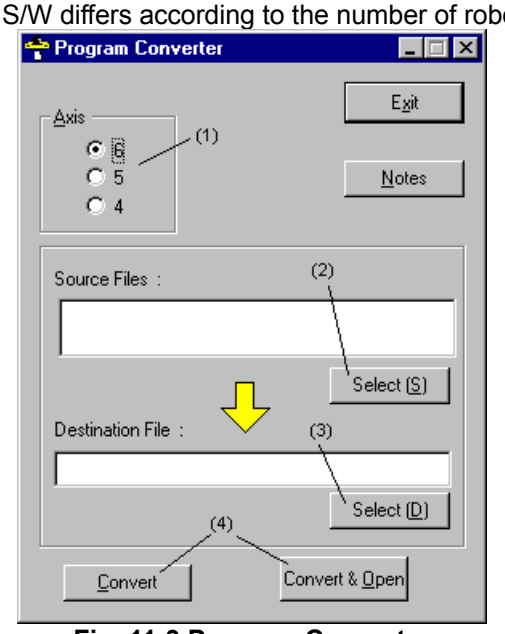


Fig. 11-3 Program Converter

(2) Designate the source files.
The [OPEN] window for file selection appears when the [Select] button of the [Source Files:] is clicked.

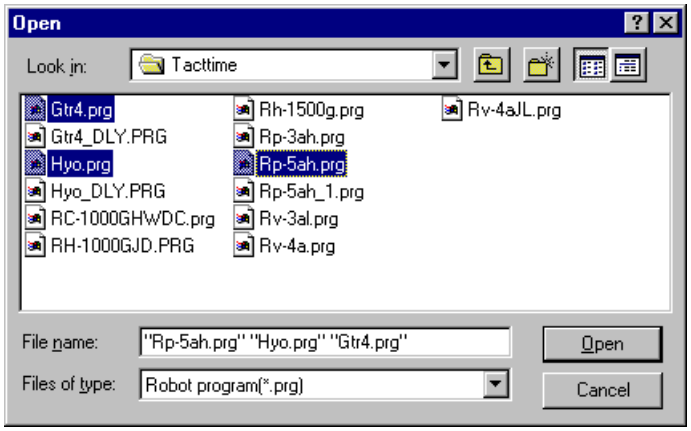


Fig. 11-4 Designate the source files

Click the file while pressing the [Ctrl] key for selecting several files. After selecting the file for conversion, click on the [Open] button. Then the selected files appear in the [Source Files:] box.

(3) Designate the file to write down the converted program. Click on the [Select (D)] button of the [Destination File:] to display the [Save As] window for file selection.

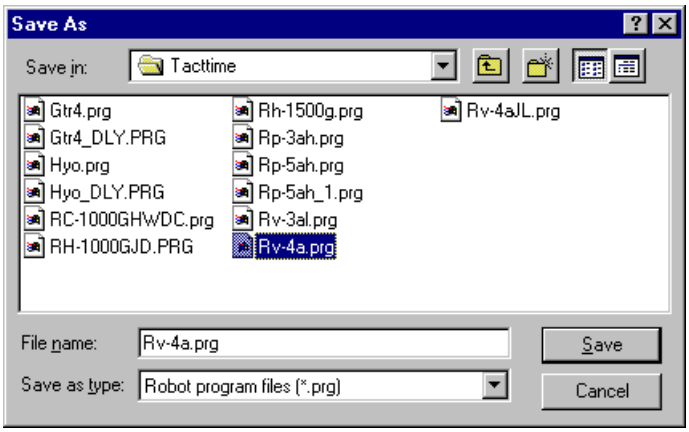


Fig. 11-5 Designate the file to write down the converted program

Name the file in which the converted program is written before clicking on the [Save] button.

(4) After designating the conversion source file and the conversion destination file, click on the [Convert] or [Convert & Open] button.
When [Convert] is clicked, the designated file is converted and written down in the conversion destination file.
When [Convert & Open] is clicked, the file is converted before being opened through program edit. Select according to the object.

12. Position Repair Support Tool

"Position Repair Support Tool" is supported by version **E1** or later of this software. However, supported Robot Controller and Model are limited. See "Table 12-2 Supported Robot Controller and Model".

"Position Repair Support Tool" is used when tool deformation due to interference or origin position shift due to replacement of motor during maintenance occurs. Past position data in the controller can be used simply by re-teaching certain location data in a robot program. (Parameters that compensate for the position shift will be generated, which corrects all location data within the controller.)

However, please note that applications that require high precision or large mechanical damage to the robot due to interference may not be rectifiable.

Moreover, there are some cases that cannot be rectified because of limits by degree of freedom of robot. Vertical 5-axis robot and Horizontal 4-axis robot have the limit like "Table 12-1 The limit by degree of freedom". Therefore the shift related to this limitation cannot be correctly rectified. In that case, please teach again without using this function, or repair the part where the gap exists. (e.g. exchanged a bent hand)

Table 12-1 The limit by degree of freedom

No.	Robot model	The limit by degree of freedom
1	Vertical 5-axis robot	It can't move in the direction of C element of the cartesian position.
2	Horizontal 4-axis robot	It can't move in the direction of A, B element of the cartesian position.

⚠ CAUTION

Position Repair Support Tool supports MELFA-BASIC IV only.

Position Repair Support Tool supports MELFA-BASIC IV only. Note that it cannot be used with MOVEMASTER command.

12.1. Specifications

This software supports the following software version and model of the robot controller.

Table 12-2 Supported Robot Controller and Model

No.	Robot model	Support Version	Robot Controller
1	Vertical 6-axis robot	Version **E1** or later	Version **J2** or later Only correction of origin data is supported in versions prior to **J2**.
2	Vertical 5-axis robot	Version **F1** or later	Version **K1** or later Only correction of origin data is supported in versions prior to **K1**.
3	Horizontal 4-axis robot (RH-SH series only)	Version **F2** or later	Version **K4** or later Any versions prior to **K4** are not available. Moreover, This function cannot be used for the RH-AH series robot.

12.2. Startup

Click the [>>] button in the main menu to expand the menu. Select [Position Repair] to display Position Repair window.

It is also possible to start from Windows [Start] – [Programs] – [MELSOFT Application] – [RT ToolBox] – [Position Repair].

(It is possible to start from Windows [Start] – [Programs] – [MELFA] – [CR-500 Position Repair].)

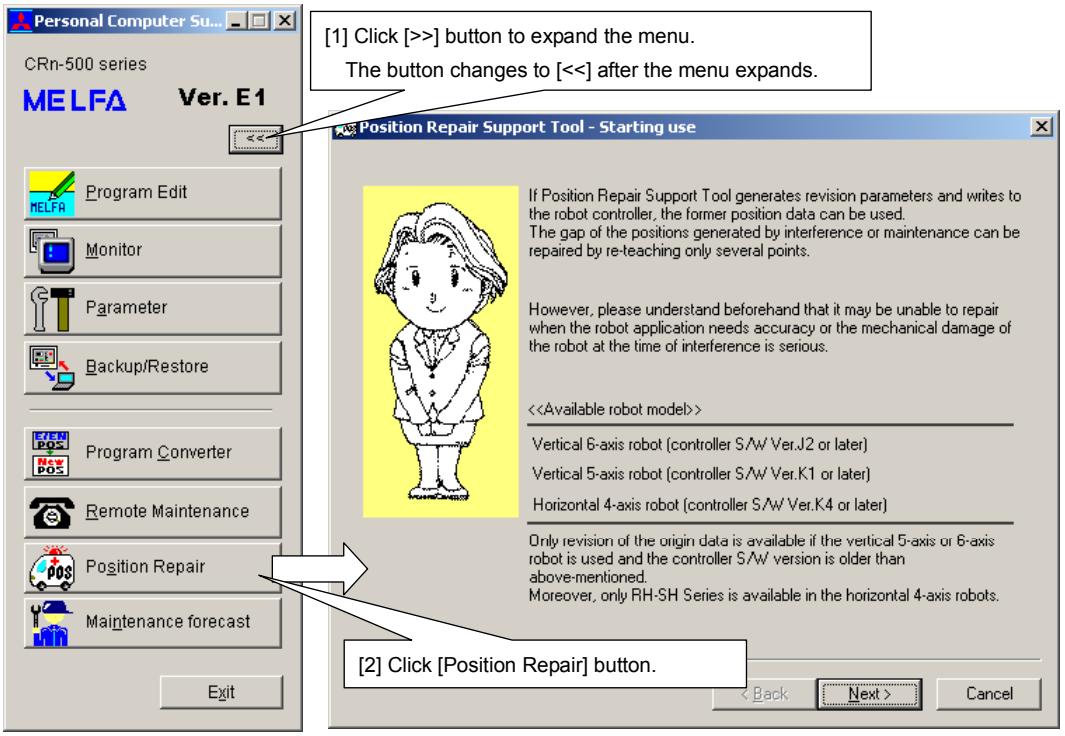


Figure 12-1 Starting from Menu

12.3. Operation Flow

This software is an application in Wizard format. Parameters will be generated if you perform operations following the instructions on each screen. The parameter values can also be set directly.

This software is used while connected to the robot controller.

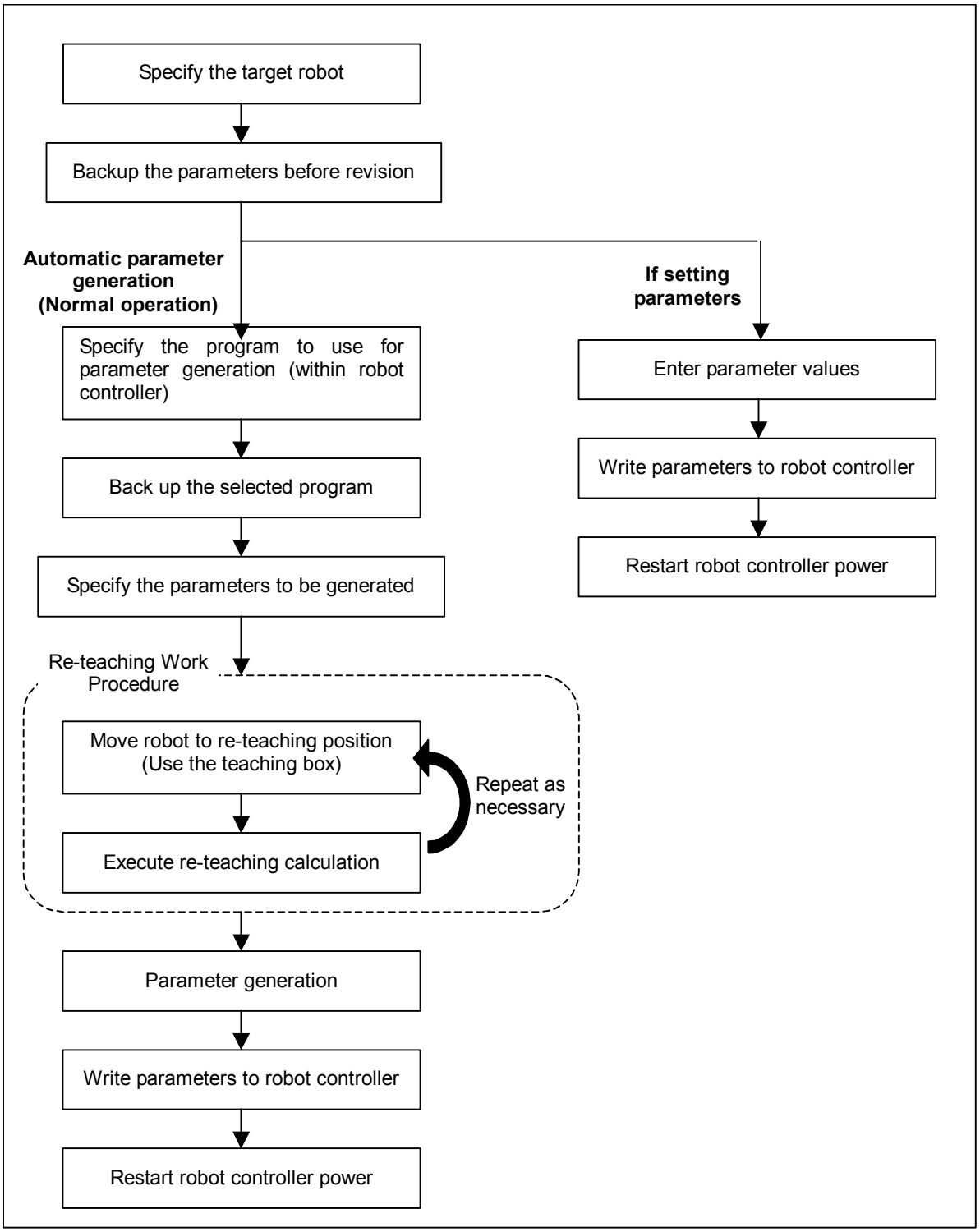


Figure 12-2 Operation Flow

From here on, the description will follow the normal operation flow. See **"12.16. Edit Revision Parameters"** for description on setting parameter values.

12.4. Starting Use

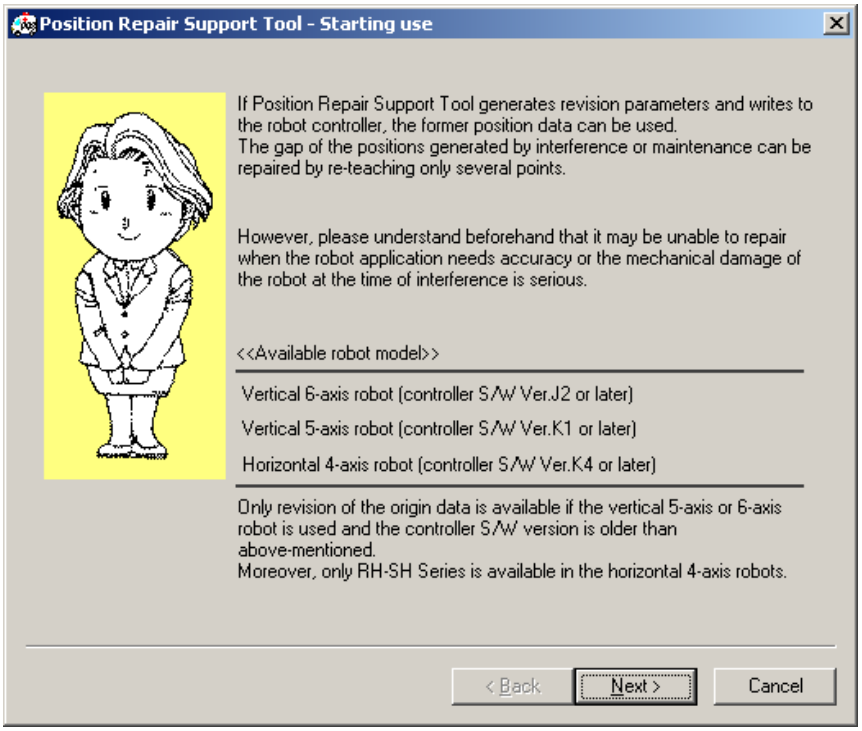


Figure 12-3 Starting use Window

This window shows the description of this software. Click [Next] after reading the description.

12.5. Communication Setting

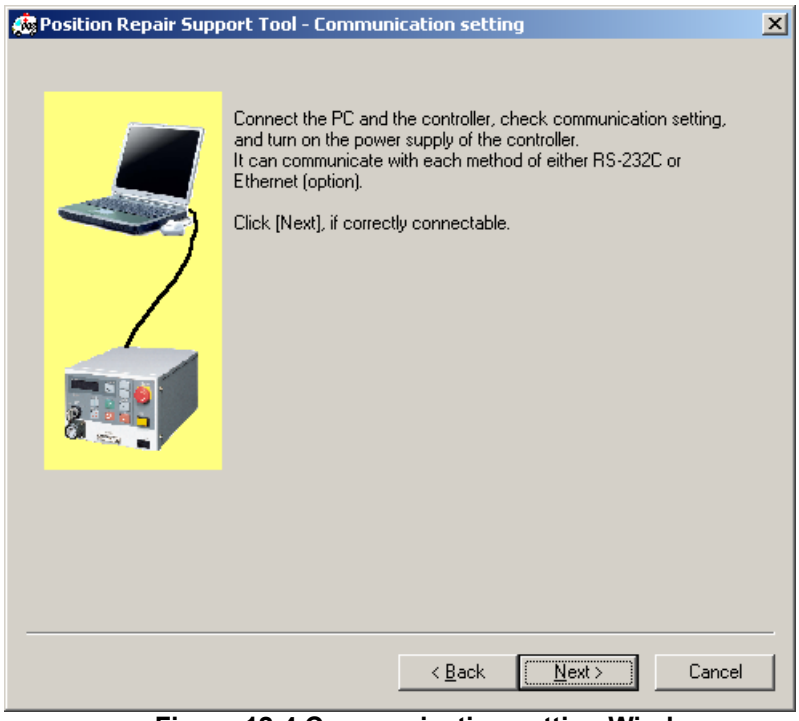


Figure 12-4 Communication setting Window

Check the communication server setting. While connected to the robot controller, click [Next]. Please see **"2.3.3. Communication Setting "** on how to perform the setting.

12.6. Select the Robot and Backup Parameters

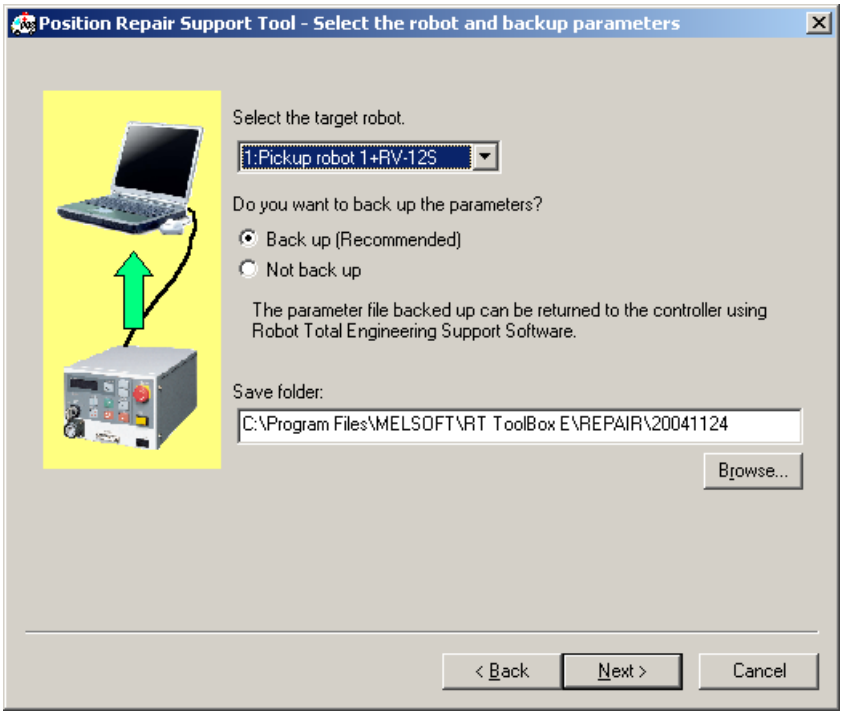


Figure 12-5 Select the robot and backup parameters Window

Select the robot to execute the re-teaching.
Robot is displayed as follows.

Controller number : Controller Name + Mechanism Name #Mechanism No.

Displayed only in multi-mechanism mode

If you wish to perform parameter backup, select [Back up] and specify the Save folder. Stored parameter file can be retrieved into the robot controller using the “Backup/Restore” in the "**RT ToolBox** Robot Total Engineering Support Software".

Click [Next] when ready to proceed.

Memo

Parameter Backup

During its operation, this software overwrites parameters to the robot controller.
It is recommended that the parameters be backed up at this point to allow the controller to revert to the original parameters.

12.7. Select Generation Procedure of Revision Parameter

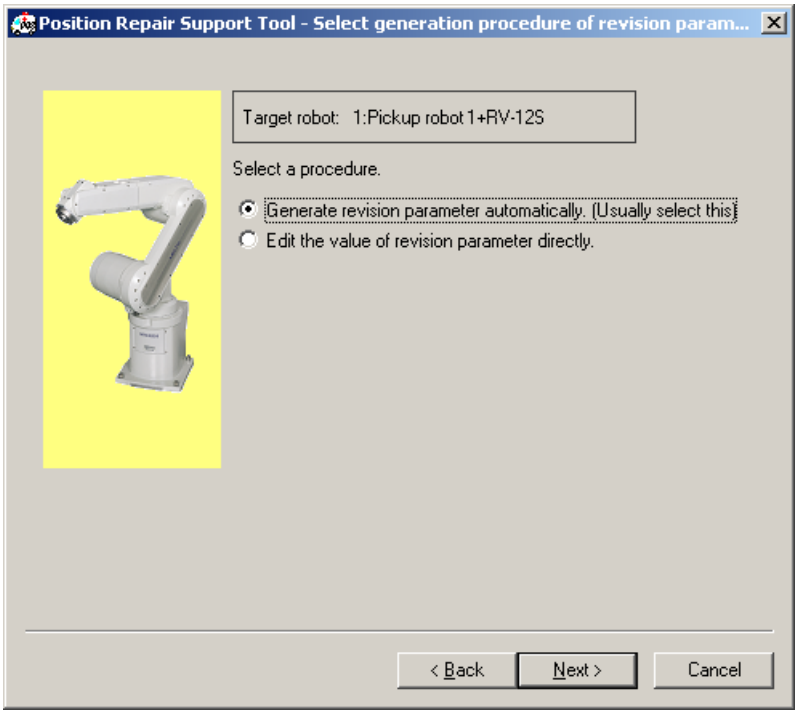


Figure 12-6 Select generation procedure of revision parameter Window

In the next step, the software can either automatically generate parameters or accept manually entered parameter values. Normally, [Generate revision parameter automatically] is selected.

Select [Generate revision parameter automatically] and click [Next] to proceed to **"Select Program"** window.
Select [Edit the value of revision parameter directly] to proceed to **"Edit Revision Parameter"** window.

12.8. Select Program

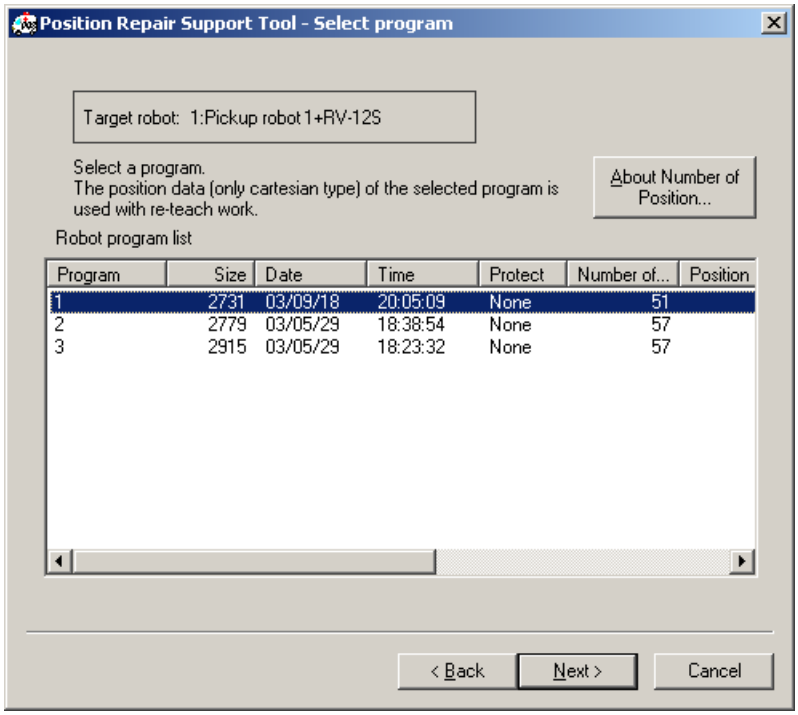


Figure 12-7 Select Program Window

Select the robot program to be used for revision parameter generation and click [Next].

Re-teaching will be performed using the position data of orthogonal coordinate system of the selected program.

See **"Table 12-3 Selecting Revision Parameters"** on the number of required position data.

Memo

The points on selecting the program

Select the program with the positions of various location and posture.

Moreover, Higher accuracy of revision parameters can be obtained by selecting the following type of position data program.

* Program with positions that are easy to re-teach
* Program with positions that require high precision

12.9. Read and Backup Program

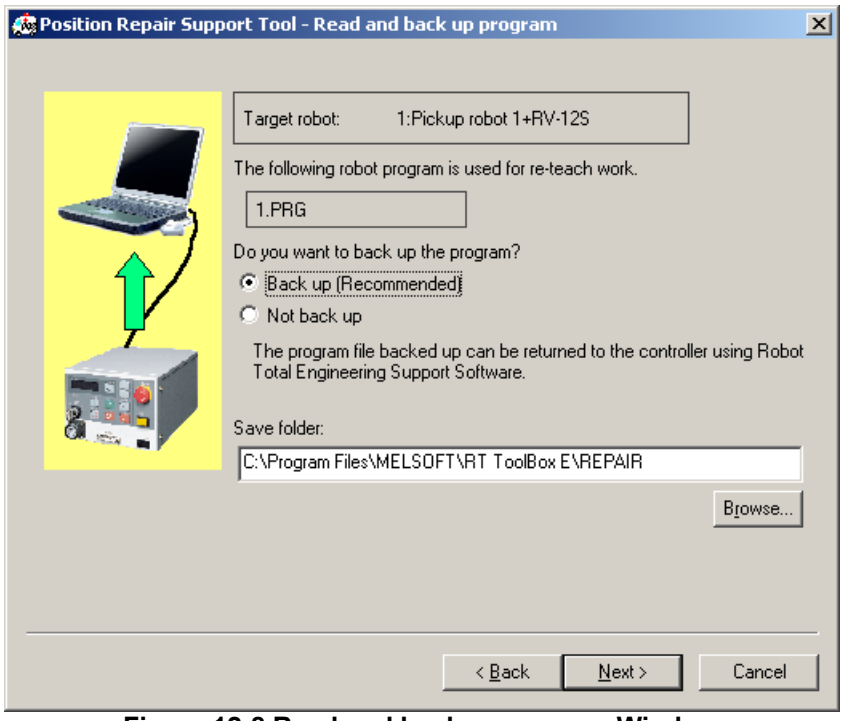


Figure 12-8 Read and backup program Window

To back up a program, select [Back up] and specify the Save folder. Stored program file can be retrieved into the robot controller using the “Program Manager” in this software.

Click [Next] when ready to proceed.

Memo

Robot Program Backup

During its operation, this software may overwrite robot controller program (position data).

It is recommended that the program be backed up at this point to allow the controller to revert to the original program.

12.10. Check of Setting Tool

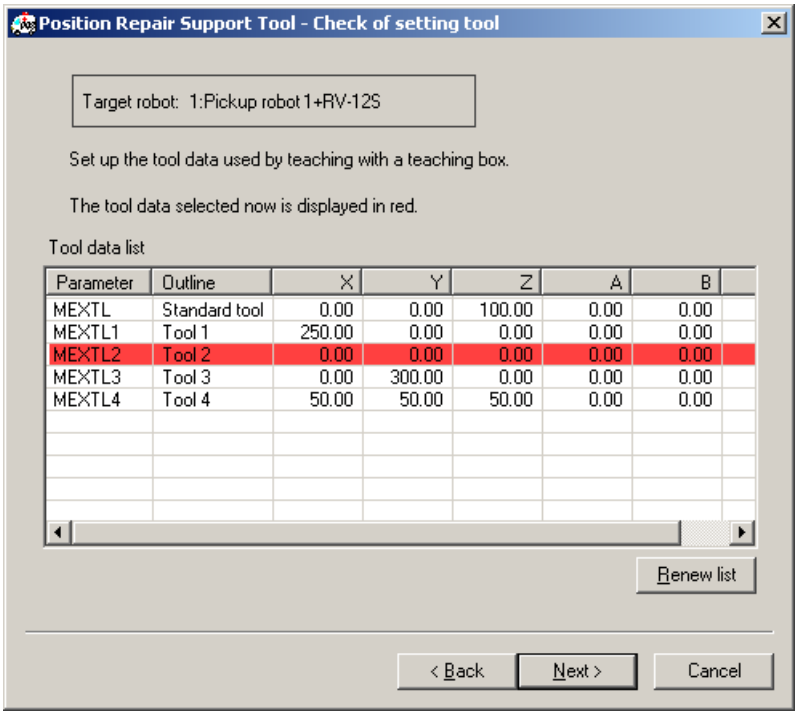


Figure 12-9 Check of setting tool Window

Parameter values set in the present robot controller for tool data are displayed. The row for the tool selected by the tool number (MEXTLNO) is highlighted in red.

Please check if the tool data and tool number used during teaching is set.

If necessary, change the value from parameter setting in teaching box. Click [Renew List] to update the contents of the display.

(If the robot controller's version is older than **J2**, only the standard tool (MEXTL) will be displayed.)

Click [Next] when ready to proceed.

⚠ CAUTION

Do not change tool data or base data.

After this window, do not change tool data or base data.

If they are changed during re-teaching operation, re-teach calculation cannot be done correctly.

When correcting tool data, if teaching was performed switching back and forth between multiple tools, perform re-teaching operation for each tool.

12.11. Select Revision Parameter

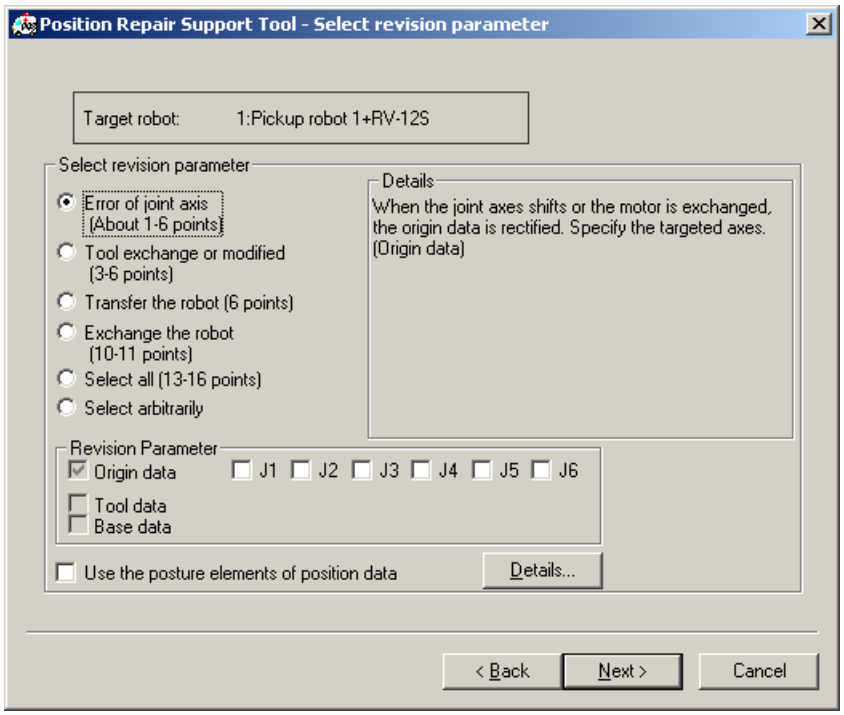


Figure 12-10 Select Revision Parameter Window

Select the revision parameter that becomes the target for re-teaching calculation.

Revision parameter will be selected automatically if an item is selected from [Select revision parameter].
Choose [Select all] to select all the revision parameters. If you wish to specify a particular combination of revision parameters, choose [Select arbitrarily] and specify the revision parameters.

Vertical 6-axis robot	If the robot controller's version is older than **J2**, only [Error of joint axis] can be selected.
Vertical 5-axis robot	If the robot controller's version is older than **K1**, only [Error of joint axis] can be selected.
Horizontal 4-axis robot (RH-SH series only)	Any versions prior to **K4** are not available. (This function cannot be used for the RH-AH series robot.)

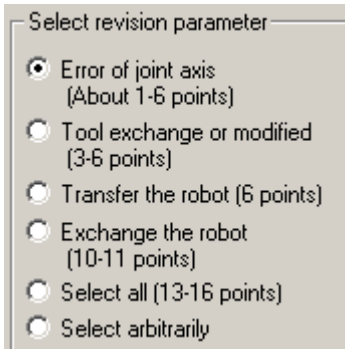
Click [Details] to see the description of the difference between checking and not checking [Use the posture elements of position data].

In the following section, details regarding revision parameters and posture elements of position data are explained.

After choosing the revision parameters, click [Next].

12.11.1. About Revision Parameters

The following table describes the parameters to be revised based on the item selected in **"Select Revision Parameter"** window.



Memo

Some elements cannot be calculated according to the robot type and the combination of revision parameters.

In this function, the amount of the gap of the robot is calculated as a correction value, and the revision parameter is generated. However, some elements cannot be calculated (the value becomes 0) as the following two kinds of cases.

*** The case which cannot be calculated by the limits of degree of freedom of robot**

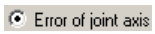
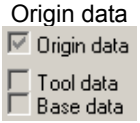
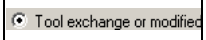
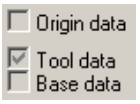
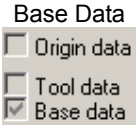
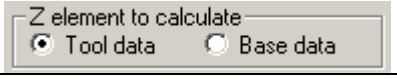
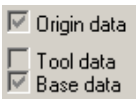
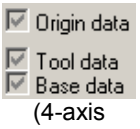
Some elements of revision parameter cannot be reflected because the Vertical 5-axis robot and horizontal 4-axis robot have the limitation.

*** The case which condensed by the combination of robot mechanism and revision parameter**

Some elements of revision parameter become the value on the same rotation axis according to the combination of robot mechanism and revision parameter. In such case, calculated value of gap is condensed to the one element of revision parameter.

At this case, though the other element becomes 0, it condenses in other elements and it is corrected. So it is not necessary to reflect it again.

Table 12-3 Selecting Revision Parameters

No.	Item	Description	Revised Parameter	Minimum number of teach points		
				Vertical 6-axis robot	Vertical 5-axis robot	Horizontal 4-axis robot
1	Error of joint axis 	Rectifies origin data when joint axis moves or when motor is replaced. Specify the target axes using the check boxes. The number of teaching points is different according to how the axis was specified.	Origin data 	1 to 6 points	1 to 5 points	1 to 4 points
2	Tool exchange or modified 	Rectifies attachment error when robot tool is exchanged. In addition, rectifies tool data error when the tool is transformed due to interference between robot and peripheral devices. **Vertical 5-axis robot:** * Only Z element of position data is corrected.	Tool data 	3 to 6 points	1 point	3 to 4 points
3	Transfer the robot 	Rectifies base data of robot position setup when the robot is transferred to another location. **Vertical 5-axis robot:** * Only X, Y, Z elements of position data are corrected.	Base Data 	6 points	3 points	4 points
4	Exchange the robot 	When robot is exchanged with the tools on, rectifies origin data error and base data of robot position setup. Only for horizontal 4-axis robot, attachment error is also rectified. **Vertical 6-axis robot:** * Origin data J1 is included in base data. **Vertical 5-axis robot:** * As to base data, only X, Y, Z elements are corrected. **Horizontal 4-axis robot:** * Origin data J1 and J3 are included in base data. * Origin data J3 and J4 are included in tool data. * Select which to be requested because Z elements of tool data and base data are not corrected at the same time. 	Base data Origin data Tool data (4-axis robot only)  (5-axis and 6-axis robot)  (4-axis robot)	10 to 11 points	7 to 8 points	7 to 8 points

No.	Item	Description	Revised Parameter	Minimum number of teach points		
				Vertical 6-axis robot	Vertical 5-axis robot	Horizontal 4-axis robot
5	Select all Select all	Selects all revision parameters. **Vertical 6-axis robot:** * Origin data J1 is included in base data. * Origin data J6 is included in tool data. **Vertical 5-axis robot:** * As to tool data, only Z element is corrected. * As to base data, only X, Y, Z elements are corrected. **Horizontal 4-axis robot:** * Origin data J1 and J3 are included in base data. * Origin data J3 and J4 are included in tool data. * Select which to be requested because Z elements of tool data and base data are not corrected at the same time. Z element to calculate: Tool data / Base data	Origin data Tool data Base data Origin data Tool data Base data	13 to 16 points	8 to 9 points	7 to 8 points
6	Select Arbitrarily Select arbitrarily	Specify revision parameters. **Vertical 6-axis robot:** * Since origin data J1 is included in base data, if base data is selected, turn off the Checkbox of origin data J1. * Since origin data J6 is included in tool data, if tool data is selected, turn off the Checkbox of origin data J6. **Vertical 5-axis robot:** * As to tool data, only Z element is corrected. * As to base data, only X, Y, Z elements are corrected. **Horizontal 4-axis robot:** * If base data is selected, turn off the Checkboxes of origin data J1 and J3. Origin data J1 and J3 are included in base data. * If tool data is selected, turn off the Checkboxes of origin data J3 and J4. Origin data J3 and J4 are included in tool data. * If tool data and base data are selected together, select which Z element to be requested, because Z elements of tool data and base data are not corrected at the same time. Z element to calculate: Tool data / Base data				

* Revision parameter names correspond to the following.
  Origin data: DJNT
  Tool data: MEXDTL, MEXDTL1 to 4 (Parameter of the tool selected by tool number)
  Base data: MEXDBS

12.11.2. About Posture Elements of Position Data

Position data of MELFA-BASIC IV consists of tip position (X, Y, Z) and tip posture elements (A, B, C) (*1). This section describes the cases where [Use the posture elements of position data] is checked and not checked.

Memo

(*1) The posture elements of position data

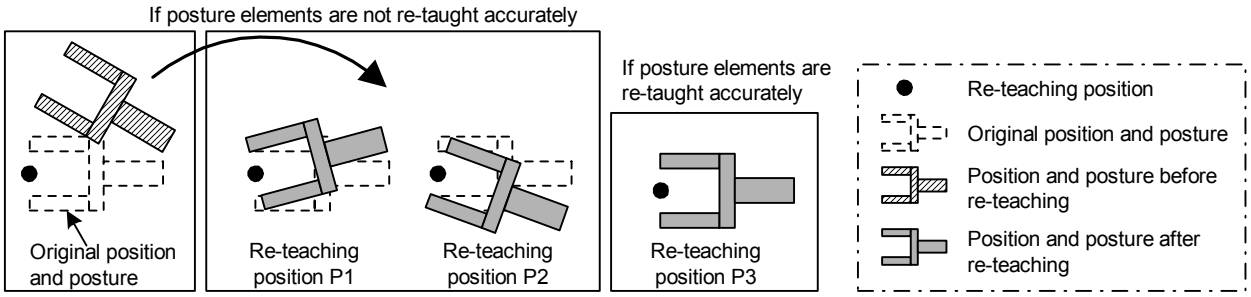
In case of the vertical 6-axis robot, the posture elements of position data are (A, B, C).
In case of the vertical 5-axis robot, the posture elements of position data are (A, B).
In case of the horizontal 4-axis robot, the posture element of position data is (C).

(1) [Use the posture elements of position data] is checked ☑ Use the posture elements of position data

Not just the robot tip position (X, Y, Z) but also the tip posture elements are used for position correction calculation.

Precision of generated revision parameter improves if the tip posture elements are also re-taught correctly.

However, if the tip posture elements are not re-taught correctly, as shown in the diagrams below (re-teaching positions P1 and P2), error occurs in position correction calculation, decreasing the precision of the calculation result.



(2) [Use the posture elements of position data] is not checked ☐ Use the posture elements of position data

Posture elements in the position data taught during re-teaching are not used for position correction calculation.

If it is not necessary to match exactly the tip posture elements during re-teaching, clear the checkbox [Use the posture elements of position data]. In such case, position correction calculation is performed using only the tool tip position data (X, Y, Z), ignoring the error from posture deviation. This increases the precision of location correction.

However, there are certain restrictions. Please refer to the following **"Table 12-4 About Posture Elements of Re-teaching Position Data"** for details.

Table 12-4 About Posture Elements of Re-teaching Position Data

Condition	Merit	Note
When using posture elements of position data	Precision of generated revision parameter improves if the tip position (X, Y, Z) and tip posture elements are re-taught correctly.	During re-teaching, posture must be taught correctly. If posture data is incorrect, ***precision of revision parameter actually decreases.***
When not using posture elements of position data	During re-teaching, revision parameters can be generated simply by correctly teaching position (X, Y, Z). (Posture elements need not be accurate.)	**In case of the vertical 6-axis robot :** * Posture elements (A, B, C) of tool revision parameters cannot be obtained. * J6 axis of origin revision parameter cannot be obtained if both X and Y components of the tool parameter are 0.0.
		In case of the vertical 5-axis robot : * J6 axis of origin revision parameter cannot be obtained.
		In case of the horizontal 4-axis robot : * Posture elements (C) of tool revision parameters cannot be obtained. * J4 axis of origin revision parameter cannot be obtained if both X and Y components of the tool parameter are 0.0.

12.12. Re-teach Work

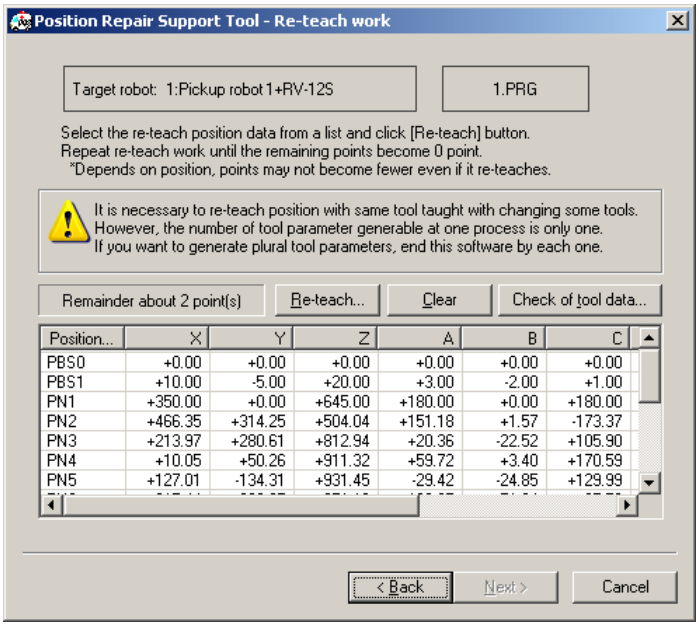


Figure 12-11 Re-teach work Window

[Remainder] Displays the number of remaining points until revision parameters are generated. However, at some positions, re-teaching may not decrease the number of remaining points.
[Re-teach] button Specifies the positions selected in the list and opens **"Re-teach the position"** screen.
[Clear] button Clears the re-teaching information for positions selected in the list.
[Check of tool data] button Displays current tool data setting in the robot controller.

⚠ CAUTION

Position data of the targeted program is write-protected.

During showing this window, the position data of the targeted program in the controller is write-protected. If this tool is interrupted when not communicating with the controller, the position data cannot be unprotected. Please release the protect by using the Teaching Box or Program manager of this software.

Position data for the program selected are displayed.
Select the position to re-teach from the list and repeat re-teaching to generate revision parameters.

Re-teaching work procedure can be described as follows. While the "Re-teach the position" screen is open, move the robot to the re-teaching position and click the [Load current position] button on the screen.

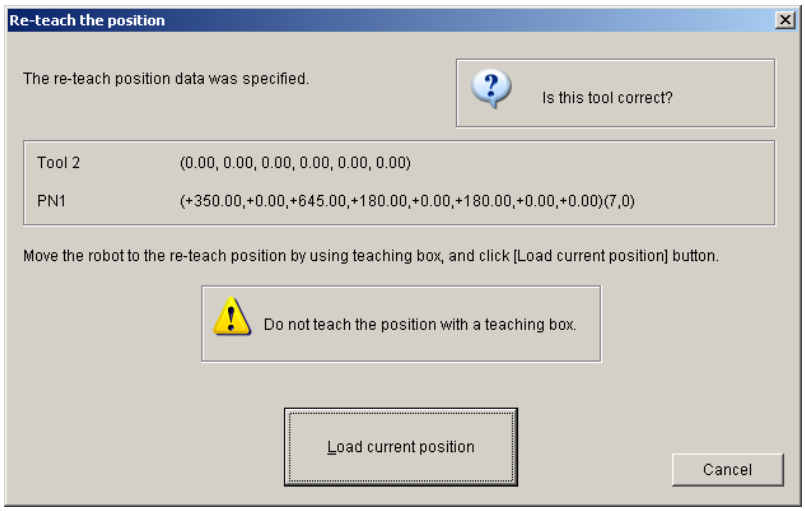


Figure 12-12 Re-teach the Position Screen

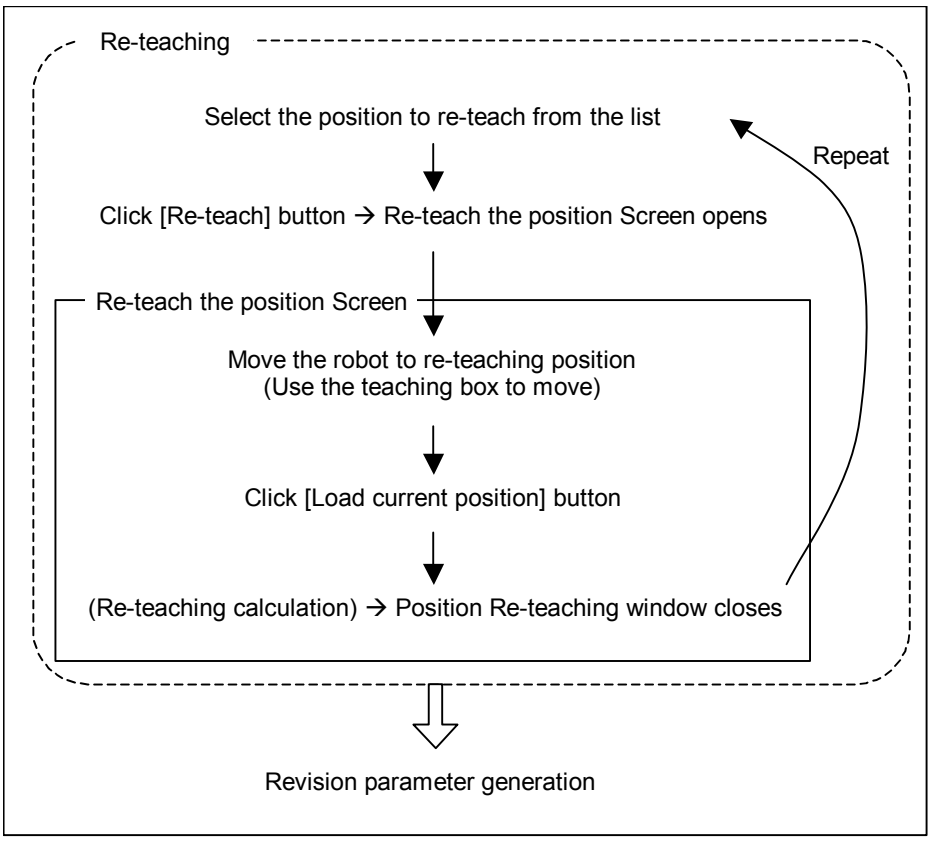


Figure 12-13 Re-teaching Work Procedure

Row for re-taught position will be highlighted in light blue.
Re-teaching does not change the position data values shown in the list.

⚠ CAUTION

Do not perform position correction using the teaching box.

When you move the robot to the re-teaching position using the teaching box, be careful not to correct the position.

During re-teaching, position data of the applicable program in the controller is write-protected.

⚠ CAUTION

Do not change tool data, tool number, or base data.

Do not change tool data, tool number, or base data during re-teaching. Re-teaching calculation will not be performed correctly.

When correcting tool data, if teaching was performed switching back and forth between multiple tools, perform re-teaching operation for each tool.

⚠ CAUTION

Select position data with a different posture element, when re-teaching two or more positions.

Select position data with a different posture element, when re-teaching two or more positions.

When position data of the same posture element are selected, there is a possibility that the parameter is not correctly calculated.

⚠ CAUTION

The cautions when using a robot with the additional axis .

Please re-teach at the position in which the additional axis is same as the original position when re-teaching by a robot with the additional axis. Otherwise, re-teaching calculation will not be performed correctly.

It is possible to change the revision parameters to be generated.
Go back one step to the **"Select revision parameter"** window to change the setting. Note that if you return one more step to **"Check of setting tool"** window, all information set by re-teaching work will be cleared.

⚠ CAUTION

When go back to "Check of setting tool" window, all information set by re-teaching work will be cleared.

12.13. Write Parameters

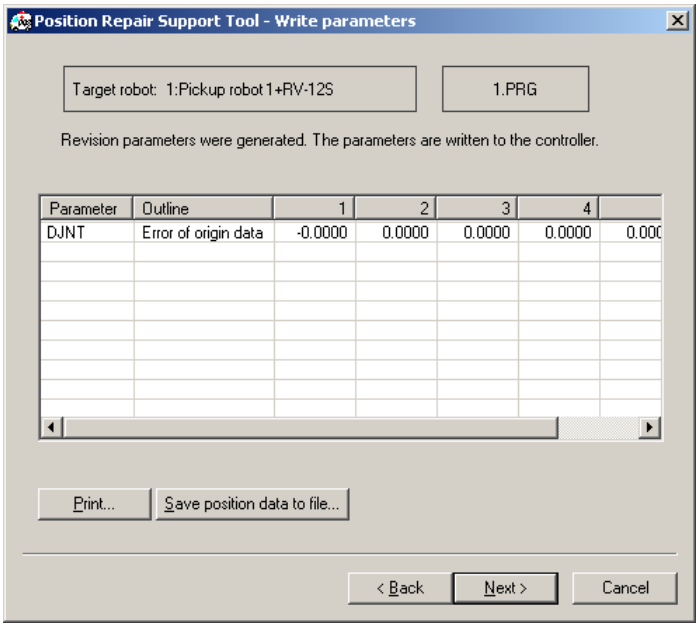


Figure 12-14 Write Parameters Window

[Print] Prints the revision parameter information displayed in the list.
[Save position data to file] Saves position data used in re-teaching as a robot program with positions only. Position data will be values converted by the revision parameters.

Revision parameters and their values generated by re-teaching are displayed.
Click [Next] button to write the parameters into the robot controller.

⚠ CAUTION

If revision parameters could not be generated

If revision parameters could not be generated, parameters are not displayed in the list.
If you click the [Next] button, position data used in re-teaching is written into the robot controller. Since parameters are not generated, position data will not be converted.

Parameters may not be generated under the following conditions.
* When one of the specified re-teaching positions is of a significantly low precision
* When one of the original position data is of a significantly low precision
* When the difference between the original position data and the re-teaching position is too large
* When tool data or base data was changed during re-teaching

Clicking the [Back] button and redoing a part of the re-teaching may generate revision parameters. Please delete the re-teaching information for the position data that meets one of the criteria mentioned above and perform re-teaching again.

12.14. Re-start the Power Supply of the Controller

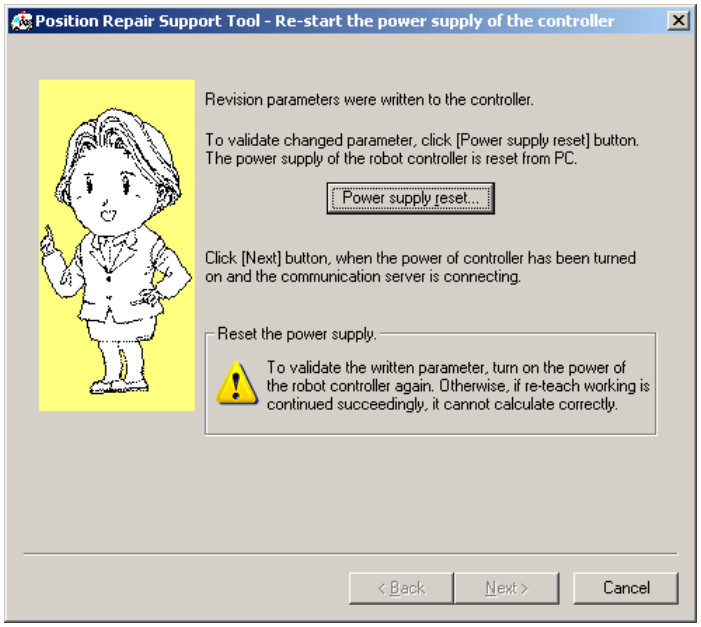


Figure 12-15 Re-start the power supply of the controller Window

To activate the written parameters, turn off and then turn on the power of robot controller.

Click the [Power supply reset] button to reset the robot controller from the personal computer.

(If the robot controller's version is older than **J2**, robot controller cannot be reset from the personal computer. In this case, operate the controller power manually.)

⚠ CAUTION

Controller Power Reset

Check the surroundings for safety before resetting the robot controller power from the personal computer.

12.15. Finish

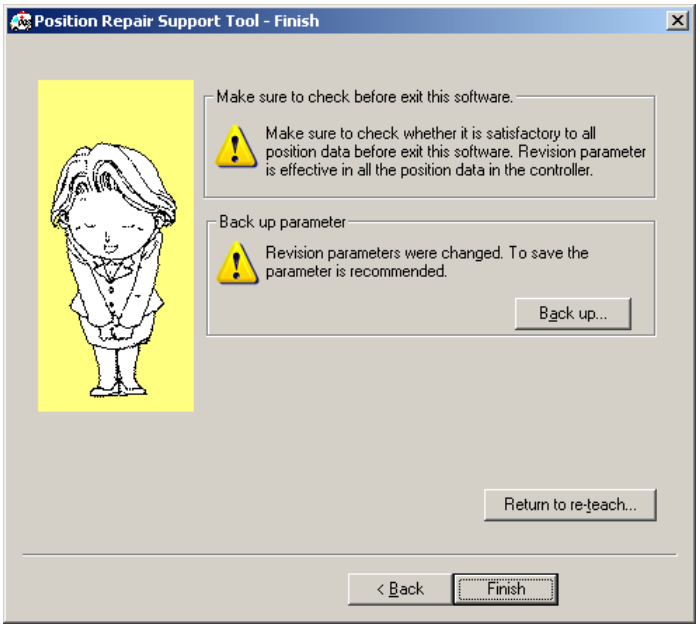


Figure 12-16 Finish Window (After Re-teaching)

When the writing of revision parameters is done, operation of this software is complete.

⚠ CAUTION

Perform an operation check before exit this software.

Before exit this software, make sure that all position data works properly.
If revision is not correct, click the [Return to re-teach] button to continue re-teaching. (However, if you exited from “Edit revision parameters” window, [Return to re-teach] button will not be shown.)

⚠ CAUTION

Back up the parameters.

This software has changed the revision parameters. Back up the parameters before exit this software.

⚠ CAUTION

Position data close to operation area boundaries may not be rectifiable.

Around the operation area boundaries, position error may put a point outside the operation area, in which case this software cannot rectify the point.

12.16. Edit Revision Parameters

This window is displayed if [Edit the value of revision parameter directly] is selected in **"12.7 Select Generation Procedure of Revision Parameter"**.

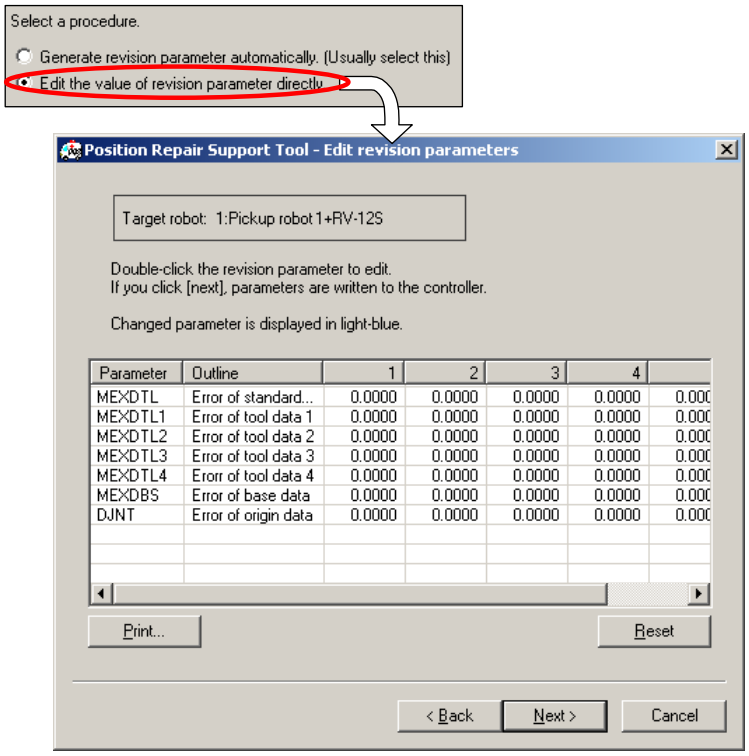


Figure 12-17 Edit Revision Parameters Window

[Print] Prints the revision parameter information displayed in the list.
[Reset] Resets all changes.

Displays values of current revision parameters in the robot controller.
Select parameter from the list and double-click it to display the setting screen. Set the parameter values.
(If the robot controller's version is older than **J2**, only the origin revision parameter (DJNT) is shown.)

Click [Next] to write all parameters into the robot controller and proceed to **"Re-start the Power Supply of the Controller"** window.

13. Maintenance Forecast

In Maintenance Forecast, the parts replacement (grease replenishment, battery and belt replacements) times can be checked from the up-do-date operating data collected inside the controller.

⚠ Caution

The results of calculations in Maintenance Forecast merely show reference values.

Please execute the daily inspection and the periodic inspection to prevent the breakdown beforehand, and to secure safety.

13.1. Specification

The following lists the software versions and models of the robot controllers supported by this software:

Table 13-1 Supported models and software versions

No.	Robot	This software	Robot controller
1	RV-12S series RV-6S series	Ver. **E1** or later	Ver. **J2** or later
2	RV-3S series RV-3SJ series		Ver. **K1** or later
3	RH-6SH series RH-12SH series RH-18SH series		Ver. **K4** or later

13.2. Start

After verifying the connection with the robot controller, click the [>>] button on the main menu to expand the menu, and then select [Maintenance Forecast]. The Maintenance Forecast window appears.

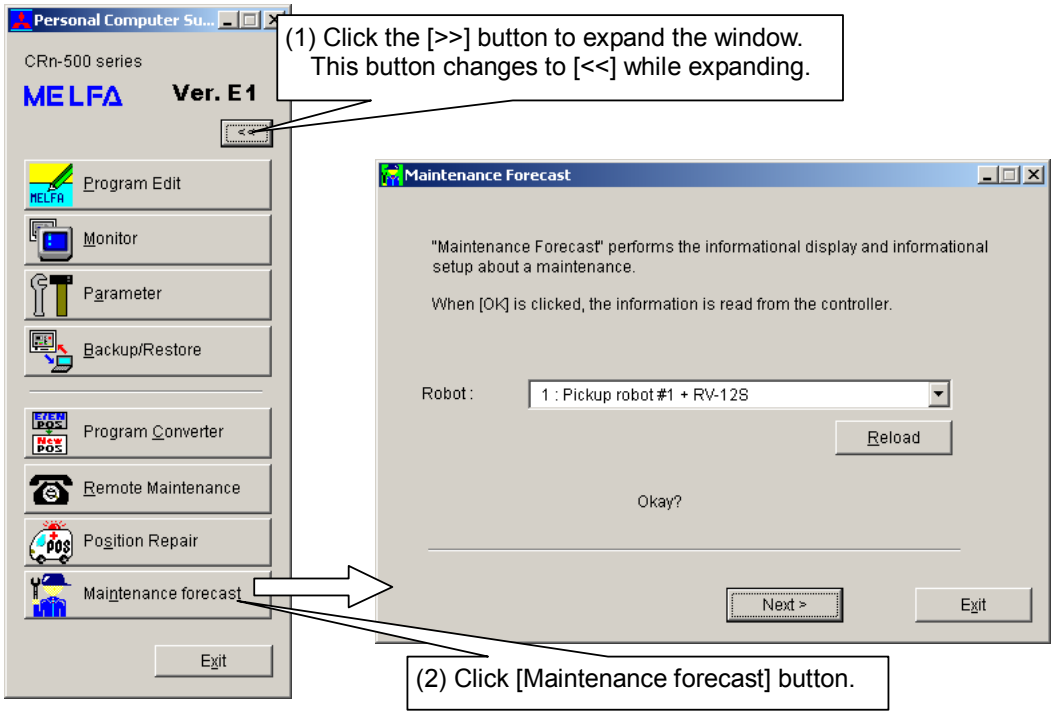


Fig. 13-1 Maintenance Forecast

13.3. Select the target controller and robot

Select the target controller and robot in the Maintenance Forecast window. The controller being connected to [Robot] in the windows are displayed together with its model name. Verify the controller and its model, and then click the [Next>] button in the lower area of the window.

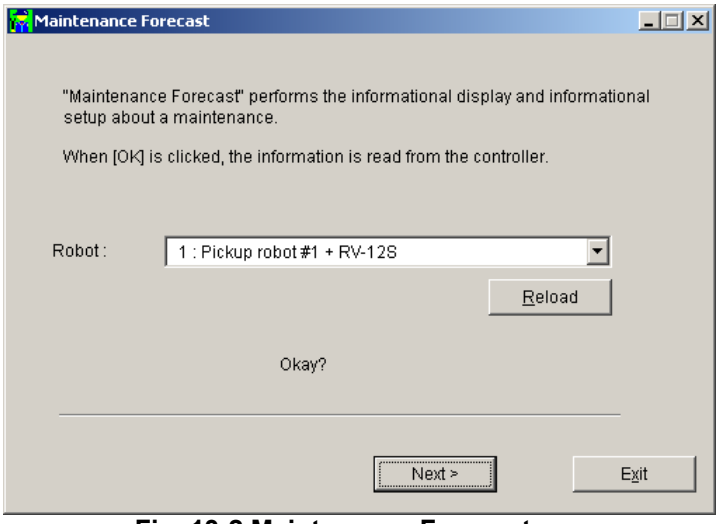


Fig. 13-2 Maintenance Forecast

When the [Reload] button is clicked, the information about the controller being connected and its model is updated.

13.4. Forecast (Battery)

When the information for Maintenance Forecast has been loaded from the controller, the Forecast window (initially, the [Battery] information) appears.

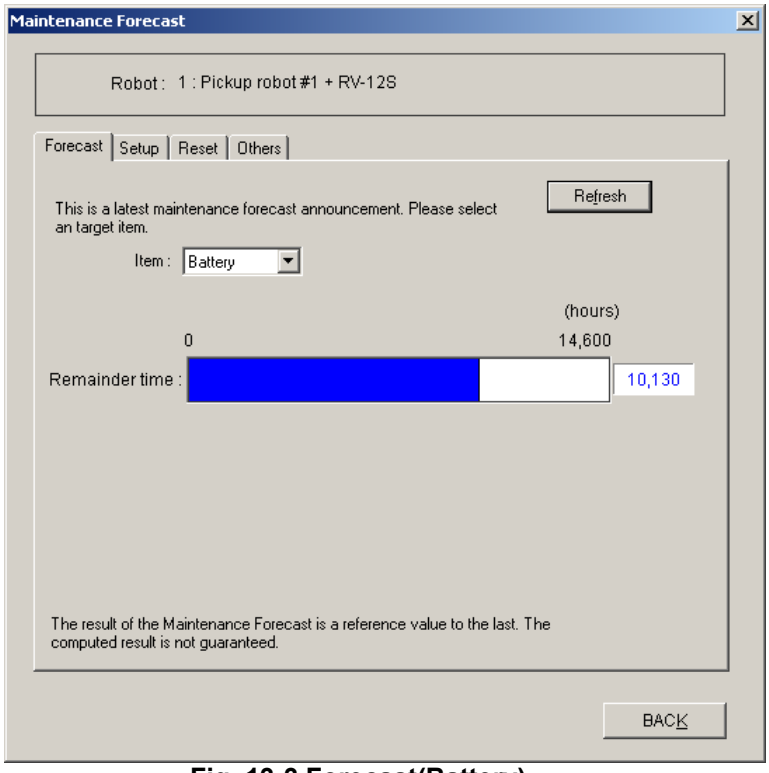


Fig. 13-3 Forecast(Battery)

If the number of remaining hours of battery life has reached
(Remainder time) < [The remainder days until presumed maintenance time] on the Setup screen)
x (24 - [Operation time of a day])
, the hours and bar graphs are displayed in orange.
(The battery replacement time is calculated during the time when the controller's power is not on.)

When the [Refresh] button is clicked on in upper-right corner of the window, the information about the maintenance is acquired again from the controller.

Here, the battery and belt replacement times as well as the grease replenishment time can be checked. To switch between displays, select the applicable item in the Item combo box.

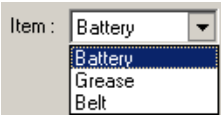


Fig. 13-4 Changing an Item

13.5. Forecast (Grease)

When [Grease] is selected in Item, the "hours until grease replenishment time" can be checked for each axis.

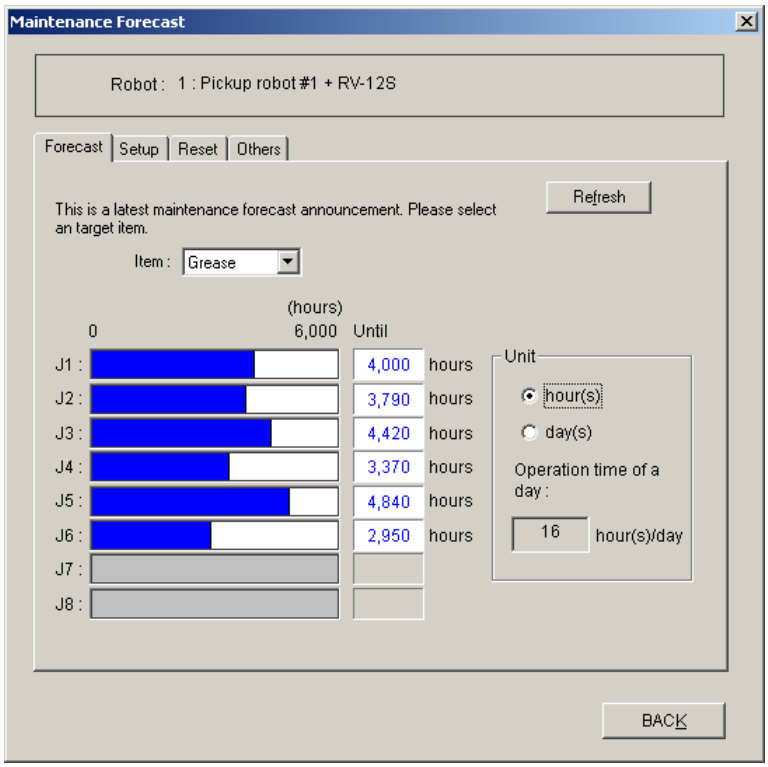


Fig. 13-5 Forecast(Grease)

The “Operation time of a day” can be set on the Setup screen. 

If the hours until replenishment time has reached
(Hours until replenishment time)
< ([The remainder days until presumed maintenance time] on the Setup screen)
x ([Operation time of a day]),
the hours and bar graphs are displayed in orange.

The display unit setting can be switched between time and day.
If day is selected in the display unit setting, the display will show the number of days in operation based on the operating hours per day.

When the [Refresh] button is clicked on in upper-right corner of the window, the information about the maintenance is acquired again from the controller.

13.6. Forecast (Belt)

When [Belt] is selected in Item, the "hours until belt replacement time" can be checked for each axis.

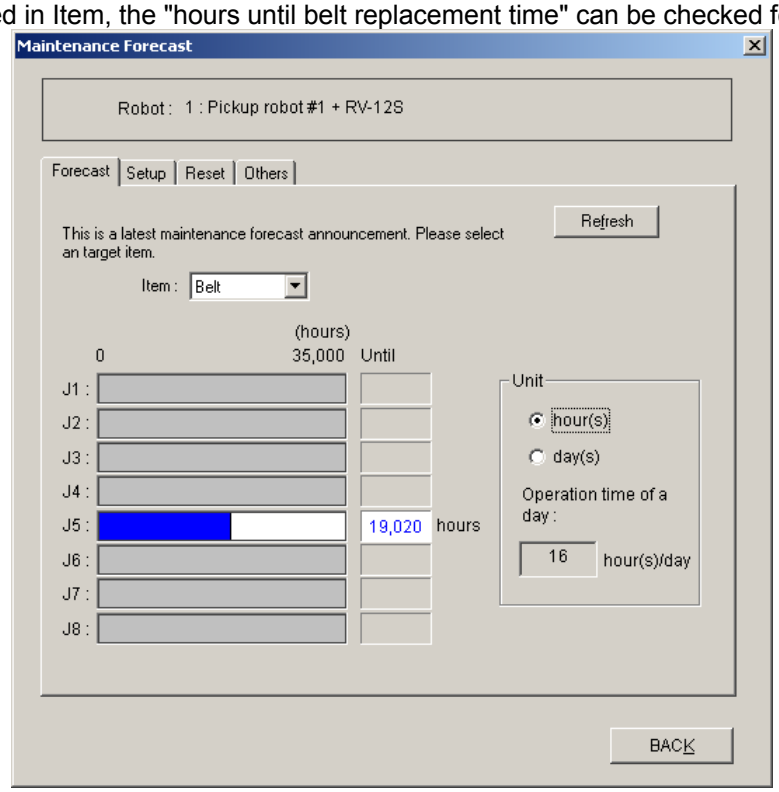


Fig. 13-6 Forecast (Belt)

The “Operation time of a day” can be set on the Setup screen. 

If the hours until belt replacement time has reached
(Hours until belt replacement time)
< ([The remainder days until presumed maintenance time] on the Setup screen)
x ([Operation time of a day]),
the hours and bar graphs are displayed in orange.

The display unit setting can be switched between time and day.
If day is selected in the display unit setting, the display will show the number of days in operation based on the operating hours per day.

When the [Refresh] button is clicked on in upper-right corner of the window, the information about the maintenance is acquired again from the controller.

13.7. Setup

Click the Setup tab.
Here, the timing to collect the information for Maintenance Forecast, the notification method and other items can be set up.

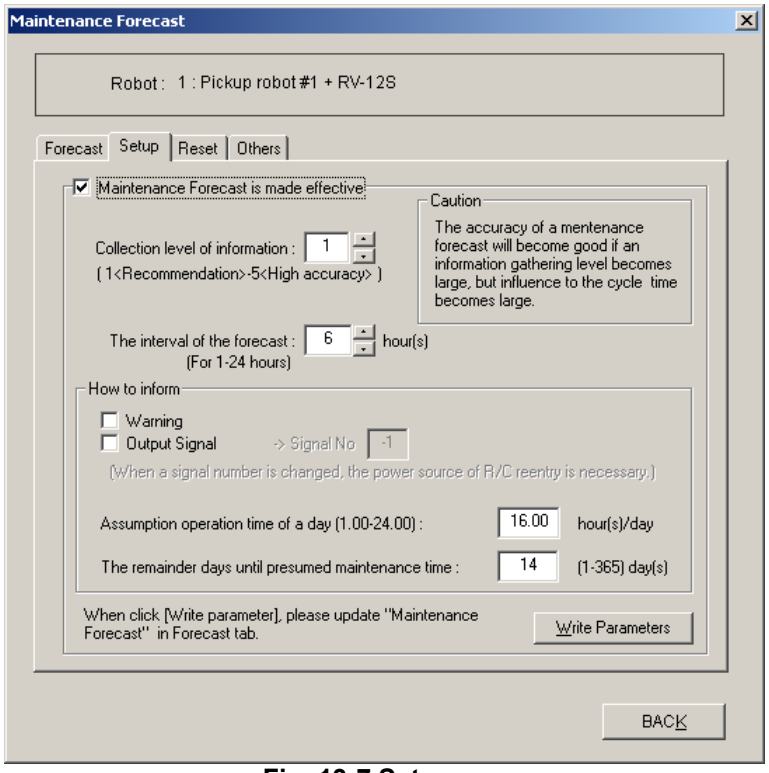


Fig. 13-7 Setup

When the [Write Parameters] button is clicked after setting each item, the setting values are written into the controller. All items other than the signal numbers of dedicated outputs take effect after they are written into the controller. If a dedicated output signal has been changed, it is necessary to power on the controller again.

For more information about the setup items, see **"Tab. 13-2 Description of the Setup Screen"**

⚠ Caution

Information needed to "Maintenance Forecast" is not accumulated while the Maintenance forecast is being invalidly set.

Factory preset value is invalidity. When the Maintenance Forecast is invalidated, information of Maintenance Forecast is not accumulated. When switched effectively from invalidity again, the reservoir of information is continued from the last value. If you have invalidated the Maintenance Forecast for a long term, the correct maintenance times cannot be calculated.

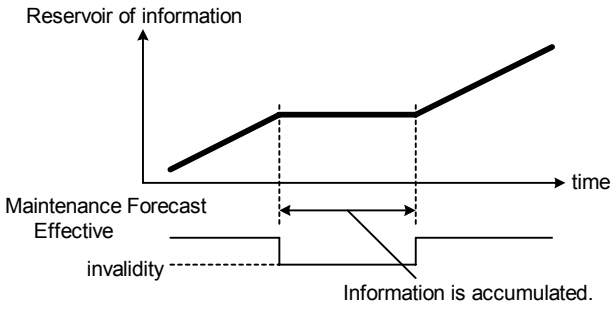


Table 13-2 Description of the Setup Screen

Item	Explanation	Factory preset value
(1) Maintenance Forecast is made effective.	If this is checked, the Maintenance Forecast function takes effect. * If a checkmark is removed, the collection of the information for Maintenance Forecast stops, and the correct maintenance times cannot be calculated.	Check ON
(2) Collection level of information	Five levels can be specified to collect the information about the maintenance. * As an information collection level gets higher, the accuracy of the maintenance improves, but it affects the tact time more.	1 (Recommended)
(3) The interval of the forecast	Specify the interval to notify the maintenance time.	6 hours
How to inform	When the grease replenishment, belt replacement and other maintenance times have reached, they can be notified by generating a warning or outputting a dedicated signal. As for the battery replacement time, one of warnings, C7500, C7510 and C7520, is generated, regardless of whether or not [Warning] under [How to inform] is checked. A warning to be generated varies depending on each situation.	
(4) Warning	If this item is checked, the maintenance time is notified as a warning. The warning numbers are listed as follows: Grease : C753* (* is the axis No.) Belt : C754* (* is the axis No.)	Check ON
(5) Output Signal	If this item is checked, signal numbers can be entered. If this item is checked and a signal number is entered correctly, the maintenance time is notified using the output of the designated signal.	Check OFF
(6) Assumption operation time of a day	Enter an estimated robot operation hours per day.	16 hours
(7) The remainder days until presumed maintenance time	Specify the number of days remaining until presumed maintenance time to be used as a reference to notify the maintenance time.	14 days

Memo

Methods for resetting the alarm and alarm signal output

As a method of notifying the replacement time of each part, an alarm (C753* and C754* (* represents the axis number)), or a dedicated output signal (M*PTEXC (* represents the robot number)) will be output.

If both are set up as the notification methods, executing the error reset operation will reset the alarm and end the signal output.

If the “alarm” method is disabled and only the output of the dedicated output signal is selected as the notification method, pushing the reset button on the front side of the controller will not end the signal output. In this case, push the [ERROR RESET] key on the teaching box or enter the error reset signal (ERRRESET) to end the signal output.

Notification method setting		Notification method	Methods to reset the notification (alarm or dedicated signal output)		
Warning	Output Signal		[RESET] key on the front of the controller	[ERROR RESET] key on the T/B	External error reset signal
☑	☐	Alarm	Will reset the alarm	Will reset the alarm	Will reset the alarm
☑	☑	Alarm and dedicated signal output	Will reset the alarm and the dedicated signal output	Will reset the alarm and the dedicated signal output	Will reset the alarm and the dedicated signal output
☐	☑	Dedicated signal output	Will not reset the dedicated signal output	Will ENABLE reset the dedicated signal output	Will ENABLE reset the dedicated signal output

13.8. Reset

The information (about battery, grease and belt) for Maintenance Forecast kept in the controller can be reset.

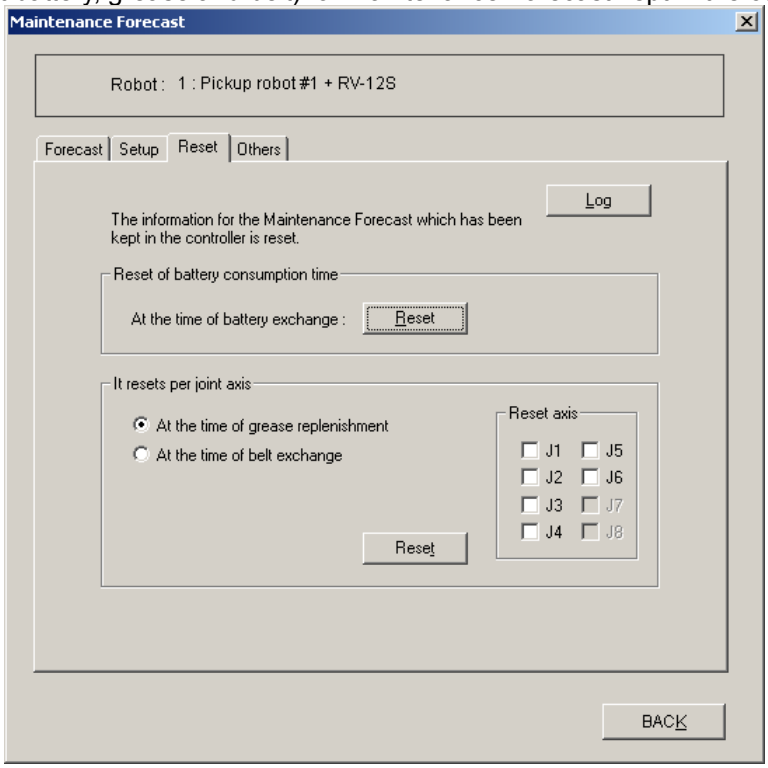


Fig. 13-8 Reset

Table 13-3 Description about each reset

Types of resets	Explanation	Note
At the time of battery exchange	It is used when an alarm urging to replace the batteries (C7500, C7510 or C7520) occurs and the batteries have been replaced. Be sure to reset the battery consumption time after a battery has been replaced.	
At the time of grease replenishment	When an alarm urging to perform periodic inspections and replenish grease (alarm numbers in the 7530s) occurs, replenish the grease and reset the replenished axis.	Axes are reset in units of joint axes. Multiple joint axes can be reset at the same time.
At the time of belt exchange	When an alarm urging to perform periodic inspections and to replace the belt when it is damaged (alarm numbers in the 7540s) occurs, replace the belt and reset the axis for which the belt is replaced.	Axes are reset in units of joint axes. Multiple joint axes can be reset at the same time.

These reset operations can be executed using the teaching box. See the following section for further details.

When the [Log] button is clicked in the upper-right corner of the window, the previous reset date/time and reset count can be checked.

However, the battery reset count is not displayed.

If no reset has not made previously, “----/--/-- --:--:--“ is displayed.

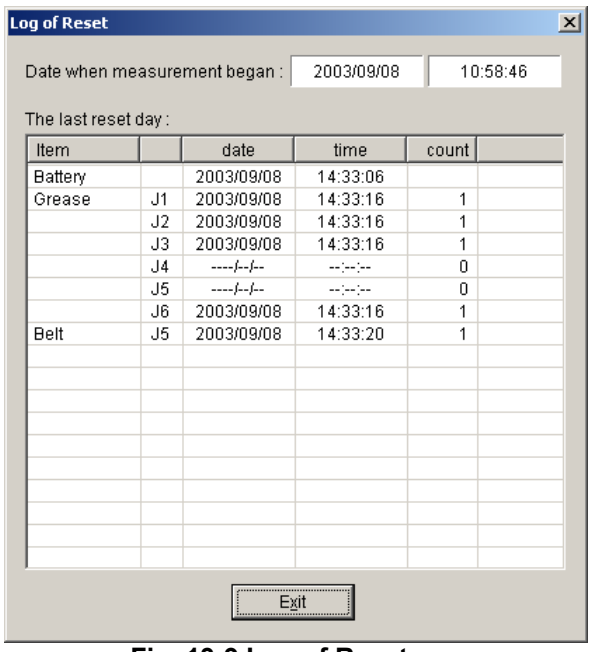


Fig. 13-9 Log of Reset

13.9. Reset the Maintenance Forecast information using the teaching box

When an alarm urges to replace the batteries, replenish the grease, or to replace the belt based on the Maintenance Forecast function and these parts are replaced or replenished, the information that has been accumulated within the controller needs to be reset for the axis where such replacement or replenishment has been performed.

The information that has been accumulated within the controller can be reset using not only this software, but also the teaching box.

13.9.1. Resetting the time of battery consumption

Table 13-4 Resetting the time of battery consumption

	Explanation	Operation
the time of battery consumption	It is used when an alarm urging to replace the batteries (C7500, C7510 or C7520) occurs and the batteries have been replaced. Be sure to reset the battery consumption time after a battery has been replaced.	On the menu screen of the teaching box, press the “5. MAINT” -> “2. INIT” -> “2. Battery” keys.

See “Controller INSTURCTION MANUAL – Detailed explanations of functions and operations” for how to initialize the time of battery consumption using the teaching box.

13.9.2. Resetting the grease and belt information

The grease and belt information can be reset by entering parameters to the controller.
The following is the list of parameter names and the values to be entered.

Table 13-5 Resetting the grease and belt information

	Explanation	Parameter	Value
Grease information	When an alarm urging to perform periodic inspections and replenish grease (alarm numbers in the 7530s) occurs, replenish the grease and reset the replenished axis.	MFGRST	0 : Reset information on all axes 1 to 8 : Reset information on the specified axis
Belt information	When an alarm urging to perform periodic inspections and to replace the belt when it is damaged (alarm numbers in the 7540s) occurs, replace the belt and reset the axis for which the belt is replaced.	MFBRST	

(* These parameters cannot be read not to input all characters in the teaching box.)

The grease or belt information will be reset immediately after a parameter name and the value are entered. (In this case, the controller power does not need to be restarted.) If a value other than 0 is entered, the reset process will be executed for each axis.

Repeat the parameter input operation when resetting information on two or more axes.

Also note that the value read is always 0 regardless of the previously entered value. If you continue the input operation in this state, all axes will be reset. Exercise caution.

See “Controller INSTURCTION MANUAL – Detailed explanations of functions and operations” for how to input parameters using the teaching box.

13.10. Others

The information for Maintenance Forecast kept in the controller can be backed up and/or restored.

Caution

The backup and restore operations are performed when the controller (CPU) is replaced.

When the controller (CPU) is replaced, perform both backup and restore operations in a batch using the Backup/Restore tool. Also, be sure to back up the information for Maintenance Forecast before replacement, and restore the backed up information after replacement.

After the controller (CPU) has been replaced, if the information for Maintenance Forecast is not restored, or it is restored after a substantial time has elapsed since the time of backup, please note that the reliability of Maintenance Forecast will be degraded.

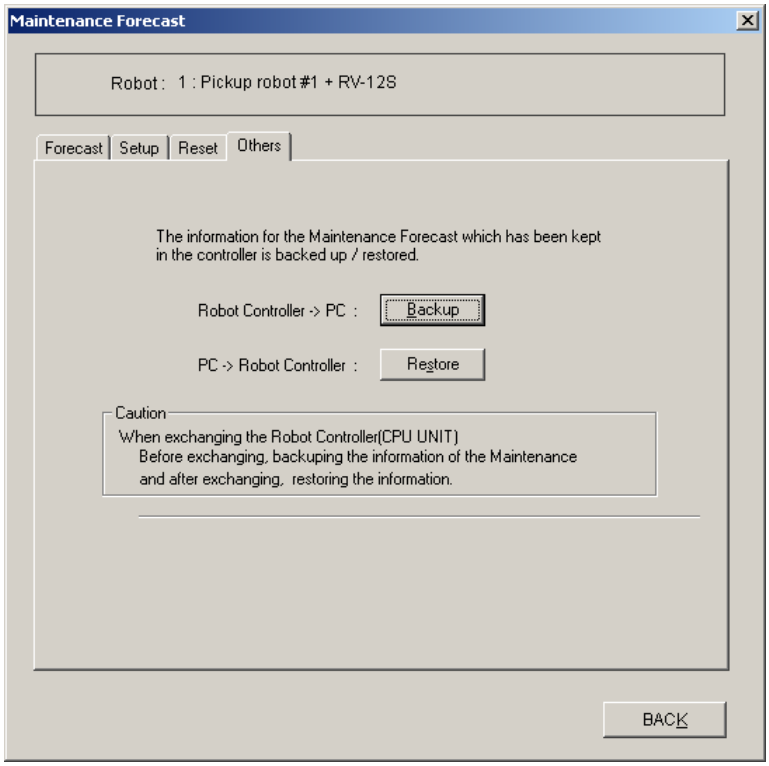


Fig. 13-10 Others

13.11. Exiting the Maintenance Forecast tool

Click the [Back] button displayed in the lower area of the window. The display returns to the initial target robot selection window. Click the [Exit] button in this window.

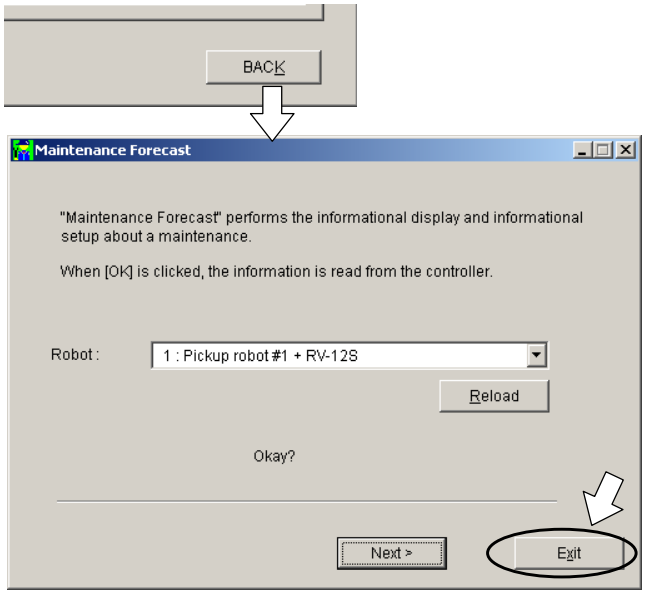


Fig. 13-11 Exiting the Maintenance Forecast tool

14. Setup of the communication middleware “MelfaRXM.ocx”

14.1. Overview

MelfaRXM.ocx is an ActiveX control that communicates with the robot controller.

MelfaRXM.ocx is enclosed by the "**RT ToolBox** Robot Total Engineering Support Software" standard version. However, when using only the function of the "Robot Total Engineering Support Software", it is not necessary to install MelfaRXM.ocx.

By using MelfaRXM.ocx, the Windows application linked to MELFA ROBOT can be created easily on your equipment.

An instruction manual and notes of MelfaRXM.ocx are enclosed in CD-ROM of the standard version "**RT ToolBox** Robot Total Engineering Support Software".
When MelfaRXM.ocx and "**RT ToolBox** Robot Total Engineering Support Software" live together in one personal computer, we ask you to surely read the instruction manual --"3.2 When making it coexist with the 'Robot Total Engineering Support Software '"-- of the communication middleware “MelfaRXM.ocx”.

14.2. Description in CD-ROM

The CD-ROM(standard) contains the following items:
Refer to the instruction manual in CD-ROM for the usage of MelfaRXM.ocx.

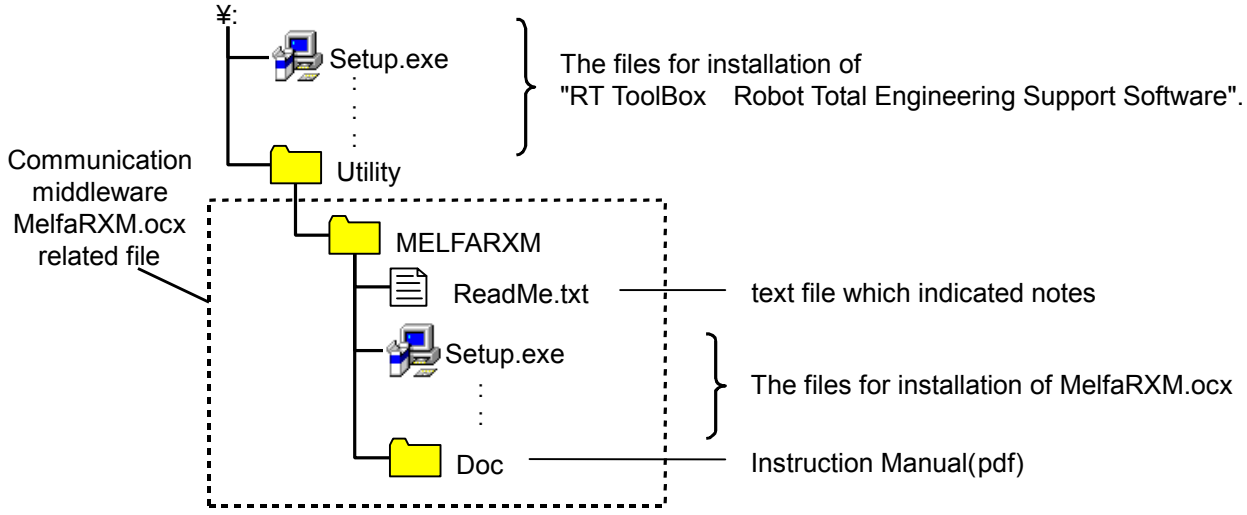


Fig. 14-1 Description in CD-ROM

14.3. Guide for reading the manual

The manual is in the CR-ROM as the Adobe PDF file.

D:/Utility/MELFARXM/Doc/MelfaRXME.pdf

* Example for the CD-ROM drive is “D:”.

(1) Prepare for reading

(i) Prepare of the personal computer

The personal computer with which is installed Microsoft® Windows® 98 or more and it has the CD-ROM drive is required.

(ii) Prepare of the software for reading

For reading the manual, Adobe Acrobat Reader Ver.5.0 or more is required.

If Adobe Acrobat Reader isn’t installed, please download from following Adobe Systems Incorporated URL(As of December, 2004).

URL: http://www.adobe.com

(2) How to read

(i) Case of starting from Explorer

Start Explorer and select the file. Then Acrobat Reader starts and the manual is displayed.

(ii) Case of starting directly from Acrobat Reader

Start Acrobat Reader and select the file. Then the manual is displayed.

14.4. Installation

Perform installation according to the following procedure:

(1) Insert the program CD-ROM into the CD-ROM drive of your personal computer. Setup of “**RT ToolBox** Robot Total Engineering Support Software” automatically starts. Please click “cancel” .
(2) Select [Run] from the [Start] button.

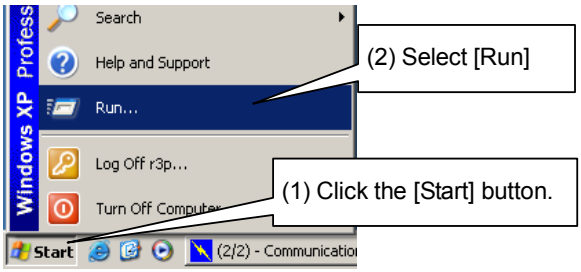


Fig. 14-2 Selecting [Run]

(3) Check the drive name of the CD-ROM drive. Enter the following and click the [OK] button. :
"drive name":/Utility/MelfaRXM/Setup.exe
(If the CD-ROM drive is “D”, enter “D":/Utility/MelfaRXM/Setup.exe”)

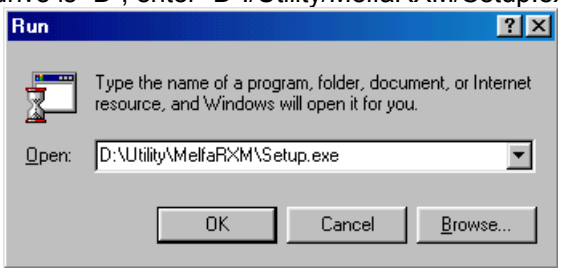


Fig. 14-3 [Run] Screen

(4) Installer starts and the Setup screen appears. Install according to the instructions that appear on the screen.
The Product ID is needed when this "MelfaRXM.ocx" is installed. Input the Product ID same as the Product ID of "RT ToolBox". "MelfaRXM.ocx" can be installed with the Product ID of standard version, but can not be installed with mini version's.

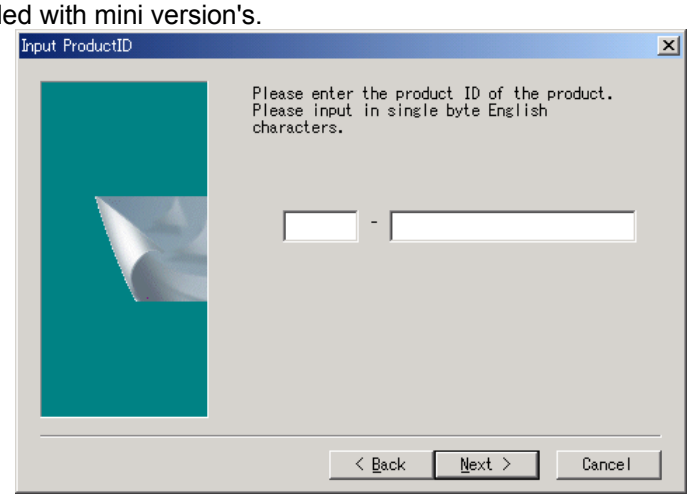


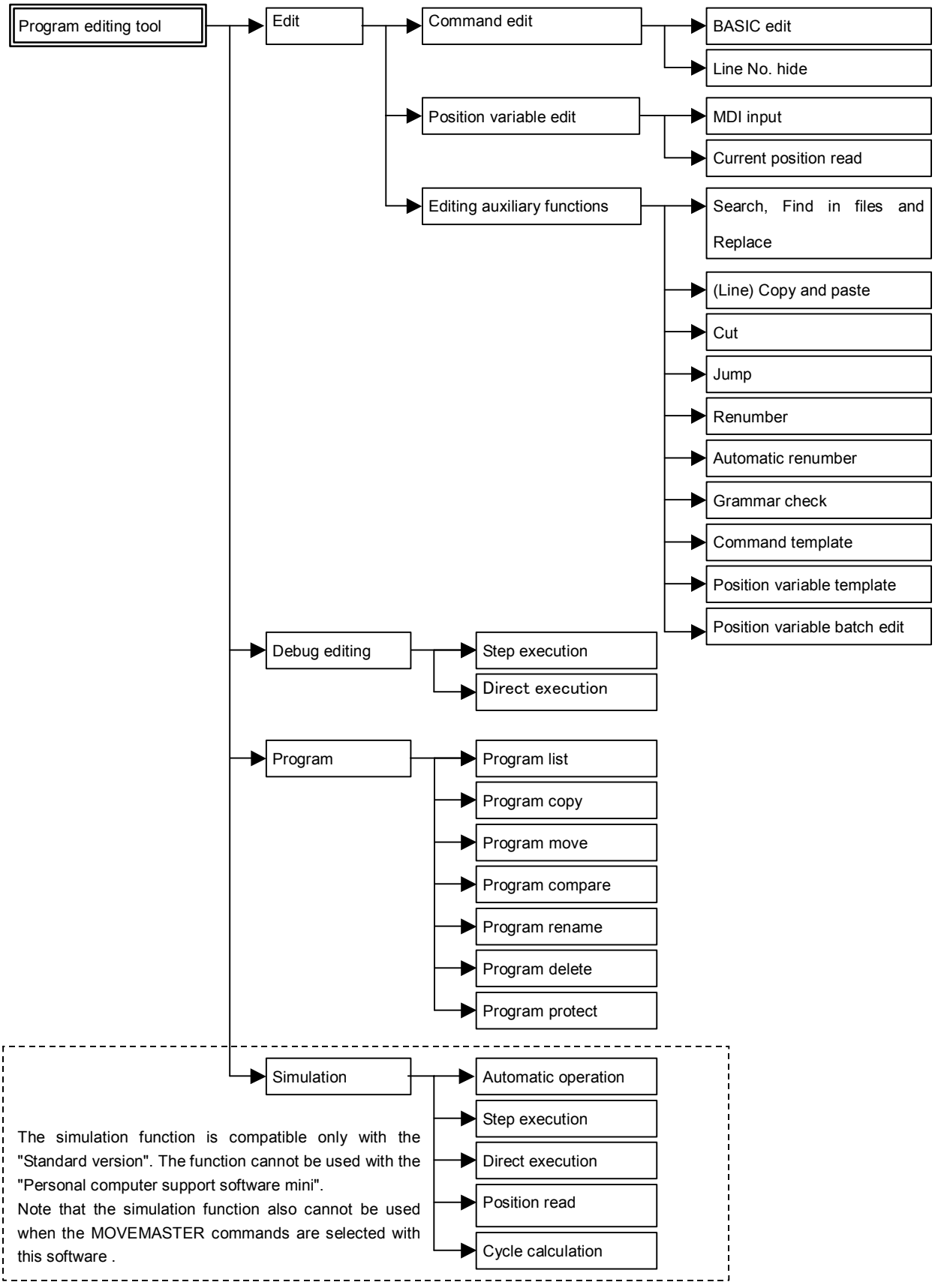
Fig. 14-4 Input Product ID

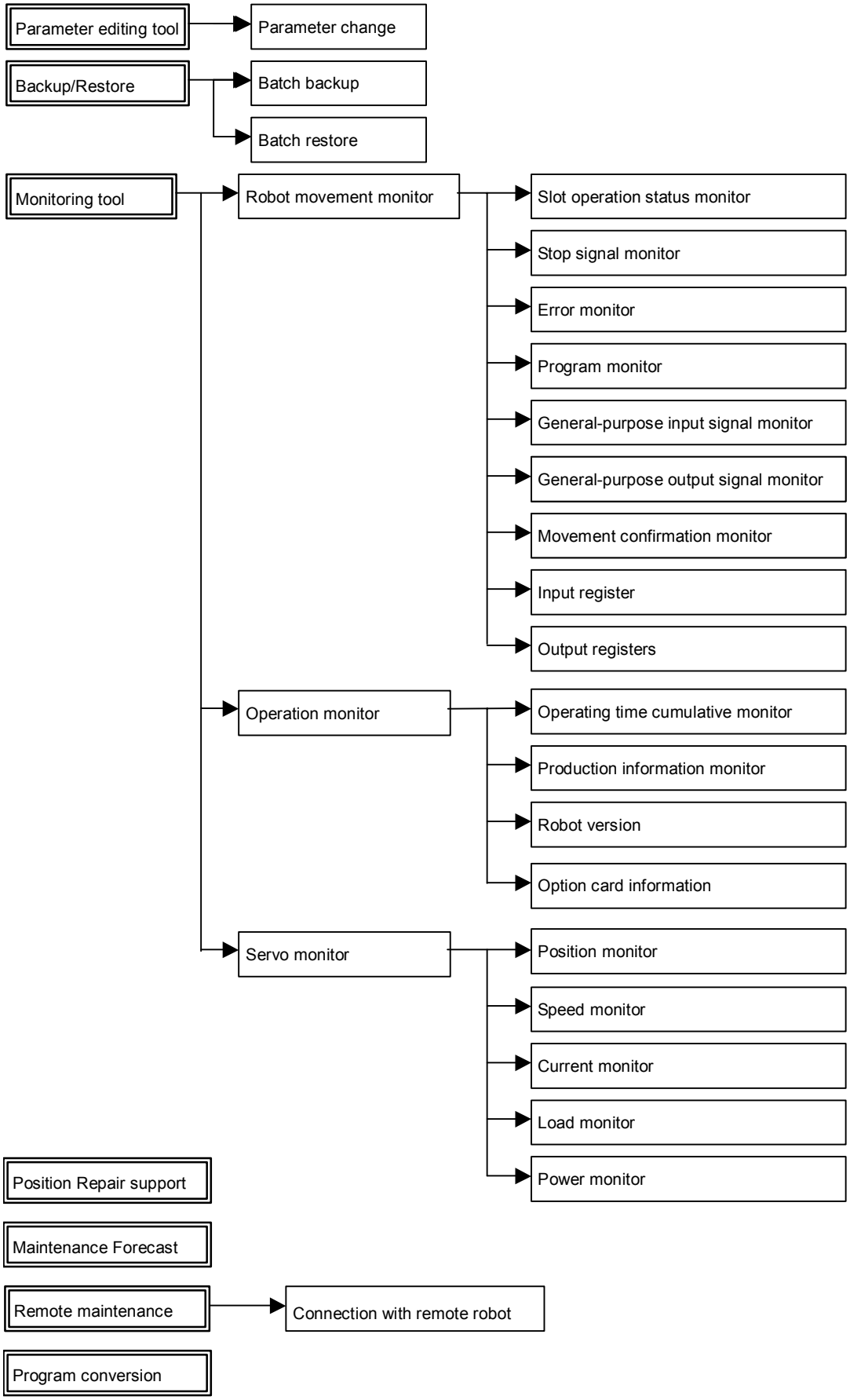
The files listed in Table 14-1 are installed at the destinations as indicated.

Table 14-1 : Files to be Installed

<table>
<tr><th>No.</th><th>Description</th><th>Install destination</th></tr>
<tr><td>1</td><td>MelfaRXM.ocx</td><td rowspan="3">/Windows/System folder
ex) Windows® 98/ Windows® Me : /Windows/System
Windows NT®/ Windows® 2000 : /Winnt/System32
Windows® XP : /Windows/System32
MelfaRXM.ocx and EzSocketRC.dll are registered in the registry.</td></tr>
<tr><td>2</td><td>EZSocketRC.dll
(communication DLL)</td></tr>
<tr><td>3</td><td>NarcServerApiM.dll
(communication DLL)</td></tr>
<tr><td>4</td><td>RoboCom.exe
(communication DLL)</td><td rowspan="4">A folder specified during install operation (Normally, C:/ is used.)
MelfaRXM_Dev
├ ReadMe.txt ····· text file which indicated notes
├ [RoboCom] ····· folder of communication server
├ [Doc] ····· folder of Instruction Manual
├ [Sample] ····· folder of sample programs
│ ├ [BCB] ····· Borland C++ Builder (5.0)
│ ├ [VB] ····· Visual Basic (6.0)
│ └ [VC++] ····· Visual C++ (6.0)
└ [Redist]
├ [Installer] ····· folder of system files Installer (for redistribution)
└ [SysFiles] ····· folder of system files (for redistribution)</td></tr>
<tr><td>5</td><td>Instruction Manual</td></tr>
<tr><td>6</td><td>Sample programs</td></tr>
<tr><td>7</td><td>Redistribution files</td></tr>
</table>

Appendix (Function tree)




Parameter editing tool
Parameter change
Backup/Restore
Batch backup
Batch restore
Monitoring tool
Robot movement monitor
Slot operation status monitor
Stop signal monitor
Error monitor
Program monitor
General-purpose input signal monitor
General-purpose output signal monitor
Movement confirmation monitor
Input register
Output registers
Operation monitor
Operating time cumulative monitor
Production information monitor
Robot version
Option card information
Servo monitor
Position monitor
Speed monitor
Current monitor
Load monitor
Power monitor
Position Repair support
Maintenance Forecast
Remote maintenance
Connection with remote robot
Program conversion

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