MITSUBISHI

Mitsubishi Electric Industrial Robots

CR750/700/500 series

RT ToolBox2 / RT ToolBox2 mini

User's Manual

(3D-11C-WINE/3D-12C-WINE)

MELFA

BFP-A8618-T

⚠ Safety Precautions

Before using the robot, always carefully read the precautions below and the separate "Safety Manual" and take all necessary safety measures.

A. These show precautions based on Labor Health and Safety Regulations (Articles 36, 104, 150, 151).

⚠Caution For the sake of safety, teaching work should only be performed by workers who have received special education.
(The same is true for any maintenance work done with the power source not cut off.)
→Implementation of safety education

⚠Caution For teaching work, prepare work regulations concerning robot operation methods and procedures, measures for when there is an abnormality and when restarting, etc. Perform teaching work according to these regulations.
(The same is true for any maintenance work done with the power source not cut off.)
→Prepare work regulations.

⚠Warning For teaching work, set up a device that can stop operation immediately.
(The same is true for any maintenance work done with the power source not cut off.)
→Emergency stop switch setting

⚠Caution During teaching work, label the start switch etc. to indicate that teaching work is underway.
(The same is true for any maintenance work done with the power source not cut off.)
→Display that teaching work is underway

⚠Danger In operation, prevent contact between workers and robots by preparing a fence and a barrier.
→ Setting up a safety fence

⚠Caution Determine a uniform signal to relevant staff for the start of operation and use that signal.
→ Signal for the start of operation

⚠Caution For maintenance work, in principle, cut off the power and label the start switch etc. to indicate that maintenance work is underway.
→Display that maintenance work is underway

⚠Caution Before starting work, check the robot, emergency stop switches, related devices, etc. and make sure there are no abnormalities.
→ Check before the start of work

B. This shows precaution points given in the separate "Safety Manual".
For details, please read the text of the "Safety Manual".

⚠Caution	Use the robot in an environment that is within the range of its specifications. Failure to do this can cause a drop in reliability and breakdown. (Temperature, humidity, atmosphere, noise, etc.)
⚠Caution	When transporting the robot, put it into its specified transport posture. Failure to do this can cause a drop in reliability and breakdown.
⚠Caution	Install the robot on a solid platform. If the robot is in an unstable posture, this can cause positional deviation and vibration.
⚠Caution	Wire cables away from noise sources as much as possible. If cables are brought too close to noise sources, this can cause positional deviation and malfunction.
⚠Caution	Do not apply excess force to a connector or bend a cable excessively. Doing so can cause a contact defect or cut line.
⚠Caution	Set work masses, including hands, so that they do not excess rated load or permitted torque. Exceeding either of these can cause an alarm or breakdown.
⚠Warning	Install hands and tools and hold work securely. Failure to do this can cause objects to fly loose during operation and cause personnel injury or damage.
⚠Warning	Ground the robot and controller reliably. Failure to do this can cause malfunction due to noise or in an extreme case, electrical shock.
⚠Caution	Display the operating state while the robot is operating. Lack of such a display can result in someone coming too close to the robot by mistake or mistaken operation.
⚠Warning	Always secure the priority right for control of the robot before doing any teaching work within the robot's operating range. Failure to do this can allow the robot to start upon instruction from the outside and cause personnel injury or damage.
⚠Caution	Make the jog speed as slow as possible and do not take your eyes off the robot. Failure to do this may cause a collision between a work piece and peripheral devices.
⚠Caution	After completing program editing but before starting automatic operation, always check operations with step operation. Failure to do this may cause a collision with a peripheral device due to a programming mistake or the like.
⚠Caution	Set up the safety fence in such a way that, while the equipment is running on automatic, either the safety fence door is locked or if anyone tries to open the door, the robot is stopped. Failure to take these protective measures can cause an accident resulting in injury.

⚠Caution Never on your own judgment make an alterations or use maintenance parts other than those designated. Doing so can cause breakdown and problems.

⚠Warning When moving the robot arm from the outside, never stick a hand or finger into an opening. Depending on the posture, the hand or finger could get caught in the equipment.

⚠Caution Do not switch the robot Off or make an emergency stop of the robot by switching Off the robot controller's main power supply.
If the robot controller's main power supply is switched Off during automatic operation, this can reduce the robot's precision. It could also cause the arm to fall or allow inertia to result in collisions with peripheral device or the like.

⚠Caution When rewriting a program, parameters, or other internal information within the robot's controller, do not switch Off the robot controller's main power supply.
If the robot controller's main power supply is switched Off during automatic operation or while a program or parameter is being rewritten, there is a danger of the internal information in the robot controller being destroyed.

⚠Warning For using RH-5AH/10AH/15AH series or RH-6SH/12SH/18SH series.
While pressing the brake releasing switch on the robot arm, beware of the arm which may drop with its own weight.
Dropping of the hand could lead to a collision with the peripheral equipment or catch the hands or fingers.

User's Manual Revision History

Printing Date	Manual No.	Revision Contents
2008/04	BFP-A8618-*	First edition (Corresponds to the Ver.1.1)
2008/08	BFP-A8618-A	Corresponds to the Ver.1.2 (Refer to the software revision history.)
2008/10	BFP-A8618-B	Corresponds to the Ver.1.3 (Refer to the software revision history.)
2009/01	BFP-A8618-C	Corresponds to the Ver.1.3.1
2009/06	BFP-A8618-D	Corresponds to the Ver.1.4 (Refer to the software revision history.)
2009/10	BFP-A8618-E	Corresponds to the Ver.1.5 (Refer to the software revision history.)
2010/04	BFP-A8618-F	Corresponds to the Ver.1.6 (Refer to the software revision history.)
2010/06	BFP-A8618-G	Corresponds to the Ver.1.6.1 (Refer to the software revision history.)
2010/10	BFP-A8618-H	Corresponds to the Ver.1.7 (Refer to the software revision history.)
2011/05	BFP-A8618-J	Corresponds to the Ver.1.8 (Refer to the software revision history.)
2011/07	BFP-A8618-K	Corresponds to the Ver.2.00A (Refer to the software revision history.)
2011/11	BFP-A8618-M	Corresponds to the Ver.2.10L (Refer to the software revision history.)
2012/05	BFP-A8618-N	Corresponds to the Ver.2.20W (Refer to the software revision history.)
2012/08	BFP-A8618-P	Corresponds to the Ver.2.30G (Refer to the software revision history.)
2013/02	BFP-A8618-Q	Corresponds to the Ver.2.40S (Refer to the software revision history.)
2013/04	BFP-A8618-R	Corresponds to the Ver.2.50C (Refer to the software revision history.)
2013/09	BFP-A8618-S	Corresponds to the Ver.3.00A (Refer to the software revision history.)
2014/01	BFP-A8618-T	Corresponds to the Ver.3.01B (Refer to the software revision history.)

Software Revision History

Version	Release Date	Revision Contents
1.0	2008/01	Initial release (Japanese version only)
1.1	2008/04	CRnQ Communications: Added the GOT transparent function. Parameter editing: Added the Multiple CPU setting screen.
1.2	2008/08	[Communication Setting] - Changed the Initial value of USB, TCP/IP and RS-232 setting. - Added the CRnQ communication routes when "Ethernet" is selected. (Added the Ethernet port communications.) [Program editor] - Added “Comment Selection”/”Uncomment Selection” function. - Added the function to edit the backed up program data. [Project] - Added the function to import the project. [Parameter] - Added the function to display the parameter changed from initial value. [Restore] - Added the function to restore individually data backed up by selecting "All files". etc.
1.3	2008/10	[Operation of Project Tree] − Added the function to copy the robot program by drag and drop. [Operation of Workspace] − Added the "Edit project" screen when the new workspace is made. [Parameter] − Added the function to print the parameter changed from initial value. − Added the screen of setting the CC-Link parameter and PROFIBUS parameter. [Backup] − Added the function to save data from all robot controllers by batch processing. etc.
1.4	2009/06	[Parameter] − Added the function to edit by offline. [Program editor] − Added the function to remove comments from all line in the program.
1.5	2009/10	[Communication Setting] − Added the screen of setting GOT communication. [Parameter] − Added the screen of editing the Work coordinate parameters. [SQ Direct] − Added the screen of editing the SQ Direct positions.
1.6	2010/04	[Program editor] − Added the function to check the program name when creating it by offline. − Added the function to rename the positional data. − Changed an initial value of the position data to the present location. − Added the function of jumping to the specified positional data. − Added the function of searching the positional data. − Added the function of distinguishing online editing and offline editing of program by color. [Simulation] − Added the function of the Tool-JOG and Work-JOG on the simulation. − Added the function of displaying the User defined area and the Free Plane Limit in 3D viewer of simulation. [Program Management] − Added the function of changing the window size. [Monitor] − Added the function of stopping the program of all task-slots.

Version	Release Date	Revision Contents
1.6.1	2010/06	[Parameter] − Added the function of editing the “Temp in RC” parameters.
1.7	2010/10	[Communication Setting] − Added the GOT(Ethernet) transparent mode. [Simulation] − Added the “3D Monitor” button to the screen of simulation operation. − "3-axis XYZ" and "Cylinder" are added to JOG mord. [Monitor] − Added the function of error record. [Computer syastem] − Corresponded to Windows 7.
1.8	2011/05	[Workspace] − Added the function to change the name of the workspace. [Servo monitor] − Added the "ABS", "Speed", "Current", and "Power" of servo monitor.
2.00A	2011/07	[Operating Environment] − Added the the Operating systems for which operation is warranted. [Maintenance] − Added the security function of the robot controller (Setup the password). [Others] − Changed the icon. − Corresponded to iQ Works(MELSOFT Navigator). etc.
2.10L	2011/11	[Simulator] − A maximum of eight simulators can be started. [Tool] − Added the function “Force control log viewer”. [Parameter] − Added the “IO unit parameter”. − Added buttons “Force initial setting”, “Force control mode”, “Force control feature“, and “Force log setting”. [Monitor] − Added the IO unit monitor. − Added the display of 3D monitor of several robots. − Added the Encoder temp in the display of Load.
2.20W	2012/05	[Parameter] − Added “Mode switch judgment/Speed reference” tab in “Force control feature” screen. [Maintenance] − Added the function “Tool automatic calculation”. − Added the File manager [Communications Settings] − Corresponded to CC-Link/IE [Tool] − Added the user definition screen editing function. [Simulator] − Added the function to manage the parts of layout by using a group.. − Added the reading function of 3D model parts. − Added the function of designing a robot hand and of displaying it on "3D view" screen. etc.
2.30G	2012/08	[Parameter] − Added buttons “Force initial setting”, “Force control mode”, “Force control feature“, and “Force log setting”.
2.40S	2013/02	[Parameter] − Added the function of editing the “Collision avoidance area” parameters.
2.50C	2013/04	Correspond to Windows 8

Version	Release Date	Revision Contents
3.00A	2013/09	[Computer syastem] − Corresponded to Windows 8.1. [Parameter] − Changed the project tree. − Added “PROFINET”, “DeviceNet”, “EtherNet/IP” parameters. − Added the function “Realtime monitor” to the “Ethernet” parameter. [Tool] − Added the function “Oscillograph”. [Simulator] − Added the supported 3D model formats “3DS”, “PLY”, and “VRML”. − The function of designing a robot hand: supported the 3D model parts. − Added the function of setting robot flange direction un-display/display. − Added the function of servo monitor. − Added the function of calculation of axis load level. [MELFA-3D Vision] − Added the function of setting MELFA-3D Vision.
3.01B	2014/01	[Parameter] − Added the function of "Load profile” in the “Robot additional axis” screen. [Tool] − Added the function of “gray scale” in the “Oscillograph” screen. − When the simulation started, the real-time function use was enabled with the oscillograph. [Simulator] − Added the function to set 5%, 2% and 1% to OVRD. − Added the function of enlargement/reduction with the mouse wheel, and function of enlargement/reduction to the screen center. − Added the function of the display on the floor and the function of the background color setting. − Added the function of Click movement. − Added the function of Operation by slider bar.

PREFACE

Thank you for purchasing this MELFA Mitsubishi Electric industrial robot.
This document is the user's manual for the MELSOFT "RT ToolBox2" and "RT ToolBox2 mini".
This document will help you to use the functions of this software to the maximum over a wide range of stages, from initial robot start to program writing, editing, and management.
In order to operate the robot safely, carefully read this document and the safety manual that comes with the robot main unit before operating the robot. Also, store this manual carefully so that you can take it out and read it whenever needed.

Target versions for this document

This document is for the MELSOFT "RT ToolBox2" and "RT ToolBox2 mini" Version 3.01B and supports the following robot controllers.

- CRn-500 series controllers
- CR750-Q/CRnQ-700 series controllers
- CR750-D/CRnD-700 series controllers
  In this manual, these also have the part written as “CR750/700/500 series”.

Target readers for this document

This document assumes that the reader understands basic Microsoft Windows operation methods and the robot controller.
Those who have not mastered basic computer operation methods should read the user's manual for their computer.

Notation method in this document

⚠**Danger**	This indicates an item for which incorrect handling could present imminent danger of death or injury.
⚠**Warning**	This indicates an item for which incorrect handling could present a danger of death or injury.
⚠**Caution**	This indicates an item for which incorrect handling could present a danger of impairment. It could also present a danger of just physical damage.

This document uses the following general terms and abbreviations

General Term/Abbreviation	Contents
RT ToolBox2	General name for the RT ToolBox2 and RT ToolBox2 mini To distinguish them in explanations, these two are called the "standard edition" and "mini edition".
Universal model QCPU	General term for Mitsubishi PLC CPU modules of Q02U, Q03UD, Q03UDE, Q04UDH, Q04UDEH, Q06UDH, Q06UDEH, Q13UDH, Q13UDEH, Q26UDH and Q26UDEH.
Built-in Ethernet port QCPU	General term for Mitsubishi PLC CPU modules of Q03UDE, Q04UDEH, Q06UDEH, Q13UDEH and Q26UDEH.
GX Developer	Abbreviation of SW D5C-GPPW-E(-EV) / SW D5F-GPPW-E type of Mitsubishi PLC programming software package.

Contents

1. Usage

This explains precautions you need to know before using this software.

1.1. How to Use this Document

The manual is in the CR-ROM as the Adobe PDF file.
D:/Doc/BFP-A8618.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 September, 2009)
URL: http://www.adobe.com/

1.2. Checking the Product

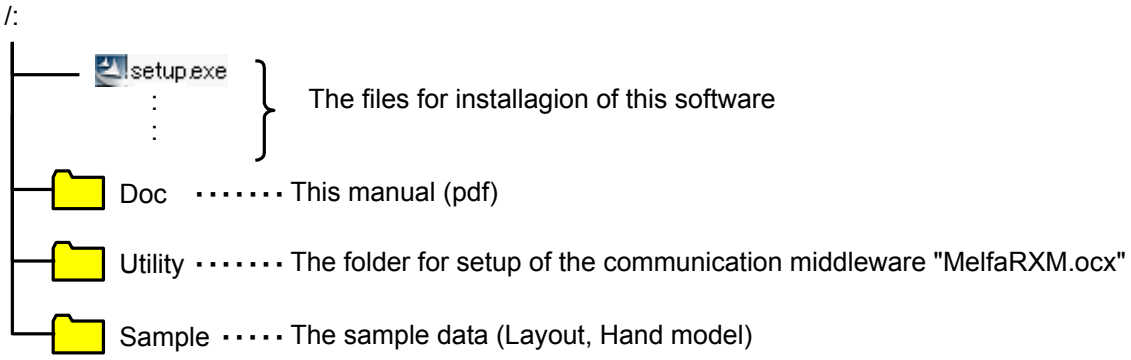
1.2.1. Checking the package

Please check if all items shown below are included in the package.
- CD-ROM "RT ToolBox2"
- 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.

1.2.2. Checking the CD-ROM contents

The CD-Rom has the following configuration.



1.2.3. About the "MelfaRXM.ocx" communications middleware

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.
For information on how to set up "MelfaRXM.ocx", refer to **"18 MelfaRXM.ocx Communications Middleware Setup"**.
In case of using only the function of “RT ToolBox2”, you don't need to install this software.

1.3. Items to be prepared by the customer

This explains what the customer needs to prepare in order to use this software

1.3.1. Computer system

Use a computer that meets the specifications given in: **"1.4 Operating Environment".**

1.3.2. Computer cable

Prepare the cable for connecting the controller and the computer. The cable required depends on the connection specifications and controller used, as shown below.
For the RS-232 cable refer to the "Standard Specifications" for your robot.

Table 1-1 CR750-D/CRnD-700/CRn500 Series Communication Cables

Method	Description		Model name	Manufacturer
USB	USB A type, USB mini B type		-	-
Ethernet	10BASE-T, 100BASE-TX		-	-
RS-232	For controller front panel	CRnD-700 series	2D-232CBL03M	Mitsubishi Electric
		CRn-500 series	RS-MAXY-CBL RS-AT-RCBL (for expansion serial interface (option))	Mitsubishi Electric
	For expansion option box (CR1-EB3)		RS-AT-RCBL	Mitsubishi Electric

Table 1-2 CR750-Q/CRnQ-700 Series Communication Cables

Method	Description	Cables confirmed by Mitsubishi Electric to operate properly	
		Model name	Manufacturer
USB	USB A type to mini B type	ZUM-430	Loas Co.
		USB-M53	Elecom Co.
		GT09-C20USB-5P	Mitsubishi Electric System Service
		MR-J3USBCBL3M	Mitsubishi Electric
Ethernet	10BASE-T, 100BASE-TX		
RS-232	For connecting by personal computer - PLC CPU (when Personal computer connector is D-sub, 9-pin)	QC30R2	Mitsubishi Electric

⚠ Caution

Use of USB to RS-232 does not guarantee normal operation.

When you use USB to RS-232 cable, normal operation is not guaranteed.
If you want to use RS-232 as a communication port, use of computer with serial ports is recommended.

1.4. Operating Environment

This explains the operating environment.

1.4.1. Connectable robot controllers

This software can be connected with the robot controllers shown below

Table 1-3 Connectable Robot Controllers and Communications Types

Robot controller	Communications (*1)		Remark
CR750-D/CRnD-700 series  (The photo is a robot controller of CR3D-700.)	USB (*2)		The commercial item such as computer and cable might be unsuitable to compatibility with our equipment or the FA environments of the temperature and the noise, etc. When it is used, please confirm the operation enough, because you might have to take measures against noise such as EMI measure or addition of ferrite core.
	Ethernet (TCP/IP)		
	RS-232		Only CRnD-700 series
	GOT communications		Communicate with CR750-D/CRnD-700series controller connected with the GOT via Ethernet by USB / RS-232. GOT 1000 series and the Ethernet communication unit (GT15-J1E71-100) are needed. (*4)
CR750-Q/CRnQ-700 series  (The photo is a robot controller of CR3Q-700.)	CRnQ communications	USB (*2)	
		Ethernet (TCP/IP)	The PLC Ethernet interface module or Built-in Ethernet port QCPU (*3) is required.
		RS-232	
CRn-500 series 	Ethernet (TCP/IP)		The robot controller must have the "Ethernet interface" option.
	RS-232		

(*1) The computer must have each ports for communications.
(*2) When using USB connection, 1 computer can connect to only 1 robot controller.
(*3) Built-in Ethernet port QCPU can be used with this software Ver.1.2 or later.
(*4) GOT communications can be used with this software Ver.1.5 or later.

This software can be connected to a maximum of 32 controllers at the same time. These controllers may be different models.

1.4.2. Computer system

This software operates on PC/AT compatible computers that meet the following specifications.

Item	Recommended environment
CPU	Pentium III 1 GHz or higher However, for using the simulation function, Pentinum IV 2 GHz or higher.
Main memory	512 MB min.
Hard disk	Available capacity 300 MB min.
Display	XGA (1024x768) or higher
Optical device	CD-ROM drive
Keyboard	PC/AT compatible keyboard
Pointing device	Must operate on Windows
Communications functions Communications port	- USB2.0 (Caution: This cannot be used for connection with the CRn-500 series controller.) - LAN: 100Base-TX/10Base-T - RS-232 communications port that operates on Windows (Minimum 9600bps: 1 port) Must have one of the above interfaces
OSs for which operation is warranted	Windows 2000 Professional (32-bit version) (*2) Windows XP Professional (32-bit version) Windows XP Home Edition (32-bit version) Windows Vista Ultimate (32-bit version) Windows Vista Business (32-bit version) Windows Vista Home Premium (32-bit version) Windows Vista Home Basic (32-bit version) Windows 7 Starter (32-bit version) Windows 7 Home Premium (32/64-bit version) (*1) Windows 7 Professional(32/64-bit version) (*1) Windows 7 Enterprise (32/64-bit version) (*1) Windows 7 Ultimate (32/64-bit version) (*1) Windows 8 (32/64-bit version) (*3) Windows 8 Pro (32/64-bit version) (*3) Windows 8 Enterprise (32/64-bit version) (*3) Windows 8.1 (32/64-bit version) (*3) Windows 8.1 Pro (32/64-bit version) (*3) Windows 8.1 Enterprise (32/64-bit version) (*3)

*1: Windows 7 is corresponded with Version 1.7 or later of software. The 64-bit version of Windows 7 can be used with version 2.00A or later of this software.

*2 : When you use Windows 2000, it is necessary to install Service Pack4 and internet Explorer version 5.5 or later.

*3: Windows 8 and Windows 8.1 are corresponded with Version 2.50C or later of software. When you install this software, [.NET Framework 3.5 (includes .NET 2.0 and 3.0)] feature should be turned on. Refer to Chapter 1.5.1.1 for the method of a present state confirmation and turning on.

1.5. Installation, Uninstallation

This section explains the method for installing the software and the method for uninstalling it.

Caution

Uninstall RT ToolBox2 before installing.

If "RT ToolBox2" has already been installed in the personal computer, it is necessary to uninstall it before "RT ToolBox2" is installed.

1.5.1. Installation

Caution

When installing, log in as a user with administrator authority.

When installing, log in as a user with administrator authority. The system will not let you install if you log in as a user who does not have administrator authority.

Caution

Please input product ID attached to RT ToolBox2 again when you install a standard version of RT ToolBox2 in the personal computer in which "iQ Works(MELSOFT Navigator" is installed.

When RT ToolBox2 is installed in the personal computer in which "iQ Works(MELSOFT Navigator)" is installed, product ID for "iQ Works(MELSOFT Navigator)" is displayed on "Input Product ID" screen. RT ToolBox2 is installed in the personal computer as mini version when this software is installed with this Product ID. Please input product ID attached to RT ToolBox2 product again when you install a standard version of RT ToolBox2.

Install this software with the procedure below.

(1) When you insert this product into the computer's CD-ROM drive, the setup screen is displayed automatically.

(2) If the setup screen is not displayed when you insert this product into the computer's CD-ROM drive, display the setup screen with the following method.

1) Display the [Run] dialog.

Table 1-4 Method of displaying the [Run] dialog

OS	Start method
Windows 2000 / XP / 7	Select [Start] button -> [Run].
Windows Vista	**< In Windows Vista, when using the [Start] menu with the classic display>** Select [Start] button -> [Run]. **< In Windows Vista, when not using the [Start] menu with the classic display >** Click [Start] button -> [All Programs] -> [Accessories], then select [Run].
Windows 8	Press the [Windows] + [R] key.

2) Check the CD-ROM drive name, then input "drive name":\Setup.exe.
(If the CD-ROM drive is "D:", input "D:\Setup.exe".)

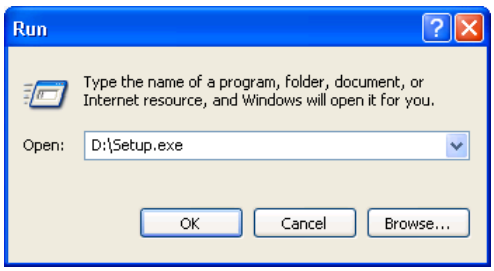
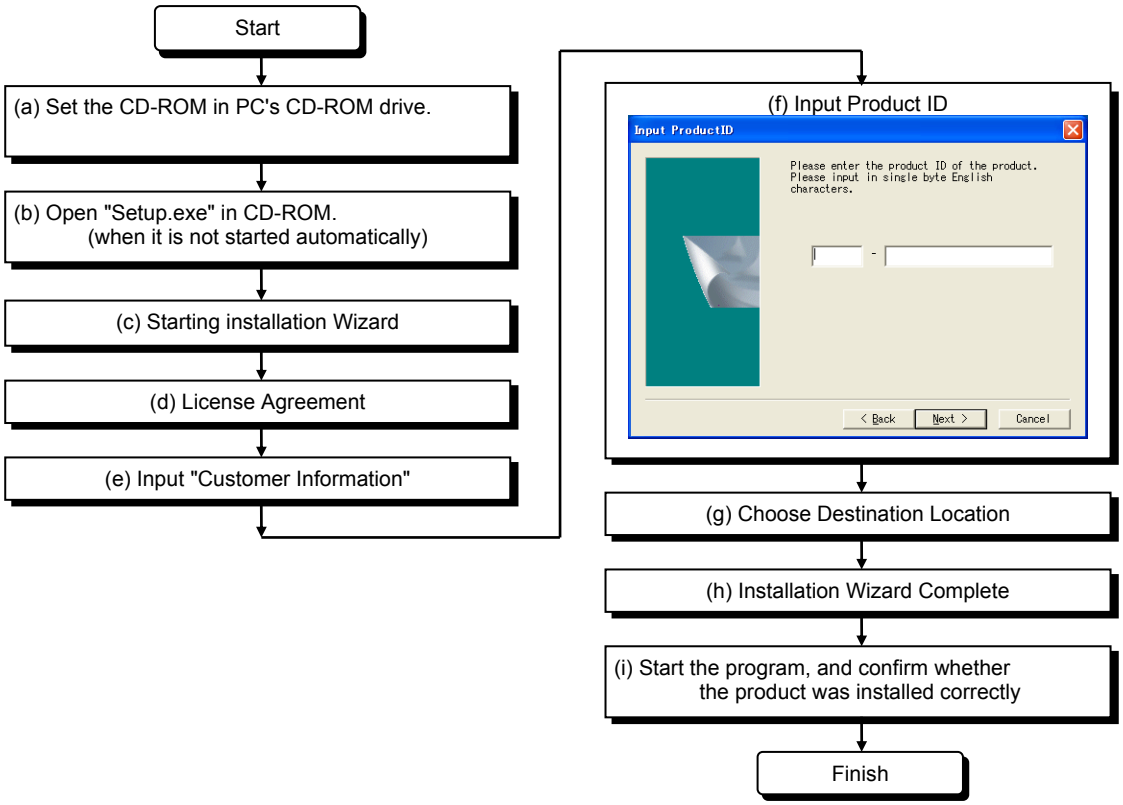


Figure 1-1 Specify the File Name and Execute

With Windows Vista, when using the classic display, when not using the [Start] menu with the classic display, you can use the [Start] menu Search box instead of executing the [Run] command.



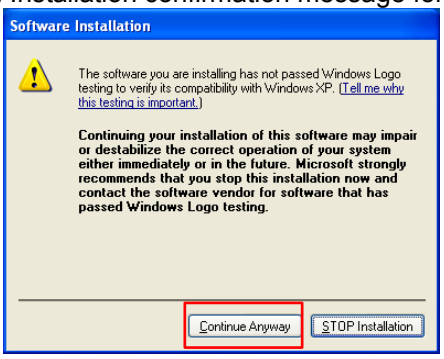
* Product ID is printed on the Certificate of License permission
* After the installation is completed, the computer should be likely to be rebooted.

⚠ Caution

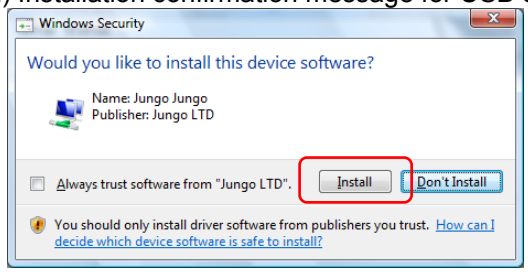
About the confirmation and warning message displayed during installation (version 1.8 or earlier of this software)

During installation on Windows XP or Windows Vista, the following confirmation and warning messages are displayed, but select to continue installation. If you select not to install, please execute the installation again.

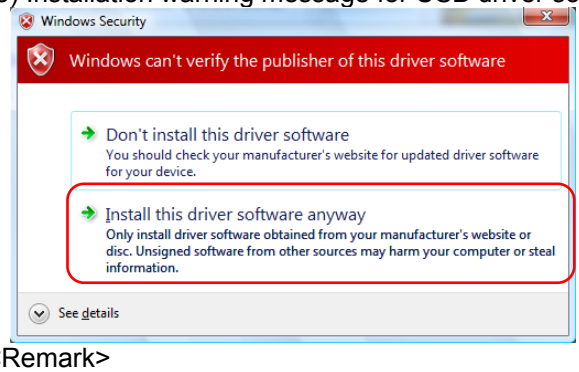
(1) Installation confirmation message for USB driver software (for Windows XP)



(2) Installation confirmation message for USB driver software (for Windows Vista)



(3) Installation warning message for USB driver software (for Windows Vista)



<Remark>

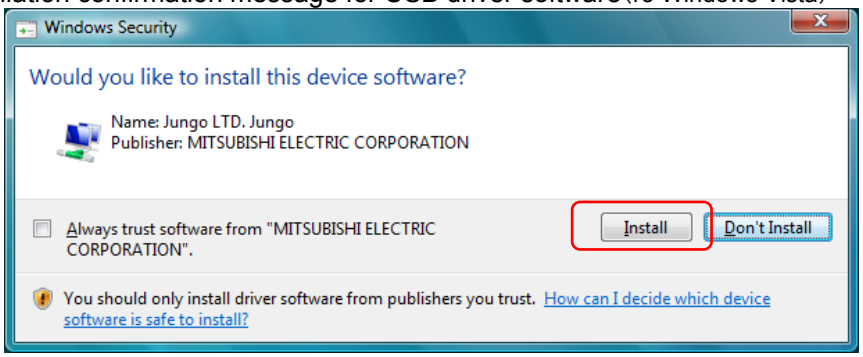
We have confirmed operation at our company. No problem occurs after installation.

⚠ Caution

About the confirmation and warning message displayed during installation (version 2.0 or later of this software)

During installation on Windows XP or Windows Vista, the following confirmation and warning messages are displayed, but select to continue installation. If you select not to install, please execute the installation again.

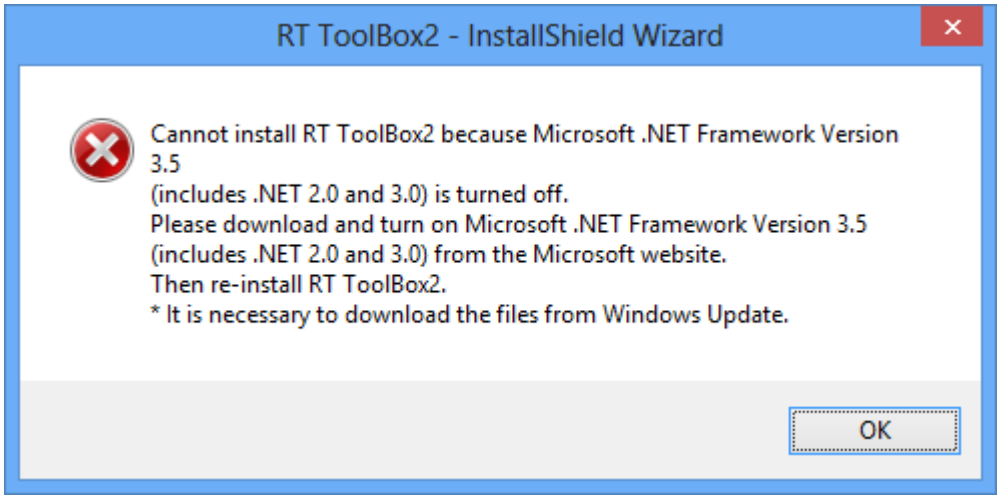
Installation confirmation message for USB driver software（ro Windows Vista）



When “Always trust software from MITSUBISHI ELECTRIC CORPORATION” is checked, the alert message will not be displayed after next time.

1.5.1.1. Installation on Windows 8 or Windows8.1

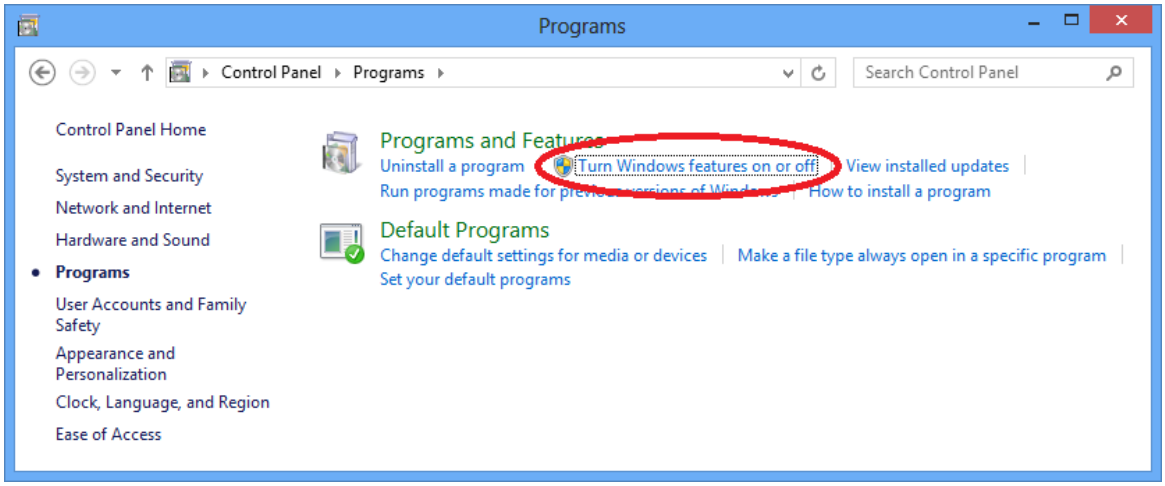
When you install this software on Windows 8 or Windows8.1, you will need to turn on ".NET Framework Version 3.5 (includes .NET 2.0 and 3.0)” feature of the PC you want to install. If you install this software during turn off the feature, the installation will stop and show the following dialog.



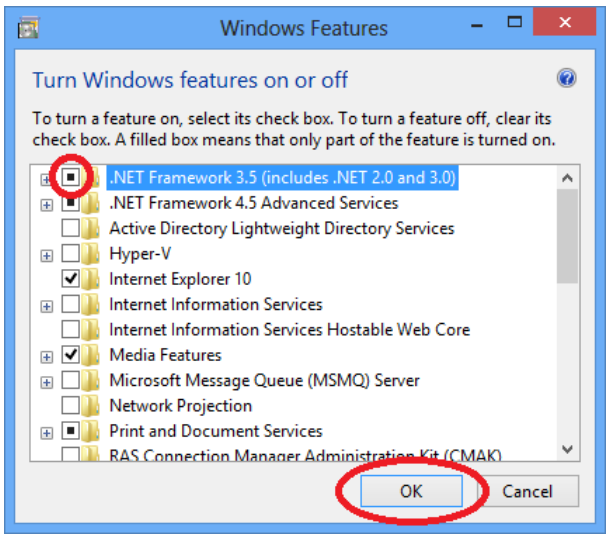
If the dialog is shown, install this software again after you turn on ".NET Framework Version 3.5 (includes .NET 2.0 and 3.0)" feature as following steps.

(1) Be ready to connect the PC to the Internet.

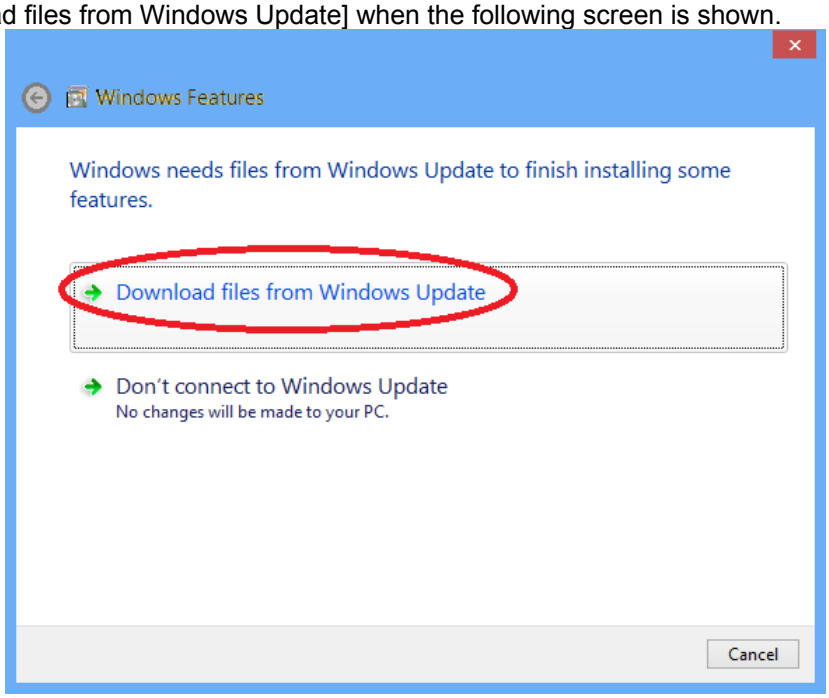
(2) Select [Programs] – [Turn Windows features on or off] from the Control Panel.



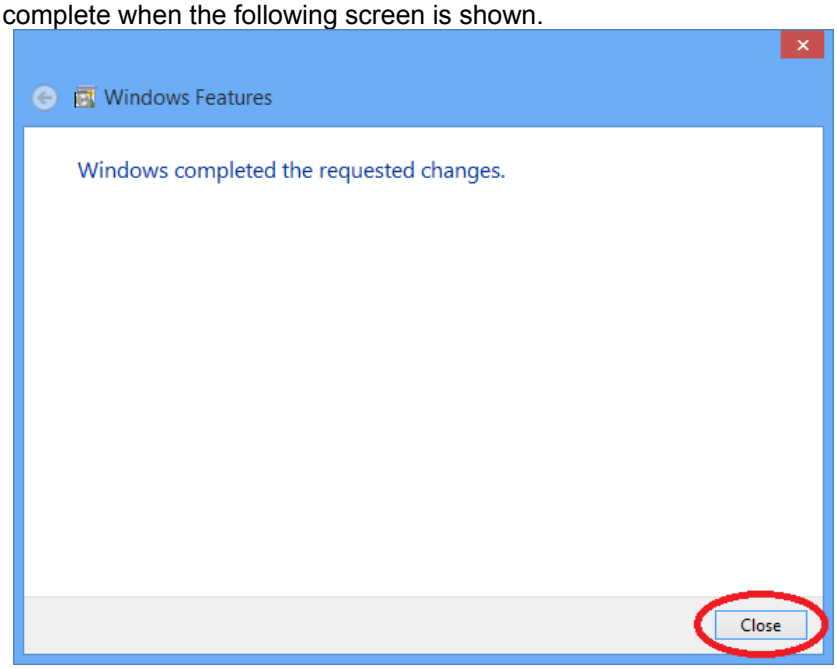
(3) Check [.NET Framework 3.5 (includes .NET 2.0 and 3.0)] check box on Turn Windows features on or off screen and click [OK].



(4) Select [Download files from Windows Update] when the following screen is shown.

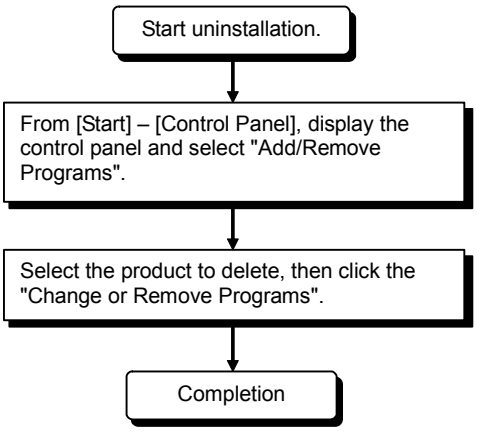


(5) This process is complete when the following screen is shown.



1.5.2. Uninstall

Uninstall with the following method.



- Windows 2000 / XP
  Execute [Start] – [Control Panel] [Program Add and Delete].

- Windows Vista
  Open [Start] – [Control Panel].

  When not using the classic display
  With [Control Panel] [Program], execute [Uninstall Program].

  For classic display
  With [Control Panel] [Program Functions], select the application name, then execute the uninstallation.

- Windows 7
  Execute [Start] – [Program Functions] or [Uninstall Program], select the application name, then execute the uninstallation.

- Windows 8 / 8.1
  Press the [Windows] + [X] key, and select the [Program Functions] from the displayed menu.

  With [Program Functions], select the application name, then execute the uninstallation.

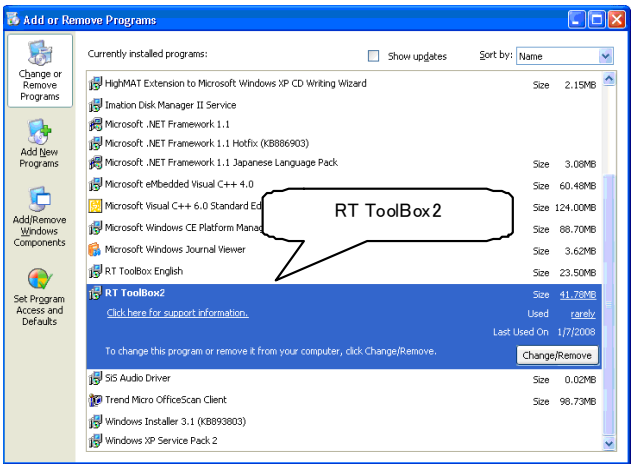


Table 1-2 Uninstalling Applications (WindowsXP)

1.5.3. USB driver (CR750-D/CRnD-700 series robot controller) installation

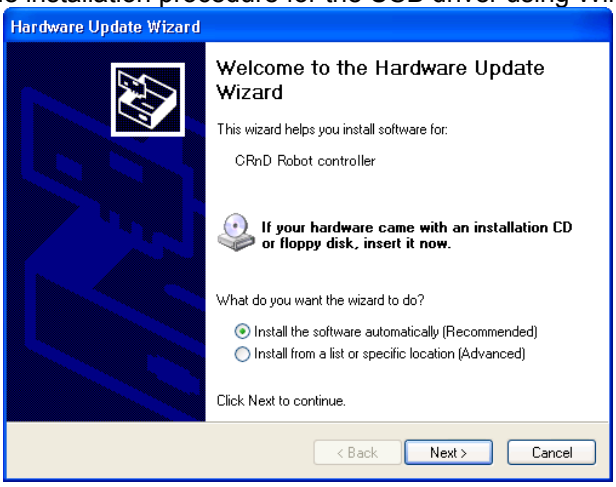
Connecting the CR750-D/CRnD-700 series robot controller with USB requires installation of the robot USB driver. Install with the following procedure.

1.5.3.1. When using Windows 2000

When you connect the CR750-D/CRnD-700 robot controller and the computer with a USB cable, installation starts and completes automatically.

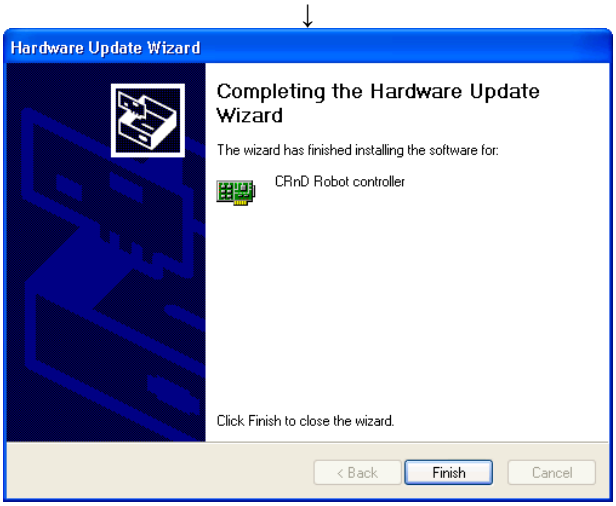
1.5.3.2. When Using Windows XP

Below is the installation procedure for the USB driver using Windows XP (Professional).



1) When you connect the computer and CR750-D/CRnD-700 series robot controller with a USB cable, the screen on the left is displayed. Select "Install the software automatically (Recommended)", then click the [Next] button. Installation of the USB driver starts.

↓



2) When the screen on the left is displayed, the installation is complete. Click the [Finish] button to end the installation.

↓

(Completed)

1.5.3.3. When using Windows Vista

When you connect the CR750-D/CRnD-700 robot controller and the computer with a USB cable, installation starts and completes automatically.

1.5.3.4. When using Windows 7 / 8 / 8.1

When you connect the CR750-D/CRnD-700 robot controller and the computer with a USB cable, installation starts and completes automatically.

1.5.4. CRnQ communications USB driver installation

Connecting the CR750-Q/CRnQ-700 series robot controller with USB requires installation of the robot USB driver. Install with the following procedure.

⚠ Caution

If the USB driver cannot be installed, check the following setting.

<When Windows 2000 is used>

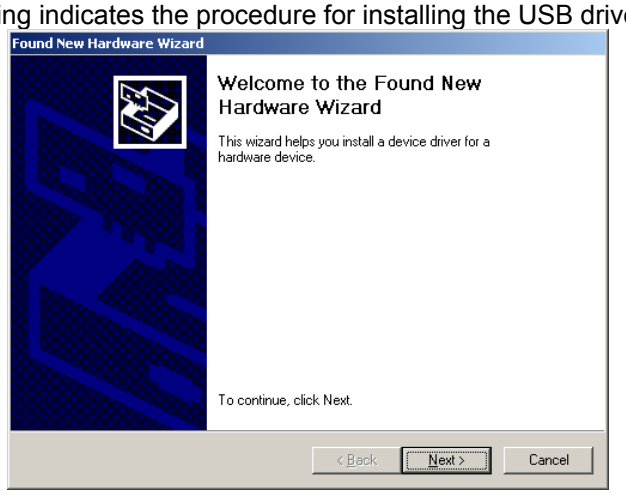
If you have selected "Block-Prevent installation of unsigned files" after [Control Panel] - [System] - [Hardware] - [Driver Signing], the USB driver may not be installed.
Choose "Ignore-Install all files, regardless of file signature" or "Warn-Display a message before installing an unsigned file" for [Driver Signing], and install the USB driver.

<When Windows XP is used>

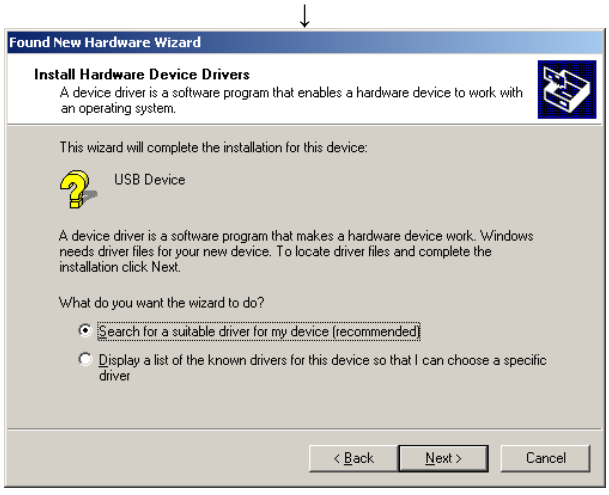
If you have selected "Block-Never install unsigned driver software" after [Control Panel] - [System] - [Hardware] - [Driver Signing], the USB driver may not be installed.
Choose "Ignore-Install the software anyway and don't ask for my approval" or "Warn-Prompt me each time to choose an action" for [Driver Signing], and install the USB driver.

1.5.4.1. When using Windows 2000

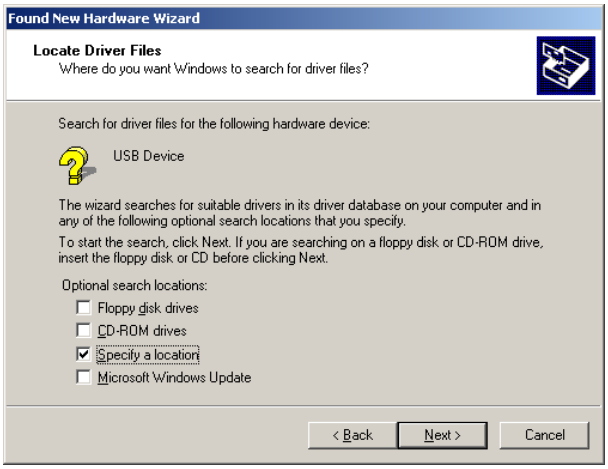
The following indicates the procedure for installing the USB driver when using Windows 2000.



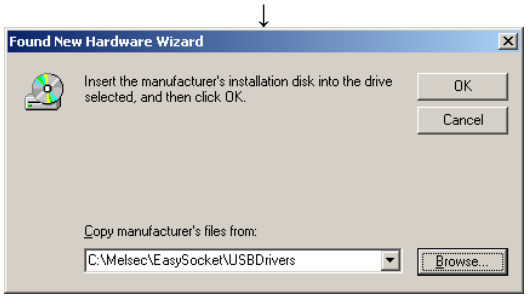
1) The screen shown on the left appears when you connect the personal computer and Universal model QCPU by the USB cable.
Click the [Next] button.



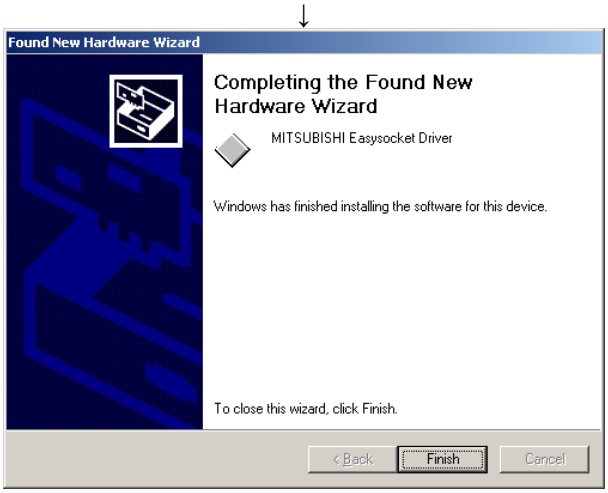
2) Choose "Search for a suitable driver for my device [recommended]" and click the [Next] button.



3) Check "Specify a location" and click the [Next] button.



4) As the left screen appears, set the "C:\Melsec\EasySocket\USBDrivers" and
If volume MELSOFT products have been installed, browse the installation destination "EasySocket\USBDrivers" of the first installed product.
After setting, click the [OK] button.



5) The screen on the left appears to indicate completion of installation.
Click the [Finish] button.

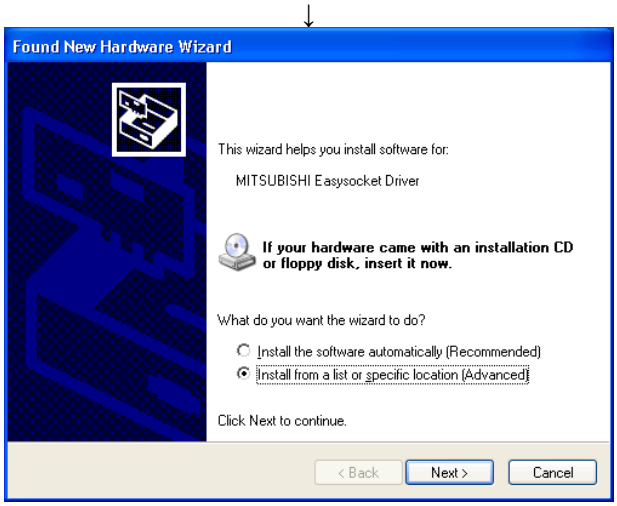
↓

(Completed)

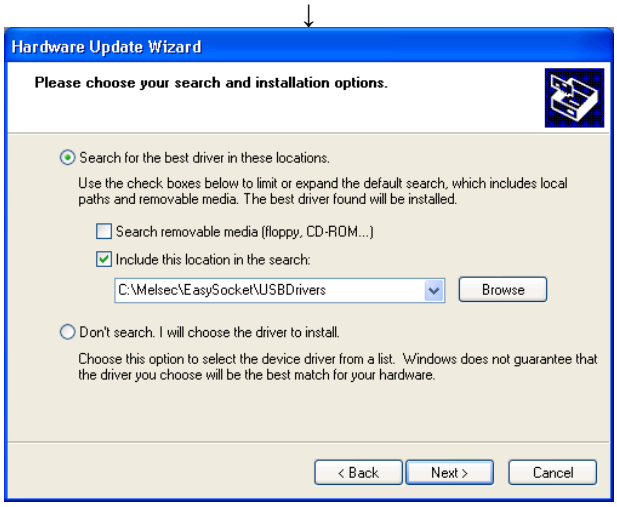
1.5.4.2. When using Windows XP

The following indicates the procedure for installing the USB driver when using Windows XP (Professional).

1) The screen shown on the left appears when you connect the personal computer and Universal model QCPU by the USB cable.
Choose "Yes, now and every time I connect a device" and click the [Next] button.



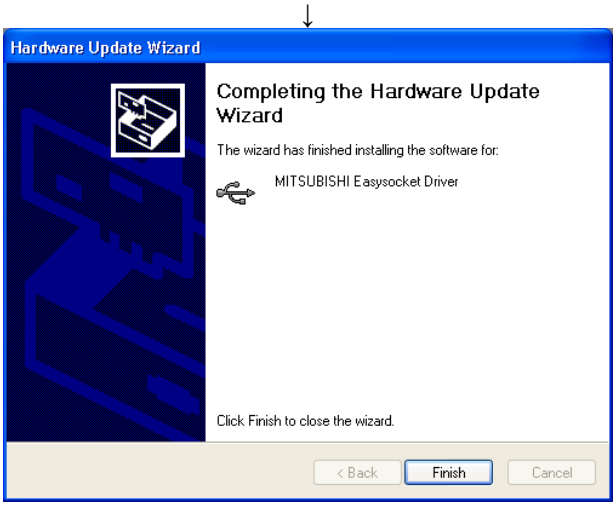
2) As the screen on the left appears, choose "Install from a list or specific location [Advanced]" and click the [Next] button.



3) As the screen on the left appears, choose "Search for the best driver in these locations".
Check "Include this location in the search" and set the "C:\Melsec\EasySocket\USBDrivers".
If volume MELSOFT products have been installed, browse the installation destination "EasySocket\USBDrivers" of the first installed product.
After setting, click the [Next] button.

4) As the screen on the left appears, click the [Continue Anyway] button to continue the installation of the USB driver.
(No problem will occur after installation of the USB driver.)

↓



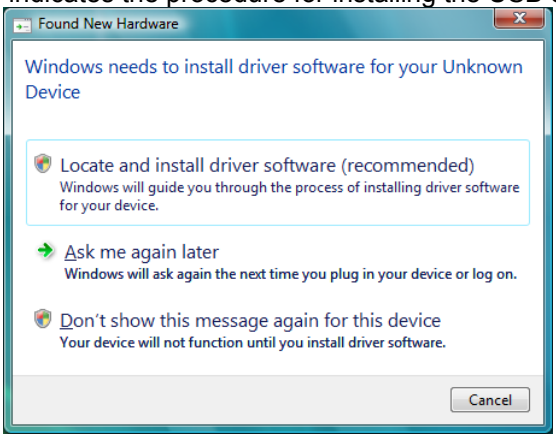
5) The screen on the left appears to indicate completion of installation.
Click the [Finish] button.

↓

(Completed)

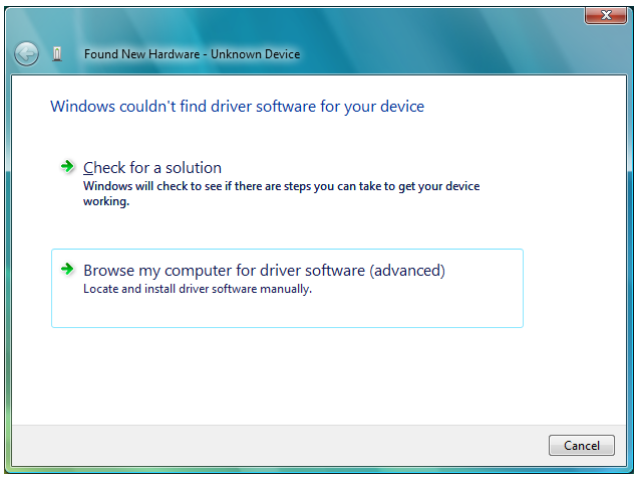
1.5.4.3. When using Windows Vista

The following indicates the procedure for installing the USB driver when using Windows Vista (Business).



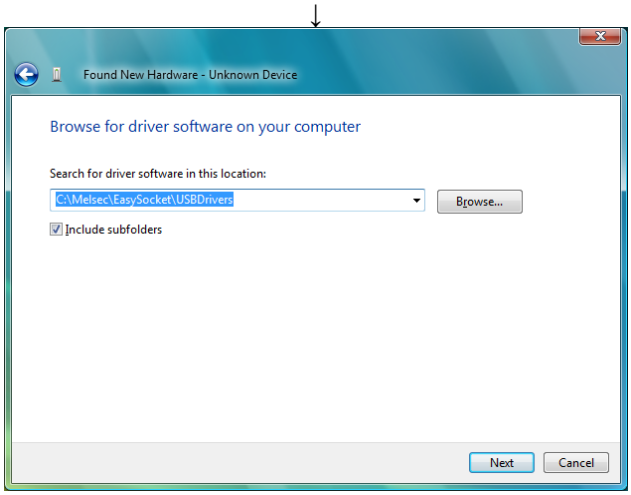
1) The screen shown on the left appears when you connect the personal computer and Universal model QCPU by the USB cable.
Select "Locate and install driver software (recommended)" and wait for the search to end.

↓



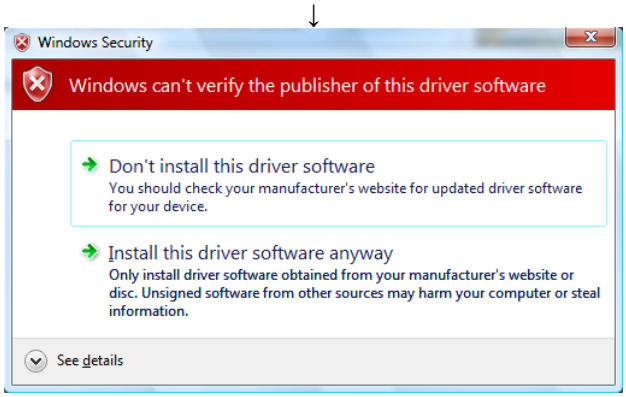
2) The screen on the left is displayed, so select "Browse my computer for driver software (advanced)".

↓



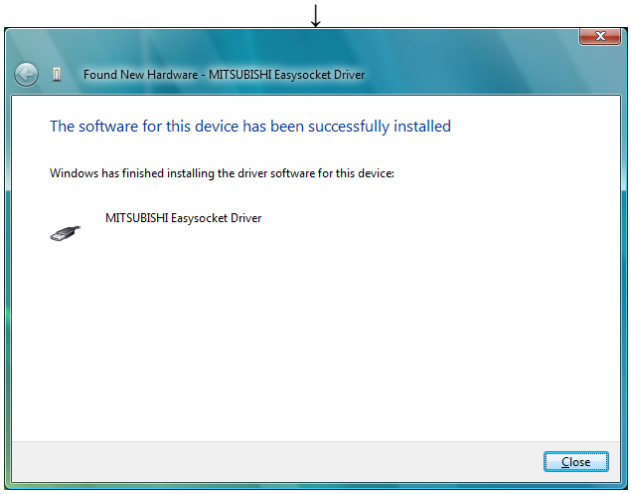
3) The screen on the left is displayed, so select “C:\Melsec\EasySocket\USBDrivers”.
If volume MELSOFT products have been installed, browse the installation destination "EasySocket\USBDrivers" of the first installed product.
After setting, click the [Next] button.

↓



4) The screen on the left is displayed, so select "Install this driver software anyway".

↓



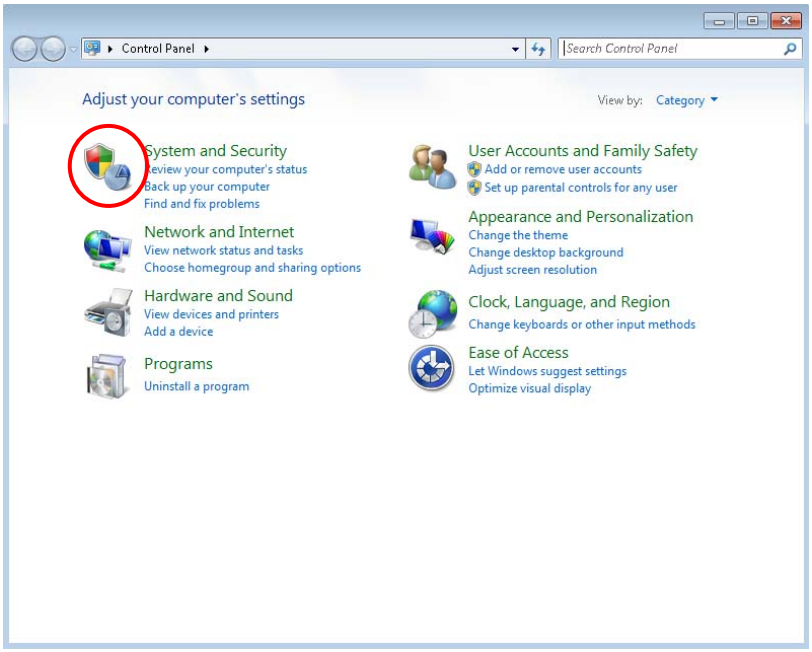
5) The screen on the left appears to indicate completion of installation.
Click the [Finish] button.

↓

(Completed)

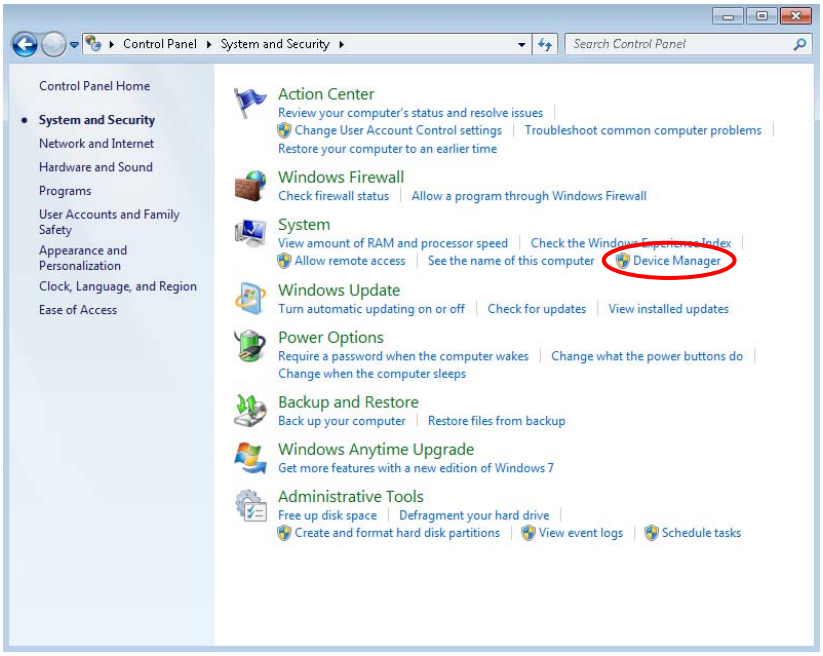
1.5.4.4. When using Windows 7 / 8 / 8.1

The following indicates the procedure for installing the USB driver when using Windows 7 / 8 / 8.1.



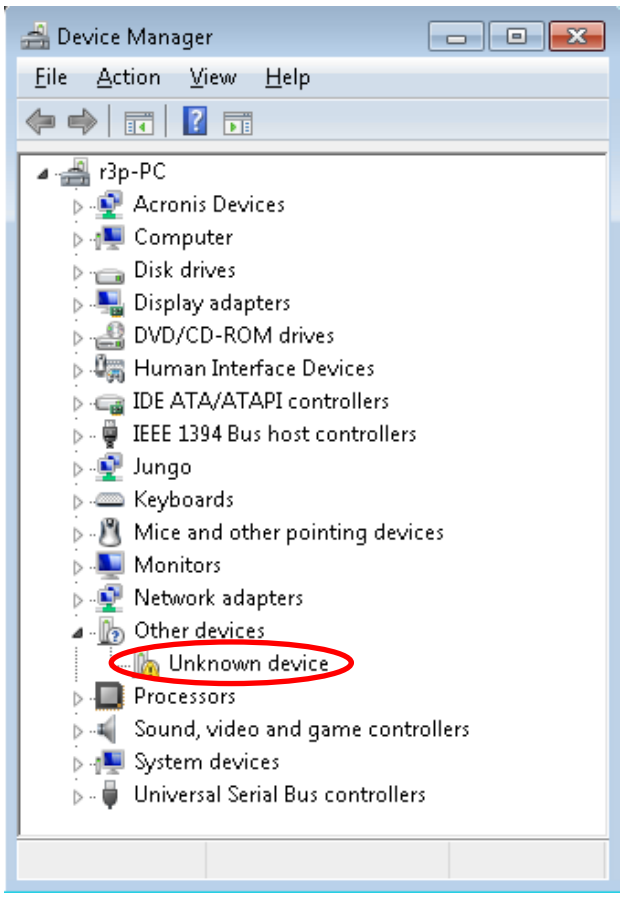
1) When "Control panel" is selected from the start menu with the USB cable connected, the following screens are displayed.
The screen on the left is displayed, clicking the red circle part in this screen.

↓

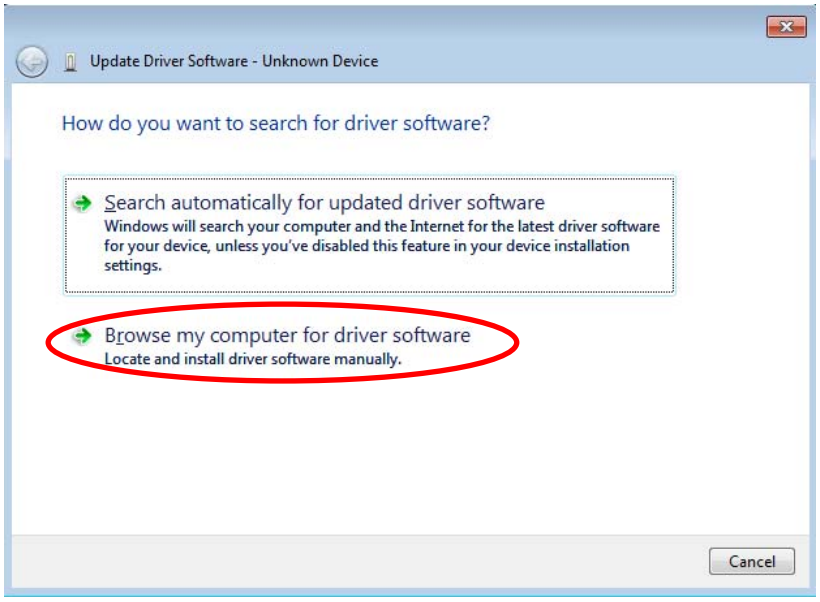


2) The screen on the left is displayed, clicking the red circle part in this screen.

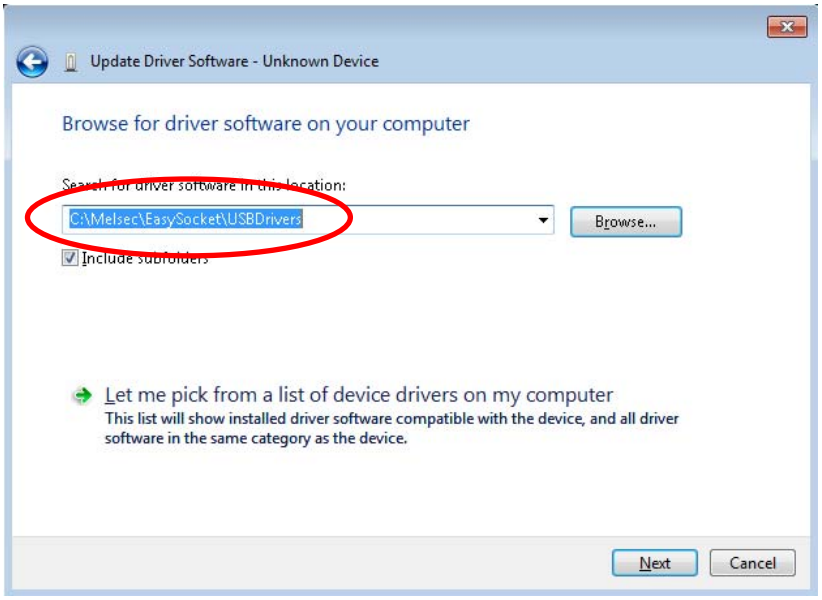
↓



3) The screen on the left is displayed, right-clicks on “Unknown device” is displayed on this screen.
Select "Update Driver Software" of the menu that right-clicks on this item and is displayed.

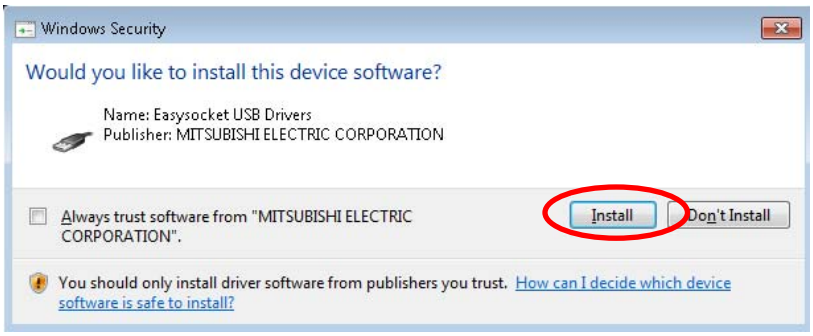


4) The screen on the left is displayed, click lower "Browse my computer for driver software".



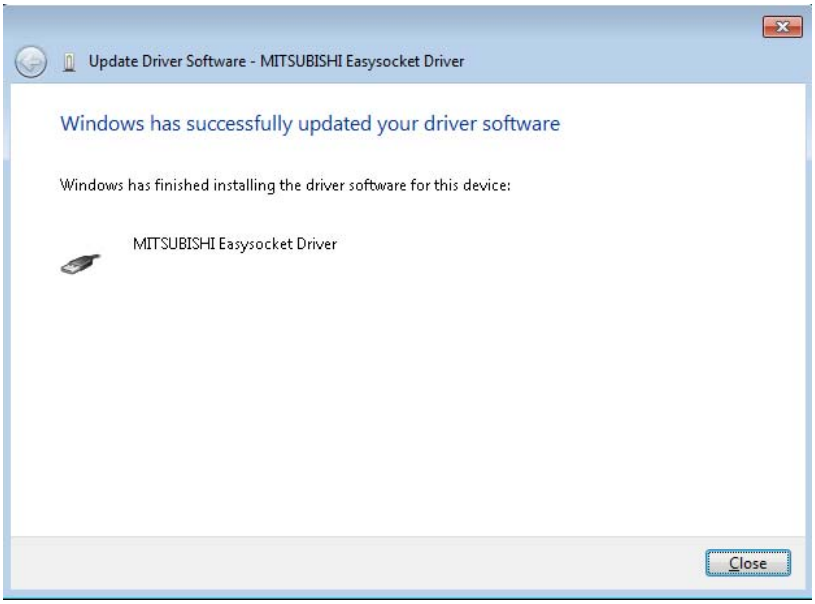
5) The screen on the left is displayed, set "C:\Melsec\Easysocket \USBdrivers".
If volume MELSOFT products have been installed, browse the installation destination "EasySocket\USBDrivers" of the first installed product.
After setting, click the "Next" button.

↓



6) The screen on the left is displayed, click "install".

↓



7) The screen on the left appears to indicate completion of installation.
Click the [Finish] button.

↓

(Completed)

1.5.5. CRnQ Communications USB driver for GOT transparent function / GOT communitation installation

Connecting the CR750-Q/CRnQ-700 series robot controller with USB via GOT transparent mode (Bus, Direct coupled or Ethernet) and connecting the CR750-D/CRnD-700 series robot controller with USB via GOT communication requires installation of the USB driver for the GOT transparent function. Install with the following procedure.
CRnQ communication GOT transparent mode is available from RT ToolBox2 Ver.1.1 or later. GOT communication is available from RT ToolBox2 Ver.1.5 or later. Ethernet is available from RT ToolBox2 Ver.1.7 or later.

1.5.5.1. When using Windows 2000

When you connect the GOT and the computer by the USB cable, installation starts and completes automatically.

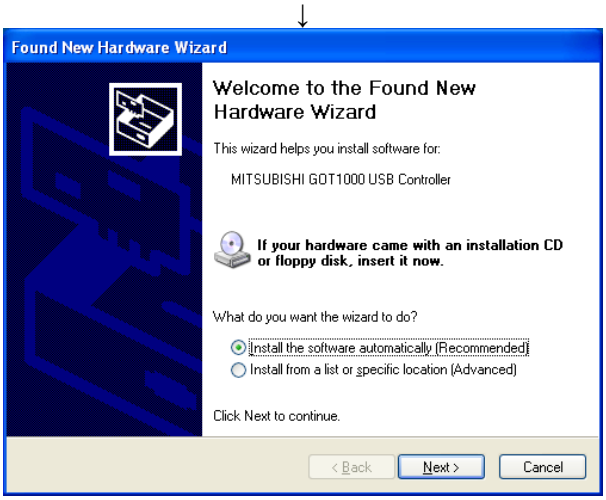
If the USB driver cannot be installed, click the following setting.

If you have selected "Block-Prevent installation of unsigned files" after [Control Panel] - [System] - [Hardware] - [Driver Signing], the USB driver may not be installed.
Choose "Ignore-Install all files, regardless of file signature" or "Warn-Display a message before installing an unsigned file" for [Driver Signing], and install the USB driver.

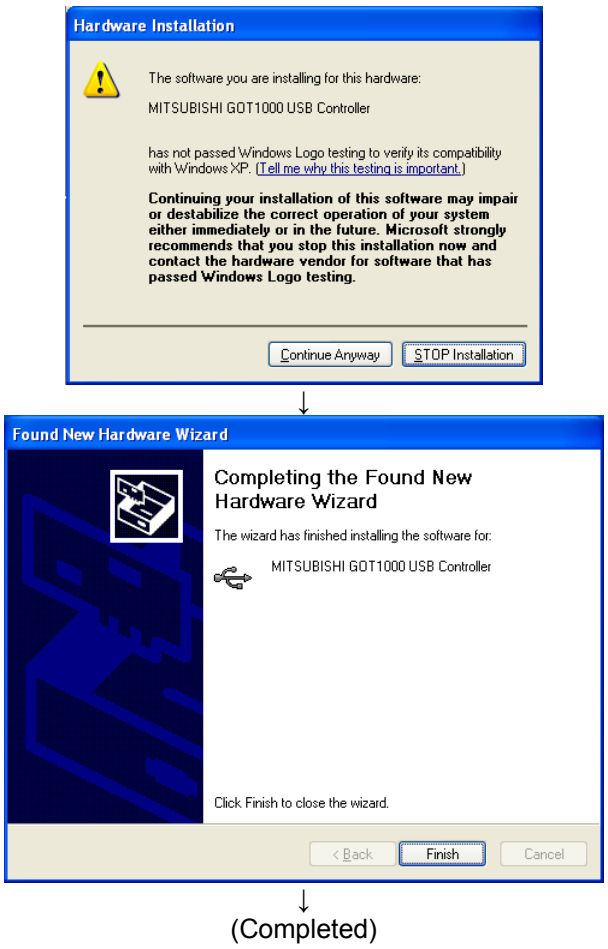
1.5.5.2. When using Windows XP

The following indicates the procedure for installing the USB driver when using Windows (Professional)

1) The screen shown on the left appears when you connect the personal computer and GOT by the USB cable. Choose "Yes, now and every time I connect a device" and click the [Next] button.



2) As the screen on the left appears, select "Install the software automatically (Recommended)", then click the [Next] button.



↓

(Completed)

3) As the screen on the left appears, click the [Continue Anyway] button to continue the installation of the USB driver.
(No problem will occur after installation of the USB driver.)

4) The screen on the left appears to indicate completion of installation.
Click the [Finish] button to terminate installation.

If the USB driver cannot be installed, click the following setting.

If you have selected "Block-Never install unsigned driver software" after [Control Panel] - [System] - [Hardware] - [Driver Signing], the USB driver may not be installed.
Choose "Ignore-Install the software anyway and don't ask for my approval" or "Warn-Prompt me each time to choose an action" for [Driver Signing], and install the USB driver.

1.5.5.3. When using Windows Vista

When you connect the GOT and the computer by the USB cable, installation starts and completes automatically.

1.5.5.4. When using Windows 7 / 8 / 8.1

When you connect the GOT and the computer by the USB cable, installation starts and completes automatically.

1.6. When Starting at the Same Time as Another Product

When starting this software and another one of our products at the same time, follow the following precaution. Correct communications and screen display are sometimes not possible.

Table 1-5 Precautions for Starting at the Same Time with Another Product

Product name	Explanation	Precaution
RT ToolBox computer support software	Older version of this software	Can not be used at the same time as this software
MELFA-Works	3D robot simulator	MELFA-Works Ver.3.0 or lator can be used at the same time as this software. Earlier version than Ver.3.0 can not be used.
MELFA-Vision	Network vision sensor software	Start this software first.
E/EN series computer support software for Windows	E/EN series software	Can not be used at the same time as this software
P/P-2	R-250R/R-300R series software	Can be used at the same time as this software

1.7. Upgrade of software

It is possible to download the latest version from MITSUBISHI ELECTRIC FA site where information on MITSUBISHI ELECTRIC Corporation FA equipment product is offered. (It is only a Japanese site.)

http://wwwf2.mitsubishielectric.co.jp/melfansweb/robot/index.html

It is necessary to register to FA members for downloading the software.

Difference update of robot model information can be performed after Ver.3.00A.

2. RT ToolBox2 Usage

This explains the usage of this software simply.

2.1. Starting RT ToolBox2

When you install this software, a shortcut is prepared on the desktop. Start RT ToolBox2 by double clicking this short cut.

Version 1.8 or earlier Version 2.00A or later

Figure 2-1 RT ToolBox2 Shortcut

From [Start] button -> [All Programs] -> [MELSOFT Applications], select [RT ToolBox2] and start it.

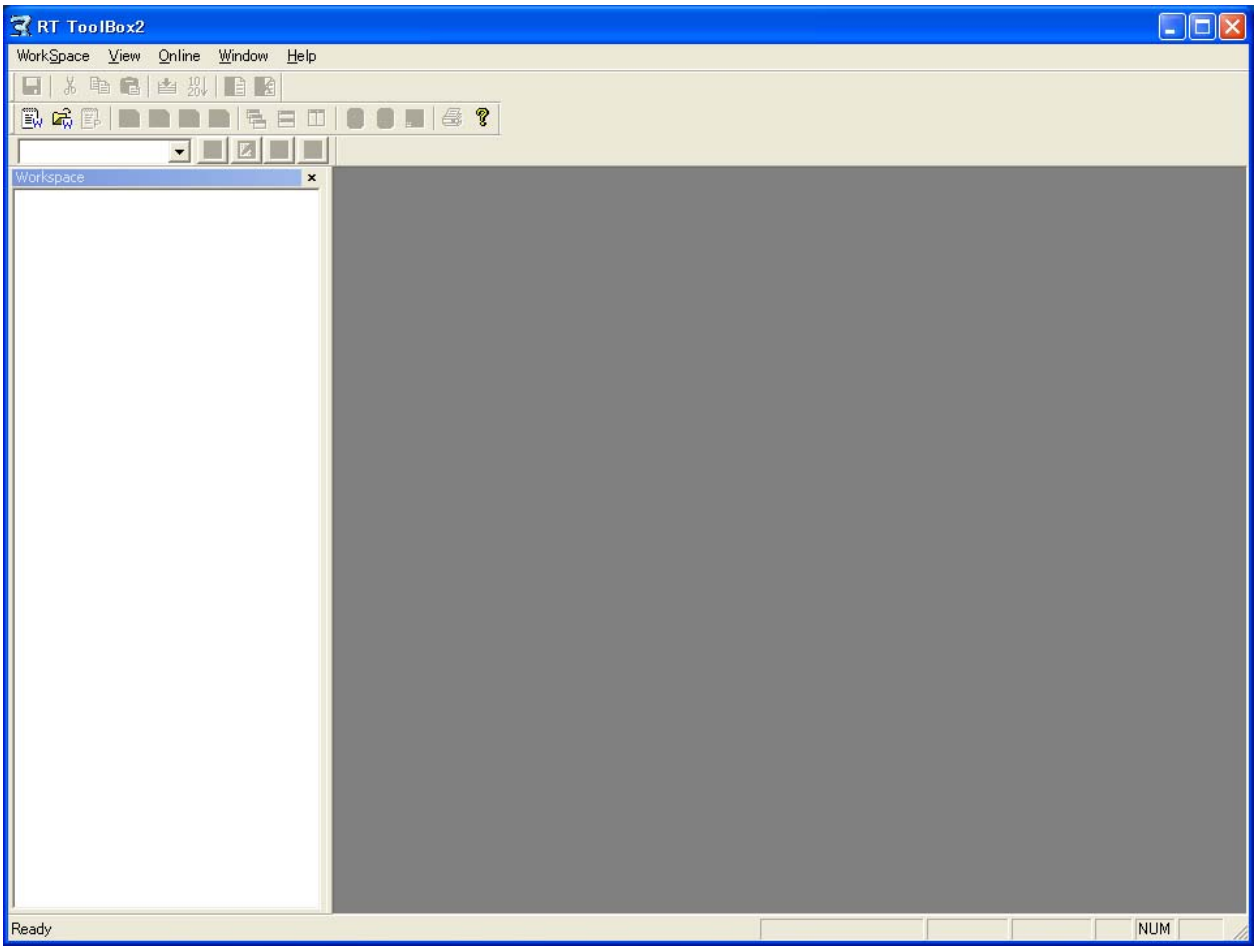


Figure 2-2 RT ToolBox2 Initial Screen

When you start RT ToolBox2, "Communications Server 2" is started up as an icon.
This Communications Server 2 has functions for connecting with a robot controller or during a simulation, a virtual controller. Do not close Communications Server 2.

Figure 2-3 Communication Server 2

2.2. Explanation of RT ToolBox2 Screens

The composition of the main RT ToolBox2 screen is as follows.

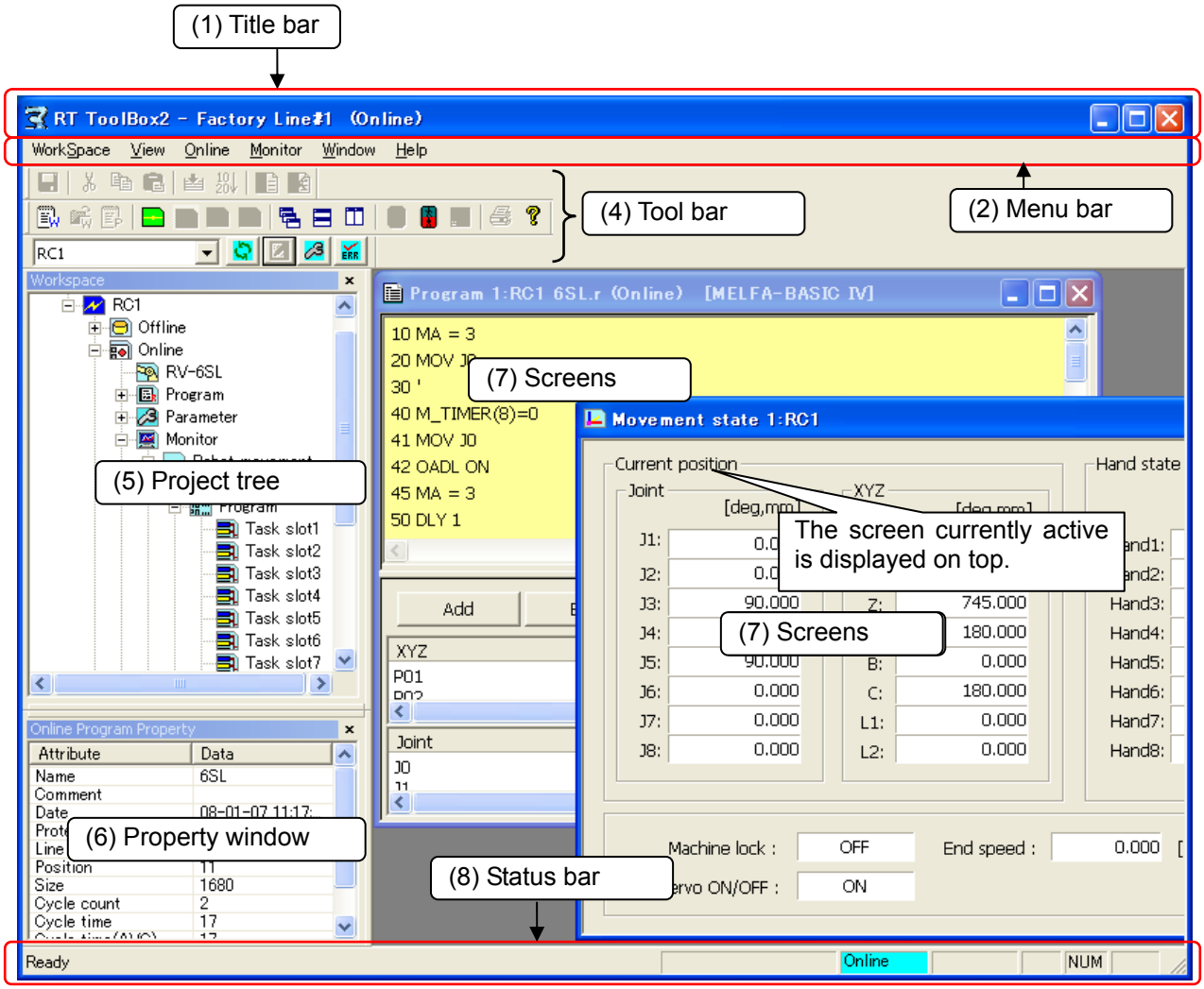
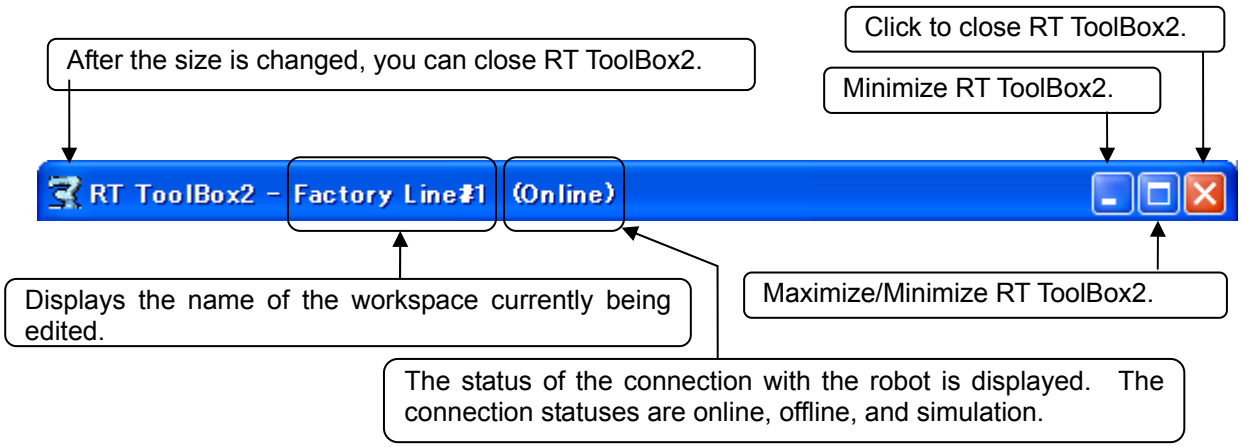


Figure 2-4 Explanation of Main Screen

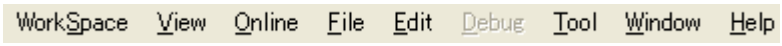
(1) Title bar

Displays the name of the workspace currently being edited.



(2) Menu bar

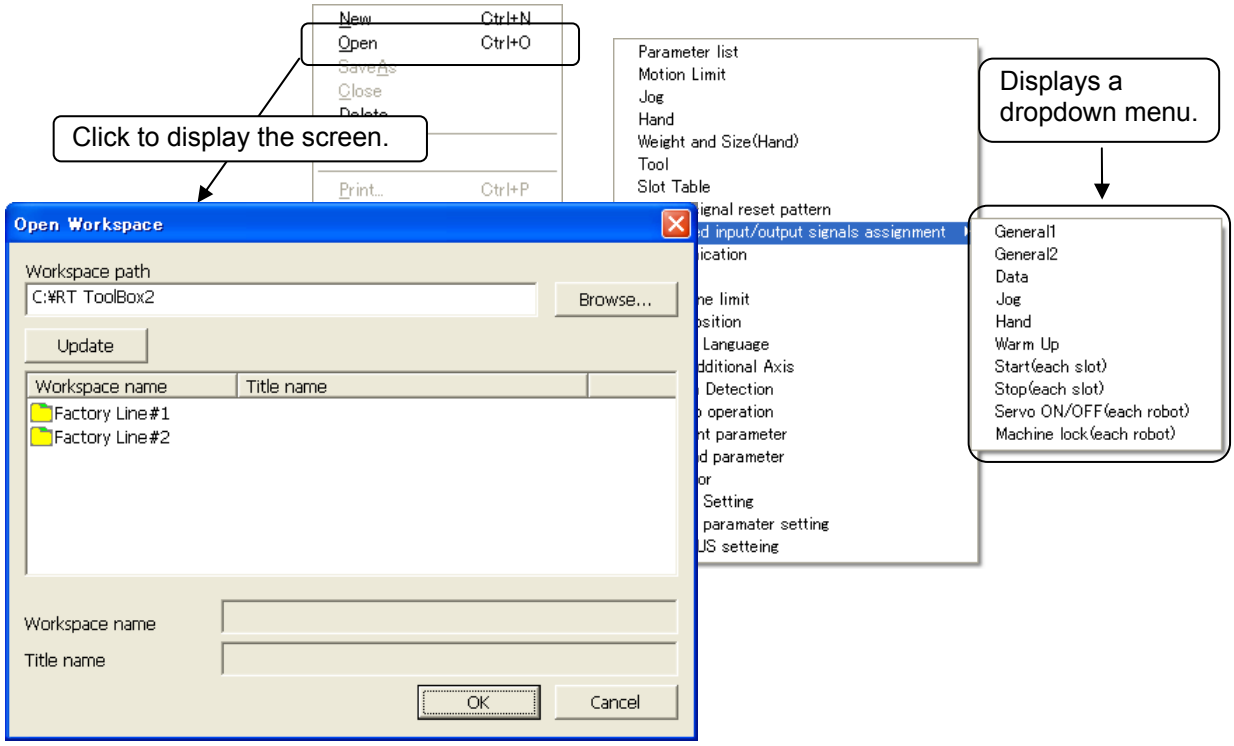
Displays the names of the menus that can be used in RT ToolBox2.
When a menu is selected, a dropdown menu is displayed from which you can use various functions.



The menu bar display contents and their enabled/disabled status depend on which screen is currently active.

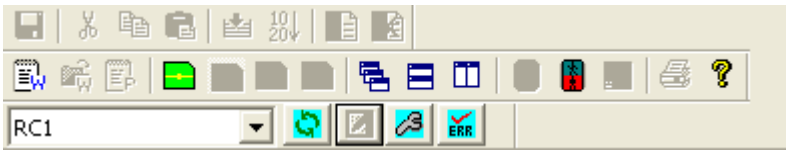
(3) Dropdown menu

Displays the names of the functions you can use in RT ToolBox2.
When you click a function name, it displays a screen with the settings etc. for the selected function.
When "▶" is displayed at the right end of a dropdown menu, a dropdown menu for the selected function is displayed



(4) Tool bar

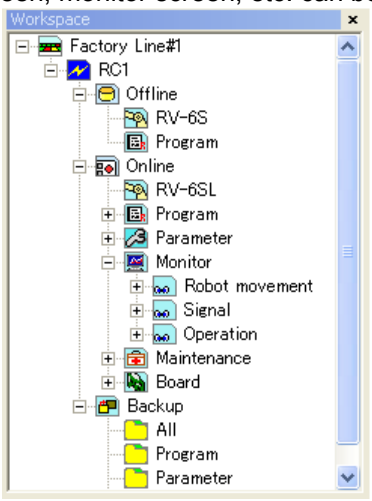
Displays buttons for the functions assigned to the menu bar.



The tool bar display depends on which screen is currently active and on the robot connection status.

(5) Project tree

Displays a list of all the projects registered in the workspace and by functions.
From this tree, the program edit screen, monitor screen, etc. can be started.

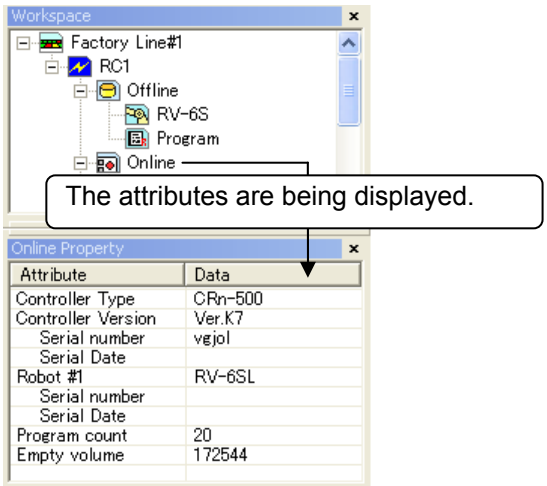


The project tree is a docking window. By dragging the title section with the mouse, you can dock the project tree at the top, bottom, left, or right edge of the main screen.

When the project tree is closed, you can display it again by clicking on the menu bar [View] -> [Project Tree].

(6) Property window

You can reference various attributes of the workspace being edited.
If you click an item on the project tree, its attributes are displayed.

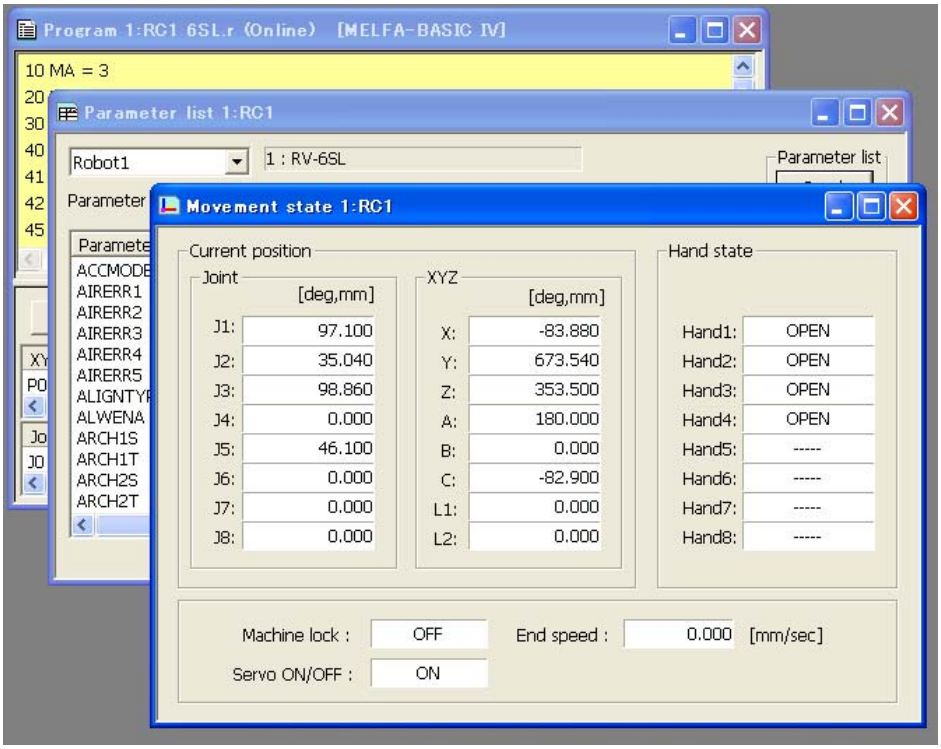


The property window is a docking window. By dragging the title section with the mouse, you can dock the project tree at the top, bottom, left, or right edge of the main screen.

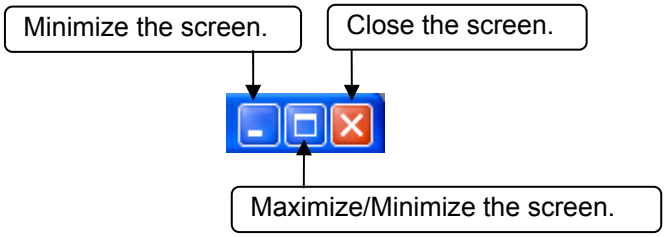
The default setting for the property window is not to be displayed. You can display the property window with the menu bar [View] -> [Property].

(7) Screens

Displays the screens that can be started from the project tree, including the program edit screen and monitor screen. The currently active screen is displayed on top.

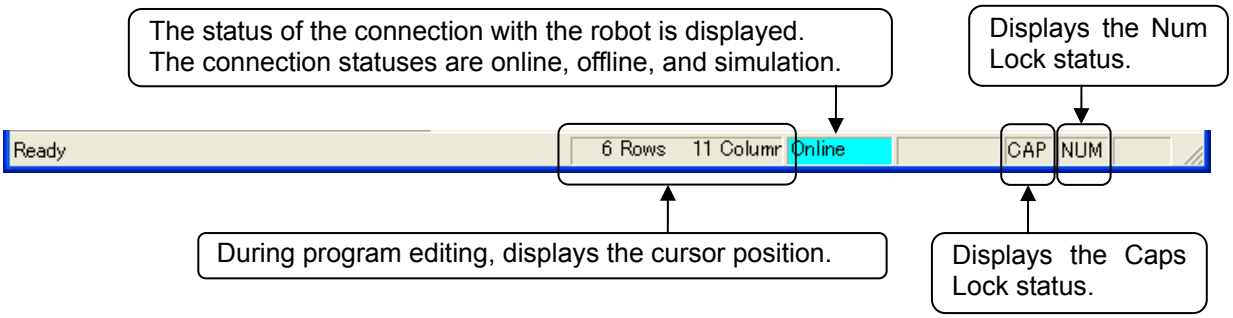


To close a screen, click the [ ] button in the upper-right corner of the screen.
You can also change the screen size with the button in the upper-right of the screen.



(8) Status bar

Displays RT ToolBox2 status information.



(9) Handy menu display

By clicking the right button on the mouse, you can display the right button menu, depending on the work contents. Using this menu can increase work efficiency.
During program editing, the right button menu includes such functions as [Copy], [Paste], and [Cut].

2.3. Communications Server 2

When you start RT ToolBox2, "Communications Server 2" is started up as an icon.
This Communications Server 2 has functions for connecting with a robot controller or during a simulation, a virtual controller.

Figure 2-5 Communications Server 2 as Icon

⚠ Caution

Do not close Communication Server 2 manually.

Communication Server 2 has functions for connecting to a robot controller or during simulation, a virtual controller. Do not close Communication Server 2. Communication Server 2 closes automatically when RT ToolBox2 is closed.

Turn Communication Server 2 into an icon.

Turn Communication Server 2 into an icon with the  button.

When you return Communications Server 2 from an icon to its original size, you can check the status of the connection with the robot.

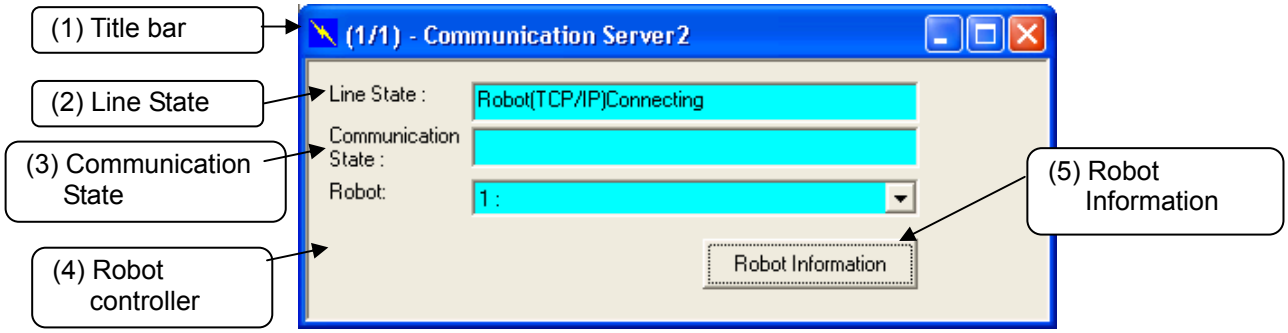


Figure 2-6 Communication Server2

(1) Title bar
(AA/BB) AA: shows the number of robot controllers with which connections are established and BB: shows the number of projects switched online.

(2) 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.

Table 2-1 Line State

Status	Content	Color
Connecting	Indicates that the connection with the robot has been established.	Light blue or Blue
Connection wait	Indicates that a communication to verify connection is being made in the case of RS-232 connection. Indicates the wait status for communication port connection in the case of TCP/IP and USB 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-232 connection. Displayed when the communication port cannot be opened in the case of TCP/IP and USB connection. In the case of USB connection, if the USB driver has not been installed, it is also displayed in red.	Red
Communication	Displayed when the communication port cannot be opened in the case of	Red

Status	Content	Color
Setting error	RS-232 connection. This is not displayed in the case of TCP/IP connection	
Waiting	Indicates the idling status displayed at the start of remote maintenance.	Yellow

(3) Communication State
The contents of communication with the robot controller are displayed.

(4) Robot
This changes the robot controller for which the "Line status" and "Communication status" are displayed.
This is only displayed for robot controllers that are online or have been switched to simulation status.

(5) Robot Information
Information on the currently connected robot can be referenced.

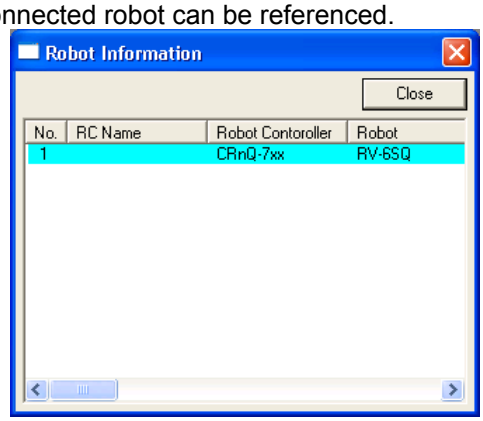


Figure 2-7 Connected Robot Information

Caution

Cautions when connected on USB with CRnQ communications

When connected on USB with CRnQ communications, after connecting normally, if the communications are cut off due to any of the following external causes, the line status display remains "Connected". If this happens, return this software offline, remove the cause of the cutoff, and then go back online.

- The robot controller power supply went off.
- The communication cable was disconnected.

This software Ver.1.5 or later can communicate with robot controller by higher reliability communication. In this case, line state color (connecting) of communication server 2 is “Blue”.

Table 2-2 Conbination of higher reliability communication

		Robot controller software version				
		CRn-500	CR750-D/CRnD-700		CR750-Q/CRnQ-700	
		All versions	Ver.P7a or former	Ver.P8 or later	Ver.N7a or former	Ver.N8 or later
This software verion	Ver.1.4.1 or former	○	○	○	○	○
	Ver.1.5 or later	○	○	◎	○	◎

○ : Conventional communication (line state color (connecting) : light bule)
◎ : Higher reliability communication (line state color (connecting) : blue)

Caution

Caution when connected on TCP/IP with higher reliability communication

When connected on TCP/IP with higher reliability communication, connect only one line of one port number.
If two or more lines are connected to the same port number, the communication error might occur.

2.4. Closing RT ToolBox2

To close RT ToolBox2, on the menu bar, click [Workspace] -> [Close Application]. You can also close with the [] button in the upper-right of the screen.
When you close RT ToolBox2, Communications Server 2 also closes automatically.

3. Notes of when RT ToolBox2 is used with iQ Works (MELSOFT Navigator)

There are some limitations when robot controller's workspace is made by using iQ Works(MELSOFT Navigator) or RT ToolBox2 is started from iQ Works(MELSOFT Navigator). Please refer to the following notes when you use iQ Works(MELSOFT Navigator).

RT ToolBox2 corresponding to iQ Works(MELSOFT Navigator) is version 2.00A or later.

3.1. Notes of when RT ToolBox2 is installed

Notes 1-1: ***Please input product ID attached to the product again when you install a standard version of RT ToolBox2 in the personal computer in which "iQ Works(MELSOFT Navigator" is installed.***

When RT ToolBox2 is installed in the personal computer in which "iQ Works(MELSOFT Navigator)" is installed, product ID for "iQ Works(MELSOFT Navigator)" is displayed on "Input Product ID" screen. RT ToolBox2 is installed in the personal computer as mini version when this software is installed with this Product ID. Please input product ID attached to RT ToolBox2 product again when you install a standard version of RT ToolBox2.

3.2. Notes concerning workspace operation

Notes 2-1: ***The workspace name and the workspace title cannot be changed.***

When RT ToolBox2 is started from iQ Works(MELSOFT Navigator), the workspace name and the workspace title cannot be changed. "Edit workspace" in the dropdown menu of the workspace name is displayed in the gray and cannot be selected. (Refer to **"Figure 3-1 Menu of [Workspace] and Dropdown-menu of the** Workspace**"**)

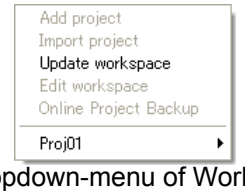
Notes 2-2: ***Please close RT ToolBox2 once when you edit another workspace.***

The another workspace cannot be opened after closing the editing workspace when RT ToolBox2 is started from iQ Works (MELSOFT Navigator). [New] of the [Workspace] menu and [Open] are displayed in the gray, and cannot be selected. (Refer to **"Figure 3-1 Menu of [Workspace] and Dropdown-menu of the** Workspace**"**) When you edit another workspace, please exit RT ToolBox2 once and start RT ToolBox2 specifying another workspace from iQ Works(MELSOFT Navigator).

Notes 2-3: ***It is not possible to save as another name when the workspace is edited.***

The editing workspace cannot be saved as another name when RT ToolBox2 is started from iQ Works (MELSOFT Navigator). [Save As] in [Workspace] menu is displayed in the gray and cannot be selected.

Menu of [Workspace]



Dropdown-menu of Workspace (online)

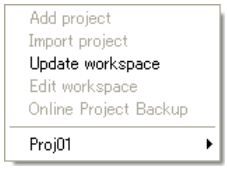
Figure 3-1 Menu of [Workspace] and Dropdown-menu of the Workspace

3.3. Notes concerning Project operation

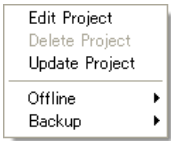
Notes 3-1: *It is not possible to delete,or and import a project.*

When RT ToolBox2 is started from iQ Works(MELSOFT Navigator), it is not possible to add a new project, import a project, or delete an existing project. [Add project] and [Import project] (in the dropdown menu by selecting a workspace name) and [Delete project] (in the dropdown menu by selecting a project name) are display in the gray and cannot be selected.

Menu of [Workspace]



Dropdown-menu of the Workspace (online)



Dropdown-menu of the Project

Figure 3-2 Menu of [Workspace] and Dropdown-menu of the Workspace

Notes 3-2: *It is not possible to change a project name.*

When RT ToolBox2 is started from iQ Works(MELSOFT Navigator), it is not possible to chage the project in the editing workspace. "Project name" in "Edit project" screen is displayed in the gray, and cannot be selected.

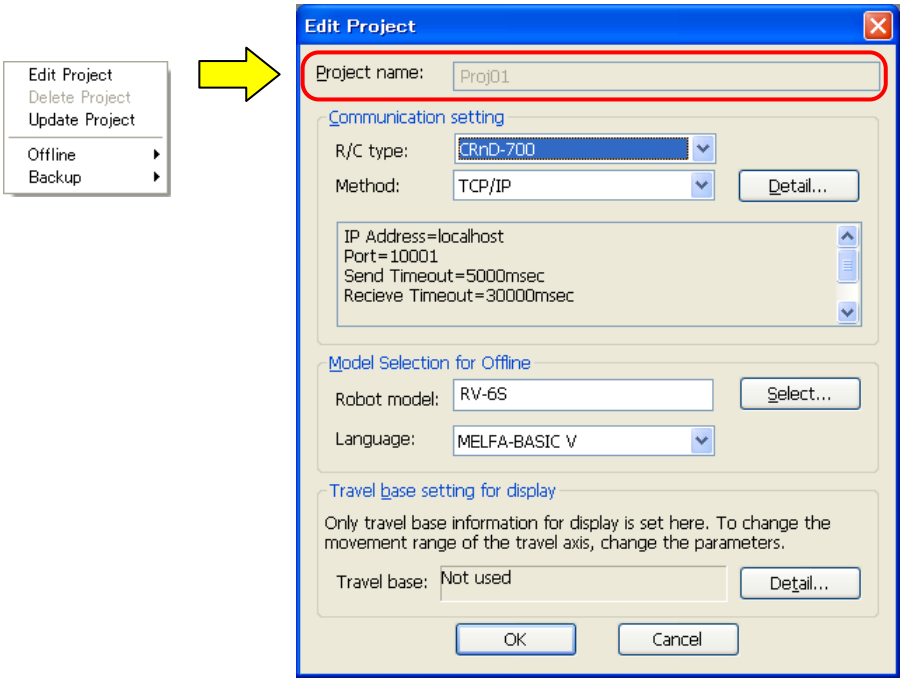


Figure 3-3 Edit project

3.4. Notes to edit the workspace created by iQ Works(MELSOFT Navigator)

Notes 4-1 : ***Do not change the composition of the workspace created by iQ Works(MELSOFT Navigator).***

The composition (changing a workspace name, changing a title, adding a project, deleting a project or changing a project name) of the workspace made with iQ Works(MELSOFT Navigator) cannot be changed with RT ToolBox2 started from iQ Works(MELSOFT Navigator). These information can be edited with RT ToolBox2 started directly by the start menu etc. However, it becomes impossible to take the correspondence in iQ Works(MELSOFT Navigator) when these information is changed. Please do not change the composition (changing a workspace name, changing a title, adding a project, deleting a project or changing a project name) of workspace when editing them with RT ToolBox2 started directly.

Prohibited matter in RT ToolBox2 started directly	
Workspace	・ Change the workspace name. ・ Change the title.
Project	・ Add a project ・ Import a project ・ Delete a project ・ Change the project name

The workspace name made with iQ Works (MELSOFT Navigator) is set as follows. Please note the handling of this workspace.

Workspace name	**RT Workspace**	This is fixation.

4. Basic Functions

The basic functions of this software are shown below.

Table 4-1 RT ToolBox2 Basic Functions

Function			Explanation
Offline			Targets files on the computer.
	Robot model		Displays the model of the robot used.
	Program		Displays the names of the robot programs written on the computer.
	SQ Direct		Displays the SQ Direct files written on the computer. (*2)
	Parameter		It is possible to set the parameters by offline and save them to the files. (*1) The saved files can be sent to the robot controllers.
Online			These are used with the robot controller connected.
	Robot model		Displays the model of the robot connected to the robot controller.
	Program		Displays the names of the programs stored on the robot controller.
	SQ Direct		It is possible to edit SQ Direct variables in the robot controllers. (*2)
	Parameters		It is possible to set the parameters and preserve them to the file without connecting the robot controller. (*1) And, the preserved parameter file can be forwarded to the robot controller.
		Parameter list	The parameters can be set individually.
		Parameter settings by function	The parameters can be set by robot function individually. The functions are as follows. ・Operating range ・Jog ・Hand ・Weight and size ・Tool ・Slot table ・Output signal reset pattern ・Dedicated input/output signal allocation ・RS-232 settings ・User-defined area ・Free plane limit ・Evacuation point ・Robot language ・Added axes ・Collision detection ・Heater operation ・Operation parameters ・Program parameters ・User error ・Ethernet setting ・CC-Link parameter setting ・PROFIBUS setting ・IO unit (*4) ・Work coordinate (*2) ・Force control (*4) ・Collision avoidance (*6)
	Monitors		
		Operation monitor	You can reference the slot status, program, monitor, operation status, and current errors.
		Signal monitor	You can check the statuses of signals input to the robot and signals output from the robot.
		Work monitor	You can check the robot work time and production information for each robot program.
	Maintenance		
		Home position data	This sets the robot home position.
		Initialization	This sets the robot controller's internal time, deletes all the programs in the controller, initializes the battery time remaining, and sets the serial number for the connected robot.
		Maintenance forecast	Forecasts the time for maintenance.
		Position repair	Supports recovery from home position deviation
		Tool automatic calculation	The tool length is calculated automatically and the value of a tool parameter is set up. (*5)
		Servo monitor	Monitors servo system information.
		Password Setup	The password to limit controller's right of access is registered, changed or deleted. (*3)

Function			Explanation
		File Manager	You can copy, delete and rename the file in the robot controller. (*5)
	Option card		You can check information on option cards mounted in the robot controller.
Tool			
	Force control log viewer		This function can display the graph of log data of force control in PC and robot controllers.
	User definition screen		It is possible to edit the user definition screen which can be operated by highly efficient T/B. (*5)
	Oscillograph		The data of a robot controller is displayed in a graph. (*7)
Simulation			This can be used connected with a virtual robot. *This can only be used with the standard edition.
	Same functions as online		The same functions can be used with a virtual robot controller as with an online one.
	Tact time measurement		The tact time for the robot program with the specified contents can be measured in the simulation.
Backup, restore			You can back up the information in the robot controller and restore backed up information into the controller.
MELFA 3D-Vision			You can do a setup of MELFA-3D Vision. (*7)

(*1) This function can be used with Version 1.4 or later of this software.
(*2) This function can be used with Version 1.5 or later of this software.
(*3) This function can be used with Version 2.00A or later of this software.
(*4) This function can be used with Version.2.10L or later of this software.
(*5) This function can be used with Version 2.20W or later of this software.
(*6) This function can be used with Version 2.40S or later of this software.
(*7) This function can be used with Version 3.00A or later of this software.

5. Workspaces and Projects

This explains about workspaces and projects.

5.1. Workspaces and Projects

This software has workspaces and projects.
The information for one controller is managed as one project. A workspace can manage up to 32 projects. If Ethernet is used for communications, you can simultaneously reference information on multiple projects (robot controllers) registered in the workspace.
When using multiple robot controllers, it is convenient to manage with separate workspaces for each manufacturing line and installation location.

(1) Using multiple robot controllers (up to 32)

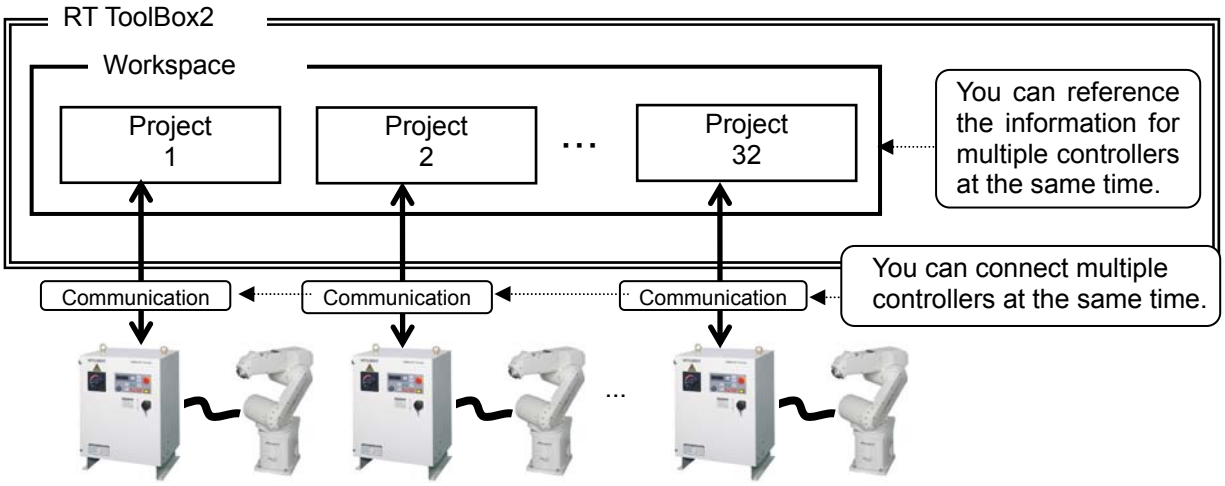


Figure 5-1 Using Multiple Robot Controllers

(2) Using 1 robot controller

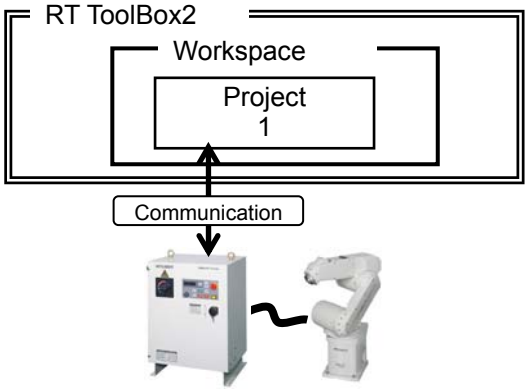


Figure 5-2 Using One Robot Controller

⚠ Caution

You cannot edit multiple workspaces at the same time.

With this software, you cannot edit multiple workspaces at the same time. Register into a single workspace all the projects (controllers) you want to reference at the same time.

Simultaneous connection with 32 units

The maximum of 32 robot connections is a theoretical value. It does not guarantee that if you actually connect 32 robots, you will achieve the same performance as when only 1 robot is connected. For example, if you monitor all the robots when 32 are connected, status updating is slower than for when 1 robot is connected.

Workspace editing and storage and project addition etc. are explained from the next section on.

⚠ Caution

Update workspaces and projects offline.

In the online status or while a simulation is running, you can not perform the following operations. Switch offline, then perform the operations.

- Opening an existing workspace
- Saving the workspace with a different name
- Adding a project
- Changing a project name
- Deleting a project

For details on switching offline, see **"5.14 Offline/Online/Simulation".**

5.2. Creating a New Workspace

Click [Workspace] -> [New Workspace] or click (Ctrl + N). Creating a New Workspace screen is displayed. Input the workspace name and title, and then click the [OK] button. The project edit screen is displayed, so set the project name (arbitrary name), the communication method and the robot model for offline (both are the information of the robot that you want to connect.), then click the [OK] button.
When you use the software Version 1.2 or earlier, the project edit screen is not displayed.

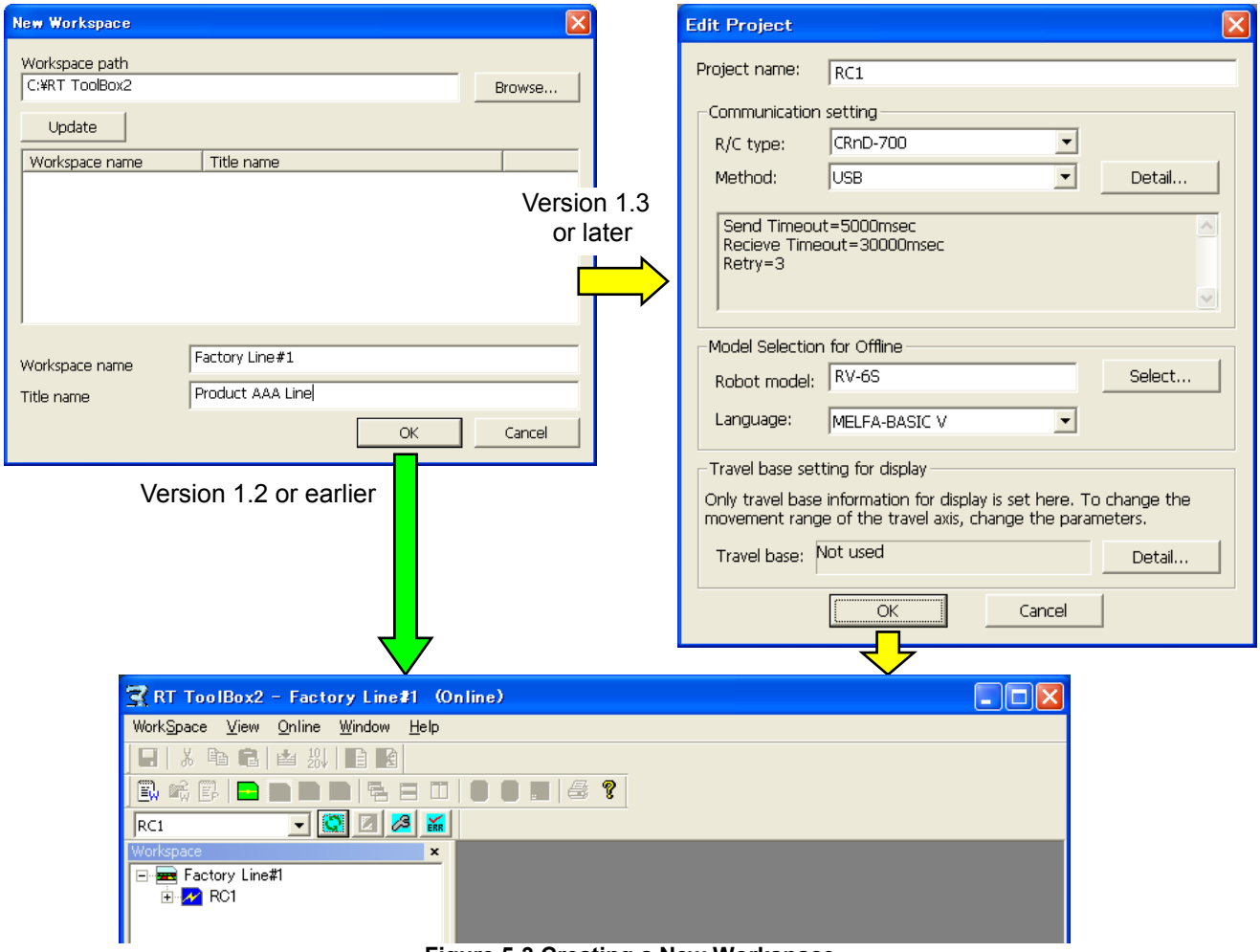


Figure 5-3 Creating a New Workspace

The project tree is displayed in the workspace and the "RC1" project is created as the default value.
This project name can be change later. For details, see **"5.9 Changing a Project Name".**

Caution

Workspace names

Workspace names are used as folder names in Windows, so you can not use characters that can not be used in Windows folders names (\ / : * ? " < > |).

Once a workspace has been created, you can not change its name with version 1.7 or earlier of this software.

Be aware that once a workspace has been created, you can not change its name with version 1.7 or earlier of this software.

When you use version 1.7 or earlier of this software, to change the name of a workspace, select "Workspace"on the menu → "Save As", save with the name you want to change to, then delete the original workspace with the old name.

5.3. Opening an Existing Workspace

To open an already existing workspace, click [Workspace] -> [Open] or click  (Ctrl + O). After selecting the workspace to edit, click the [OK] button.

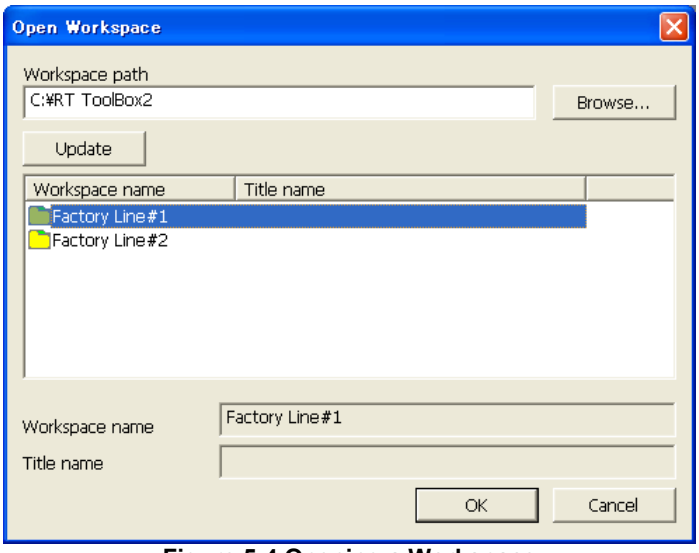


Figure 5-4 Opening a Workspace

The names of the last up to four workspaces used are added to [Workspace] on the menu bar. You can open one of these workspaces by clicking its name here.

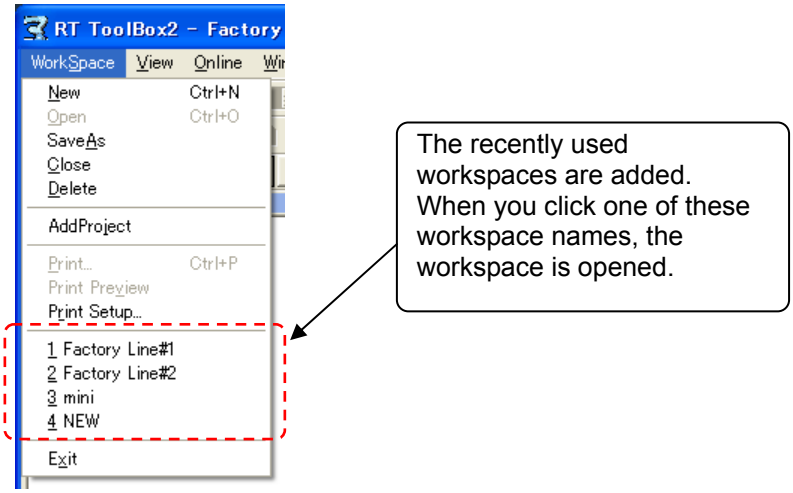


Figure 5-5 Recently Used Workspace Names

5.4. Closing a Workspace

To close the workspace being edited, click [Workspace] -> [Close]. Note that to delete a workspce, you must close it first.

5.5. Deleting a Workspace

Click [Workspace] -> [Delete]. The "Delete Workspace" screen is displayed, so check the name of the workspace to delete, and then click the [OK] button.

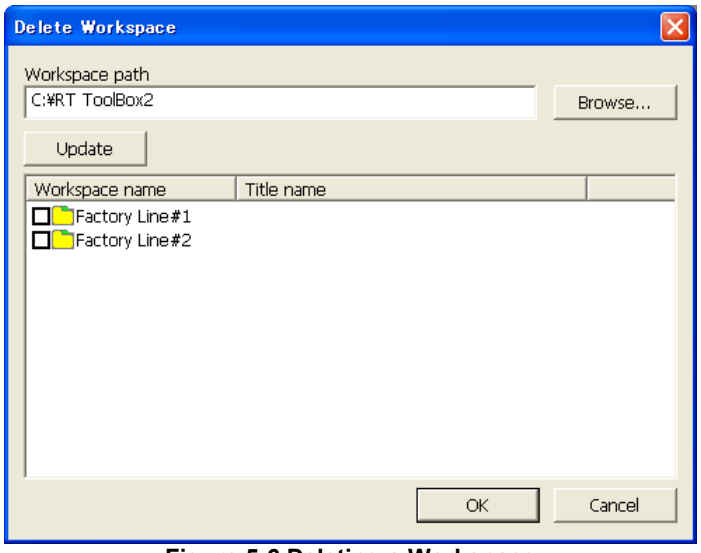


Figure 5-6 Deleting a Workspace

⚠ Caution

Deleting a workspace

To delete a workspace, close that workspace. You can not delete a workspace that is being edited.

5.6. Saving a Workspace

The information added to the workspace is saved automatically.

You can also save a workspace with a different name. Click [Workspace] -> [Save As], input the new workspace name and title, then click the [OK] button.

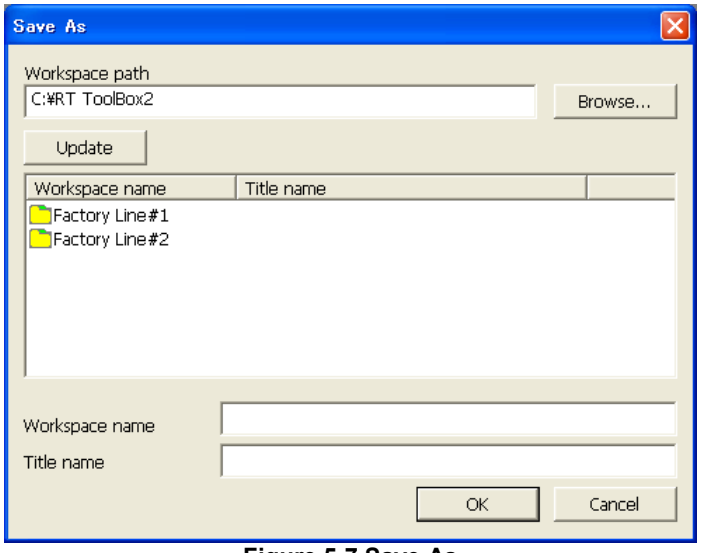


Figure 5-7 Save As

5.7. Changing a Workspace Name and Workspace Title

It is possible to change directly the workspace with version 1.8 or later of this software.

⚠ Caution

Don't change the workspace name and the workspace title made with iQ Works(MELSOFT Navigator).

Don't change the workspace name and the workspace title made with iQ Works(MELSOFT Navigator). It becomes impossible to take the correspondence in iQ Works(MELSOFT Navigator) when these information is changed.

Click the name of the workspace with the right button on the mouse, then click "Edit workspace" on the right button menu. The "Change Workspace" screen is displayed, so input the new workspace name and new workspace title, then click the [OK] button.

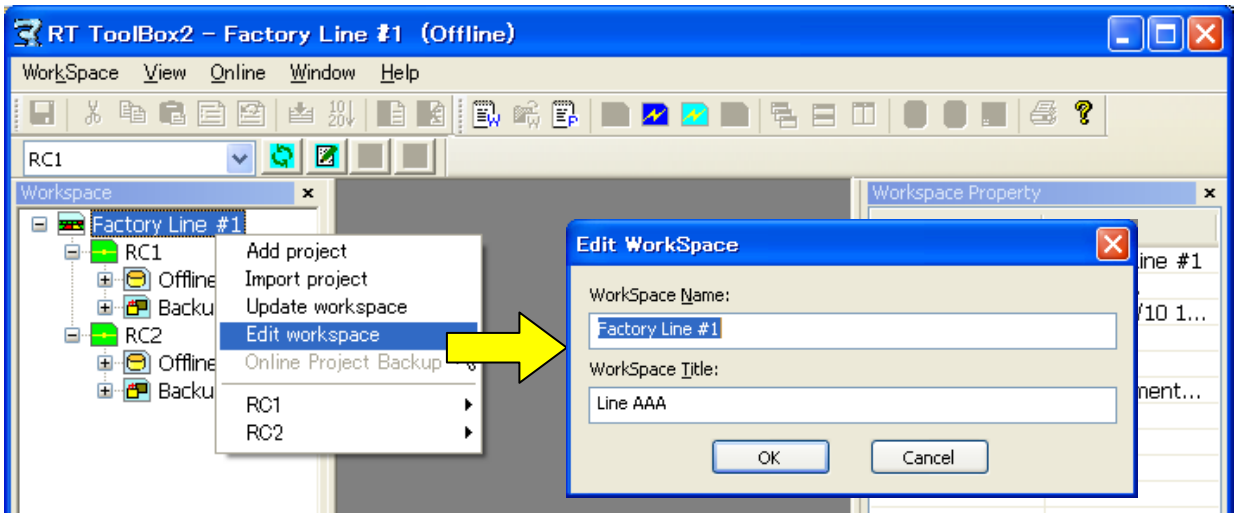


Figure 5-8 Changing the name of the workspace and workspace title

Once a workspace has been created, you can not directly change its name with version 1.7 or earlier of this software. When you use this software of these version, to change a workspace name, use the menu bar [Workspace] -> [Save As] to save the workspace with the desired new name, then delete the old workspace.

When the workspace title is changed, click the name of the workspace with the right button on the mouse, then click "Edit workspace title" on the right button menu. The workspace title screen is displayed, so input the new workspace title, and then click the [OK] button.

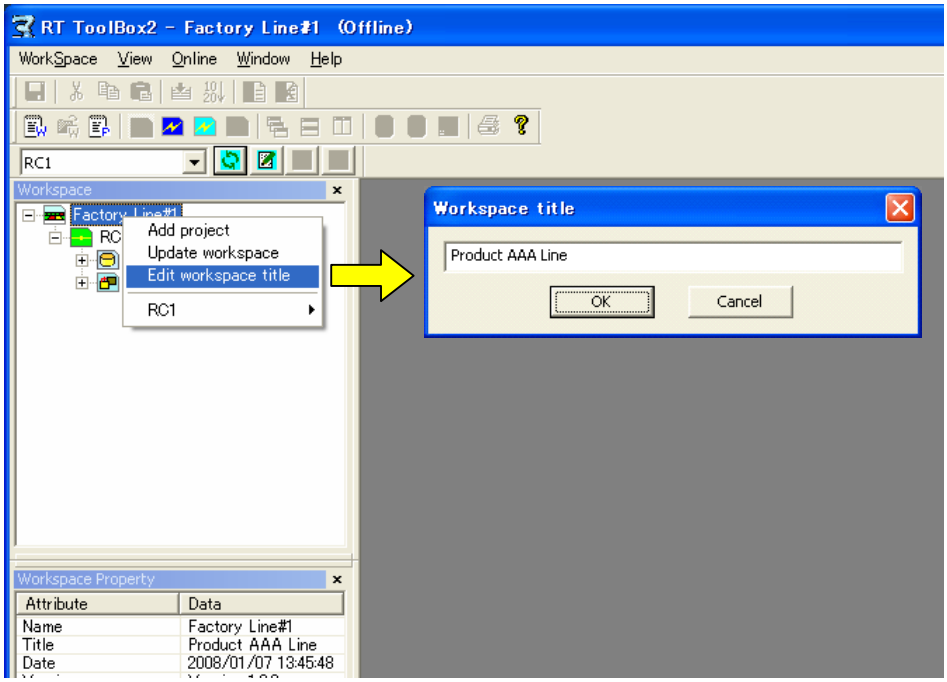


Figure 5-9 Changing the title of the workspace (version 1.7 or earlier)

5.8. Adding a Project

You can create up to 32 projects in one workspace.
Click [Workspace] -> [Add Project].

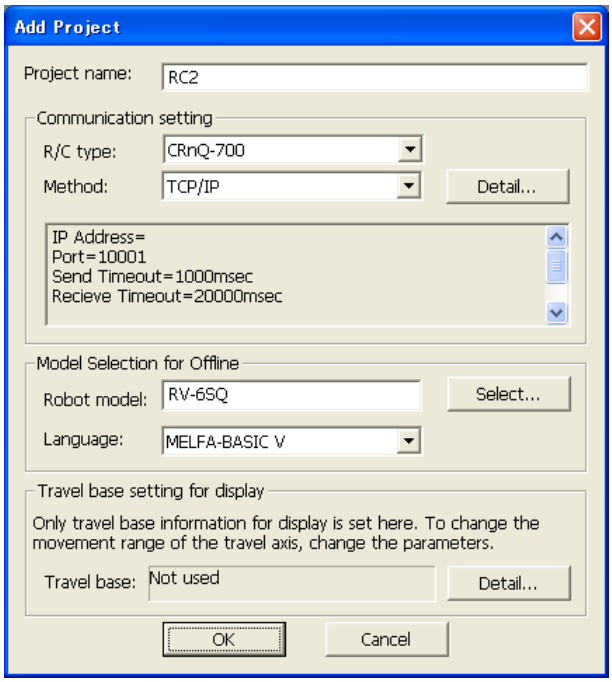


Figure 5-10 Adding a Project

After setting the project name, information on the robot connected, and the communication method, then click the [OK] button.
The project is added to the workspace.

Projects can also be added from a project tree.
After selecting the workspace, use the mouse right button to select [Add project]. Or, double click the workspace name on the project tree. (Note that this function can be used with Version 1.3 or later of this software)

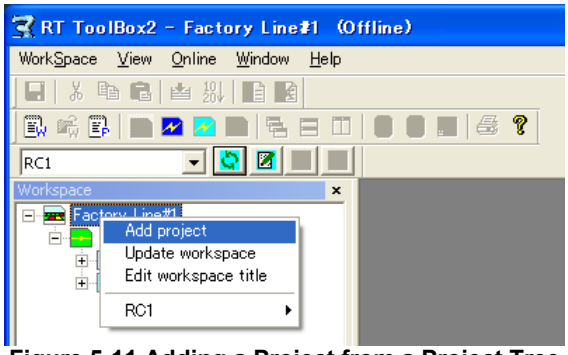


Figure 5-11 Adding a Project from a Project Tree

⚠ Caution

Add a new projects offline.

It is possible to add a new project offline. A new project cannot be added, when the status of either of project is "Online" or "Simulation".

Don't add a project to the workspace made with iQ Works(MELSOFT Navigator).

Don't add a project to the workspace made with iQ Works(MELSOFT Navigator). It becomes impossible to take the correspondence in iQ Works(MELSOFT Navigator) when these information is changed.

5.9. Changing a Project Name

You can change the name of a project even after it has been created.
Click the name of the project with the right button on the mouse, then click "Edit Project" on the right button menu. The project edit screen is displayed, so input the new workspace title, then click the [OK] button.

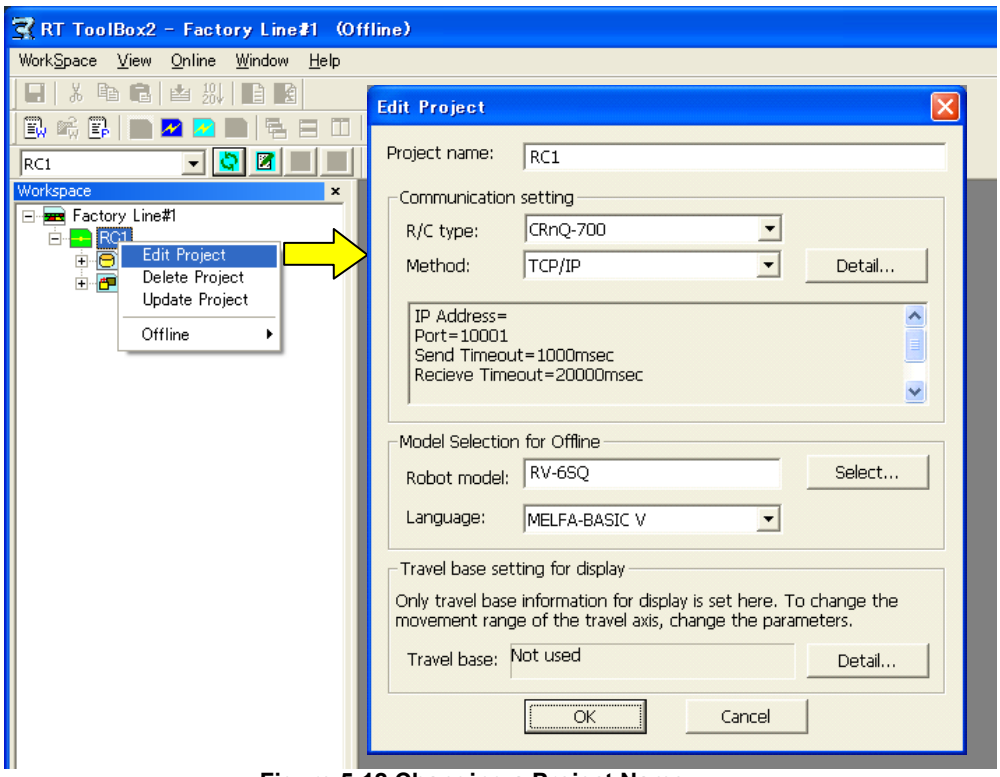


Figure 5-12 Changing a Project Name

⚠ Caution

Don't change a project name in the workspace made with iQ Works(MELSOFT Navigator).

Don't change a project name in the workspace made with iQ Works(MELSOFT Navigator). It becomes impossible to take the correspondence in iQ Works(MELSOFT Navigator) when these information is changed.

5.10. Deleting a Project

A project can not be deleted when it is running a simulation or has a robot connected online.
Click the name of the project with the right button on the mouse, then click "Delete Project" on the right button menu. The deletion confirmation message is displayed, so check that you have clicked the correct project name, then click the [OK] button.

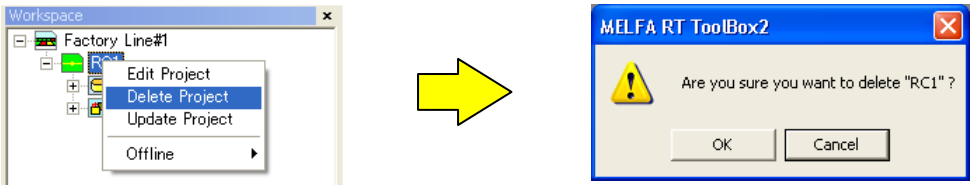


Figure 5-13 Deleting a Project

⚠ Caution

Don't delete a project in the workspace made with iQ Works(MELSOFT Navigator).

Don't delete a project in the workspace made with iQ Works(MELSOFT Navigator). It becomes impossible to take the correspondence in iQ Works(MELSOFT Navigator) when these information is changed.

5.11. Contents of Project Tree

A project tree shows the current workspace's project configuration in a hierarchical manner. You can start all functions from the project tree, including program editing, monitor, etc.
The contents of the project tree depend on the state of connection with the robot controller.

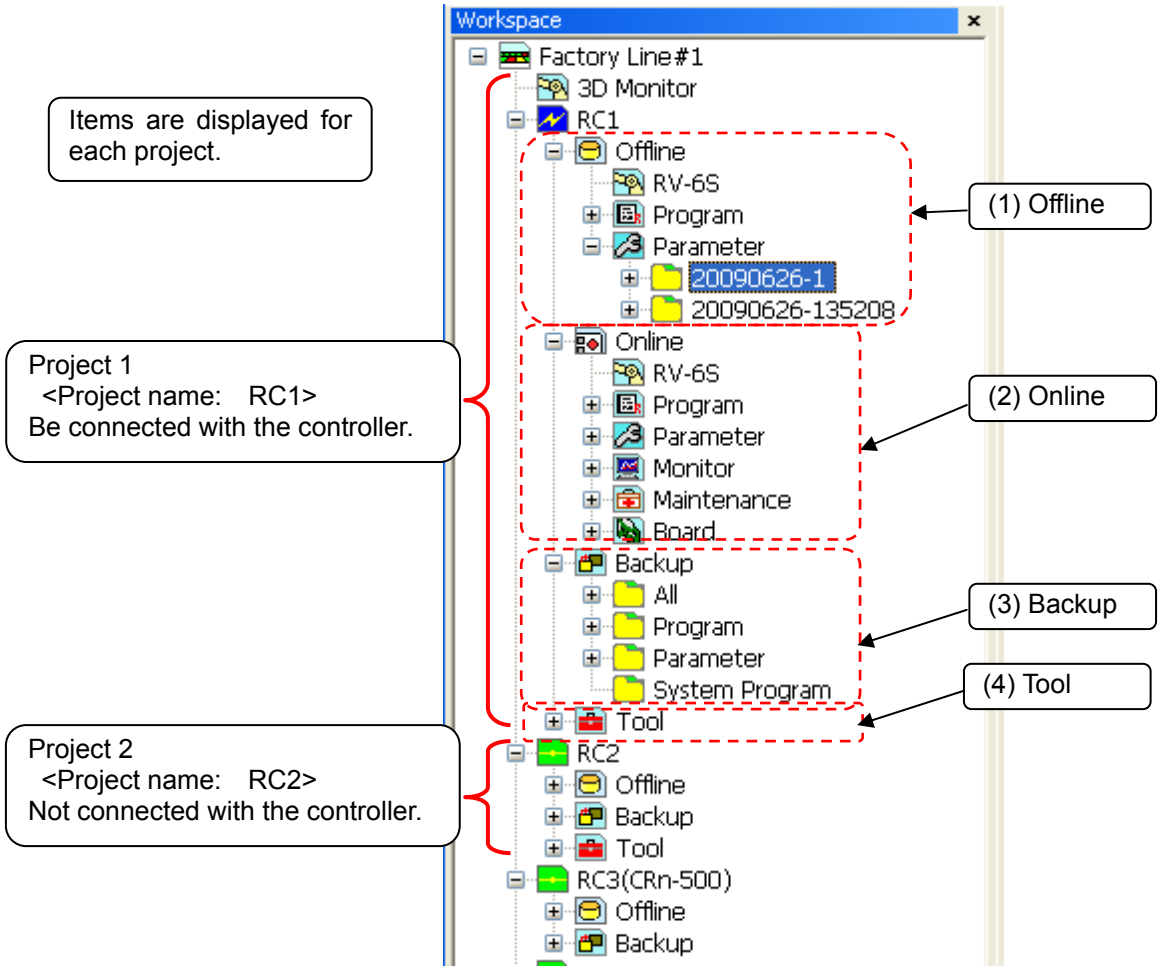


Figure 5-14 Structure of Project Tree in Workspace

(1) Offline
Displays the information stored in computer.
Displays the robot model set up currently and the name of robot programs created.

(2) Online
The "Online" section is displayed when a robot is switched into being connected online with its controller or starts a simulation. This section displays the connected robot model and the information items that can be referenced in the controller or a simulation controller.

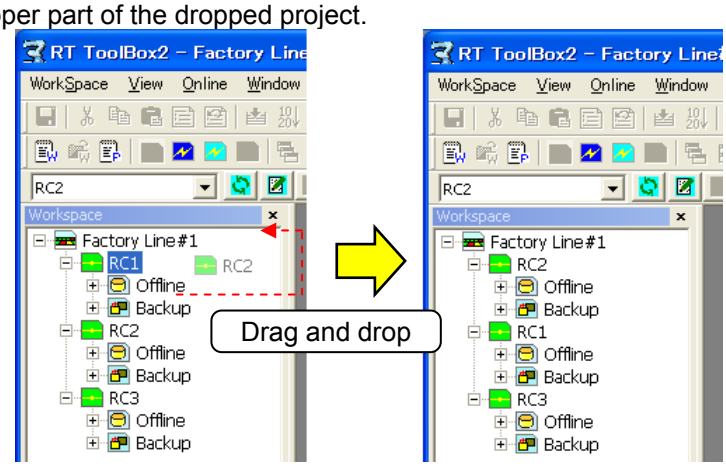
(3) Backup
Controls the information backed up from the controller.

(4) Tool
Other functions are displayed.

Memo

It is possible to change the order of the display of the project in the tree.

It is possible to change the order of the display of the project in the tree with version 1.3 or later. Drag the project with the mouse, and drop it to the transportation destination. The project is moved to the upper part of the dropped project.



5.12. Copying Programs Between Projects

To copy or move a created robot program to another project, do this with program management. For details on the operation methods, see **"8.10 Program Management"**, **"8.10.2 Copy"**, or **"8.10.3 Move".**

With this software Version 1.3 or later, It is possible to copy by drag and drop the project name on the project tree.
Please refer to **"8.10 Program Management"** in this manual for details.

5.13. Import of project

It is possible that the project in other workspace is imported to the current workspace. Note that this function can be used with Version 1.2 or later of this software.

The project can be imported only at offline. Please operate after change to offline when current mode is online or simulation.

⚠ Caution

Don't import a project to the workspace made with iQ Works(MELSOFT Navigator).

Don't import a project to the workspace made with iQ Works(MELSOFT Navigator). It becomes impossible to take the correspondence in iQ Works(MELSOFT Navigator) when these information is changed.

Click [Work space]->[Import project] on the menu bar.
After "Select Workspace" window is displayed, select the workspace including the project that you want to import, and click [OK] button. The list of the project in selected workspace is displayed on "Select the projects" window. Check the project, and click [OK] button.

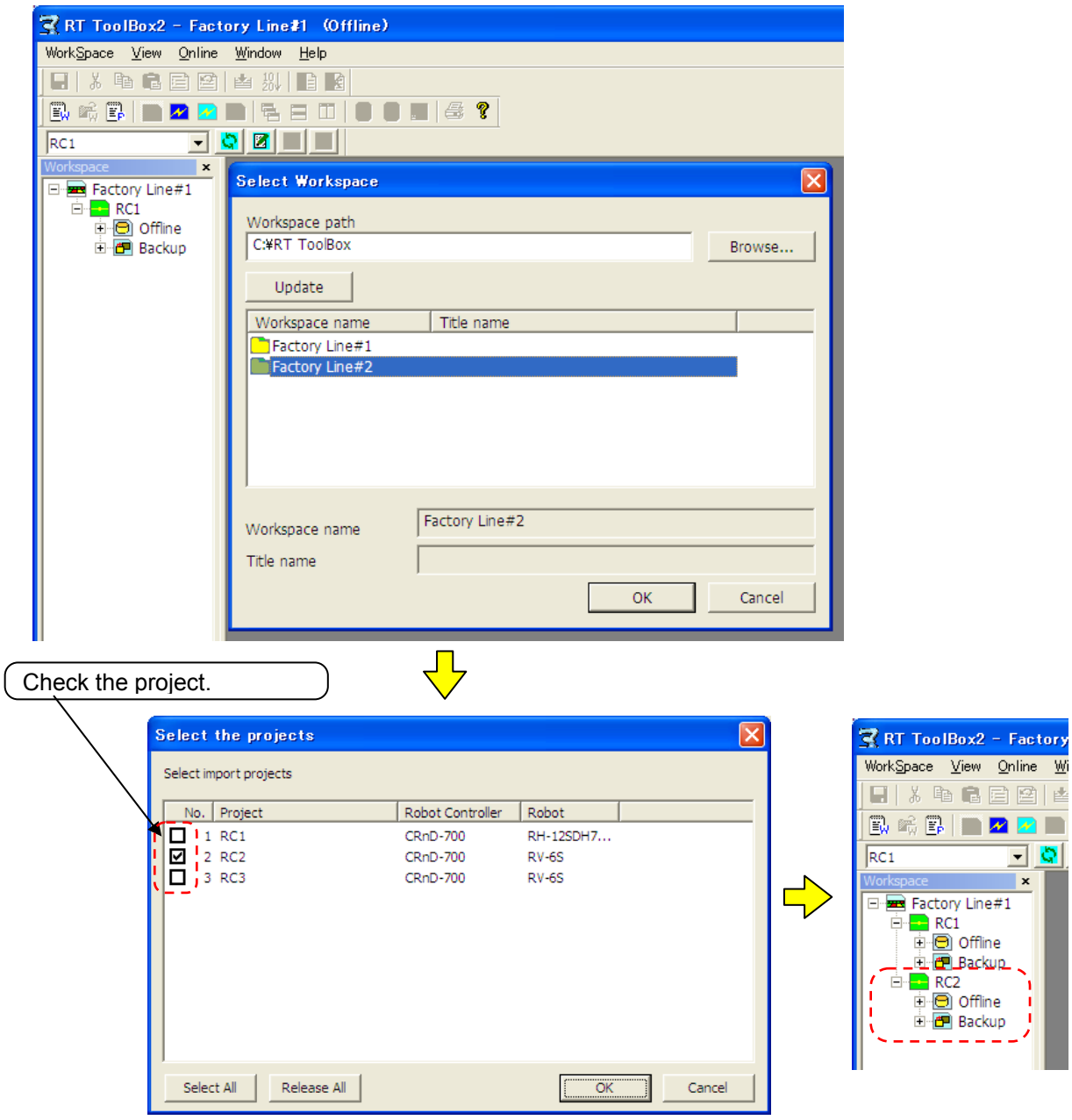


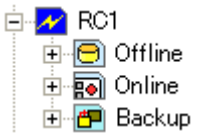
Figure 5-15 Import of project

The maximum number of the projects in one workspace is 32.

5.14. Offline/Online/Simulation

The project status are offline, online, and simulation. The meaning of each status and the contents displayed in the project tree are shown below.

Table 5-1 RT ToolBox2 Status

Status	Explanation	Project tree display
Offline	Targets files stored on the computer. When a robot is offline, the icon displayed on the left of the project name on the project tree turns green and Offline and Backup are displayed on the project tree.	
Online	The robot is connected to the robot controller and you can check and change the information in the controller When a robot is online, the icon displayed on the left of the project name on the project tree turns blue and Offline, Online, and Backup are displayed on the project tree.	
Simulation *This can only be used with the standard edition.	This targets a virtual robot controller running on the computer and you can check and change the information in the virtual controller When a simulation is running, the icon displayed on the left of the project name on the project tree turns blue and Offline, Online, and Backup are displayed on the project tree.	

When this software starts, it goes into "Offline" status.
You can change a workspace or a project only in the "Offline" status.

Caution

The simulation function only supports the "RT ToolBox2" standard edition. It can not be used with the mini edition.
Also, please be aware that even with the standard edition, the simulation function can not be used when Movemaster commands are selected.

To switch among offline, online, and simulation, do so from [Online] on the menu bar or from the tool bar. With the tool bar, you can switch as follows.

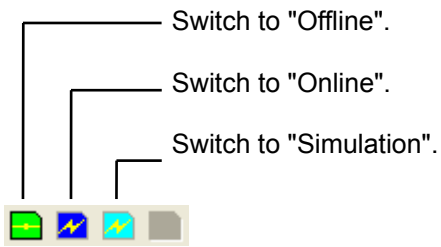


Figure 5-16 Explanation of Tool Bar

The current status and the statuses into which the current status can be switched are as followed.

Table 5-2 Current Status and Switchable Status

Current status	Switchable status	Menu bar [Online] display	Tool bar display
Offline	Can be switched to online or simulation.		
Online	Can only be switched to offline.		
Simulation	Can only be switched to offline.		

The current status is displayed checked at [Online] on the menu bar.

When switching to online or simulation, if multiple projects are registered in the workspace being edited, the project selection screen is displayed as in **"Figure 5-17 Screen for Selecting Project to Switch Online"**. Check only the project to be switched online or to simulation, then click [OK]. Only one project can be switched to simulation.
This screen is not displayed if there is just one project in the workspace.

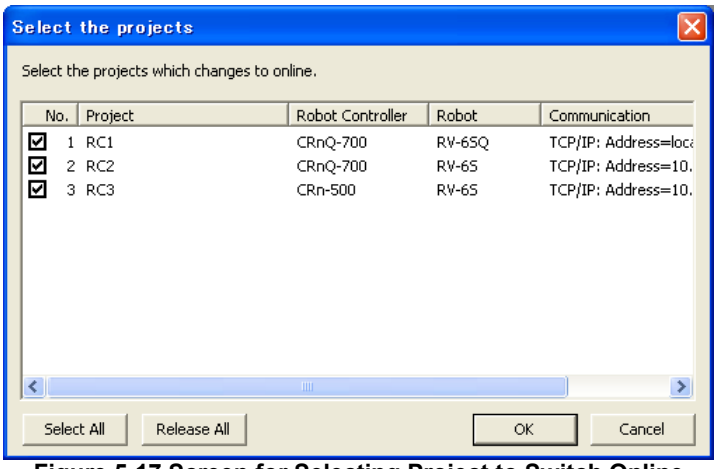


Figure 5-17 Screen for Selecting Project to Switch Online

6. Connecting with the Robot

This explains the method for connecting the robot controller and the computer.
With this software, you must make the communication settings for each project.

⚠ Caution

Please do not pull out the cable while communicating.

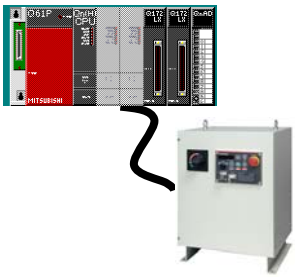
Please never pull out the cable while communicating with the robot controller. If the communication cable is removed while communicating, the status of the robot controller or the computer might become abnormal. Please remove the cable when the status is not “Online” or this software exited.

Also when communicating by using the USB, please do not pull out the USB cable until the communication is completed.

6.1. Robots Connected and Types of Communication

When connecting the robot controller and computer, there are the methods shown below. Be aware that the connection method that can be used is restricted by the robot controller connected.

Table 6-1 Robot Controllers That Can Be Connected and Types of Communication

Robot Controller	Communication Type		Remarks
CR750-D/CRnD-700 series  (The photo is a robot controller of CR3D-700.)	USB (*4)		The commercial item such as computer and cable might be unsuitable to compatibility with our equipment or the FA environments of the temperature and the noise, etc. When it is used, please confirm the operation enough, because you might have to take measures against noise such as EMI measure or addition of ferrite core.
	Ethernet(TCP/IP) (*1)		
	RS-232		Only CRnD-700
	GOT communications		Communicate with CR750-D/CRnD-700 series controller connected with the GOT via Ethernet by USB / RS-232. GOT 1000 series and the Ethernet communication unit (GT15-J1E71-100) are needed. (*6)
CR750-Q/CRnQ-700 series  (The photo is a robot controller of CR3Q-700.)	CRnQ communications (*2)	USB	
		Ethernet (TCP/IP)	The PLC Ethernet interface module or Built-in Ethernet port QCPU (*5) is required.
		RS-232	
CRn-500 series 	Ethernet(TCP/IP) (*3)		The robot controller must have the "Ethernet interface" option.
	RS-232		

(*1) For details on the communication settings on the robot controller side for CR750-D/CRnD-700 series controllers, see **" Detailed explanations of functions and operations"** and **"Standard Specifications"** in the user's manual for the robot controller.

(*2) For details on the communication settings on the robot controller side for CR750-Q/CRnQ-700 series controllers, see **" Detailed explanations of functions and operations"** and **"Standard Specifications"** in the user's manual

for the robot controller.
Moreover, please use the “GX Developer” to set the communication setting of PLC.

(*3) For details on Ethernet connections on the robot controller side for CRn-500 series controllers, see the **"Ethernet Interface Option User's Manual"**.

(*4) When using USB connection, 1 computer can connect to only 1 robot controller.

(*5) Built-in Ethernet port QCPU can be used with this software Ver.1.2 or later.

(*6) The GOT communication can be used with this software Ver.1.5 or later.

6.2. Connection Settings

Click the name of the project to display the project tree for with the right button of the mouse, then from the right button menu, click [Edit Project]. The project edit screen is displayed.

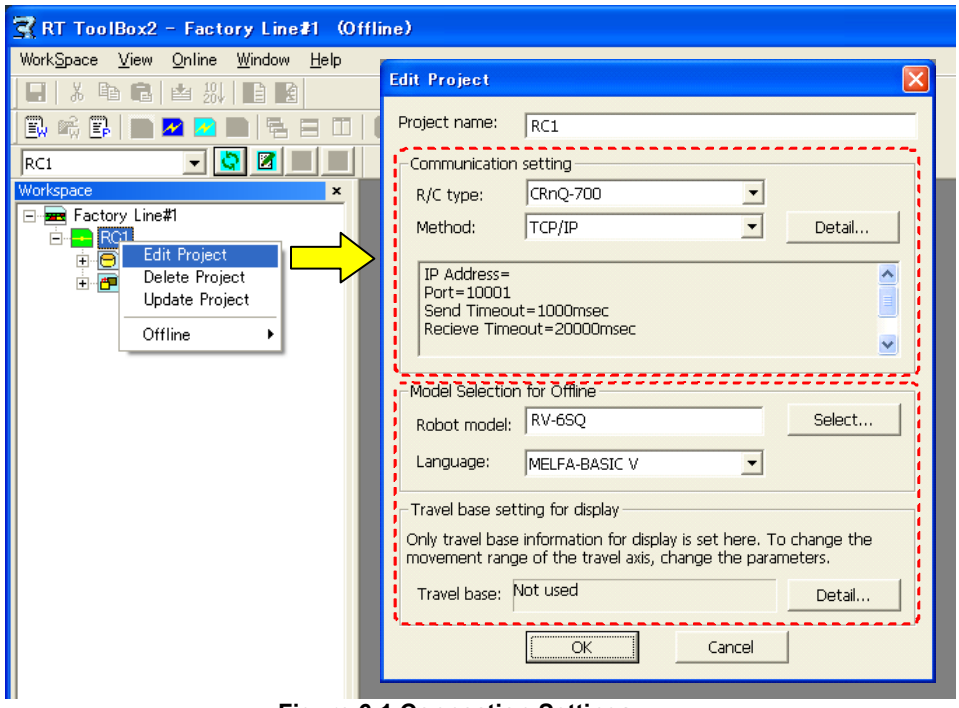


Figure 6-1 Connection Settings

Select the controller to connect to and the communications method, then click the "Detailed Settings" button to set the details.
Normally, the offline robot settings and the travel platform settings for display are also set according to the controller connected to.

After you complete the details settings, click the [OK] button.

The detailed settings screen will be explained from the next item.

⚠ Caution

Do not connect from multiple projects to 1 controller at the same time.

Do not connect from multiple projects to 1 controller at the same time.
Data might not be able to be read correctly referring to the same data.

Do not connect USB to multiple controllers from 1 computer.

When using USB connection, 1 computer can connect to only 1 robot controller. It is also not possible to connect to multiple controllers by using the USB hub.

6.2.1. USB Communication Settings

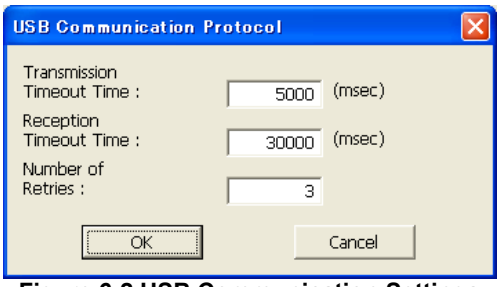


Figure 6-2 USB Communication Settings

Table 6-2 TCP/IPCommunication Setting Items and Default values

Item	Explanation	Default value	
		Ver.1.1 or earlier	Ver.1.2 or later
Send timeout	Timeout time for sending Range that can be set (*1) Minimum value : 1000 msec Maximum value : 30000 msec	3000 msec	5000 msec
Receive timeout	Timeout time for receiving Range that can be set (*1) Minimum value : 5000 msec Maximum value :120000 msec	3000 msec	30000 msec
Retries	Number of communication retries Range that can be set (*1) Minimum value : 0 Maximum value : 10	3	3

(*1) The setting range of Send timeout, Receive timeout and Retries are limited function of this software Ver.1.2 or later.

When the USB cable is connected to the computer, the screen for installing the USB driver may be displayed. For details on USB driver installation, see **"1.5.3 USB driver (CR750-D/CRnD-700 series robot controller) installation "**.

6.2.2. TCP/IP (Ethernet) Communication Settings

Input the IP address assigned to the robot controller connected to, then click the [OK] button.

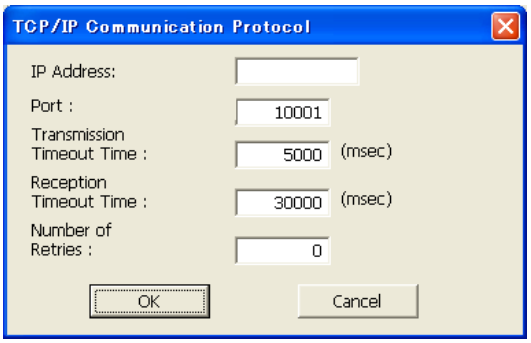


Figure 6-3 TCP/IP Communication Settings

Table 6-3 TCP/IP Communication Setting Items and Default Values

Item	Explanation	Default value	
		Ver.1.1 or earlier	Ver.1.2 or later
IP address	Sets the IP address of the robot controller connected to.	Blank	
Port used	Number of the port used for communications	10001	
Send timeout	Timeout time for sending Range that can be set (*1) Minimum value : 1000 msec Maximum value : 30000 msec	1000 msec	5000 msec
Receive timeout	Timeout time for receiving Range that can be set (*1) Minimum value : 5000 msec Maximum value :120000 msec	20000 msec	30000 msec
Retries	Number of communication retries Range that can be set (*1) Minimum value : 0 Maximum value : 10	3	0

(*1) The setting range of Send timeout, Receive timeout and Retries are limited function of this software Ver.1.2 or later.

For help with the computer side network settings (IP address, subnet mask, default gateway, etc.), ask the network administrator.
Moreover, for details on the communication settings on the robot controller side, please refer as follow.

CR750/700 : See **"Detailed explanations of functions and operations"** and **"Standard Specifications"** in the user's manual for the robot controller.
CRn-500 : See **"Ethernet Interface Option User's Manual"**.

⚠ Caution

When connecting to 10 or more robot controllers at the same time.

When connecting to 10 or more robot controllers at the same time, set the reception timeout time to at least 10000 msec, because it takes time to connected processing.

⚠ Caution

Caution for connecting with robot controller by Ethernet.

In the program edit function, please change “Receive timeout” and “Retries” of TCP/IP communication setting when it corresponds to all of the following use conditions, and the program is written to robot controller.

<< Use conditions >>
1. You use Ethernet .
   (* In CRn-500 controller, Ethernet is an option.)
2. When you write only command line in the controller.
   (Only “Command lines” is selected when the program is written to robot controller.)
3. The number of lines of the command line of the robot program is 1600 or more.
4. In TCP/IP Communication Settings, the both value of “Receive timeout” and “Retries” are numbers except 0.

⇩

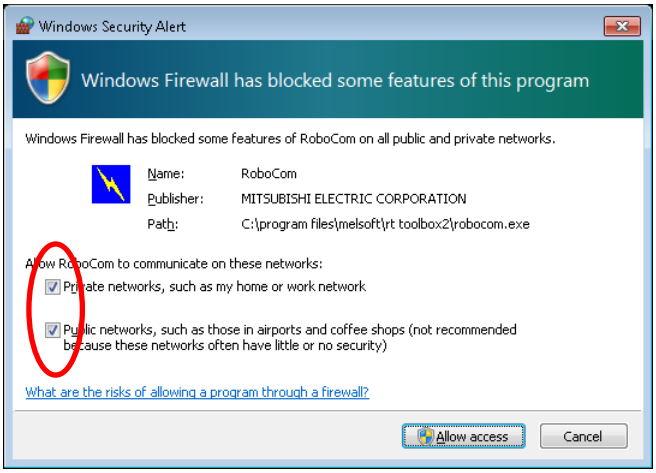
item	Value
Receive timeout (msec)	30000 or more
Retries	0

When using it on the condition of corresponding without changing the communication setting, the robot program might not be correctly written or the error might occur while writing the robot program. Therefore, it is necessary to check all content of the robot program. So please change the communication setting.

⚠ Caution

When the following screen is displayed connecting by Ethernet.

When the following screen is displayed connecting by Ethernet, click [Allow access] button with checking all the checkboxes in the screen.



6.2.3. RS-232 Communication Settings

Change the RS-232 communication settings to match the robot controller side communications settings.

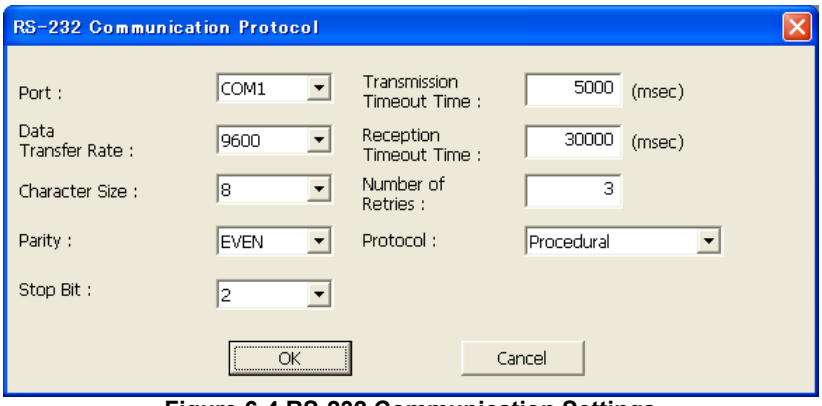


Figure 6-4 RS-232 Communication Settings

Table 6-4 RS-232 Communication Setting Items and Default Values

Item	Explanation	Default value
Port used	COM1 – COM10 can be selected.	COM1
Communications speed	Select from 4800, 9600, and 19200. + It is possible to select Baud rate 38400 only when connecting this software with CRnD-700 controller.	9600
Character size	7 or 8 can be selected, but select 8.	8
Parity	None, Odd, or Even can be selected.	EVEN
Stop bit	Select from 1, 1.5, and 2.	2
Send timeout	Timeout time for sending Range that can be set (*1) Minimum value : 1000 msec Maximum value : 30000 msec	5000 msec
Receive timeout	Timeout time for receiving Range that can be set (*1) Minimum value : 5000 msec Maximum value : 120000 msec	30000 msec
Retries	Number of communication retries Range that can be set (*1) Minimum value : 0 Maximum value : 10	3
Usage protocol	Non-Procedural or Procedural can be selected.	Procedural

(*1) The setting range of Send timeout, Receive timeout and Retries are limited function of this software Ver.1.2 or later.

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 to the same value of the robot controllers at this time.

⚠ Caution

Use of USB to RS-232 does not guarantee normal operation.

When you use USB to RS-232 cable, normal operation is not guaranteed.
If you want to use RS-232 as a communication port, use of computer with serial ports is recommended.

6.2.4. GOT Communications Settings

The GOT Communications is the method to connect with the CR750-D/CRnD-700 series controller by using the RS-232 / USB on the GOT which is connected with the controller via Ethernet.
GOT Communication can be used with this software Ver.1.5 or later.

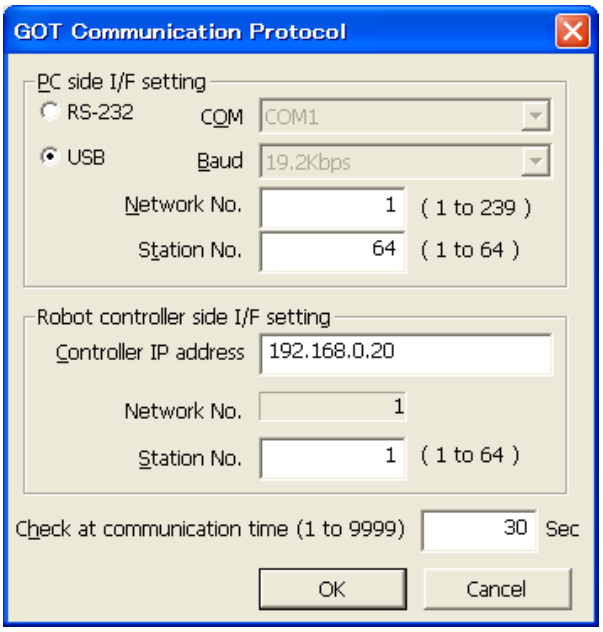


Table 6-5 GOT Communication Setting Items and Default Values

Item	Explanation	Default value
COM (*1)	COM1 - COM10 can be selected.	COM1
Baud (*1)	Select from 9.6Kbps、19.2Kbps、38.4Kbps、57.6Kbps、115.2Kbps.	19.2Kbps
Network No.	1 - 239 can be set. Be matched to Network No. of the GOT.	1
Station No. (PC side I/F setting)	1 - 64 can be set. Be matched to Station No. of the GOT. Set a value different from the Station No. of Robot controller side I/F setting.	64
Controller IP address	Set the IP address of the controller connected with GOT.	192.168.0.20
Station No. (Robot controller side I/F setting)	1 - 64 can be set. Be matched to Station No. set by GOT.	1
Check at communication time	1 - 9999 can be set. Set the timeout after transmits. Note: If too short time is set, the timeout error occurs.	30 seconds

(*1) COM and Baud are available only that RS-232 is selected.

6.2.5. CRnQ Communications Settings

The CRnQ communication is the method to connect with the CR750-Q/CRnQ-700 series controller by using the PLC Universal model QCPU module or the PLC Ethernet Interface module.

When using RS-232 or USB, please connect to connector of the PLC Universal model QCPU module.

When using Ethernet, please connect to connector of the PLC Ethernet Interface module or Built-in Ethernet port QCPU. (*Built-in Ethernet port QCPU can be used with this software Ver.1.2 or later.)

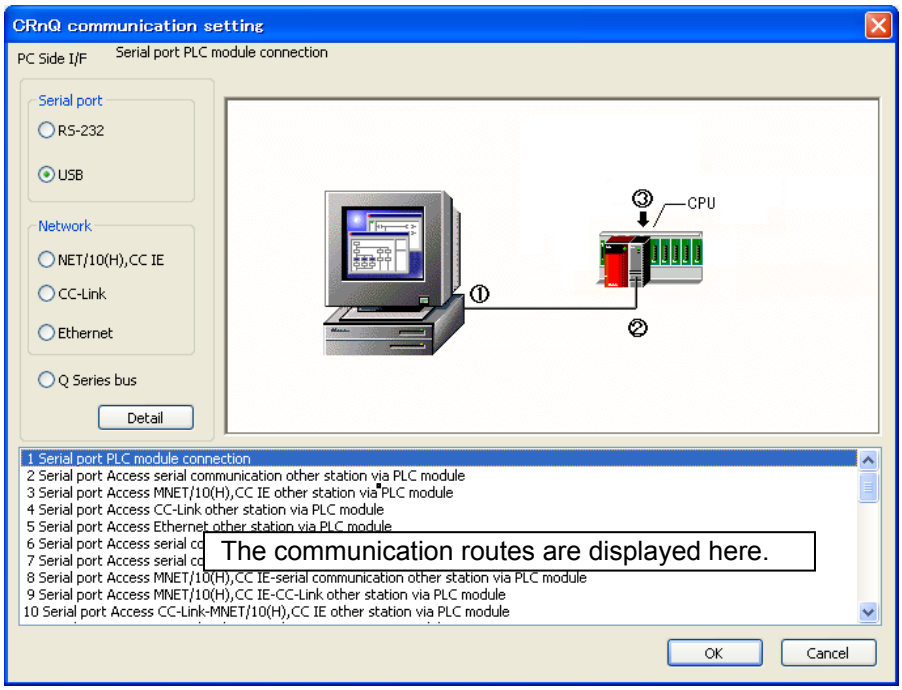


Figure 6-5 CRnQ Communications Settings

On the CRnQ communications setting screen, when you select the computer interface, the communications routes using the selected interface are displayed at the bottom of the screen. Select the communications route, then press the [Detailed Settings] button. The detailed settings screen corresponding to the selected communications route is displayed. These detailed settings will be explained from the next item.

6.2.5.1. When RS-232 is selected

When "RS-232" is selected as the computer interface, the communications routes that can be selected are as follows.

Table 6-6 Communications Routes That Can Be Selected for "RS-232"

No.	Communications routes
1	Serial communications CPU unit connection
2	Serial communications Serial communications other station access through CPU unit
3	Serial communication NET/-0(H) other station access through CPU unit
4	Serial communication CC-Link other station access through CPU unit
5	Serial communication Ethernet other station access through CPU unit
6	Serial communication Serial communication through CPU unit - NET/10(H), CC IE other station access
7	Serial communication Serial communication through CPU unit-Ethernet other station access
8	Serial communication NET/10(H), CC IE through CPU unit - serial communication other station access
9	Serial communication NET/10(H), CC IE through CPU unit - CCLink other station access
10	Serial communication Other station access CCLink - NET/10(H), CC IE through CPU unit
11	Serial communication CCLink through CPU unit - Ethernet other station access
12	Serial communication Ethernet through CPU unit - serial communication other station access
13	Serial communication Ethernet through CPU unit - CCLink other station access
14	Serial communication Serial communication connection
15	Serial communication Other station access serial communication through serial communication
16	Serial communication Other station access NET/10(H), CC IE through serial communication
17	Serial communication Other station access CC-Link through serial communication
18	Serial communication Other station access Ethernet communication through serial communication
19	Serial communication Serial communication through serial communication - NET/10(H), CC IE other station access
20	Serial communication Serial communication through serial communication - Ethernet other station access
21	Serial communication NET/10(H), CC IE through serial communication - serial communication other station access
22	Serial communication NET/10(H), CC IE through serial communication - CCLink other station access
23	Serial communication CCLink through serial communication - NET/10(H), CC IE other station access
24	Serial communication CCLink through serial communication - Ethernet other station access
25	Serial communication Ethernet through serial communication - serial communication other station access
26	Serial communication Ethernet through serial communication - CCLink other station access
27	Serial communication CC-Link other station access through G4
28	Serial communication CCLink through G4 - NET/10(H), CC IE other station access
29	Serial communication CC-Link through G4 – Ethernet other station access
30	Serial communication Serial communication other station access through NET/10(H), CC IE remote
31	Serial communication NET/10(H), CC IE other station access through NET/10(H), CC IE remote
32	Serial communication CC-Link other station access through NET/10(H), CC IE remote
33	Serial communication Ethernet other station access through NET/10(H), CC IE remote
34	Serial communication Serial communication other station access through NET/10(H), CC IE remote
35	Serial communication Serial communication through NET/10(H), CC IE remote - Ethernet other station access
36	Serial communication NET/10(H), CC IE through NET/10(H), CC IE remote - Serial communication other station access
37	Serial communication NET/10(H), CC IE through NET/10(H), CC IE remote - CC-Link other station access
38	Serial communication CC-Link through NET/10(H), CC IE remote - NET/10(H), CC IE other station access
39	Serial communication CC-Link through NET/10(H), CC IE remote - Ethernet other station access
40	Serial communication Ethernet through NET/10(H), CC IE remote - Serial communication other station access
41	Serial communication Ethernet through NET/10(H), CC IE remote - CC-Link other station access

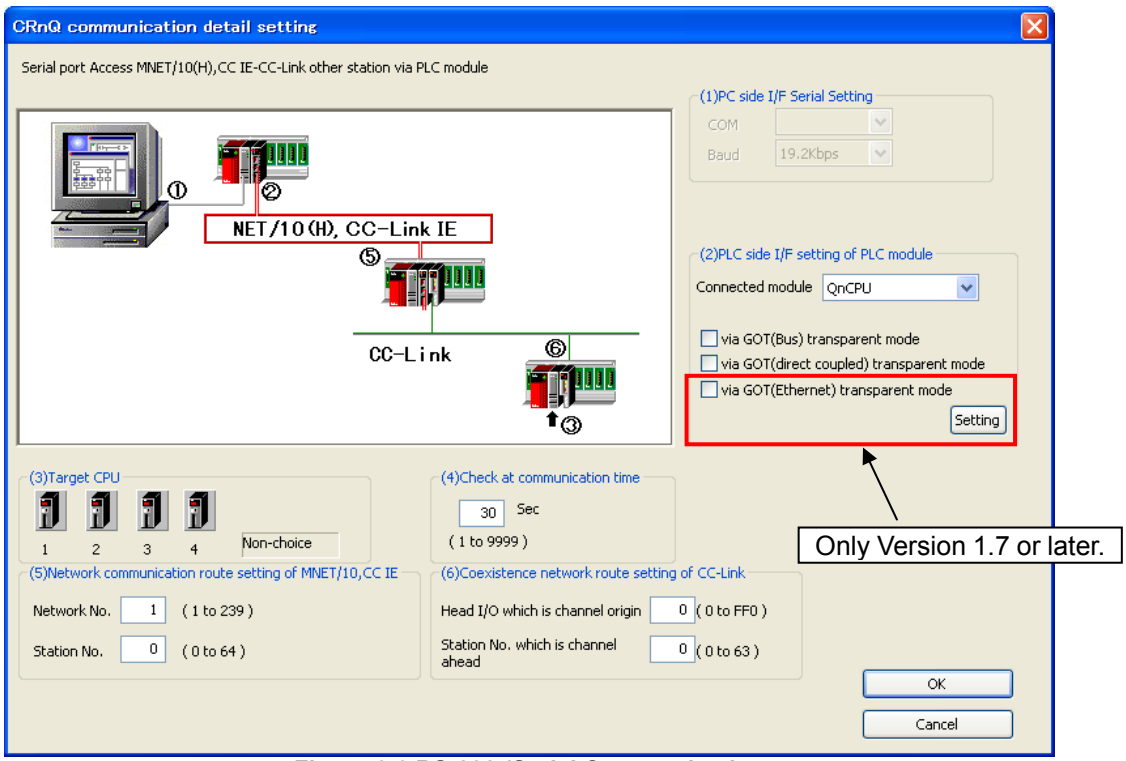


Figure 6-6 RS-232 (Serial Communication NET/10(H), CC IE through CPU Unit – CCLink Other Station Access) Detailed Settings

For some communications routes that you can select, "(5)Network communication route setting of MNET/10" and "(6)Coexistence network route setting of C24" can not be set.
GOT(Ethernet) transparent mode can be used with Version 1.7 or later of software. When you use GOT(Ethernet) transparent mode, please display a set screen clicking the “Setting” button, and set the communication item.

6.2.5.2. When USB is selected

When "USB" is selected as the computer interface, the communications routes that you can select are the same as for RS-232. See **"Table 6-6 Communications Routes That Can Be Selected for** "RS-232"**".**

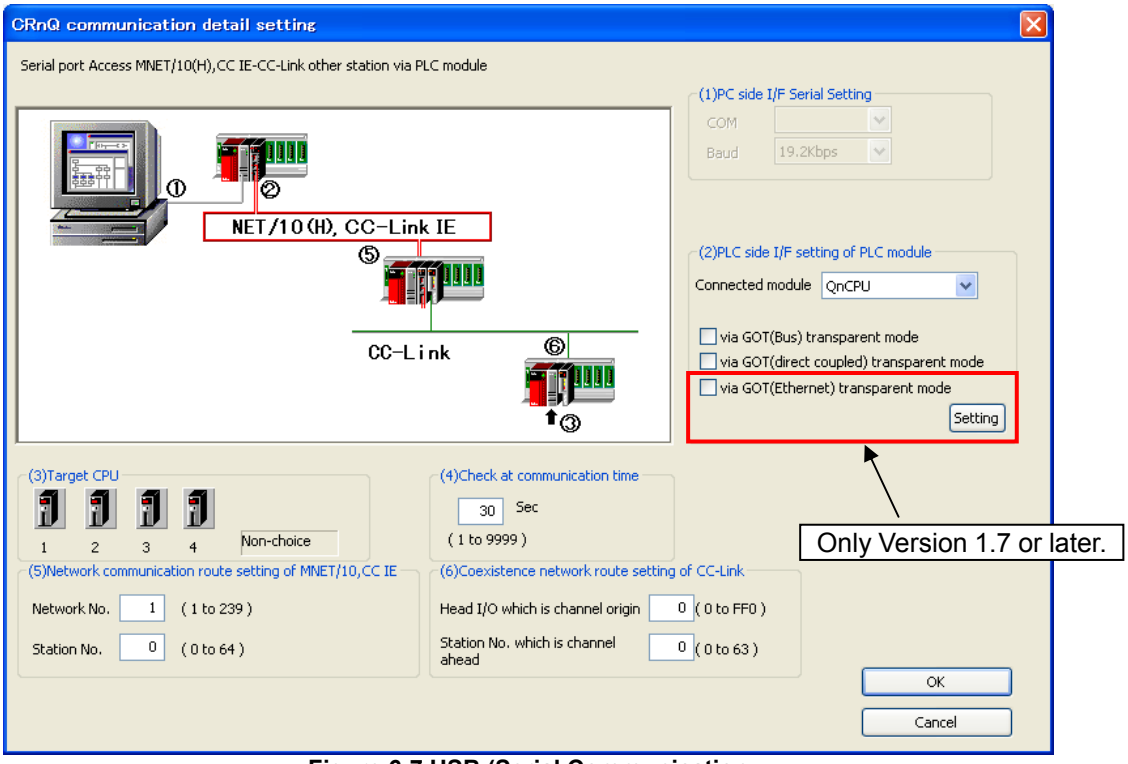


Figure 6-7 USB (Serial Communication NET/10(H), CC IE through CPU Unit – Serial Communication Other Station Access) Detailed Settings

For some communications routes that you can select, "(5)Network communication route setting of MNET/10" and "(6)Coexistence network route setting of C24" can not be set.
GOT(Ethernet) transparent mode can be used with Version 1.7 or later of software. When you use GOT(Ethernet) transparent mode, please display a set screen clicking the “Setting” button, and set the communication item.

6.2.5.3. When NET/10(H), CC IE is selected

In this software version 2.20W or later, it is possible to communicate using "CC-Link IE controller network port" or "CC-Link IE field network port" newly established in QnCPU.

When "NET/10, CC IE" is selected as the computer interface, the communications routes that you can select are as follows.

Table 6-7 Communications Routes That Can Be Selected for "NET/10(H), CC IE"

No.	Communications Route
1	NET/10(H), CC IE board communication Other station access through NET/10(H), CC IE unit
2	NET/10(H), CC IE board communication unit – CC-Link other station access NET/10(H), CC IE through NET/10(H), CC IE
3	NET/10(H), CC IE board communication Serial communication other station access NET/10(H), CC IE through NET/10(H), CC IE unit -

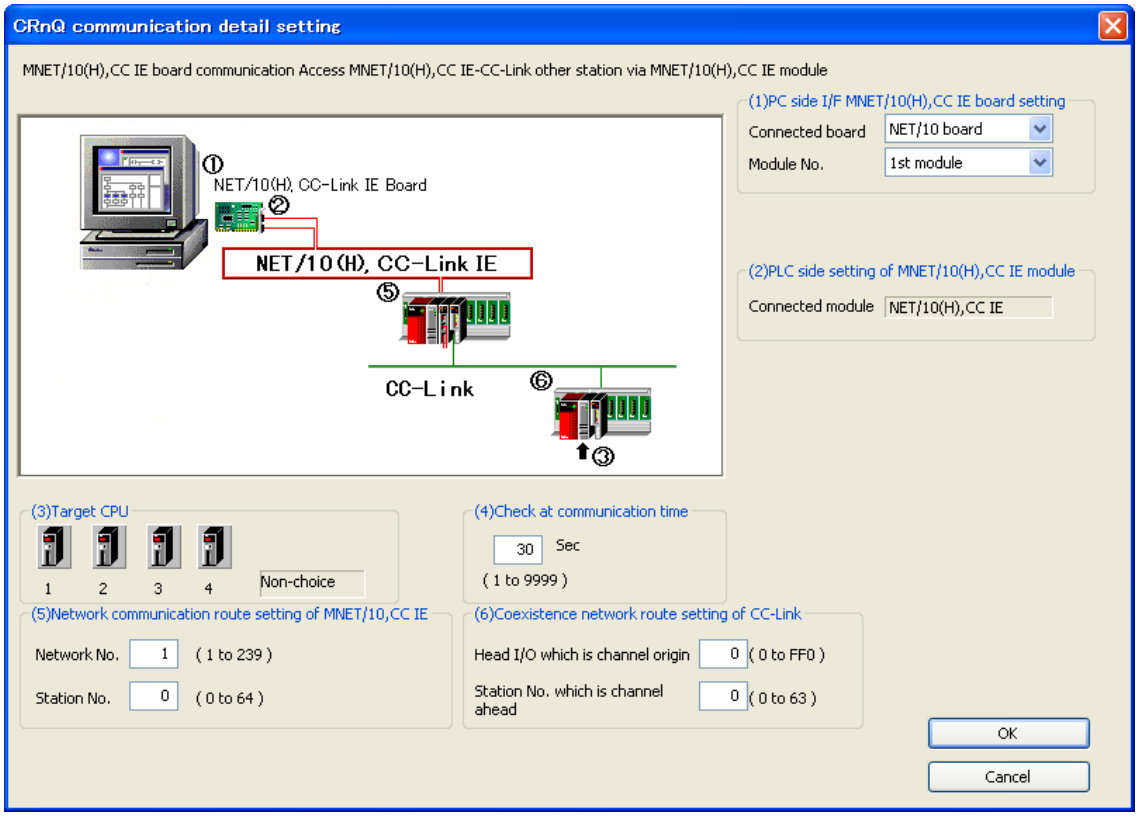


Figure 6-8 NET/10(H), CC IE (NET/10(H), CC IE Board Communication NET/10(H), CC IE through NET/10(H), CC IE Unit – CC-Link Other Station Access) Detailed Settings

For some communications routes that you can select, "(5)Network communication route setting of MNET/10" and "(6)Coexistence network route setting of C24" can not be set.

6.2.5.4. When CC-Link is selected

When "CC-Link" is selected as the computer interface, the communications routes that you can select are as follows.

Table 6-8 Communications Routes That Can Be Selected for "CC-Link"

No.	Communications Route	
1	CC-Link board communication	Other station access through CC-link unit
2	CC-Link board communication other station access	CC-Link through CC-link unit – NET/10(H), CC IE
3	CC-Link board communication access	CC-Link through CC-link unit – Ethernet other station

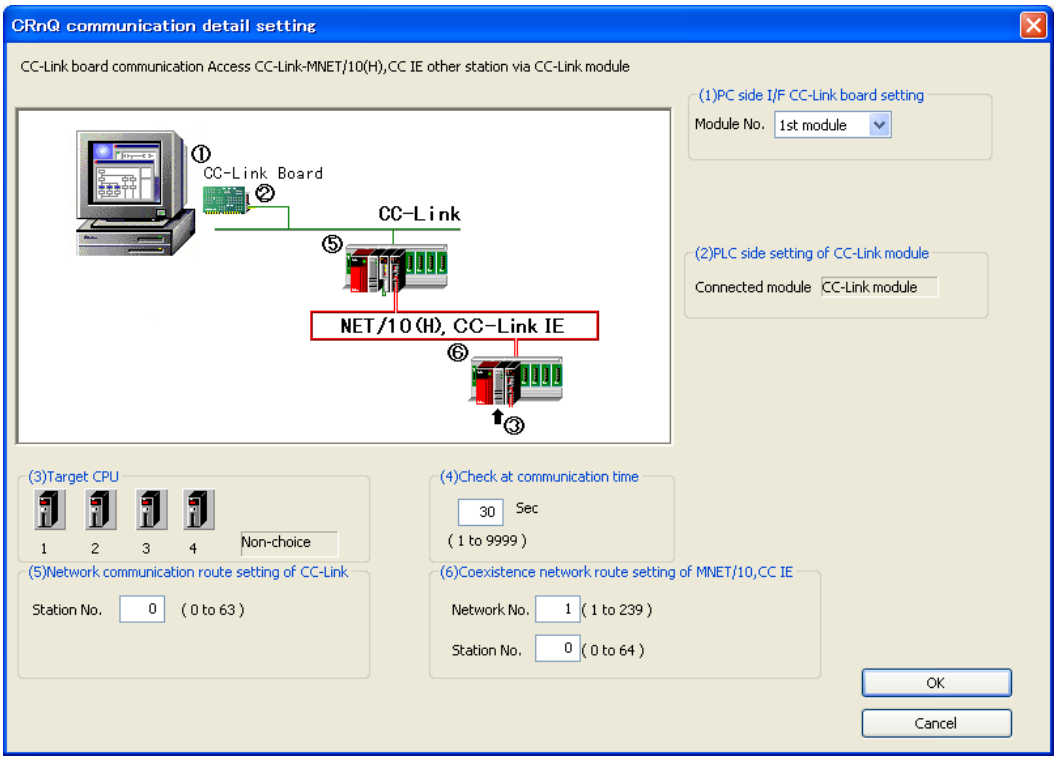


Figure 6-9 CC-Link (CC-Link Board Communication CC-Link through CC-Link Unit – NET/10(H), CC IE Other Station Access) Detailed Settings

For some communications routes that you can select, "(5)Network communication route setting of MNET/10" and "(6)Coexistence network route setting of C24" can not be set.

6.2.5.5. When Ethernet is selected

When "Ethernet" is selected as the computer interface, the communications routes that you can select are as follows.

Table 6-9 Communications Routes That Can Be Selected for "Ethernet"

No.	Communications Route	Special mention
1	Ethernet board communication Access other station via Ethernet module	
2	Ethernet board communication Access Ethernet-serial communication other station via Ethernet module	
3	Ethernet board communication Access Ethernet-CC-Link other station via Ethernet module	
4	Ethernet port direct communication PLC module connection	Ver.1.2 or later
5	Ethernet port direct communication Access serial communication other station via PLC module	
6	Ethernet port direct communication Access CC-Link other station via PLC module	
7	Ethernet port IP address designate communication PLC module connection	
8	Ethernet port IP address designate communication Access serial communication other station via PLC module	
9	Ethernet port IP address designate communication Access CC-Link other station via PLC module	

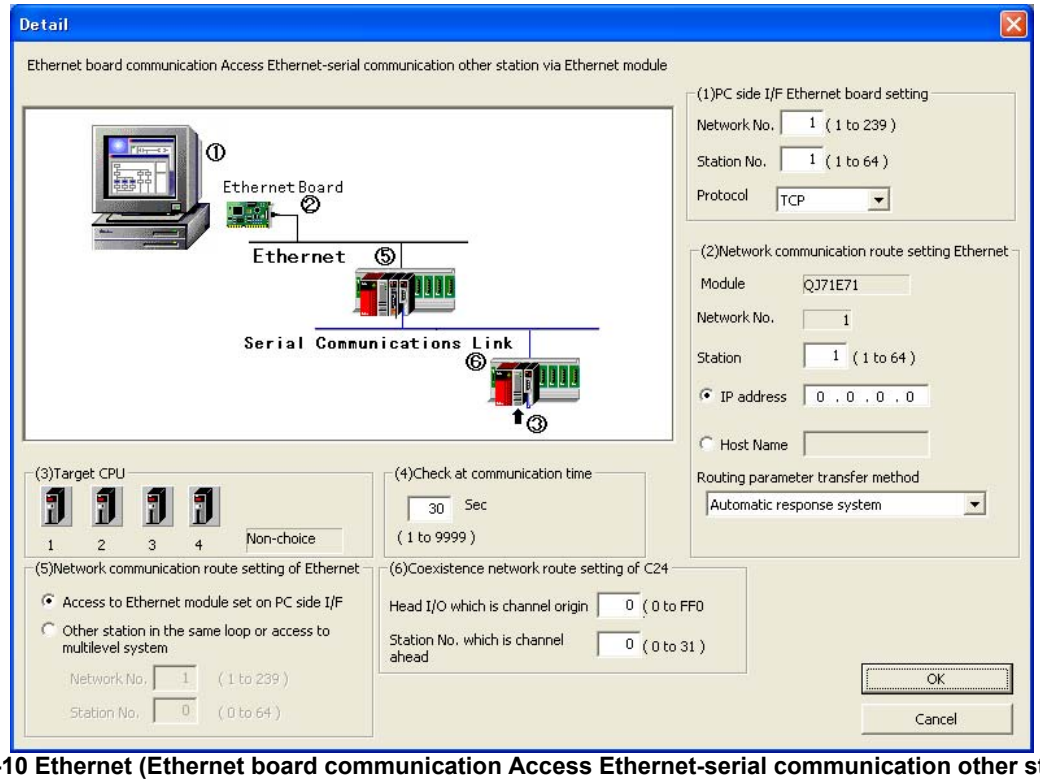


Figure 6-10 Ethernet (Ethernet board communication Access Ethernet-serial communication other station via Ethernet module) Detailed Settings

For some communications routes that you can select, “(1)PC side I/F Ethernet board setting”, “(2)Network communication route setting Ethernet”, "(5)Network communication route setting of MNET/10" and "(6)Coexistence network route setting of C24" can not be set.

6.2.5.6. When Q series bus is selected

When the "Q series bus" is selected as the computer interface, the communication route that can be selected is as follows.

Table 6-10 Communication Route That Can Be Selected with the "Q Series Bus"

No.	Communications Route
1	Q bus communications CPU unit connection

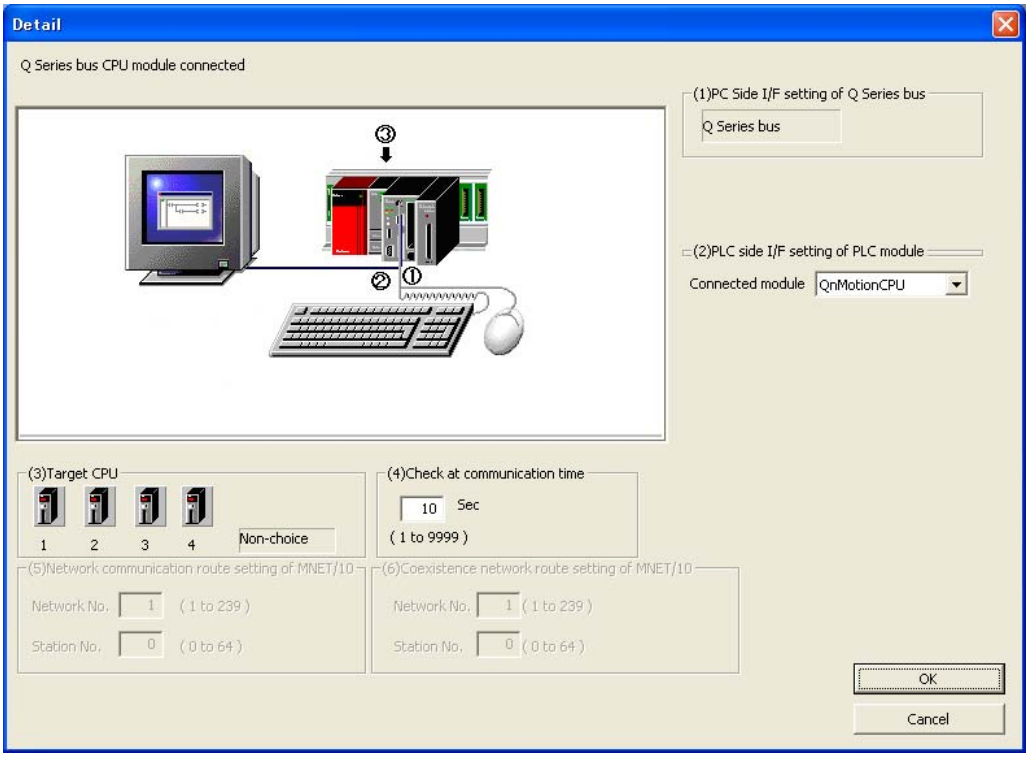


Figure 6-11 Q Series Bus (Q Bus Communications CPU Unit Connection) Detailed Settings

7. Robot Program Language Setting

This switches the robot program language used. The languages you can switch to are as follows.

Table 7-1 Robot Program Languages for Each Controller

Robot controller	Robot program language		
	MELFA-BASIC V	MELFA-BASIC IV	Movemaster command
CR750-D/CRnD-700	○	○	○
CR750-Q/CRnQ-700	○	○	○
CRn-500	×	○	○

The Movemaster commands are restricted by the robot models that can be used. Before trying to use Movemaster commands, check in the "Standard Specifications" that the model you are using supports Movemaster commands.

Also, this software allows you to select Movemaster commands for CR750-D/CRnD-700 series and CR750-Q/CRnQ-700 series robot controllers, but these robot controllers themselves do not actually support Movemaster commands. (As of December 2007)

On the project tree, click the desired project name with the right mouse button, then from the right button menu, select "Edit Project". The project edit screen is displayed.

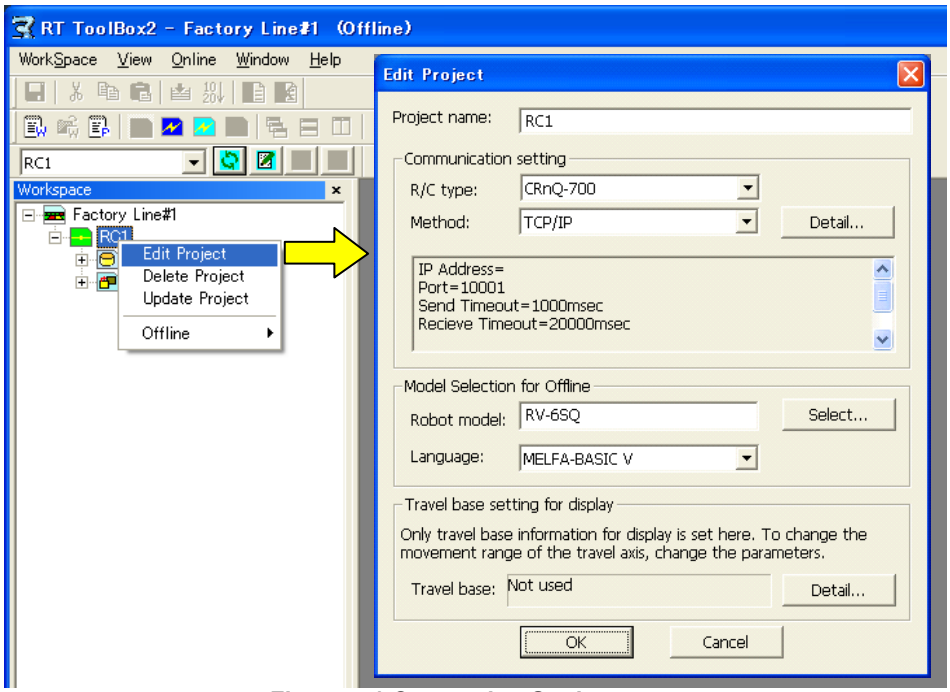


Figure 7-1 Connection Settings

Select the controller connected, the robot model, and the robot language used, then click the [OK] button

8. Writing Programs

This chapter explains robot program editing methods. You can directly edit programs in the robot controller or edit programs stored on the computer.

⚠ Caution

Program names that can not be handled on the computer

If a program name in the robot controller is the same as a "reserved term" in Windows, when you try to open that program for program editing, this causes an error. In this case, it is necessary to change the program name in the controller.

"Reserved terms" are special character strings that the Windows system uses and therefore can not be used as file names. These "reserved terms" are character strings such as the following.

AUX, COM1 to COM9, CON, LPT1 to 9, NUL, PRN

Program names that can not be handled on the robot controller.

It is not possible to use the program name of the following.

1. The program name is too long. (13 characters or more).
2. The program name contains the character other than the alphabet or number.
3. The top of the program name is "0"(Zero).

Warning is displayed when you input the program name including these conditions in the following operation.

- Writing a New Program
- Copying the program
- Renaming the program name
- Drag and drop operation

This function corresponds with Version 1.6 or later of software.

When the password is registered in “program“ by robot controller's security function, the program in the robot controllers cannot be read, cannot be saved, cannot be copied, cannot be renamed or cannot be deleted.

When the password is registered in “program“ by robot controller's security function, the program among the robot controllers cannot be operated as follows.

○ : Enable、 × : Disable

	Item to which password of security function is registered.		
	Program	Parameter	File
Reading of programs.	×	○	○
Saving programs			
Copying programs			
Renaming programs			

Please delete the password of robot controller's security function when you operate these. Please refer to **"12.7.3 Delete the Password"** for the method of deleting the password.

The setting(register the password) and the release(delete the password) of robot controller's security function can be used with this software version 2.00A or later. Please refer to **"Table 12-15 Compliant version of this function and controller"** for robot controller's compliant version.

8.1. Writing a New Program

8.1.1. Writing a new program on the computer

For the new program you are going to write, select [Offline] -> [Program], then click the right mouse button. The right button menu is displayed, so click [New].

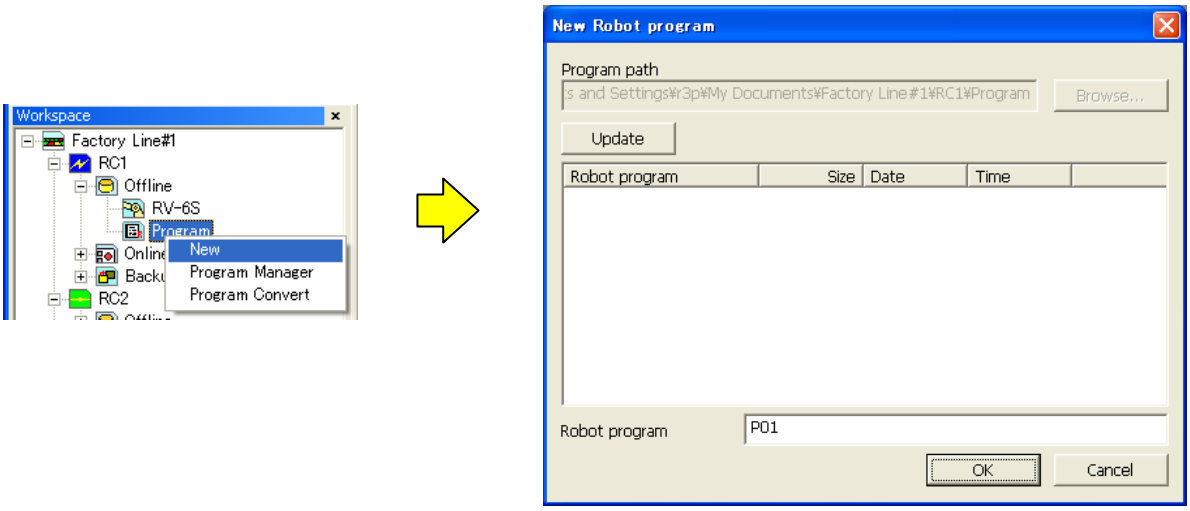


Figure 8-1 Writing a New Program on the Computer

Input the robot program name, then click the [OK] button.

Caution

Folder in which programs are stored

Programs on the computer are managed in units of workspace projects. The folder they are stored into is workspace writing folder\project name\Program.

To store into any other folder, first store in this folder, then copy into the desired folder with the program management copy function.

8.1.2. Writing a new program in the robot controller

For the new program you are going to write, select [Online] -> [Program], then click the right mouse button. The right button menu is displayed, so click [New].

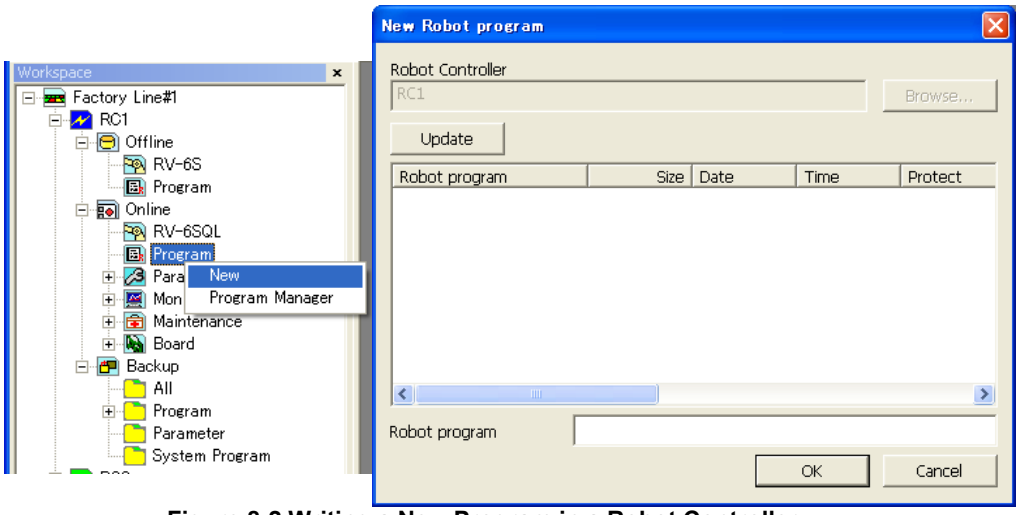


Figure 8-2 Writing a New Program in a Robot Controller

Input the robot program name, then click the [OK] button. The "Read Item" screen is displayed, so check the read items, then click the [OK] button. For details on the read items, see **"8.2.3 Read Items when opening program in robot controller".**

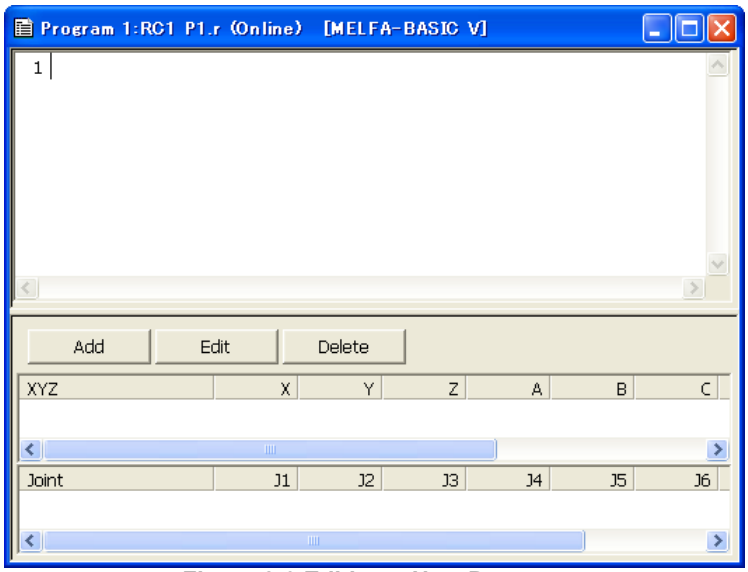


Figure 8-3 Editing a New Program

8.2. Opening an Existing Program

8.2.1. Opening an existing program on the computer

Open the target project in the project tree with [Offline] -> [Program]. The stored programs are displayed on the project tree, so double click the program you want to edit.

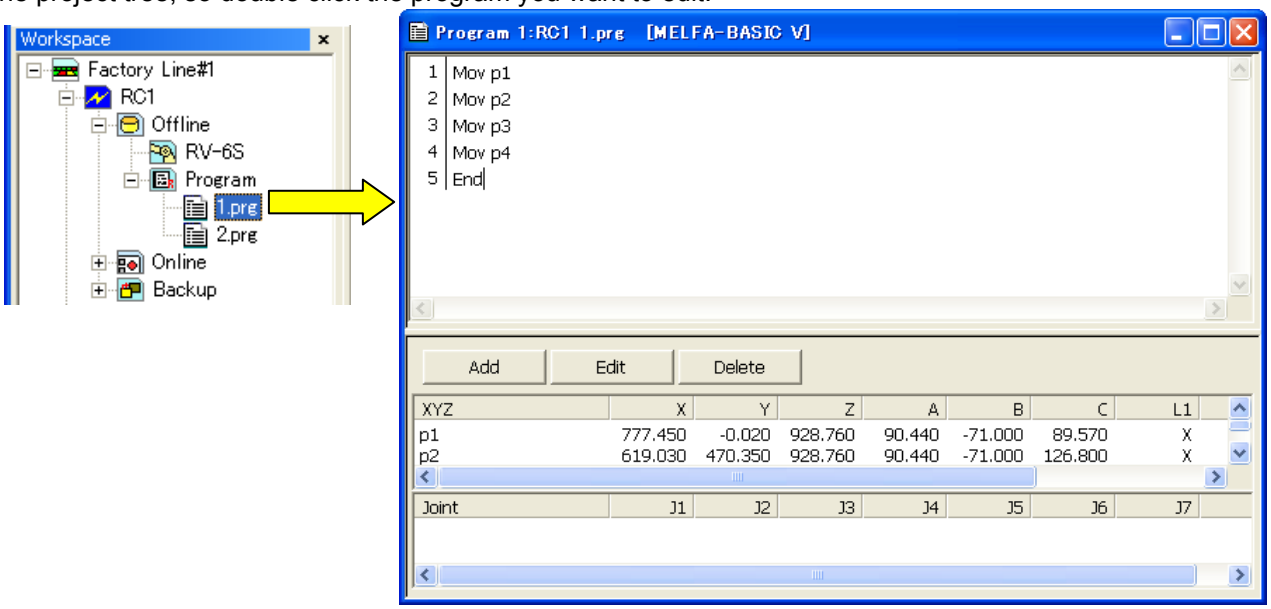


Figure 8-4 Opening a Program on the Computer

8.2.2. Opening a program in a robot controller

Open the target project in the project tree with [Online] -> [Program]. The stored programs are displayed on the project tree, so double click the program you want to edit.

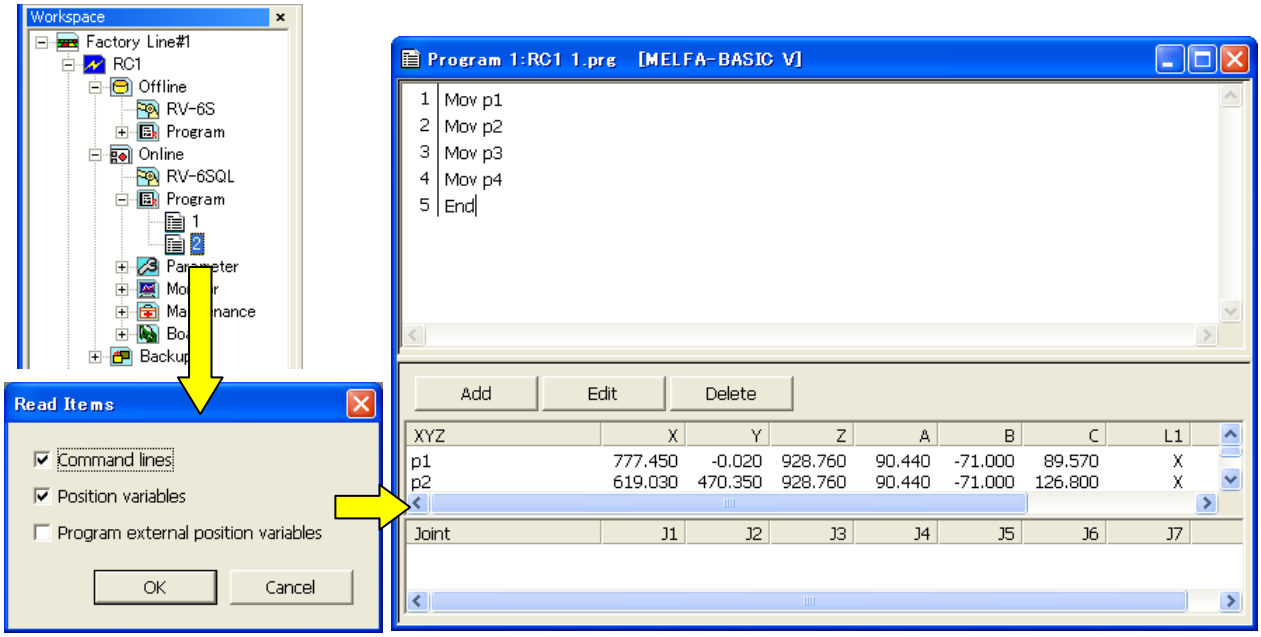


Figure 8-5 Opening a Program in a Robot Controller

Input the robot program name, then click the [OK] button. The "Read Item" screen is displayed, so check the read items, then click the [OK] button. For details on the read items, see **"8.2.3 Read Items when opening program in robot controller".**

8.2.3. Read Items when opening program in robot controller

You can set the robot program read items divided into command lines, position variables, and program external position variables. This function is displayed after H1 edition on CRn-500 series controller.

The default values of read items are as follows.

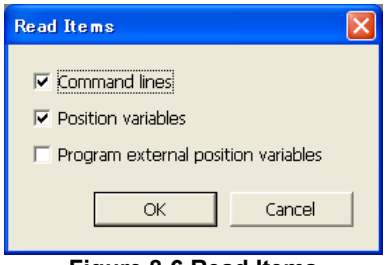


Figure 8-6 Read Items

The program external position variable read operations are shown in **"Table 8-1 ".** (For details on program external position variables, see **"Detailed explanations of functions and operations"** in the robot controller's user's manual.)

Table 8-1 Program External Position Variable Read Operations

<table>
<tr><td rowspan="2"></td><td rowspan="2"></td><td colspan="3">Read Item</td><td rowspan="2">Position variable, joint variable (P_01, J_02, etc.) (MOVEMASTER command : 901-999)</td><td rowspan="2">Position array variable, joint array variable (P_100( ), J_102( ), etc.)</td></tr>
<tr><td>Command</td><td>Position</td><td>External position variable</td></tr>
<tr><td colspan="2" rowspan="4">CR750/700 series robot controller</td><td>☑</td><td>☑</td><td>☑</td><td rowspan="2">Reads only the external position variables (position variables, joint variables) used in instruction statements. (*1)</td><td rowspan="2">Reads all elements used in instruction statements. (*2)</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="10">CRn-500 series 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. (*1)</td><td rowspan="2">Reads all elements used in instruction statements. (*2)</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 orearlier</td><td colspan="5">This screen is not displayed.</td></tr>
</table>

*1: When Movemaster commands are used, all external position variables are read.

*2: When only P_100(1) is used in the command statement, P_100(1) to P_100(10) are all read. However, the number of valid elements depends on the robot controller software version used.

8.2.4. Opening a program in the backup data

Program data backed up on the personal computer by the backup function can be opened by the program edit. Note that this function can be used with Version 1.2 or later of this software.

Open the target project in the project tree with [Backup]. Select the backup data (All files or Program) stored the program you want to edit. From the right mouse button menu, click [Open Backup program]. The stored programs are displayed on “Open Backup Program” window, so select the program you want to edit, and click [OK] button.
The extension of program data file in the backup data is “*.MB5” or “*.MB4”.

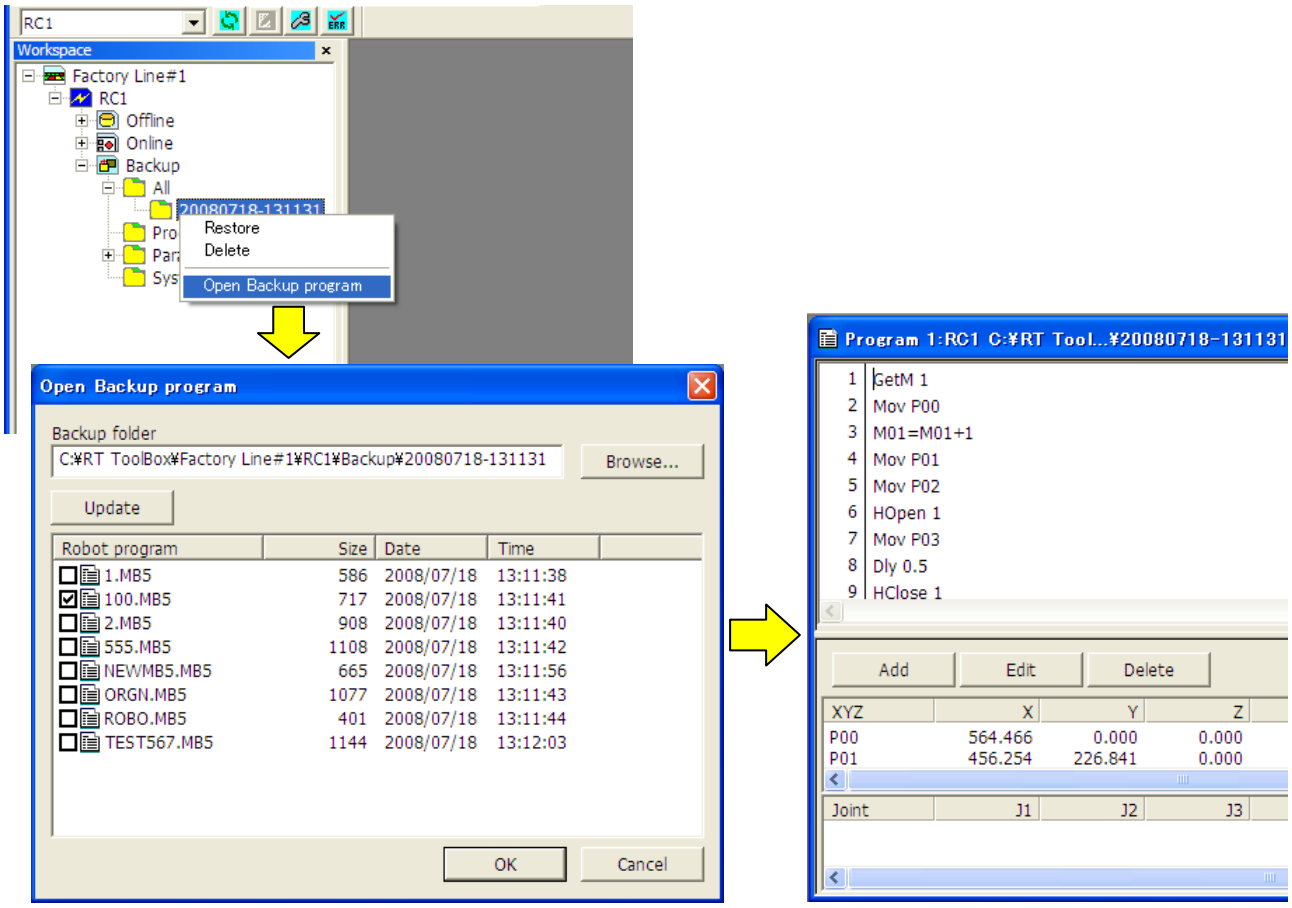


Figure 8-7 Opening a program in the backup data

The opened program in the backup data can be saved as a usual program (text type file whose extension is “*.prg”).

⚠ Caution

Notes of opening the program backed up.

The notes of when the program backed up is opened are as follows,

(1) The program that can be opened is only a program made in the robot program language specified by the current project.
(2) The program external position variables used in the program cannot be read.
(3) If the program is opened from Program backup data, the values of the user definition external variables become 0.
(4) If the program is opened from Program backup data or the data of unsupported robot, joint position variables, the values of the additional axis, and the values of the direct-driven axis used might be not converted correctly.

8.3. Explanation of Program Edit screen

This explains the program edit screen.

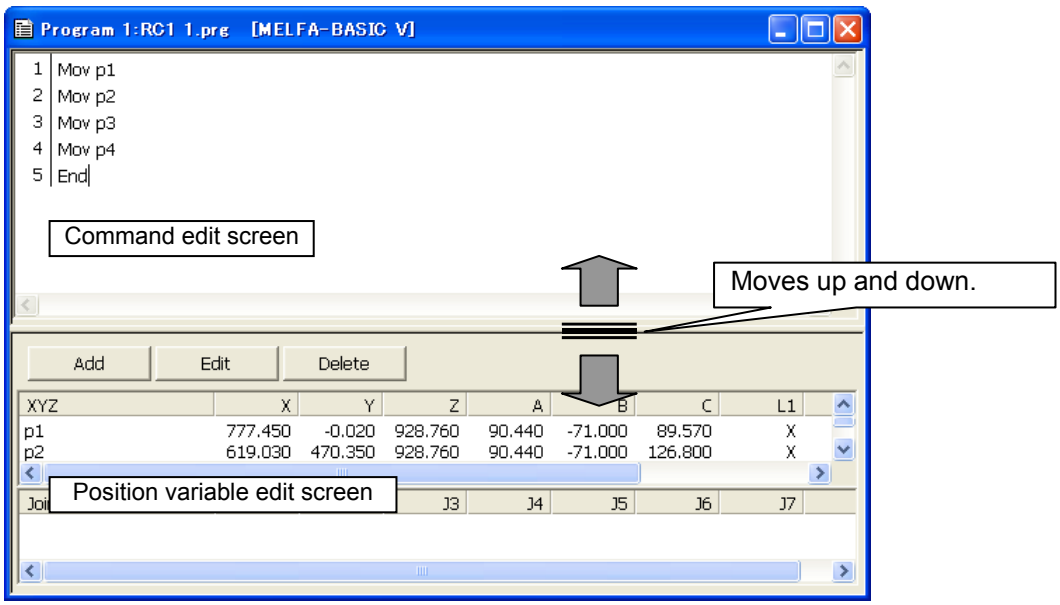


Figure 8-8 Explanation of Program Edit screen

The top part of the screen is the program command statement edit screen and the bottom part is the position variable edit screen.

To change the position dividing the top and bottom screens, drag the border line with the mouse. This is handy when you want to expand the command edit screen, for example because there are many lines of commands.

This edit screen display area can be customized. For details, see **"8.5.1 Changing the display area".**

Also, the background color for the command edit screen depends on the robot language used.

Table 8-2 Command Edit Screen Background Color

Robot language	Background color	
	Normal	Debugging
MELFA-BASIC V	White	Light blue
MELFA-BASIC IV	Light yellow	
Movemaster commands	Light green	

Debugging means when the program is opened in debugging status.

8.4. Program Editing Menu Bar

During program editing "File", "Edit", "Debug", and "Tool" are added to the menu bar.

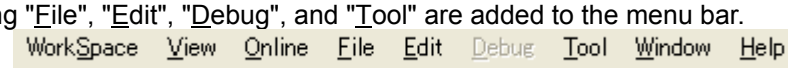
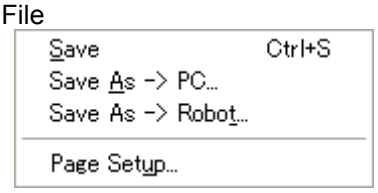
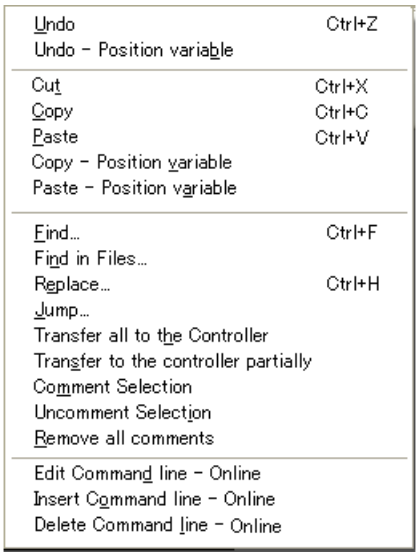
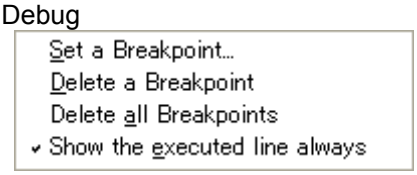
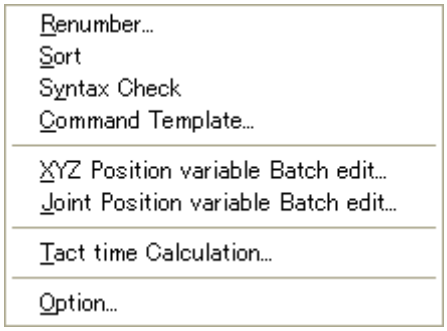


Figure 8-9 Program Editing Menu Bar

The menus are as follows.

Menu item		Explanation	Menu item
File  	Save	Saves the program being edited with its current name.	8.7.1
	Save As -> PC	Saves the program being edited with its current name on the PC	8.7.2
	Save As -> Robot	Saves the program being edited with its current name on Robot controller	8.7.3
	Page Setup	You can customize the pages the program is printed with.	8.8.3
Edit  (version 1.6 or later) * The function of “Comment Selection” / ”Uncomment Selection” can be used in version 1.2 or later. * The function of “Remove comments from all lines” can be used in version 1.4 or later. * The function of “Transfer all to the controller” can be used in version 1.6 or later.	Undo	Cancel the edition by the command and return to the previous state	
	Undo - Position variable	Cancel the edition by the position variable and return to the previous state	
	Cut	Cuts a character string from the command being edited.	8.6.4.2
	Copy	Copies a character string in the command being edited.	8.6.4.1
	Paste	Pastes the copied or cut character string to the specified location.	8.6.4.3
	Copy - Position variable	Copies position data.	8.6.4.4
	Paste - Position variable	This pastes the copied position data.	8.6.4.5
	Find	This searches for the specified character string.	8.6.4.6
	Find in Files	This searches for the specified character string in the program files.	8.6.4.7
	Replace	This replaces the specified character string with another character string.	8.6.4.8
	Jump	Jumps to the specified step number or label.	8.6.4.9
	Transfer all to the controller	Write the all lines of the program to the robot controller. This can not be used when the program is opened in debugging status.	8.6.4.11
	Transfer to the controller partially	Writes the selected program lines to the robot controller. This can not be used when the program is opened in debugging status.	8.6.4.10
	Comment Selection	The selected lines are exchanged by the batch as a comment.	8.6.4.17
	Uncommnet Selection	The comment on the selected lines are released by the batch.	
	Remove all comments	It is possible to remove comments from all lines in the program.	8.6.4.18
	Edit Command line - Online	Edit the command lines for a program pened in debugging status.	8.9.3
	Insert Command line - Online	Insert the command lines for a program opened in debugging status.	

Menu item		Explanation	Menu item
	Delete Command line - Online	Delete the command lines for a program opened in debugging status.	8.9.3

Menu item		Explanation	Menu item
Debug  (This can only operate when the program has been opened in debugging status.)	Set a Breakpoint	You can set a breakpoint in a program opened in debugging status.	8.9.4
	Delete a Breakpoint	You can delete a breakpoint in a program opened in debugging status.	
	Delete all Breakpoints	You can delete all breakpoints in a program opened in debugging status	
	Show the executed line always	You can set to dispplay/not to display the executed line always to the program opened in debugging status.	8.9.1
Tool  (This can not operate when the program has been opened in debugging status.) Renumbering and sorting can only be used with MELFA-BASIC IV and Movemaster commands. Tact time calculation can only be used in a simulation.	Renumber	The renumbering function can only be used with MELFA-BASIC IV and Movemaster commands. You can renumber line numbers in a batch.	8.6.4.15
	Sort	The sorting function can only be used with MELFA-BASIC IV and Movemaster commands. This sorts the edited program by line number.	8.6.4.16
	Syntax Check	You can check whether or not the edited robot program is syntactically correct.	8.6.4.12
	Command Template	You can display a list of the commands and make insertions on the program command edit screen.	8.6.4.13
	XYZ Position variable Batch Edit	You can change the position variables in the program being edited in a batch and can sum up all the values	8.6.4.14
	Joint Position variable Batch Edit		
	Tact time calculation	Tact time calculation can only be used in a simulation. Tact time of the program can be calculated.	16.12
	Option	You can customize the program edit area, screen display area and syntax check before saving a program	8.5 8.7.5

8.5. Customizing the Program Edit Screen

You can customize the program edit screen.
With the program opened, on the menu bar, click [Tool] -> [Option] and set the program edit screen as you want with the displayed option screen.

Clicking the [Restore Defaults] button restores the default settings.
The "Save and Read of the program" function and the "Background color" function can be used with version 1.6 or later of software.

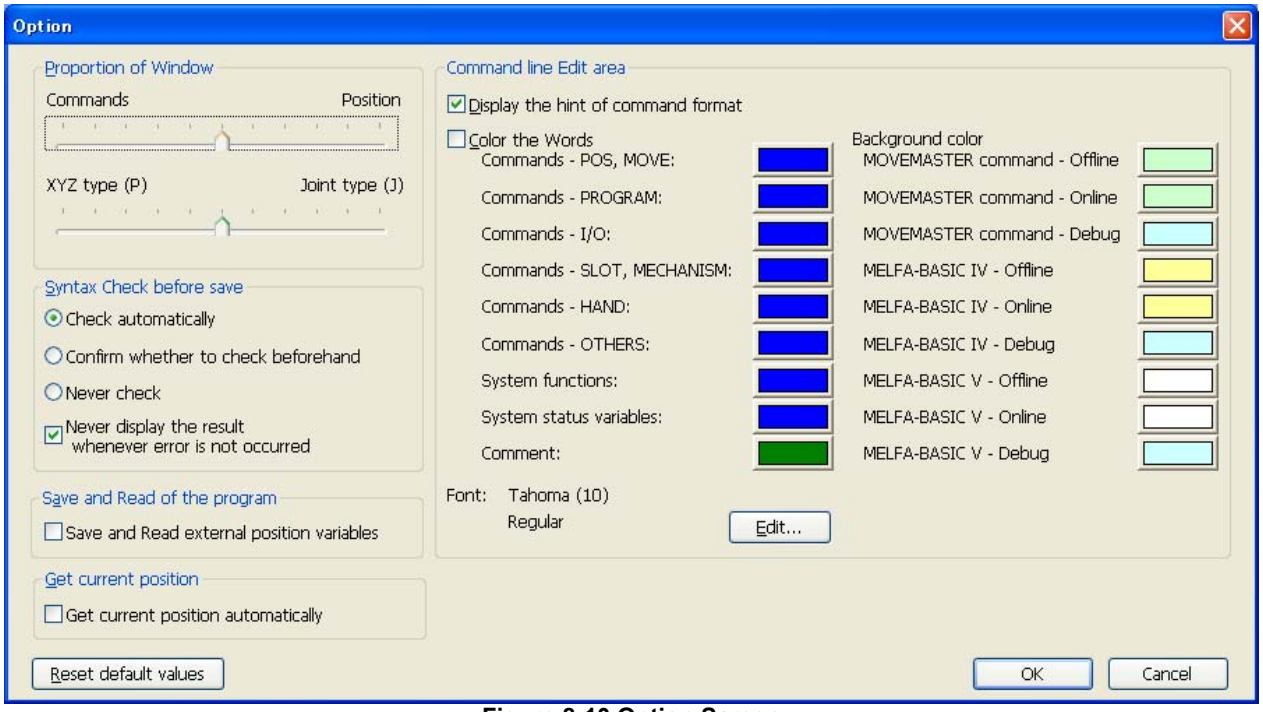


Figure 8-10 Option Screen

8.5.1. Changing the display area

In the "Display area" group, you can set the command display area and position edit area display ratios and for the position edit area, the XYZ (P) variable and joint (J) variable proportions.

Figure 8-11 Program Edit Screen Display Area Change

8.5.2. Command format hints

You can use pop-up hint display to display the format for the robot program command, system functions, and system status variables displayed in the command edit area.

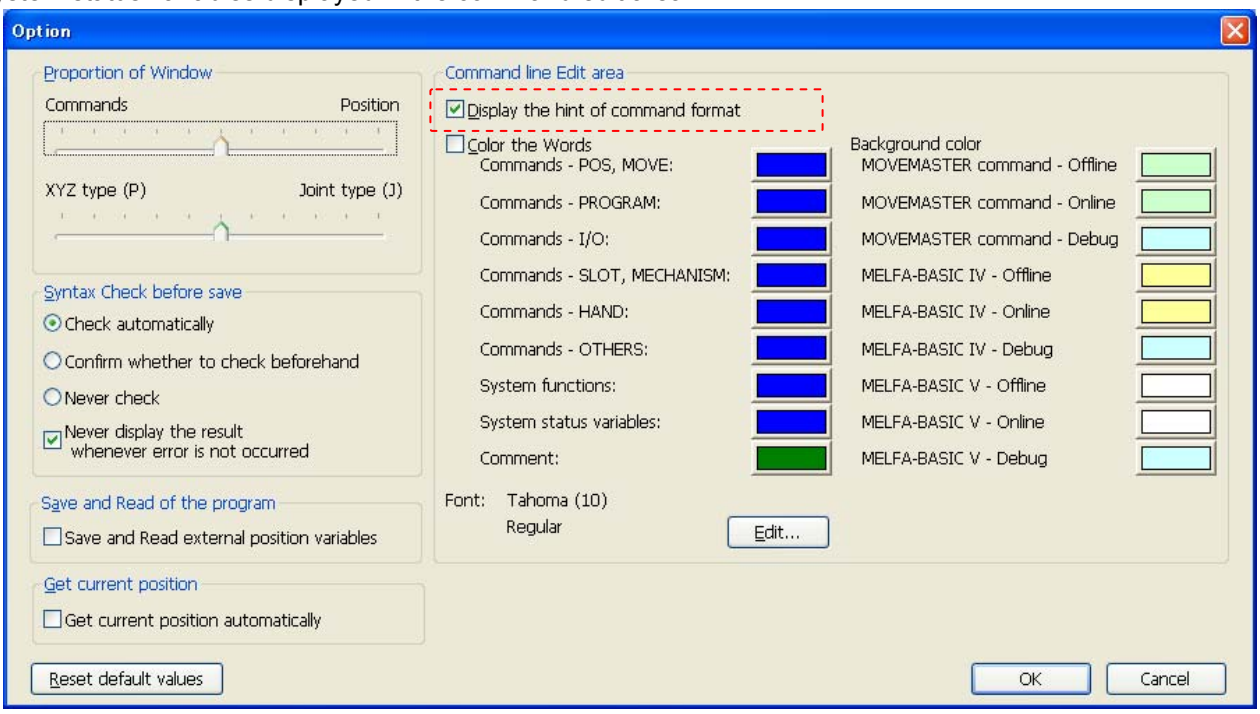


Figure 8-12 Command Edit Area Command Format Hint Display Settings

8.5.3. Character colors

You can assign the colors for displaying robot program command, system functions, and system status variables displayed in the command edit area.

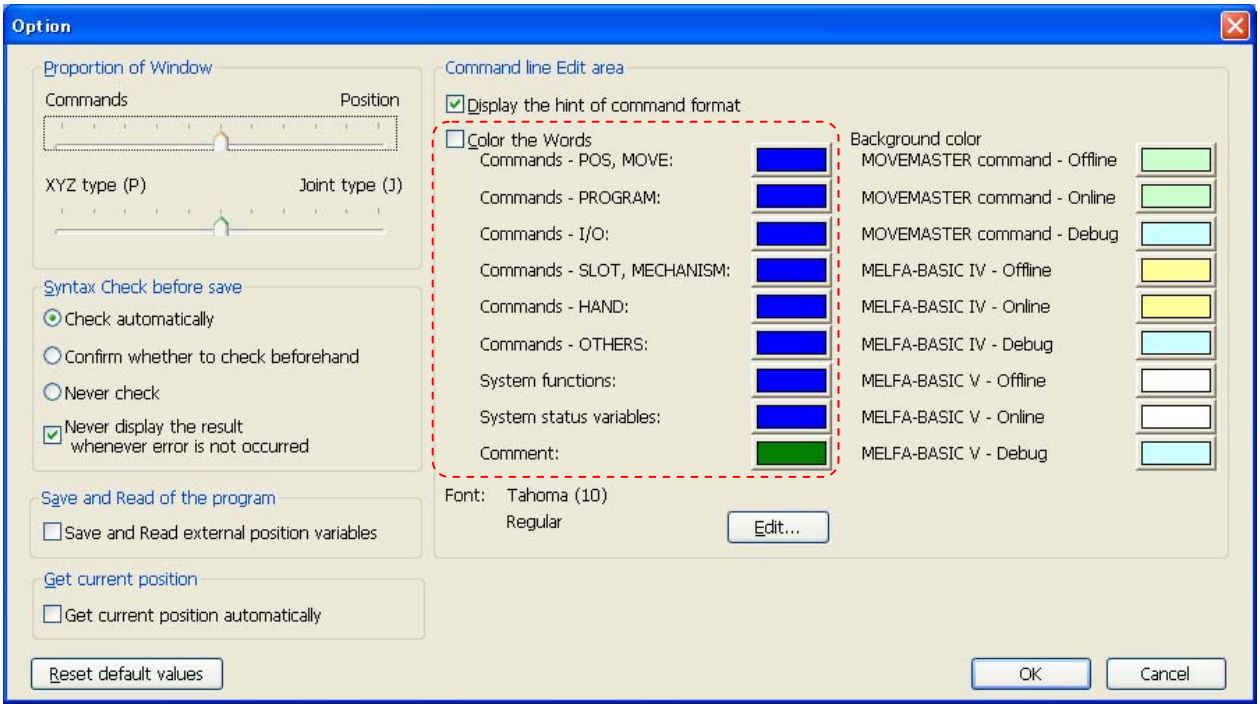


Figure 8-13 Command Edit Area Character Color Settings

8.5.4. Changing the font

You can change the font displayed in the command edit area.
Click the option screen font [Change] button. The font setting screen is displayed, so after setting the font name, style, and size, click the [OK] button.

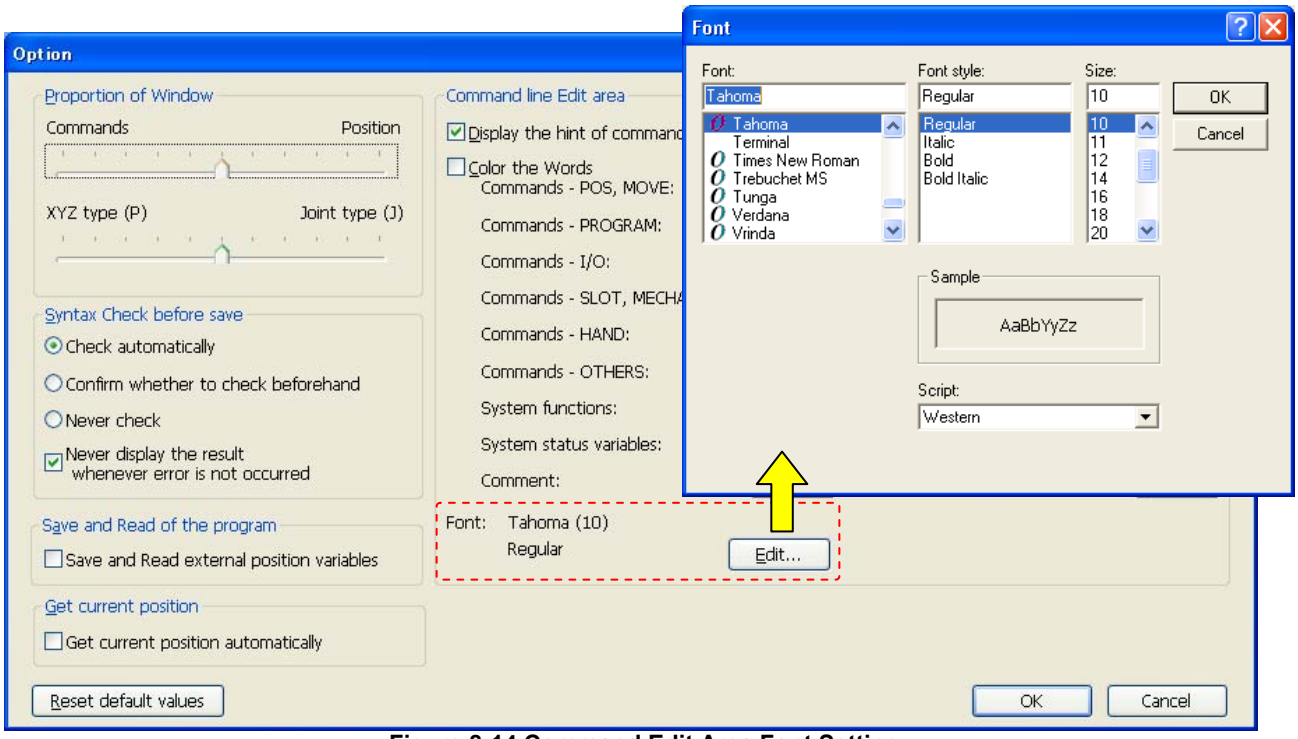


Figure 8-14 Command Edit Area Font Setting

8.5.5. Save and Read of program

In the reading item at the time of the writing item when the program is preserved and reading, the screen can be started with the check entered "Outside program positional variable".
This function can be used with version 1.6 or later of software.

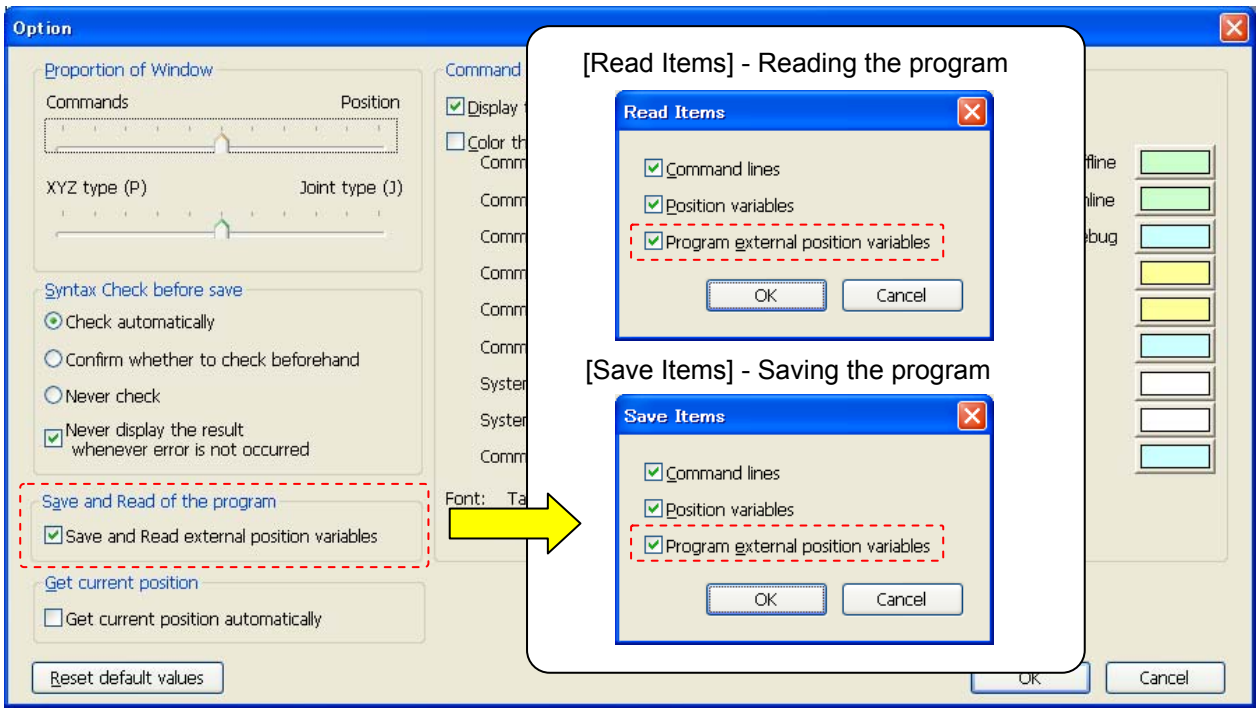


Figure 8-15 Initial setting of “Program external position variables” in the [Read Items] and the [Save Items].

8.5.6. Get current position

When adding a position variable, the current position can be got in automatically if connected to the robot. This function can be used with version 1.6 or later of software.

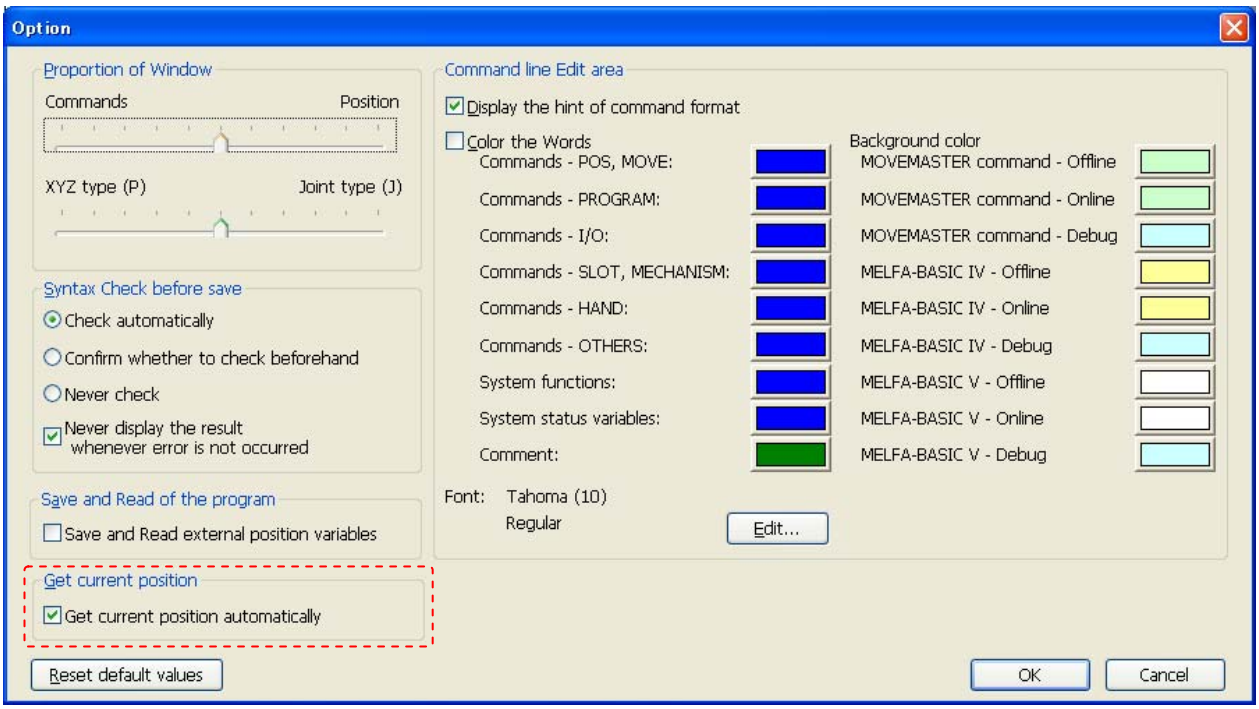


Figure 8-16Setting the get current position.

8.5.7. Setting the background color of the program editor

It is possible to set the the background color of the command area in the program editor.
This function can be used with version 1.6 or later of software.

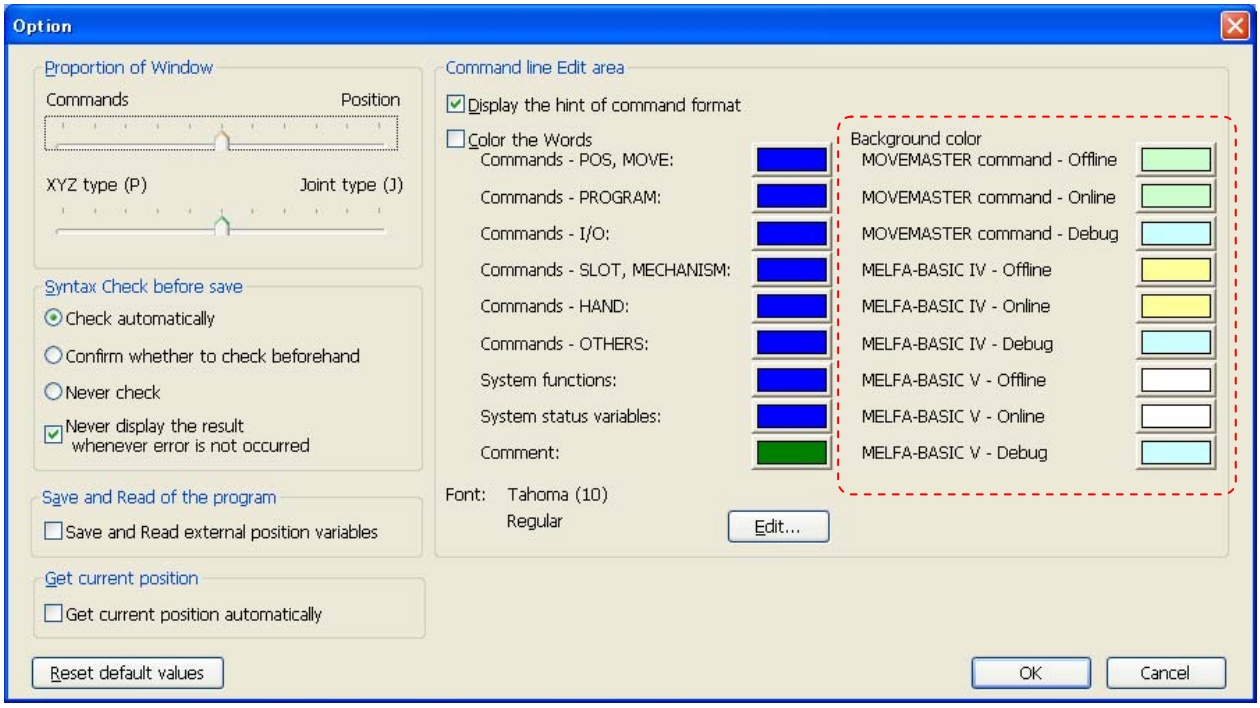


Figure 8-17Setting the background color of the program editor.

⚠ Caution

Please note that it becomes easy to make a mistake in off-line and online, etc. if the same color is used by the background color.

8.6. Program Editing

This chapter explains the methods for editing MELFA-BASIC V programs.
For RT ToolBox2 command statement editing, you can input in the same way as with a general editor like a notebook. There is no need to input the [Enter] key for each line as was the case with RT ToolBox.

8.6.1. MELFA-BASIC V command statement editing

When writing a program using MELFA-BASIC V, you do not use line numbers, unlike MELFA-BASIC IV or Movemaster commands. Instead the step position is displayed on the left end. These step numbers are automatically displayed with the keyboard [Enter] key.

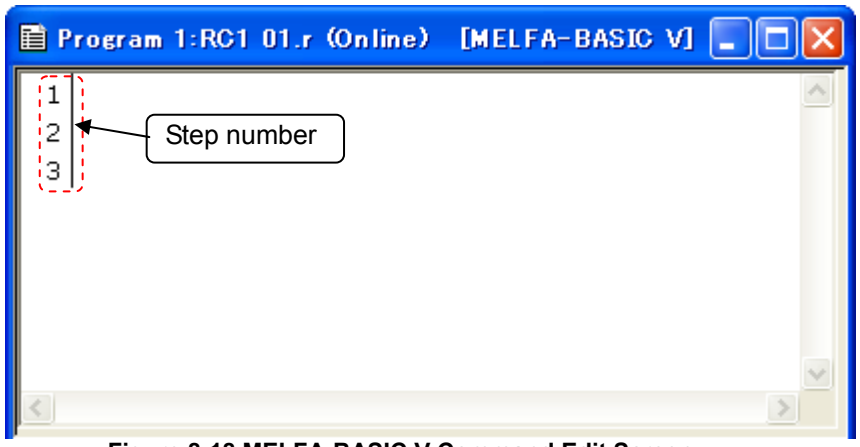


Figure 8-18 MELFA-BASIC V Command Edit Screen

Even if you input MELFA-BASIC V commands with all lowercase characters, when the program is written to the robot controllers, the commands are converted into the correct mixture of uppercase and lowercase letters.

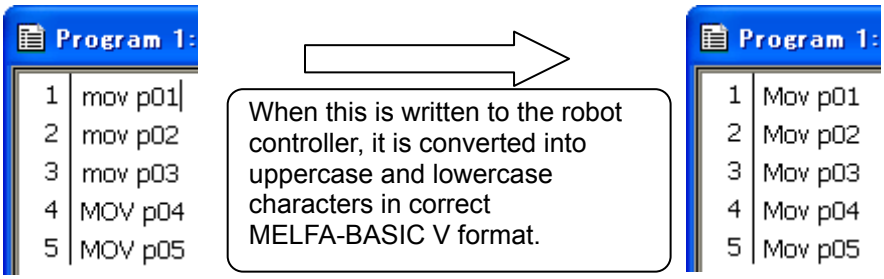


Figure 8-19 MELFA-BASIC V Character Input

8.6.2. MELFA-BASIC IV and Movemaster command command statement editing

When writing a program using MELFA-BASIC IV or Movemaster commands, step numbers like those of MELFA-BASIC V are not displayed. Input the line number at the front of the command statement.

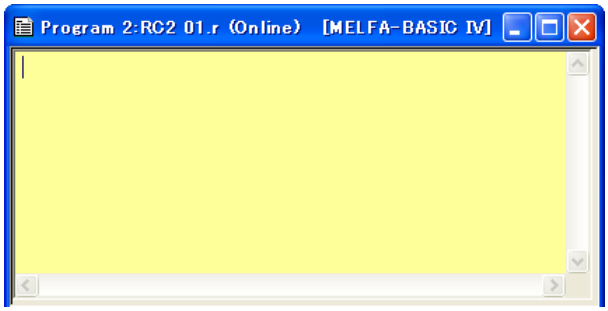


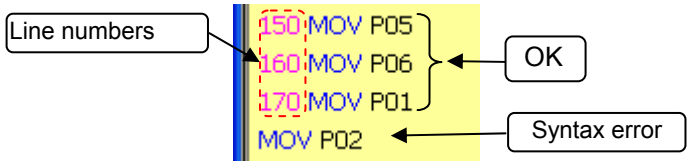
Figure 8-20 MELFA-BASIC IV Command Edit screen

Caution

For MELFA-BASIC IV and Movemaster commands, input line numbers.

Step numbers are not displayed on the MELFA-BASIC IV and Movemaster command edit screen. When using MELFA-BASIC IV and Movemaster commands, always input line numbers.

If there are no line numbers, this is a syntax error.



There is a function for sorting commands in order of line number even if you do not input them in order of line numbers. For details, see **"8.6.4.16 Sorting".**

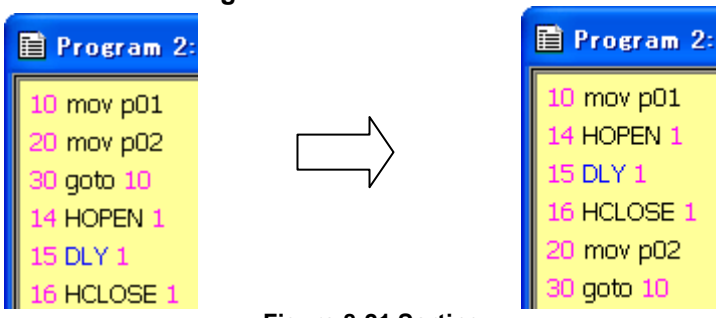


Figure 8-21 Sorting

There is a function for reordering commands in order of line number even if you do not input them in order of line numbers. For details, see

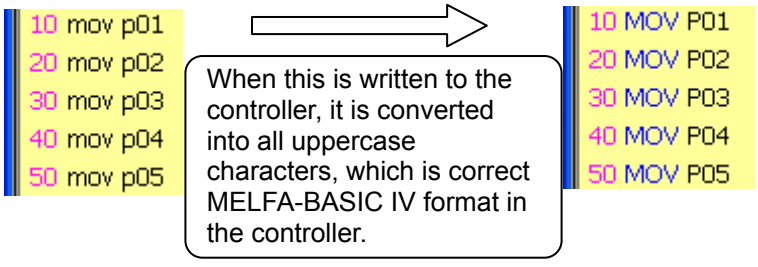


Figure 8-22 MELFA-BASIC IV Character Input

8.6.3. Position variable editing

Position variables are edited on the position edit screen. The upper list is a list of XYZ coordinate variables and the lower list is a list of joint coordinate variables.

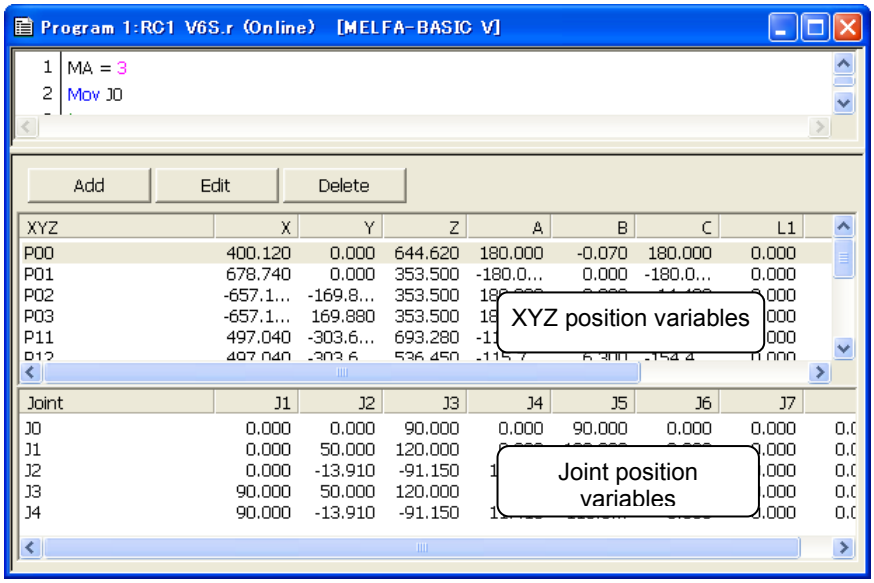


Figure 8-23 Position Variable Edit Screen

Array variables are displayed developed in their own lists.

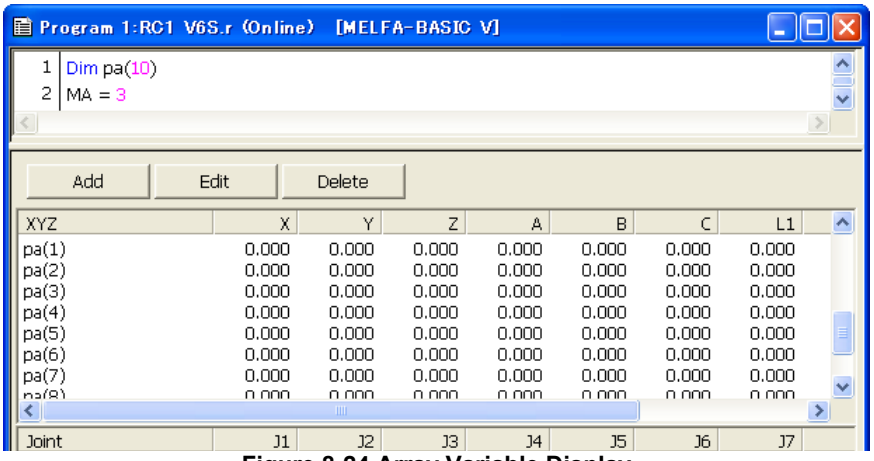


Figure 8-24 Array Variable Display

⚠ Caution

About uppercase characters and lowercase characters in position variables names

With MELFA-BASIC V, you can use lowercase letters in variable names.

This software does not differentiate between uppercase letters and lowercase letters in variable names. For example, the position variables PA and pa are recognized as the same position variables.

The controller converts all later variables to match the first position variable name defined. For example, if you write a program like that below, the position variable "pa" is used and "PA" is converted into "pa".

```
1 Mov pa        1 Mov pa
2 Mov PA   ⇒    2 Mov pa
```

When this is written to the controller, it is converted in the controller as on the right.

8.6.3.1. Adding/changing position variables

To add a position variable, click the [Add] button. The position variable adding screen is displayed. At this time, if position data is selected in the list, the contents of that position data (XYZ/joint, position information) are displayed. When "Get current position automatically" of the option screen is checked and connected to the robot, the current position of the robot is displayed with version 1.6 or later of software. However, the variable name remains blank. The current position is not displayed when not connected to the robot.

To revise a position variable, select the position variable to be revised in the list, then click the [Change] button.
The position name can be changed with version 1.6 or later of software. However, it is not possible to use it in the following cases.

- In case of opening the program in debugging status.
- With SQ Direct.
- With version 1.5.1 or earlier of this software.

Select either XYZ coordinate type or joint coordinate type, input the values of each element of the position data, input the position variable name, then click the [OK] button.

While editing an online program in online status or simulation status, you can read the current robot position by pressing the [Read Current Position] button.

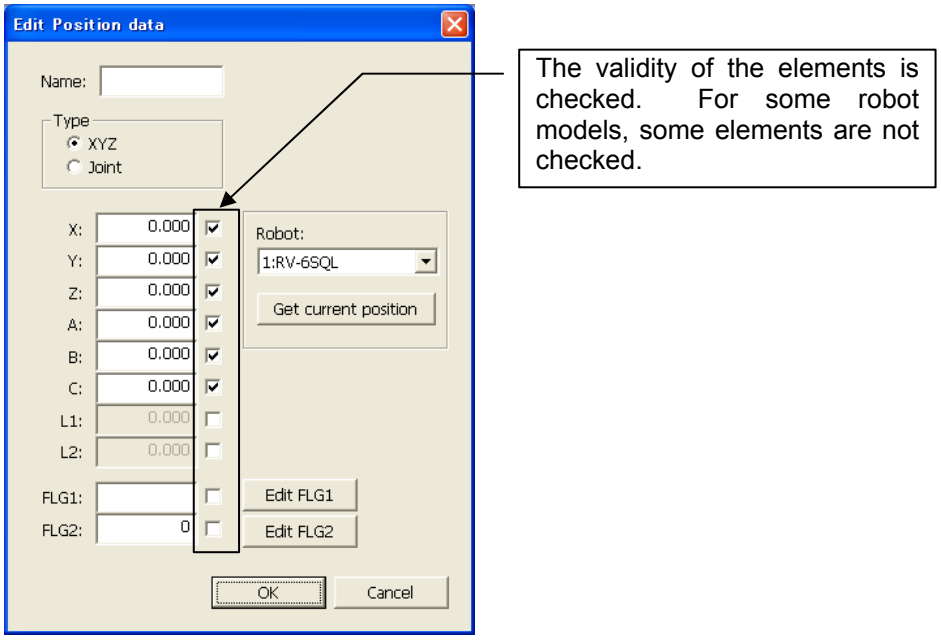


Figure 8-25 Position Data Variables

8.6.3.2. Deleting position variables

After selecting the target position variable, click the [Delete] button. The selected position variable is deleted. You can also delete multiple position variables at the same time. You can select multiple position variables by clicking position variables while holding down the [Ctrl] key or the [Shift] key on the keyboard. However, you cannot select XYZ position variables and joint position variables at the same time.

⚠ Caution

To delete a position array variable, delete the command statement. "Dim" declaration.

With this software, even if a position variable is deleted, if a program with a "Dim" declaration is written to a robot controller, the position array variables declared with the "Dim" are left with 0 for all their components.

8.6.4. Edit assist functions

This explains the edit assist functions, which help in command editing.

Edit assist functions such as copy, cut, find, replace, and jump are used from [Edit] and [Tool] on the menu bar.

8.6.4.1. Copy

Copies a character string in the command being edited. You can also copy multiple lines.
Selecting the character string to copy, click on the menu bar [Edit] -> [Copy].
You can use the paste function, explained below, to paste this copied character string to another location in the program.
For details on position data copying, see **"8.6.4.4 Copy position data"**.

8.6.4.2. Cut

Cuts a character string from the command being edited. You can also cut multiple lines.
Selecting the character string to cut, click on the menu bar [Edit] -> [Cut].
You can use the paste functio
n, explained below, to paste this cut character string to another location in the program.

8.6.4.3. Paste

Pastes the copied or cut character string to the specified location.
Put the cursor where you want to paste, then click on the menu bar [Edit] -> [Paste]. The copied or cut character string is inserted at the specified location.
For details on position data pasting, see **"8.6.4.5 Pasting position data"**.

8.6.4.4. Copy position data

Copies position data. You can also copy multiple position data items.
Selecting the position data to copy, click on the menu bar [Edit] -> [Copy – Position data].

8.6.4.5. Pasting position data

This pastes the copied position data.
Make active the program you want to paste into, then click on the menu bar [Edit] -> [Paste – Position data].
The copied position data is inserted into the specified program.
At this time, if there is already position data with the same name in that program, a confirmation message is displayed.

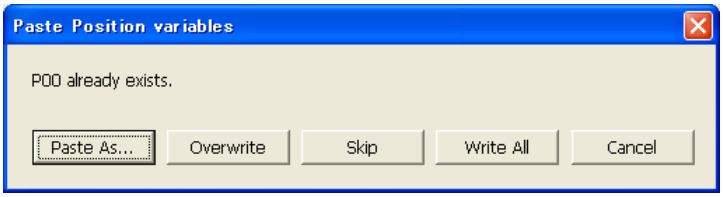


Figure 8-26 Paste Position Data Confirmation Message

8.6.4.6. Find

This searches for the specified character string.
Click on the menu bar [Edit] -> [Find]. The find screen is displayed.

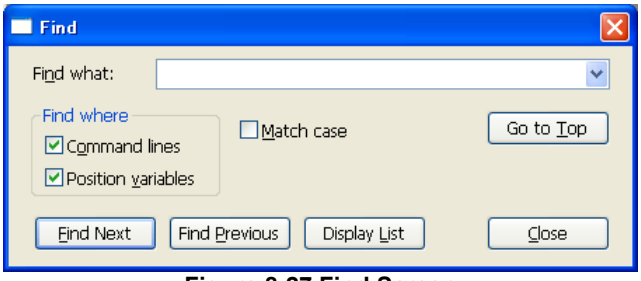


Figure 8-27 Find Screen

Input the character string to find, and then click [Find Next] or [Find Previous]. The character string search starts.

If you click [Display List], all the instances of the specified character string are found from programs and displayed in a list.

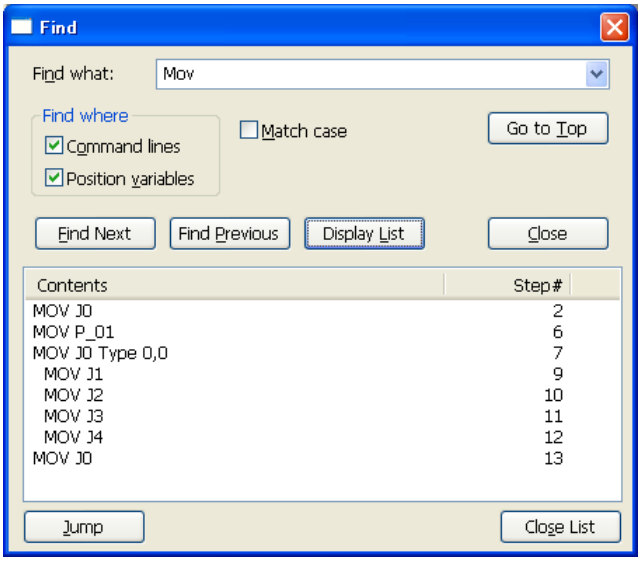


Figure 8-28 Find Results List Display

When you select an item from the find results list and click the [Jump] button, the display jumps to the line that includes the selected item.

It is possible to search the name of position variables with version 1.6 or later of software.

8.6.4.7. Find in Files

This searches for the specified character string in the "Online" or "Offline" program files registered in the current project.
Click on the menu bar [Edit] -> [Find in Files]. The find in files screen is displayed.
You can also display this screen by clicking the program management [Find in Files] button.

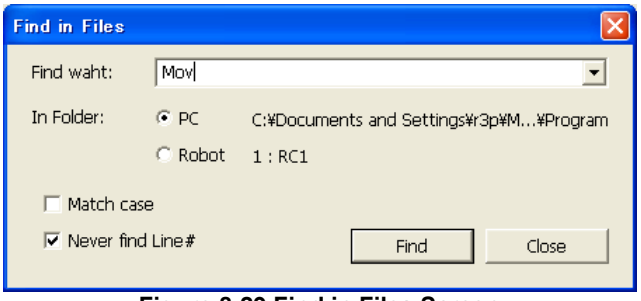


Figure 8-29 Find in Files Screen

Input the character string to find and select the location to search.
When "PC" is selected as the location to search, all the offline programs registered in the current project are searched.
When "Robot" is selected as the location to search, all the online programs registered in the current project are searched. In other words, all the programs in robot controllers in the "online" status connected to a robot are searched. If a simulation is running, all the programs in the virtual controller are searched. When you search in controllers, the communications with the controllers may take time.

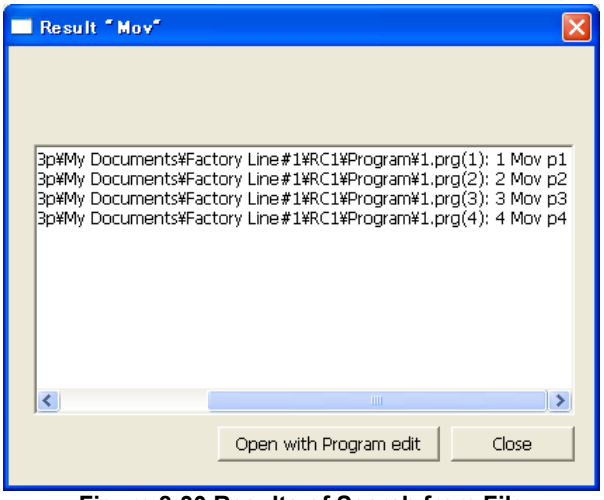
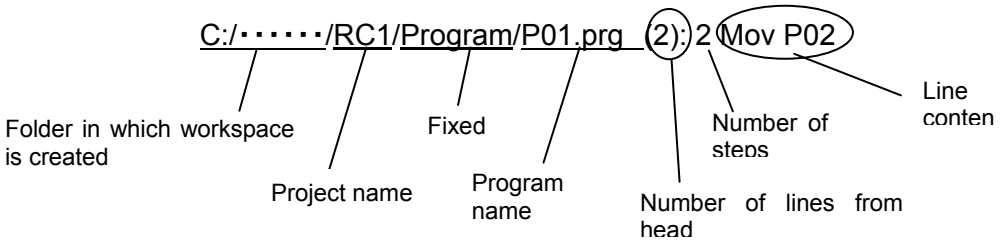


Figure 8-30 Results of Search from File



With the [Open with Program edit] button, you can open the program that includes the contents of the line selected from the list of search results.

8.6.4.8. Replace

This replaces the specified character string with another character string.
Click on the menu bar [Edit] -> [Replace]. The Replace Screen is displayed.

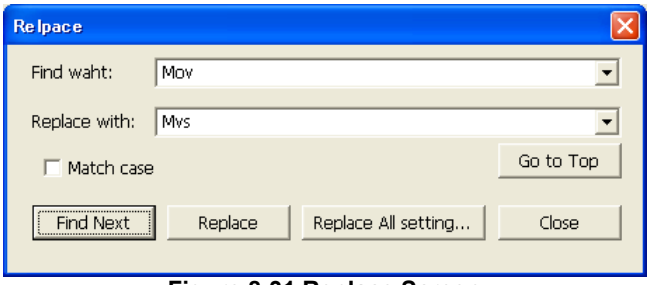


Figure 8-31 Replace Screen

[Find Next] : Searches for the next instance of the character string to be replaced.
[Replace] : Replaces the found character string.
[Replace All] : An item is displayed for specifying the range in which to replace all instances of the specified character string.

With Replace All, you can specify a range in which to replace.
When you click the [Replace All] button, all the instances in the specified range are replaced.

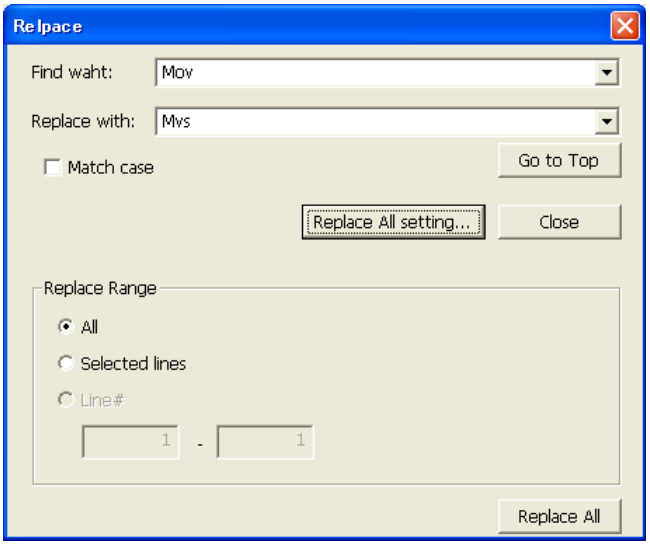


Figure 8-32 Replace All Setting Screen

8.6.4.9. Jump to specified line

Jumps to the specified step number or label.
Click on the menu bar [Edit] -> [Jump]. The jump screen is displayed.

Figure 8-33 Jump Screen

Input the step number or label to jump to, then click the [OK] button. Display jumps to the specified step number or label.

8.6.4.10. Partial writing

Writes the selected program lines to the robot controller.

This is handy for reflecting the contents of the partially revised program in the robot controller, but be careful. Only the selected part of the program is written.

Select the lines to be written to the robot controller, then click on the menu bar [Edit] -> [Partial Write]. Check the contents to be written, then click [Yes].

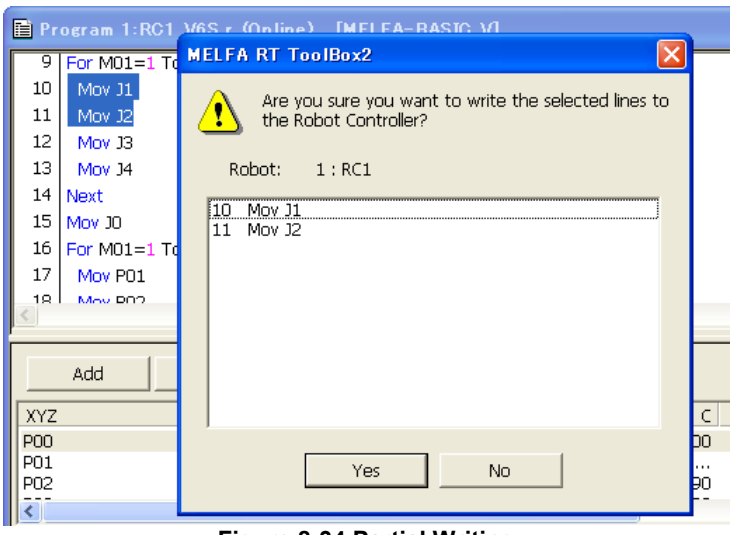


Figure 8-34 Partial Writing

8.6.4.11. Transfer all lines of the program

Write the all lines of the program to the robot controller.
Click on the menu bar [Edit] -> [Transfer all to the controller] after opening the program. After displaying the confirmation message, and then click “Yes”.

This function can be used with version 1.6 or later of software.

8.6.4.12. Syntax check

You can check whether or not the edited robot program is syntactically correct. Execute this before writing the program to the robot controller.
Click on the menu bar [Tool] -> [Check Syntax]. If there is a syntax error, the error location and details are displayed.

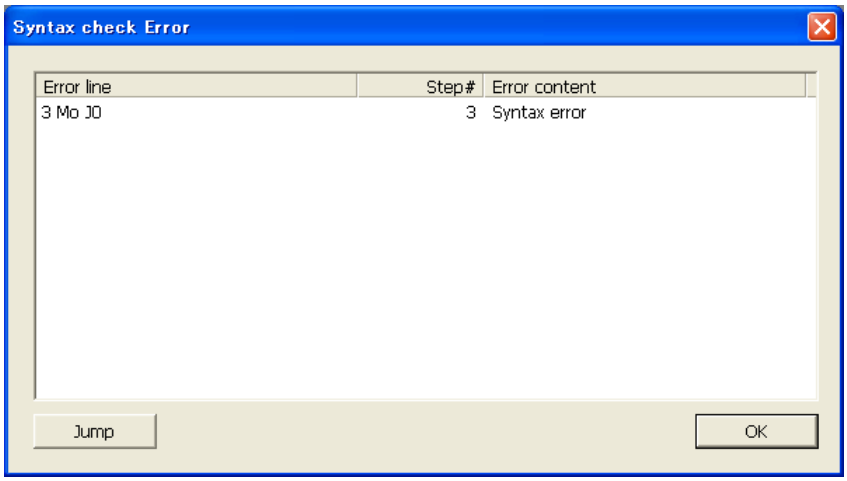


Figure 8-35 Syntax Check Results Screen

If you select the detected error and click the [Jump] button, it jumps to the command statement with the error.

8.6.4.13. Command template

You can display a list of the commands and make insertions on the program command edit screen. Click on the menu bar [Tool] -> [Command Template].

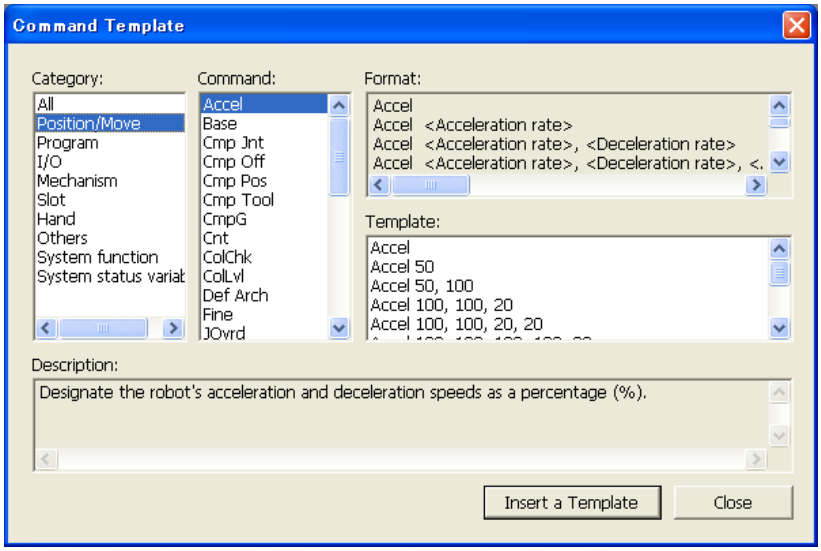


Figure 8-36 Command Template

When you select the template for the selected command from the list, then either click the [Insert Template] button or double click, the command is inserted onto the program command edit screen.

8.6.4.14. XYZ position data batch editing/joint position data editing

You can change the position variables in the program being edited in a batch and can sum up all the values. For example, you can add 10.00 to the X components of the P00, P01, P02, P03, and P04.

To batch edit XYZ position variables, click on the menu bar [Tool] -> [Batch Edit XYZ Position Data].
To batch edit joint position variables, click on the menu bar [Tool] -> [Batch Edit Joint Position Data].
All the position variables of the respective type are displayed.
The positional variables selected are displayed in the “Target” with version 1.6 or later of software.

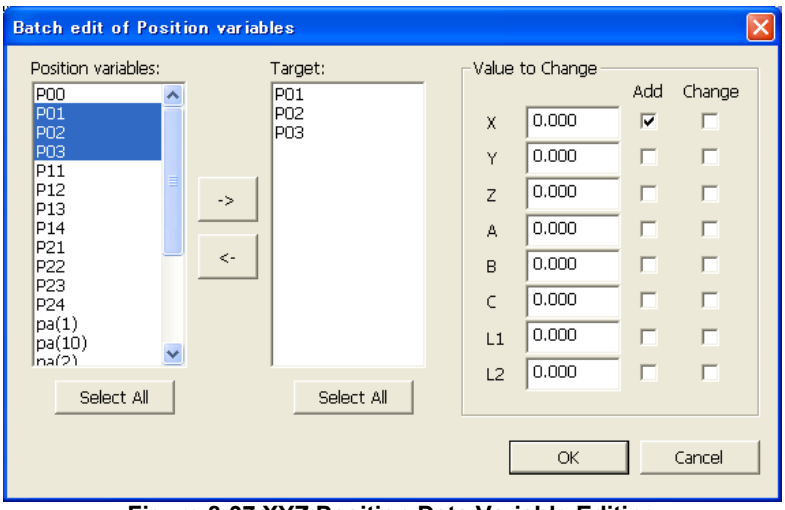


Figure 8-37 XYZ Position Data Variable Editing

From the position variable list, select the position variable to change, then add it to the change list with the [->] button.

Input the change value, select the change method [Add] / [Change], then click the [OK] button. You can not set both [Add] and [Change] for the same element.

You can cancel the registration of a position variable for change with the [<-] button.

8.6.4.15. Renumbering

The renumbering function can only be used with MELFA-BASIC IV and Movemaster commands.
You can renumber line numbers in a batch. You can specify the range for renumbering.
With the setting dialog, you can specify the start and end lines numbers, the new starting line number, and the line number interval.

While editing a program created with MELFA-BASIC IV or Movemaster commands, click the tool bar [Tool] -> [Renumber]. The renumber set screen is displayed.

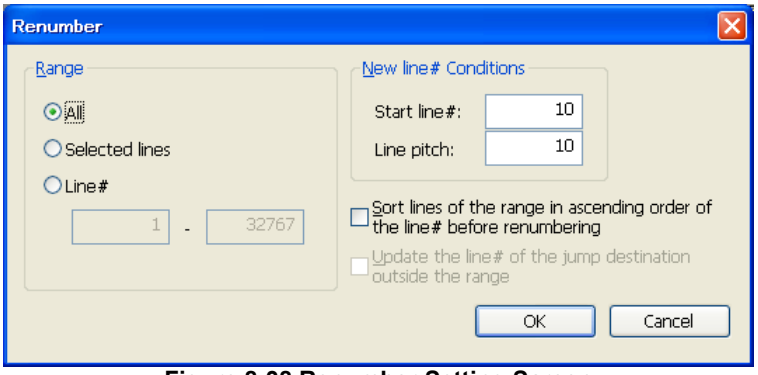


Figure 8-38 Renumber Setting Screen

Caution

Renumbering can only be used with MELFA-BASIC IV and Movemaster commands.

The renumbering function can only be used with MELFA-BASIC IV and Movemaster commands. It can not be used with standard MELFA-BASIC V.

8.6.4.16. Sorting

The sorting function can only be used with MELFA-BASIC IV and Movemaster commands.
This sorts the edited program by line number.
While editing a program created with MELFA-BASIC IV or Movemaster commands, click the tool bar [Tool] -> [Sort]. The confirmation message is displayed, then the line numbers are sorted in ascending order.

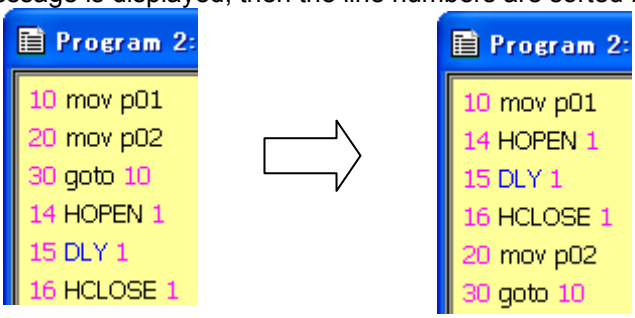


Figure 8-39 Sorting

Caution

Sorting can only be used with MELFA-BASIC IV and Movemaster commands.

The sorting function can only be used with MELFA-BASIC IV and Movemaster commands. It can not be used with standard MELFA-BASIC V.

8.6.4.17. Comment Selection/Uncomment Selection

The selected lines are exchanged as a comment by the batch. Or the comments in the selected lines are removed comment by the batch.
This function can be used in Ver. 1.2 or later.

In command edit screen, after selecting the lines you want to change into the comment, click [Edit]->[Comment Selection] on menu bar. Comment character " ' " is added to the head of the selected lines.
Moreover, after selecting the lines you want to release the comment, click [Edit]->[Uncomment Selection] on menu bar. Then the comments in the selected lines are removed comment.
However, even if you select the line where "Rem" command is included, "Rem" is not removed.

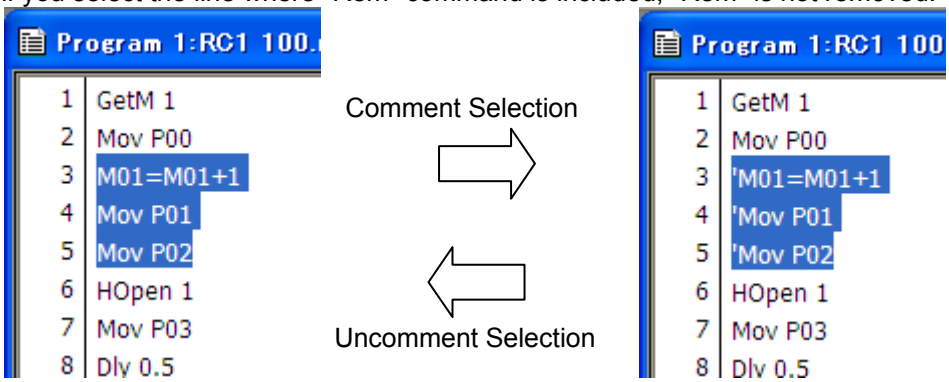


Figure 8-40 Comment Selection / Uncomment Selection

Example for setting / removing of comment is as follows;

Table 8-3 Example for setting / removing comment

program language	Set comment	Remove comment
MELFA-BASIC V	1 Mov P1 2 Mov P2 3 'Mov P3 4 REM ABCDEFG ⇨ 1 'Mov P1 2 ' Mov P2 3 ''Mov P3 4 'REM ABCDEFG	1 'Mov P1 2 ' Mov P2 3 ''Mov P3 4 'REM ABCDEFG 5 REM P4 ⇨ 1 Mov P1 2 Mov P2 3 'Mov P3 4 REM ABCDEFG 5 REM P4
MELFA-BASIC IV	10 MOV P1 20 MOV P2 30MOV P3 40 REM ABCDEFG ⇨ 10 'MOV P1 20 ' MOV P2 30 'MOV P3 40 'REM ABCDEFG	10 'MOV P1 20 ' MOV P2 30 'MOV P3 40 'REM ABCDEFG 50 REM MOV P4 ⇨ 10 MOV P1 20 MOV P2 30 MOV P3 40 REM ABCDEFG 50 REM MOV P4

⚠ Caution

Caution for comment in the robot program in debugging status

When the program is opened in debugging status, it is written as soon as the comment is set or removed. At this time, when the robot controller is driving, it becomes an error.

8.6.4.18. Removing comments from all lines in the program

It is possible to remove comments from all lines in the program.
This function can be used with the software Ver.1.4 or later.

Open the program that removes all the comments, and click [Edit]->[Remove comments from all lines] in the menu bar. All comments in the program are removed excluding "'" (single quotation) and "Rem" command.

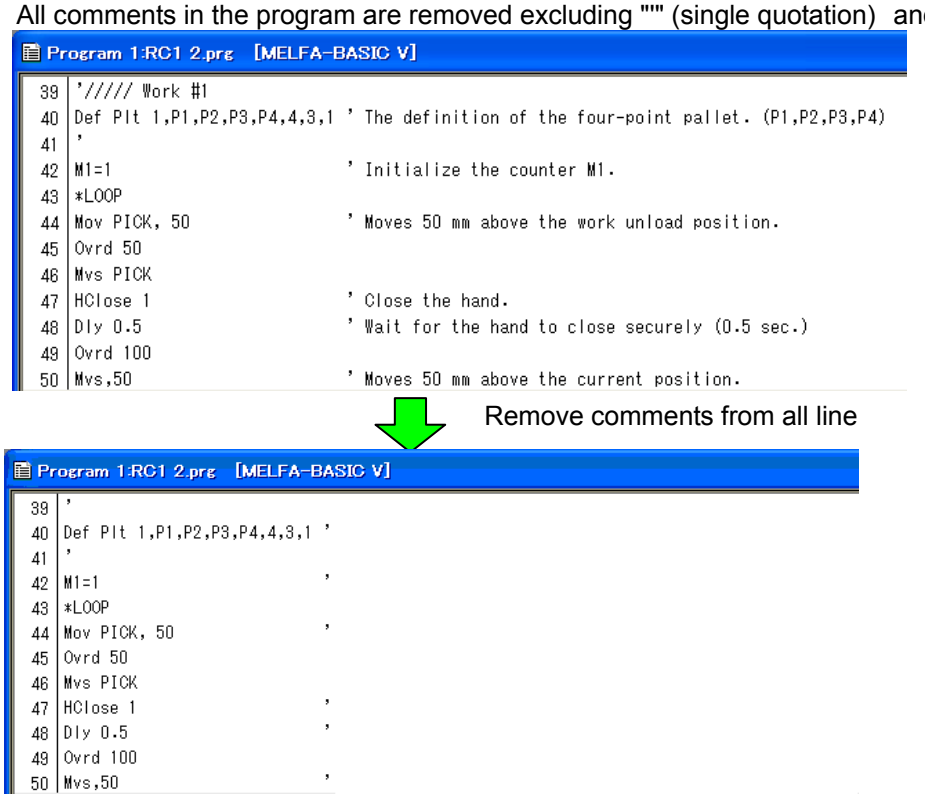


Figure 8-41 Removing comments from all lines in the program

Caution

Removal processing of special comment command "Rem"

Space division between comment command “Rem” and line number or other command need to inserted. In the case of Robot Controller, it may judge comment command “Rem” as a comment without space division. But this software judges comment command “Rem” as a comment if “Rem” is devided by the space.

If there is a character “Rem” in the command line, this software doesn’t remove comment contents. After the processing, these command lines are displayed in the command editing screen. Confirm the contents and remove comment contents in the screen. When you select displayed command line and click [Jump] button, you can jump to command line in the command editing screen.

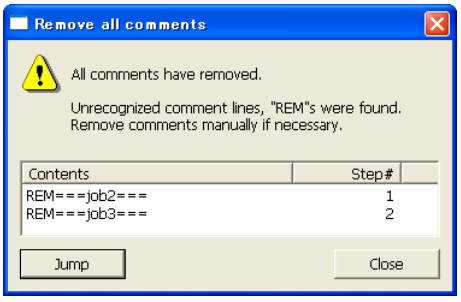


Figure 8-42 List of command line which includes “Rem” that cannot take as the comment

8.7. Saving Programs

Always save the edited program.
There are three methods for saving: saving, saving to computer, saving to robot controller.

Caution

Do not write a program to the controller with duplicate step numbers.

Even programs with duplicate step numbers or that are still being edited and are not yet syntactically correct can be saved on the computer. However, be careful not to copy or otherwise transfer such a program to a robot controller with the program management functions.

If a program with duplicate step numbers is written to the robot controller, the duplicate step lines are written over each other.

8.7.1. Save

Saves the program being edited with its current name.
When you click on the menu bar [File] -> [Save], the program is saved, overwriting the older version of itself.

If you are editing a program on a robot controller, the "Save Items" setting screen is displayed. Set the items to write, and then click the [OK] button.
For details on the "save items", see**"8.7.4 Items written when saving in robot".**

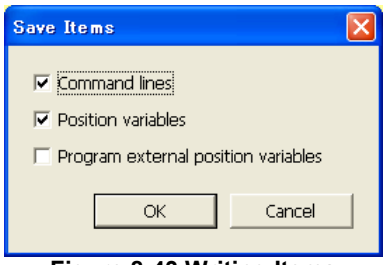


Figure 8-43 Writing Items

8.7.2. Saving on computer

Saves the program being edited to the computer. At this time, you can set a new program name.
Click on the menu bar [File] -> [Save to PC].

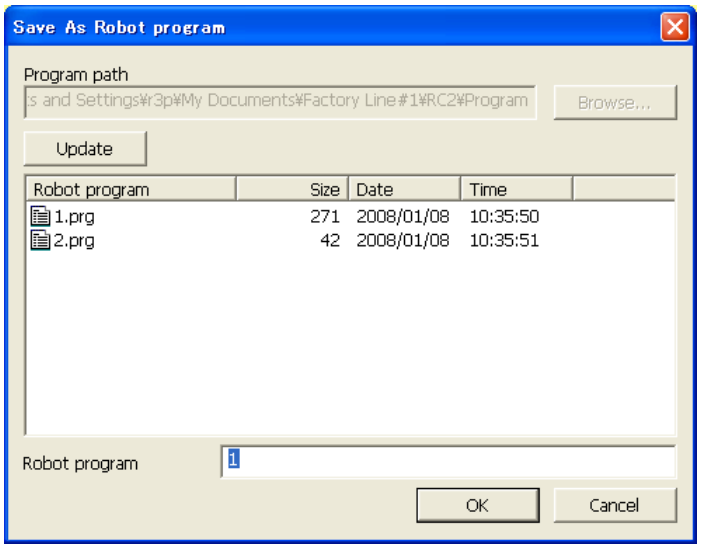


Figure 8-44 Saving on Computer

Input the robot program name, and then click the [OK] button.

⚠ Caution

Folder in which programs are stored

Programs on the computer are managed in units of workspace projects. The folder they are stored into is workspace writing folder/project name/Program.

To store into any other folder, first store in this folder, then copy into the desired folder with the program management copy function.

⚠ Caution

About the program name which is disable on PC

Windows, error is occurred in the Program editing tool when opening that program. To solve this problem, it is necessary to change the program name in the robot controller.

The “Reserved words” are the special words used by Windows system. Therefore, it is impossible to use these words as the file name on PC. The following words are in “Reserved words”.

AUX, COM1 to 9, CON, LPT1 to 9, NUL, PRN

8.7.3. Saving in robot controller

Saves the program being edited to the robot controller with a new name. At time, you can set a new program name.

Click on the menu bar [File] -> [Save in Robot]. The "Save Items" setting screen is displayed, so set the save items, then click the [OK] button.

For details on the "save items", see "8.7.4 Items written when saving in robot".

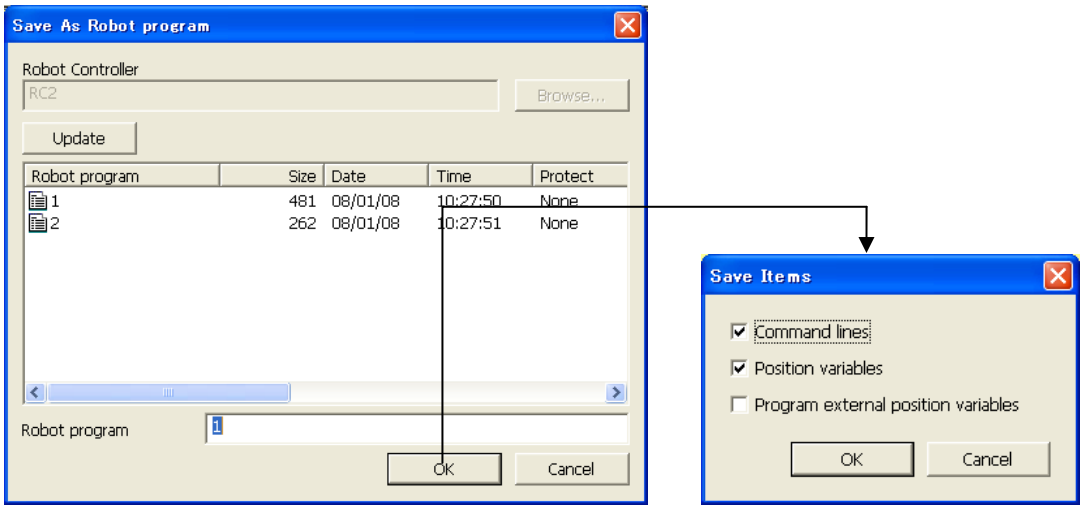


Figure 8-45 Saving on Robot Controller

8.7.4. Items written when saving in robot

When saving a robot program in a robot controller, write items can be set by categorizing them into instructions, position variables and program external position variables.

This function is displayed on CRn-500 series robot controllers from the H1 edition on.

This save item default values for when you have read a robot controller program are the same as the "Read Items" when you read the program. When you have created a new program or opened a program on the computer, the display becomes as in **"Save Items".**

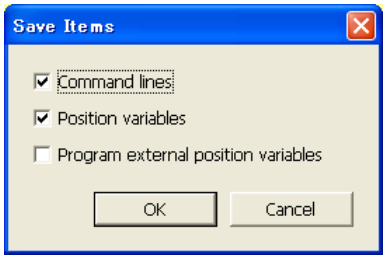


Figure 8-46 Save Items

We will explain the operations for saving to a robot when only command lines or only position variables are specified, using the following example for illustration.

Example: When there are programs in program editing on the computer or in the robot controller

<<Program in 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 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 command line written

<<Program in 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)
```

Changing only the command line

The position variables are not changed.

(2) When writing position variable only

<<Program in 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)
```

The command line is not changed.

The position variables on the computer are overwritten. However, position variables that are in the robot controller, not on the computer, are left as is. (Reference)

⚠ Caution

Timing from which program external position variables is written.

Timing from which the program external position variable is possible to back up comes to be going to turn on the power supply next time.

Please turn on controller's power supply again when you use the program external position variable written in the controller.

8.7.5. Setting the syntax check for before program saving

You can set whether or not to have the syntax checked when you save a program and whether or not to display a message when there are no syntax errors.

With the program opened, on the menu bar, click [Tool] -> [Option] and set with the option screen. The default setting is automatic syntax checks with no message displayed if there is no syntax error.

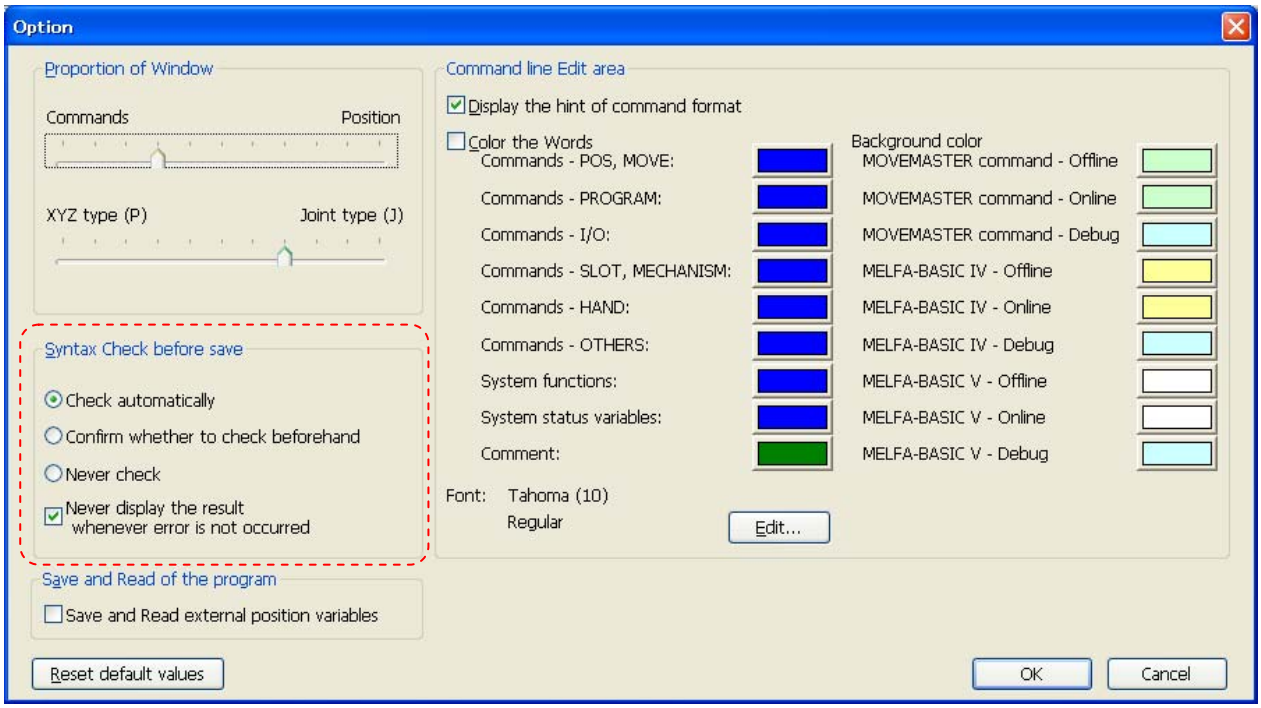


Figure 8-47 Settings for Syntax Check Before Saving

8.8. Program Printing

You can print programs you have written.

8.8.1. Checking a print image

You can display a print image of the program on the screen.
Make active the program you want to print, then click on the menu bar [Workspace] -> [Print Preview]. The print image for currently active program is displayed.

8.8.2. Printing a program

Make active the program you want to print, then click on the menu bar [Workspace] -> [Print]. The currently active program can be printed.

8.8.3. Setting to print a program

You can customize the pages the program is printed with.
When you click on the menu bar [File] -> [Page Setup], the page setup screen is displayed.
You can set whether or not to print the file name, print date and time, and page numbers, the space between lines and the margin sizes.

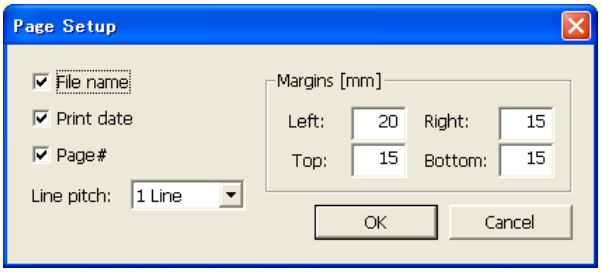


Figure 8-48 Page Setup for Printing

8.9. Program Debugging

You can debug robot programs you have written.

Caution

Debugging is for programs on a controller or on a virtual controller with a simulation running.

When debugging, use a program on a controller or on a virtual controller with a simulation running. You can not debug a program stored on a computer.

The function of the “Position Jump” can be used with version 1.6 or later of software.

8.9.1. Starting debugging

Open the robot program in debugging status. From the project tree [Online] -> [Program], select the program, then click the right mouse button. From the right mouse button menu, click [Debug Open].

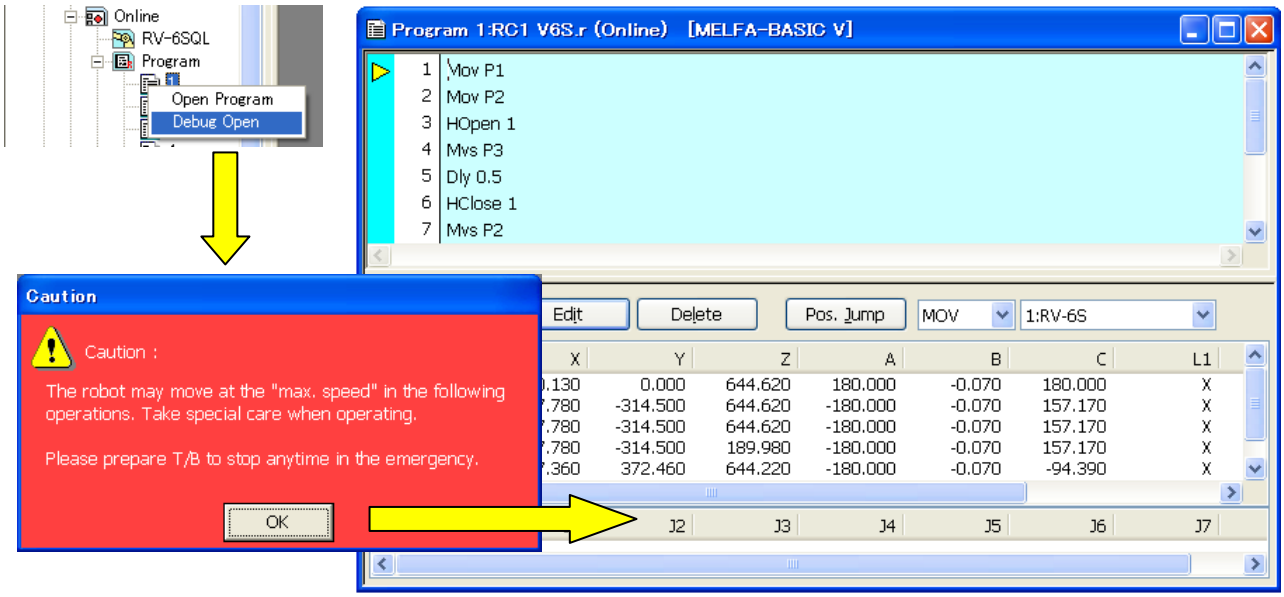


Figure 8-49 Opening a Program in Debug Status

The specified robot program is opened in debugging status. The execution line cursor "▶" is displayed at the left end of the command edit area. The line on which this execution line cursor is displayed is the line currently being executed.

The display of this execution line cursor can be switched on/off with the menu bar [Debug] -> [Display/Do not display Execution Line].

8.9.2. Executing programs step by step

Danger

With program debugging, the robot may operate at 100% speed. Watch out for the safety around the robot. Also, prepare a T/B at hand and use the robot in a status in which an emergency stop can be made at any time.

A program that has been opened in debugging status can be run step by step.
Operate using the debug operation screen that is displayed at the same time the program was opened in debugging status.

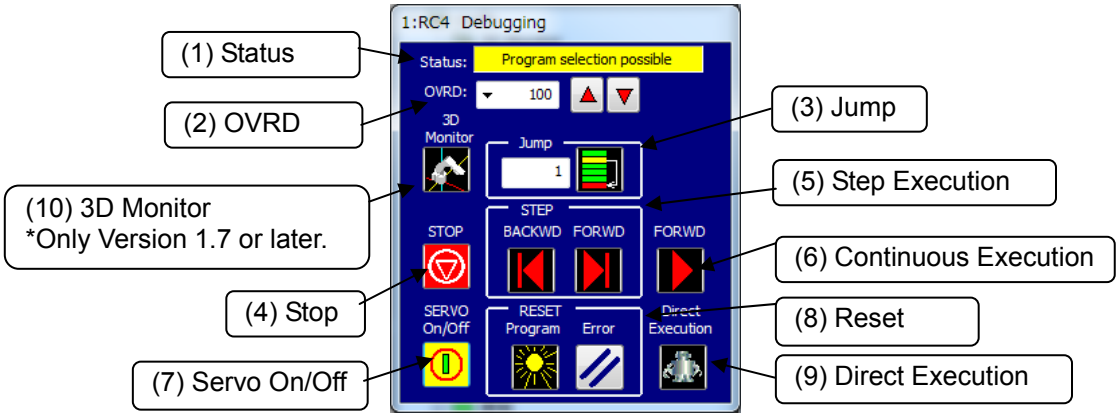


Figure 8-50 Debug Operation Screen

(1) Status
The controller's task slot status is displayed.

(2) OVRD
This displays and sets the robot speed override.
You can set by operating the drop down list with Version 3.01B or later of this software. 5%, 2%, and 1% can be selected too in this operation.

(3) Jump
You can specify the line in the program to execute.

(4) Stop
You can stop the program.

(5) Step Execution
This executes the specified program one line at a time. Pressing the [FORWD] button executes the command on the current execution line and advances the current execution line one line. Pressing the [BACKWD] button executes the command on the current execution line and returns the current execution line one line.

(6) Continuous Execution
This executes the program continuously from the current line.

(7) Servo On/Off
You can switch the robot servo On/Off.

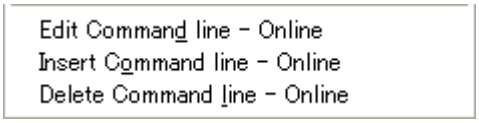
(8) Reset
You can reset the program and any errors that have occurred.

(9) Direct Execution
You can execute any command without relationship to the robot program.

(10) 3D Monitor
You can display 3D monitor of the robot.

8.9.3. Revising programs

The command statements for a program that has been opened in debugging status can not be edited in the command edit area. You can revise command statements from [Edit] on the menu bar. Click on the menu bar [Edit] -> [Edit Command line (Online)], [Insert Command line (Online)], and [Delete Command line (Online)]. Position variables can be edited as usual.



(1) Edit command line

You can edit the contents of the specified command line.

Click the command line to be edited with the mouse, click on the menu bar [Edit] -> [Edit Command line (Online)]. The screen for editing the command line is displayed.

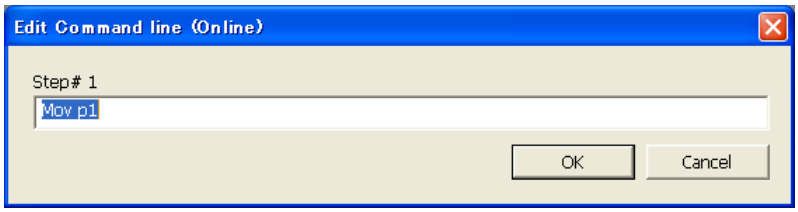


Figure 8-51 Command Line Editing (Online)

Revise the command line, and then click the [OK] button.

(2) Insert command line

You can insert a command statement at the specified line.

Click the line at which the command statement is to be inserted with the mouse, then click on the menu bar [Edit] -> [Insert Command line (Online)]. The screen for inserting the command line is displayed.

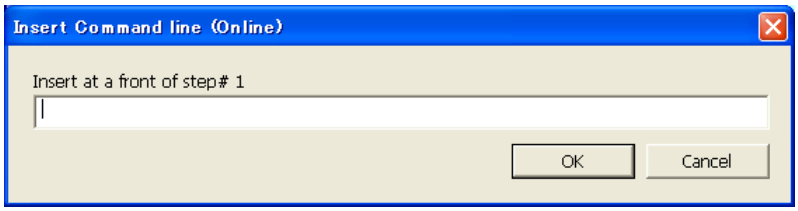


Figure 8-52 Command Line Insertion (Online)

(3) Delete command line

You can delete the specified command line.

Click the line at the line with the command statement to be deleted with the mouse, then click on the menu bar [Edit] -> [Delete Command line (Online)]. The confirmation screen for the command line deletion is displayed.

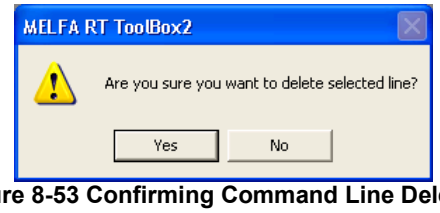


Figure 8-53 Confirming Command Line Deletion

(4) Edit position variables
For details on the method for editing the position variable, **"8.6.3 Position variable editing".**

Caution

Be careful when changing the value of a variable.

When you change the value of a variable, the operation target position of the robot may change and result in a collision. This is particularly dangerous during robot operation, so check carefully before changing the value of a parameter.

Caution

Partial writing can not be performed while editing a program in debugging status.

8.9.4. Setting and deleting breakpoints

You can set a breakpoint in a program that has been opened in debugging status.
If you set a breakpoint, when you open the program in debugging status, you can stop the program at the line while executing the Continuous execution. After stops, you can execute the program continuously.

Breakpoints can be set up to 128. Moreover, when the program is quitted, every breakpoint is deleted.
There are the following two types of breakpoints.

Permanent breakpoint	:	After stopping, the breakpoint keeps being set.
One-time breakpoint	:	After stopping, the breakpoint is automatically deleted at the same time as stopping.

Caution

Breakpoints can only be used with MELFA-BASIC V.

(1) Set a Breakpoint
The breakpoint is set according to the following procedure.
1) Click the command line where breakpoint is set with the mouse, then click on the menu bar [Debug] -> [Set Breakpoint].

2) The breakpoint setting screen is displayed.
Select the type of breakpoint to set, then click the [OK] button. The breakpoint is set at the specified command line.

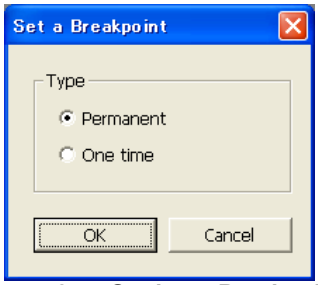


Figure 8-54 Setting a Breakpoint

3) "●" is displayed at the left end of command lines at which breakpoints are set.

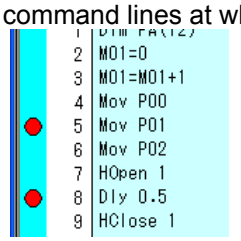


Figure 8-55 Display of Lines with Breakpoints Set

(2) Delete a Breakpoint

To delete a breakpoint, click the command line with the breakpoint to be deleted with the mouse. And then click on the menu bar [Debug] -> [Delete a Breakpoint].

To delete all the breakpoints set in this program, click on the menu bar [Debug] -> [Delete All Breakpoints].

You can also perform the breakpoint setting and deleting operations with tool bar buttons.

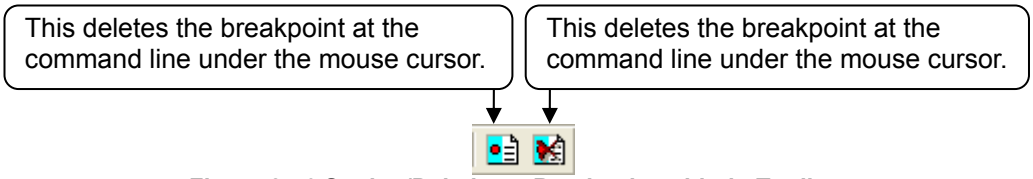


Figure 8-56 Setting/Deleting a Breakpoint with theToolbar

8.9.5. Position jump

It is possible to move the robot to the position with the specified interpolation movement.
This function can be used with version 1.6 or later of software.

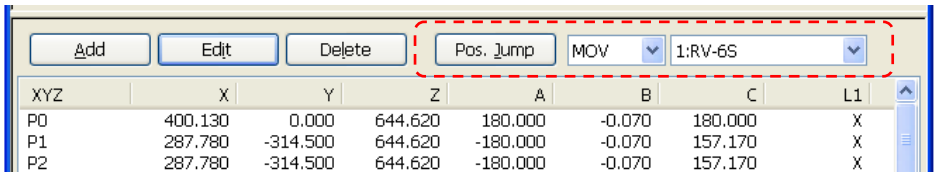


Figure 8-57 Position jump

The operation of "Position jump" function is as follows.

(1) Select the robot.(In case of multiple robots)
(2) Select the interpolation movement.(MOV:Joint interpolation movement, MVS:Linear interpolation movement)
(3) Select the target position.
(4) Click [Pos. jump] button.
(5) In case of moving the actual robot, attention message is displayed.In case of moving the robot in the simulation, it is moved without attention message.

8.9.6. Ending debugging

To end debugging, close the program with the "" button at the upper-right of the edit screen for the program opened in debugging status.

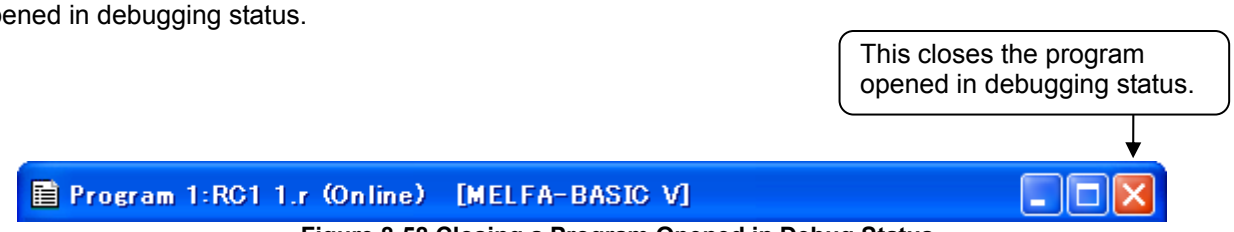


Figure 8-58 Closing a Program Opened in Debug Status

At this time, if the program has been changed, a confirmation message is displayed asking if you want to save the changed contents.

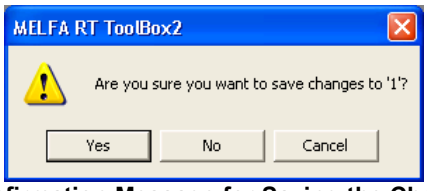


Figure 8-59 Confirmation Message for Saving the Changed Contents

Here, if you select "No", the changed contents are all thrown out. To put the changed contents into effect, always select "Yes".

8.10. Program Management

You can copy, move, delete, compare the contents of, rename, and set protection for robot programs.

From the project tree, select the target project program, then click the right mouse button.
The right button menu is displayed, so select [Manage Programs]. The manage programs screen is displayed.

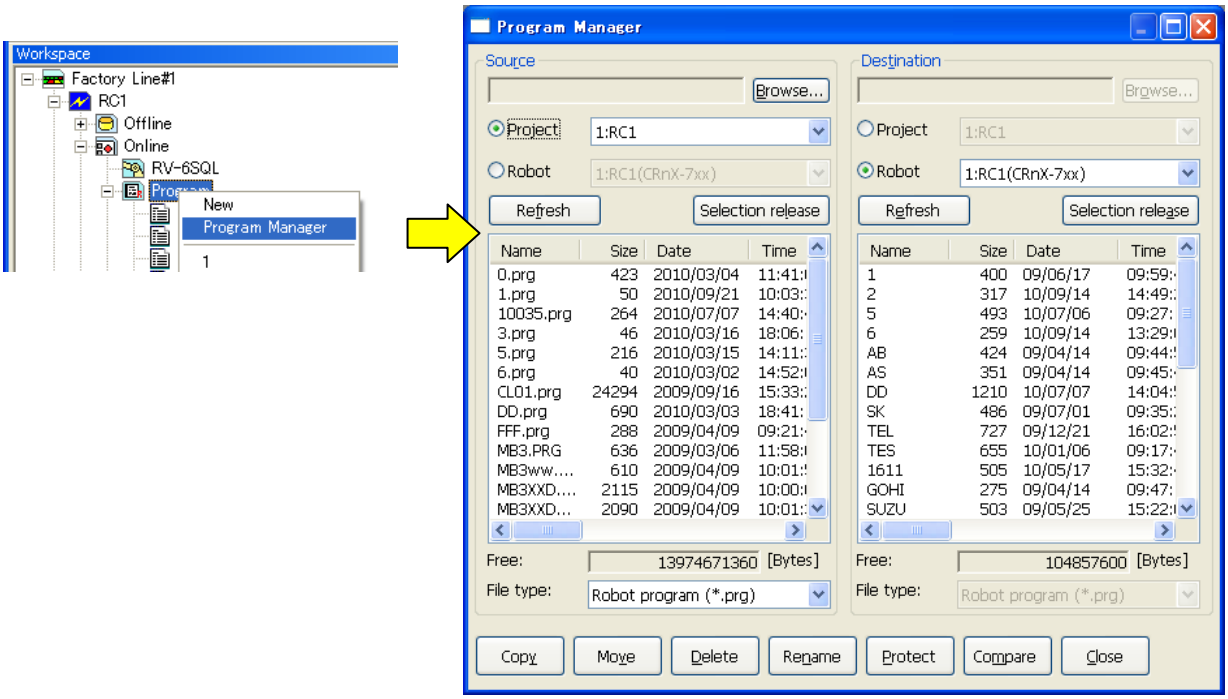


Figure 8-60 Starting Program Management

Caution

All the operations of these functions are for robot programs.

8.10.1. Program list display

On the left and right lists, the lists are programs of the displayed in the robot controller and the specified folder.

(1) Project　　You can specify projects in the workspace.
(2) Robot　　You can specify a robot controller that is currently connected.
(3) […] button　　When you select [Project], you can specify any folder on the computer.

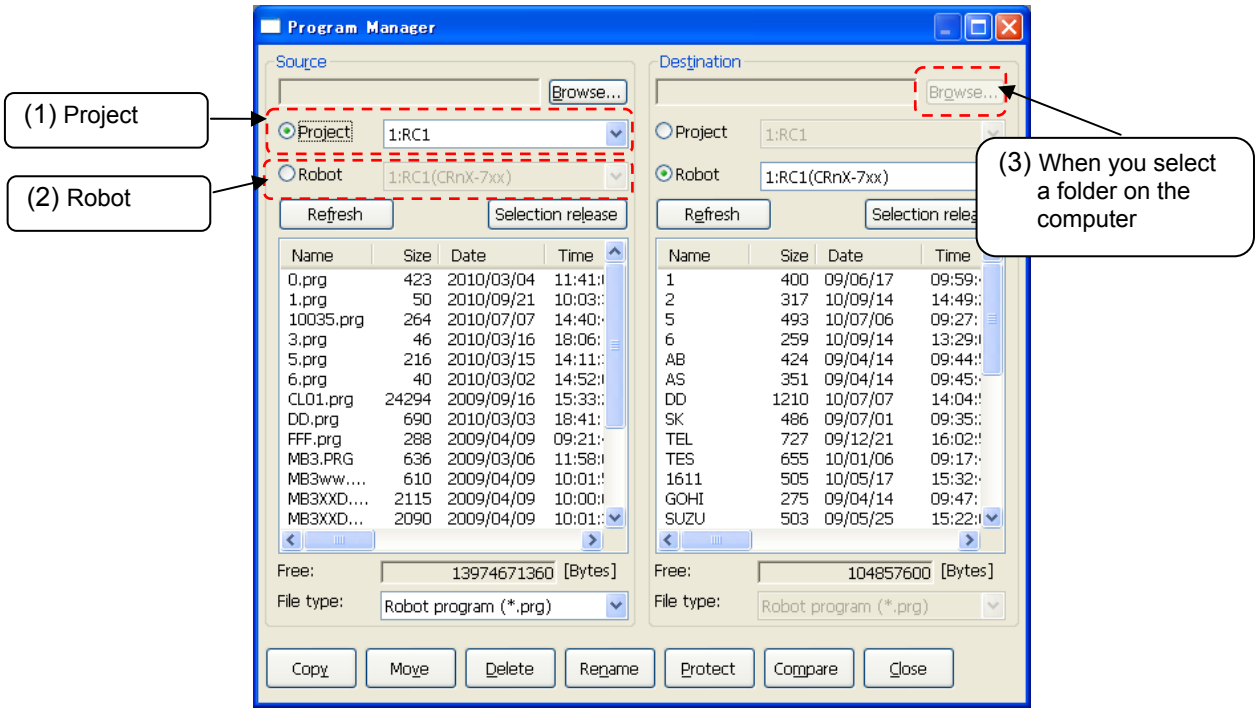


Figure 8-61 Program List Display

8.10.2. 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 [Setting for copy] dialog is set.

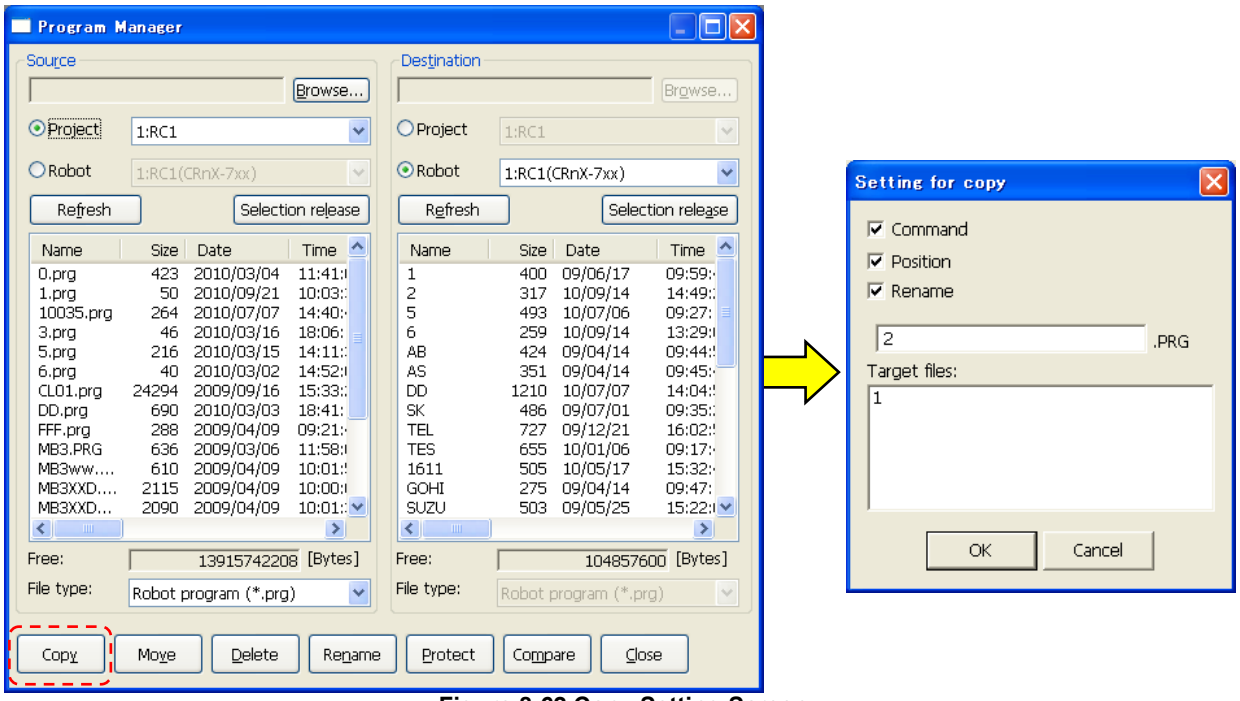


Figure 8-62 Copy Setting Screen

It is possible to copy by using the project tree with this software Version 1.3 or later.

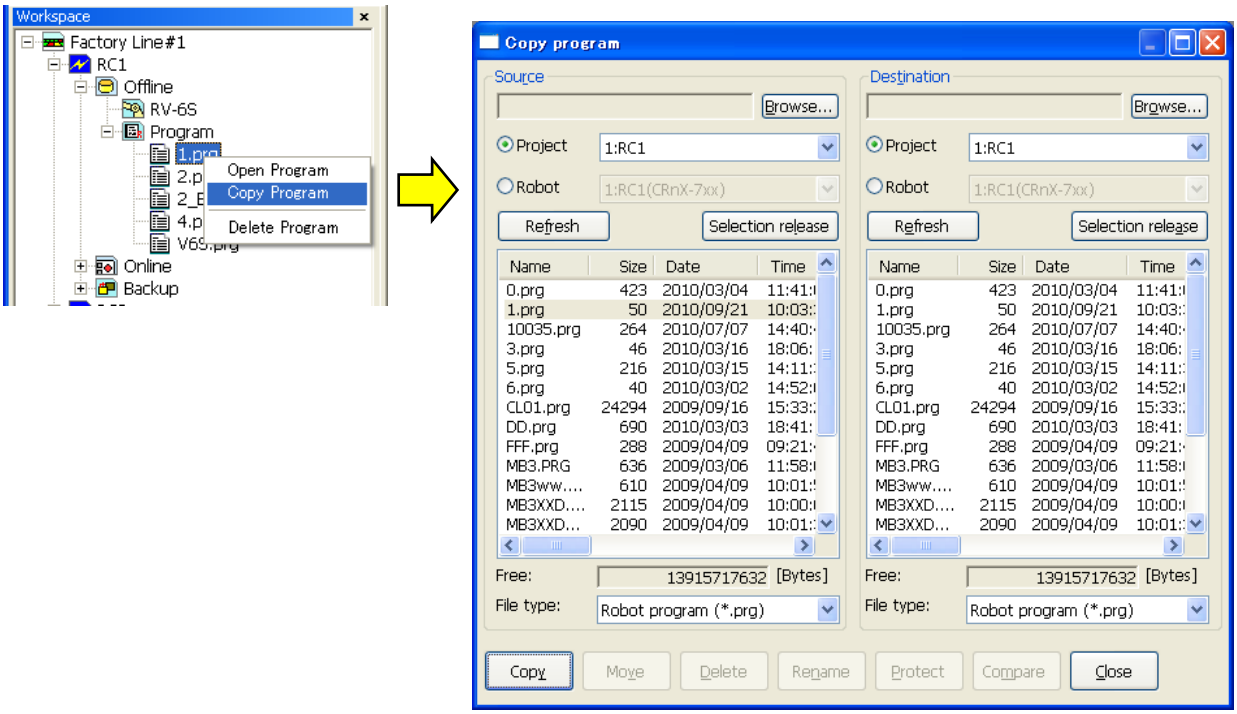


Figure 8-63 Copying the program by using the project tree(Version 1.3 or later).

With this software Version 1.3 or later, it is possible to copy by drag and drop the project name on the project tree.

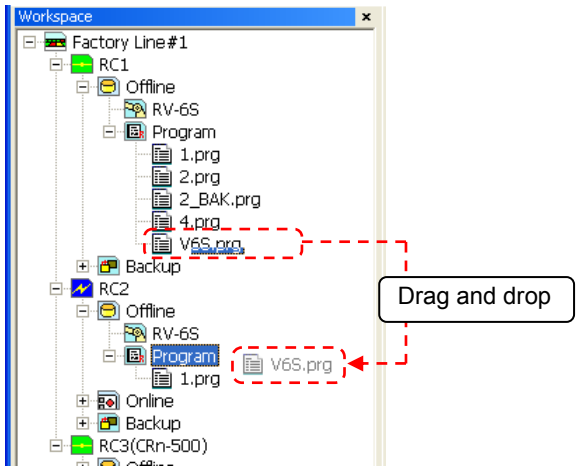


Figure 8-64 Copying the program by drag and drop in the project tree(Version 1.3 or later)

⚠ Caution

An operation possible by drag and drop is only a copy of the program. However, the copy that changes the name cannot be done.

An operation possible by drag and drop is only a copy of the program. However, the copy that changes the name cannot be done.

Please operate it on the program management screen when the name of the program is changed, or the program is moved.

8.10.3. Move

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.

8.10.4. Delete

The program files can be deleted.

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. The deletion confirmation message is displayed.

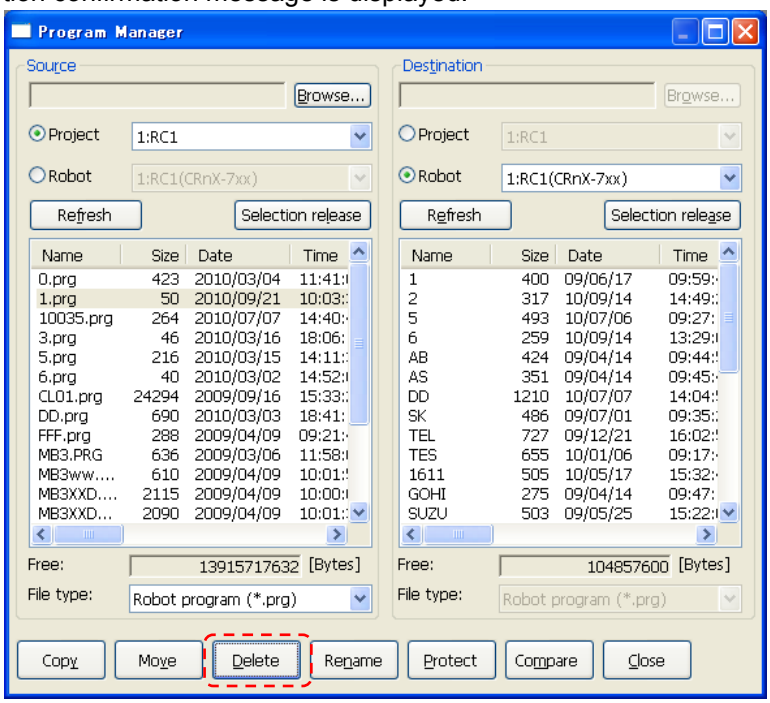


Figure 8-65 Deleting the program

It is possible to delete the program by operating shown blow with RT ToolBox2 version 1.3 or later.
After selecting the program name in the project tree, click the right button of mouse and select the "Delete Program" of right button menu. The deletion confirmation message is displayed.

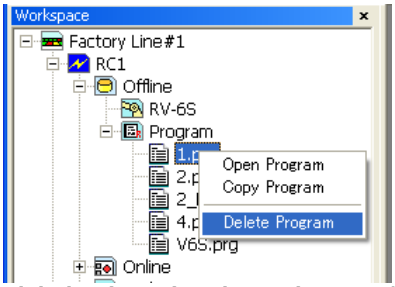


Figure 8-66 Program deletion by using the project tree(Version 1.3 or later).

Caution

It is not possible to delete the program which is editing.

When you delete the program which is editing, the error message is displayed. Please go after completing the edit when you delete the program.

Caution

That once the program files are deleted, they cannot be recovered.

8.10.5. 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.

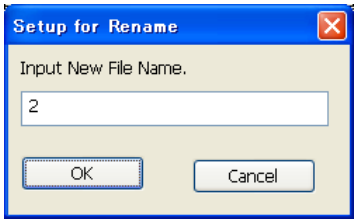


Figure 8-67 Rename Screen

8.10.6. Protect settings

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.

You cannot move, delete, or rename a protected file. Release the protection before any of these operations.

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 [Setting for protect] dialog is set.

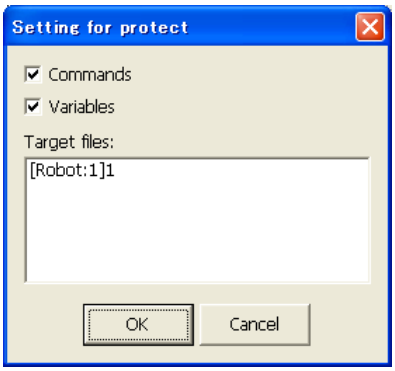


Figure 8-68 Protect Settings Dialog

Caution

The only programs to which protect operations apply are programs in robot controllers.

8.10.7. 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 [Setting for compare] dialog is set.

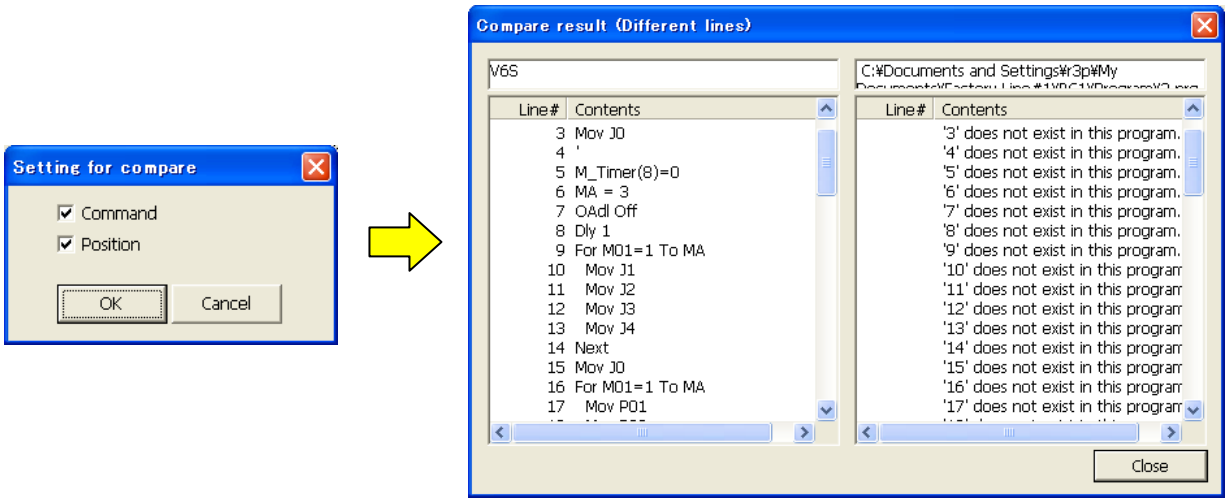


Figure 8-69 Program Comparison Settingsand Comparison Results

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

⚠ Caution

After this software Ver.1.5, the comparison methods of the position variable are changed.

Comparing the program before this software Ver.1.4, It was judged to be different in the notation of the value of each ingredient of the position variable that I showed below with different position variables. After Ver.1.5, the thing that the value of each ingredient of the position variable accords is changed to judge it to be the same position variable.

#	A variable example for the comparison
1	P1=(1.00,2.00,3.00,4.00,5.00,6.00)(7,0) P1=(1.000,2.000,3.000,4.000,5.000,6.000)(7,0)
2	P1=(1.00,2.00,3.00,4.00,5.00,6.00)(7,0) P1=(+1.00,+2.00,+3.00,+4.00,+5.00,+6.00)(7,0)
3	P1=(1.00,2.00,3.00,4.00,5.00,6.00)(7,0) P1=(1.00, 2.00, 3.00, 4.00, 5.00, 6.00)(7, 0)

8.11. Program Conversion

You can convert existing robot programs written in a different program language into the currently set program language.

Table 8-4 Combination list of program conversion

No.	Source	Target	Content
1	MELFA-BASIC III	MELFA-BASIC IV	The position data is converted. If “MELFA-BASIC V” is chosen for the target, the lines No. are also converted in addition to this conversion.
2	MELFA-BASIC III	MELFA-BASIC V	
3	MELFA-BASIC IV	MELFA-BASIC V	The lines No. are converted.
4	MOVEMASTER command (CR-116/356)	MOVEMASTER command	The position data is converted.

There are the following two types of conversion.
For details, see **"8.11.2 Line number conversion (from MELFA-BASIC IV to MELFA-BASIC V", "8.11.3 Position data conversion (from E/EN/M1/M2 series to CR750/700/500 series"**.

(1) Conversion of the lines No.
Convert the line No. and relevant command line, because the deal of line No. in MELFA-BASIC IV is different from MELFA-BASIC V.

(2) Conversion of the position data
Convert the format of position data and relevant command, because the configuration of the E/EN/M1/M2 E/EN/M1/M2 series controller’s position data is different from the CR750/700/500 series controller’s.

Caution

Only programs on the computer can be converted.

Program conversion is only possible for programs on the computer. It is not possible to directly convert a program on a controller or on a virtual controller with a simulation running. To convert a program on a controller or on a virtual controller with a simulation running, first use program management to copy it onto the computer, then convert it there.

8.11.1. Starting program conversion

From the project tree, select the conversion destination project with [Offline] -> [Program], then click the right mouse button. From the right mouse button menu, click [Program Convert].
The destination is in the program language set for this project.

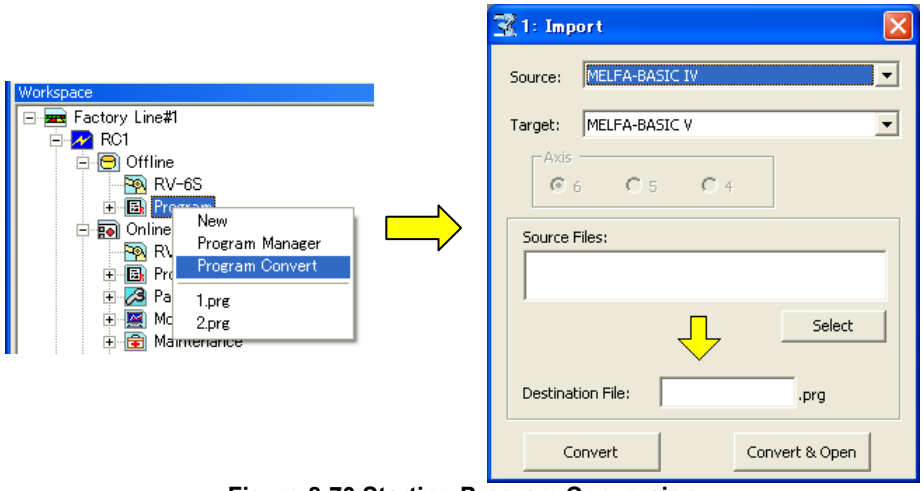
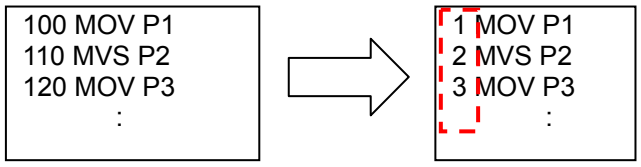


Figure 8-70 Starting Program Conversion

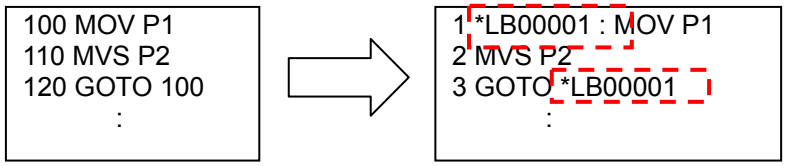
8.11.2. Line number conversion (from MELFA-BASIC IV to MELFA-BASIC V)

Convert the lines No. and relevant command line, because the deal of line No. in MELFA-BASIC IV is different from MELFA-BASIC V.

For the MELFA-BASIC V, convert as follows.
- The line No. is converted to the step No. (sequential No. which starts from 1).



- The command line using line No. jump is converted to the command line using label jump.



*LB00001 is the label name created automatically by this conversion.

Convert the program according to the following procedure.

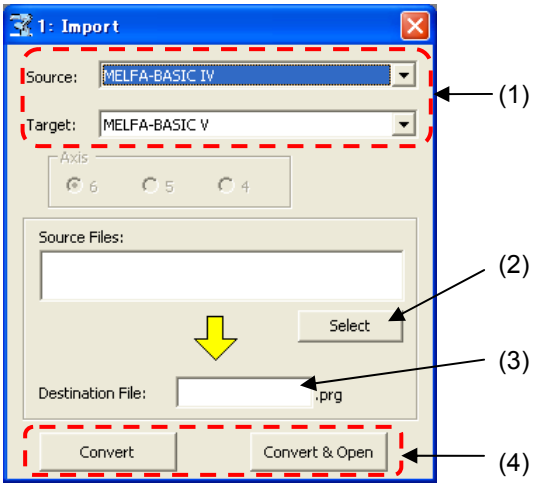
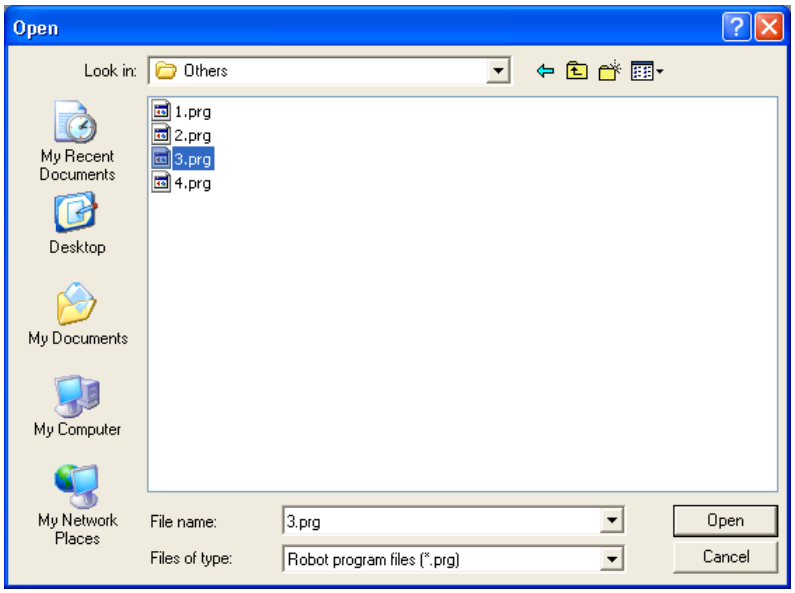


Figure 8-71 Conversion from MELFA-BASIC IV to MELFA-BASIC V

(1) Select the program language of the source and target for conversion.
Start program conversion with the project set with "MELFA-BASIC V"
Choose “MELFA-BASIC IV” for the source and choose “MELFA-BASIC V” for the target.
It is NOT necessary to select the axis of robot.

(2) Select the file as source.
Click the [Select] button of the source, and select the file of MELFA-BASIC IV program.



Input the name of the file to save the converted program into.

(3) After designating the conversion source file and the conversion destination file, click the [Convert] button or the [Convert & Open] button.
When [Convert] button is clicked, the designated selected file is converted and written in the target file.
When [Convert & Open] button is clicked, the file is converted, written in the target file and opened through at Program edit tool.

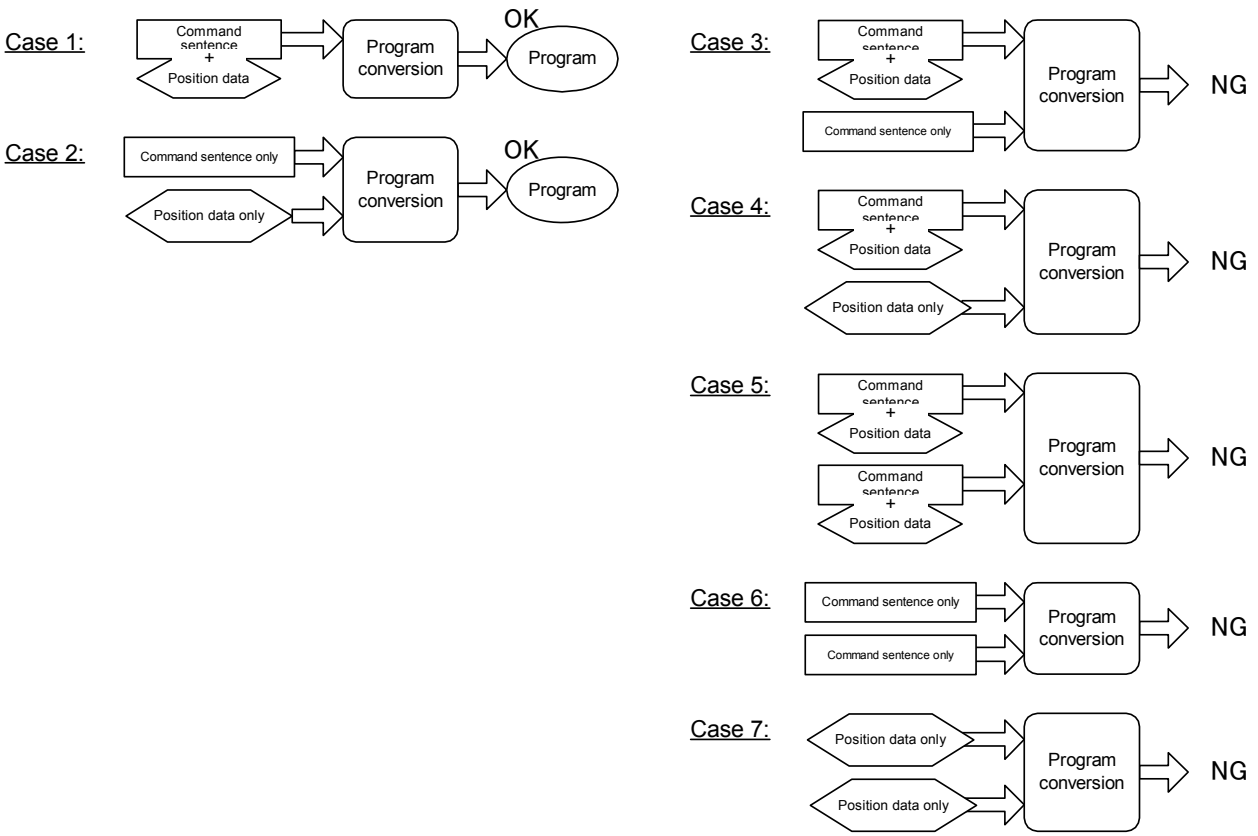
8.11.3. Position data conversion (from E/EN/M1/M2 series to CR750/700/500 series)

This function converts the format of position data and relevant command (DJ, MP and PD command of MOVEMASTER command), because the configuration of the E/EN/M1/M2 series controller's position data is different from the CR750/700/500 series controller's.

Note1: The program conversion converts the position data as well as the commands related to the position data.
It is not possible to convert commands automatically. Be sure to make grammatical check using this software before using the program of E/EN/M1/M2 series by the CR750/700/500 series, and change the commands if necessary.

Note2: The position data of the MOVEMASTER command program for M1/M2 series has the base-coordinate rotated 90º. When using the program for M1/M2 by the CR750/700/500 series, convert M1/M2 program into EN program with the E/EN/M1/M2 series support software DOS version, before carrying out the program conversion.

Note3: In the case of the E/EN/M1/M2 series support software DOS version and E/EN series Robot programming supporter for Windows, 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 occurs error. (As following case 3 to 7.)



Convert the program according to the following procedure.

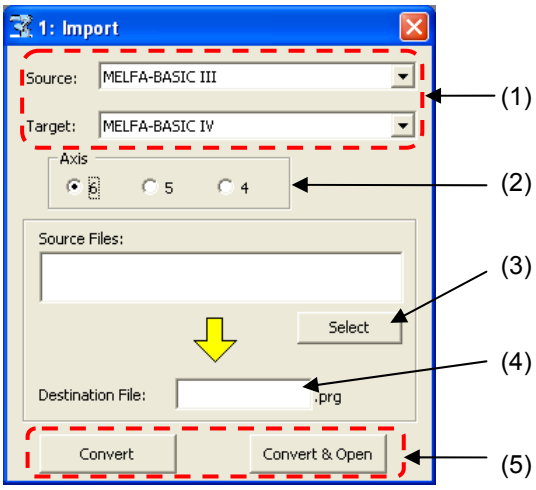
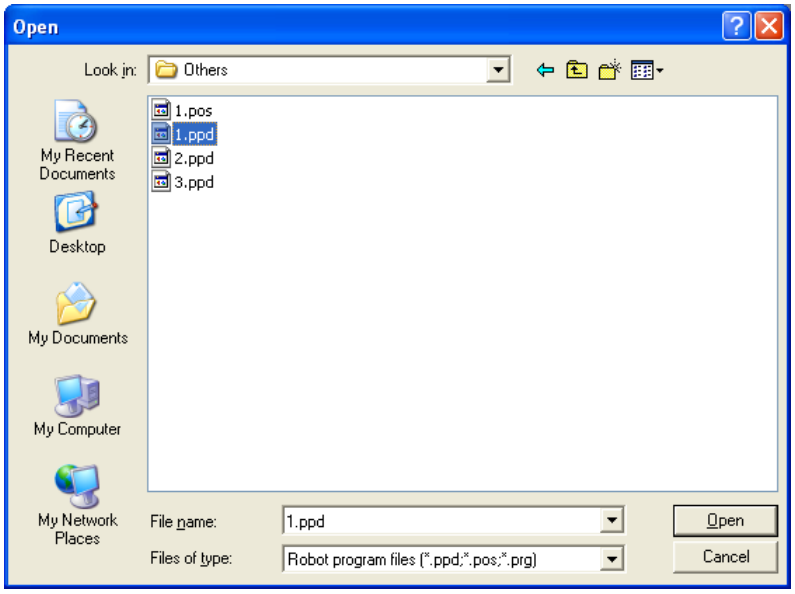


Figure 8-72 Conversion from MELFA-BASIC III to MELFA-BASIC IV

(1) Select the program language of the source and target for conversion.
Start program conversion with a project set for "MELFA-BASIC V" or "MELFA-BASIC IV".
For the source, choose “MELFA-BASIC III” or “MOVEMASTER (CR-116/356)” which is the program language of the E/EN/M1/M2 series.
If “MELFA-BASIC V” is chosen for the target, the lines No. are also converted in addition to this conversion.

(2) Select the axis of robot.
Select the correct number of axes, so that the configuration of the E/EN/M1/M2 series controller’s position data is different depending on the number of axes.

(3) Select the file(s) as source.
Click the [Select] button of the source, and select the file(s) of E/EN/M1/M2 series program.
When selecting the multiple files, click the file while pushing the [Ctrl] key.



(4) This specifies the file to write the converted program into.
Input the name of the file to save the converted program into.

(5) After designating the conversion source file and the conversion destination file, click the [Convert] button or the [Convert & Open] button.
When [Convert] button is clicked, the designated selected file is converted and written in the target file.
When [Convert & Open] button is clicked, the file is converted, written in the target file and opened through at Program edit tool.

9. Position data editing for SQ Direct

SQ Direct(PLC Direct Function) can be used with Version 1.5 or later of this software.
This function can be used with software version P8 or later of CR750-Q/CRnQ-700 series controller.
To use this function, you must set the parameter of controller.
Available position data for SQ Direct is only 999 points of XYZ-origin whose position number is 1 to 999.
These numbers are used as external position number P_DM(1) to P_DM(999) in controller.

SQ Direct position data can edit online and offline.
Edit screen of SQ Direct position data is different from edit screen of program in command line and orthogonal(J) number being omitted.

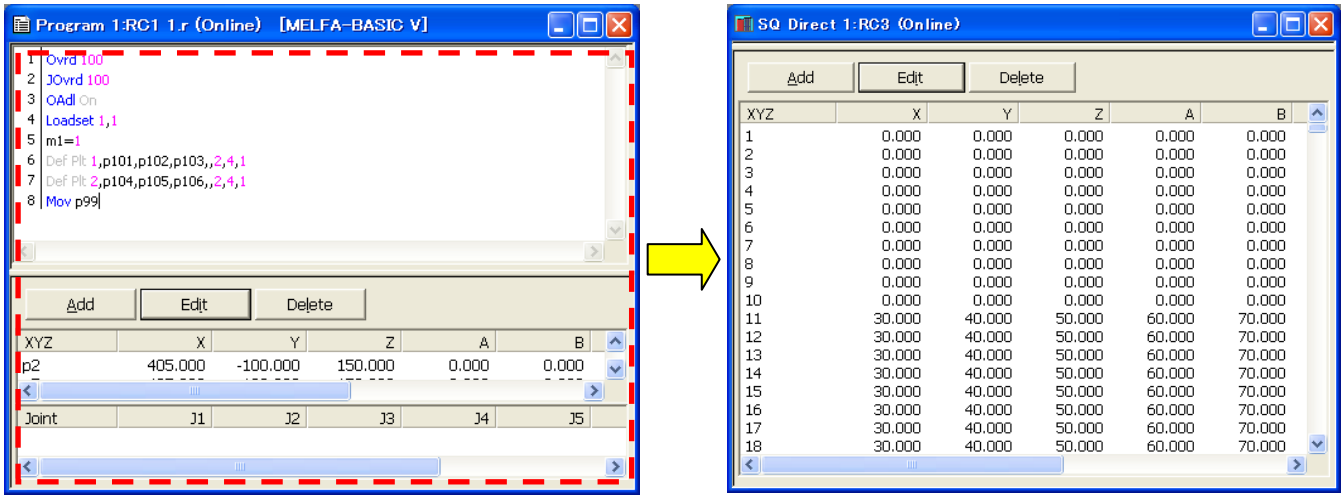


Figure 9-1 Program editing and position data editing screen for SQ Direct

Caution

As edit operation of SQ Direct is similar to XYZ coordinate edit of program editing, the following page explains only different function. For details on the operations for opening a program, see 8.6 Program Editing.

Caution

When the password is registered in "program" by robot controller's security function, the position data for SQ Direct cannot be read, or cannot be write.

When the password is registered in "program" by robot controller's security function, the position data for SQ Direct cannot be read from the robot controller, or cannot be write to the robot controller.

○ : Enable、 × : Disable

	Item to which password of security function is registered.		
	Program	Parameter	File
Writing the position data. Reading the position data.	×	○	○

Please delete the password of robot controller's security function when you operate these. Please refer to **"12.7.3 Delete the Password"** for the method of deleting the password.
The setting(register the password) and the release(delete the password) of robot controller's security function can be used with this software version 2.0 or later. Please refer to **"Table 12-15 Compliant version of this function and controller"** for robot controller's compliant version.

9.1. Diffence from program editting

9.1.1. Add/Edit position data

When you want to add positiondata, please click [Add] button.
Position data editing screen is displayed.
When position number is selected, those data are displayed.
When "Get current position automatically" of the option screen is checked and connected to the robot, the current position of the robot is displayed with version 1.6 or later of software. However, the variable name remains blank. The current position is not displayed when not connected to the robot.

When you want to revise position data, and select the position data and click [Edit] button.
Selected position data is displayed.
You cannot change the position number.

Please input each element of position data and the number name (1 to 999).
And click [OK] button.
When you connect to controler as online mode or simuration mode, you can load current robot position by clicking [Get current position] button.

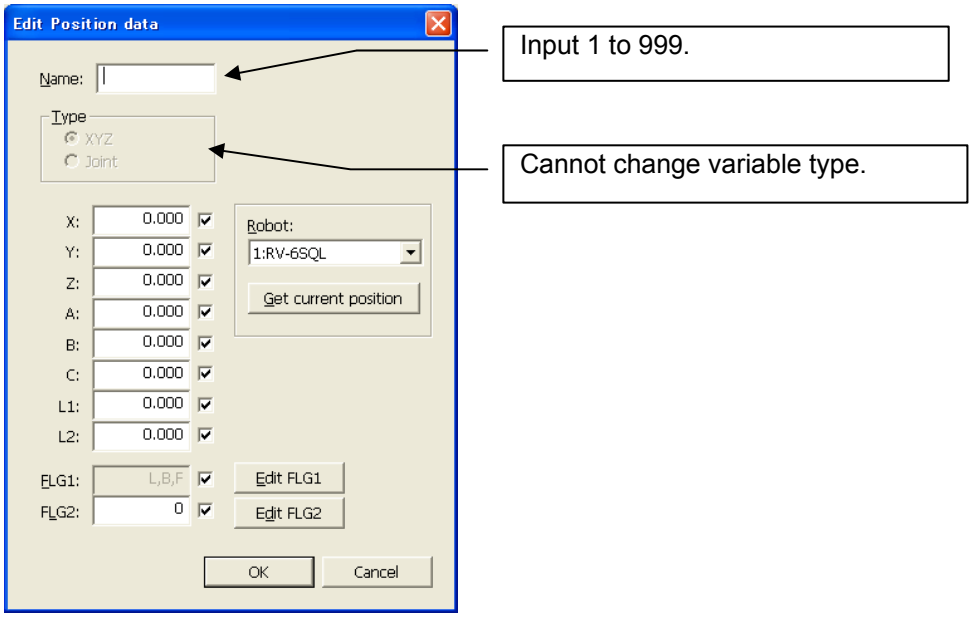


Figure 9-2 position number data

9.1.2. Delete position data

After you selected position data which you want to delete, please click [Delete] button.
Selected position data is deleted.
You can delete plural position data.
When you click position number with [Ctrl] or [Shift] key pushing, you can select plural position data.

⚠ Caution

After you delete position data, position numbers are not disappear.

Element of variables are cleared.

9.1.3. Editing supporting function

Editing supporting function supports only copy of position data and paste of position data.

9.2. Online editing

When you connect to controller suppoeted SQ Direct, [SQ Direct] menu is added to [Online] menu in project-tree.
When you doubleclick [Online] - [SQ Direct] in the target project,
SQ Direct screen is displayed with position data 1 to 999 loaded.

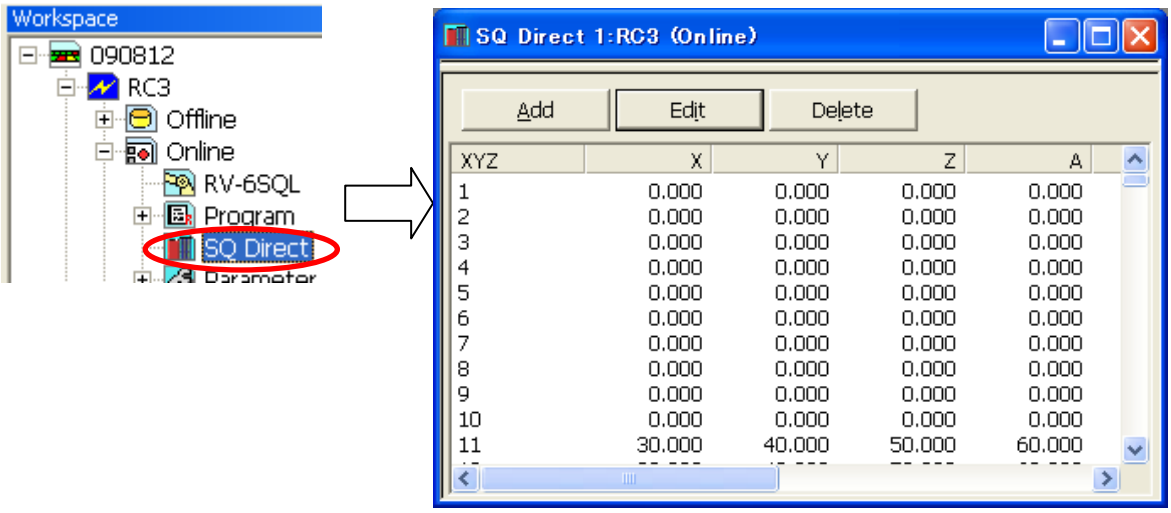


Figure 9-3 position edit screen for SQ Direct (Online)

⚠ Caution

Timing from which position data is written.

Timing from which position data is written by the controller comes to be going to turn on the power supply next time.

Please turn on controller's power supply again when you use controller's position data after online edit.

9.3. Offline editing

You can edit SQ Direct position data in offline.

Set [R/C-Type] to [CRnQ-7xx/CR75x-Q] and set [Language] to [MELFA-BASIC V] in [Edit Project], then [SQ Direct] menu is added to [Offline] menu in project-tree.
You can manage plural SQ Direct files in offline editing.

9.3.1. Creating the new SQ Direct file

Select [Offline] – [SQ Direct] menu in the project you want to create the new SQ Direct File.
And click a right button with the mouse.
Then right button menu is displayed, and click [New].

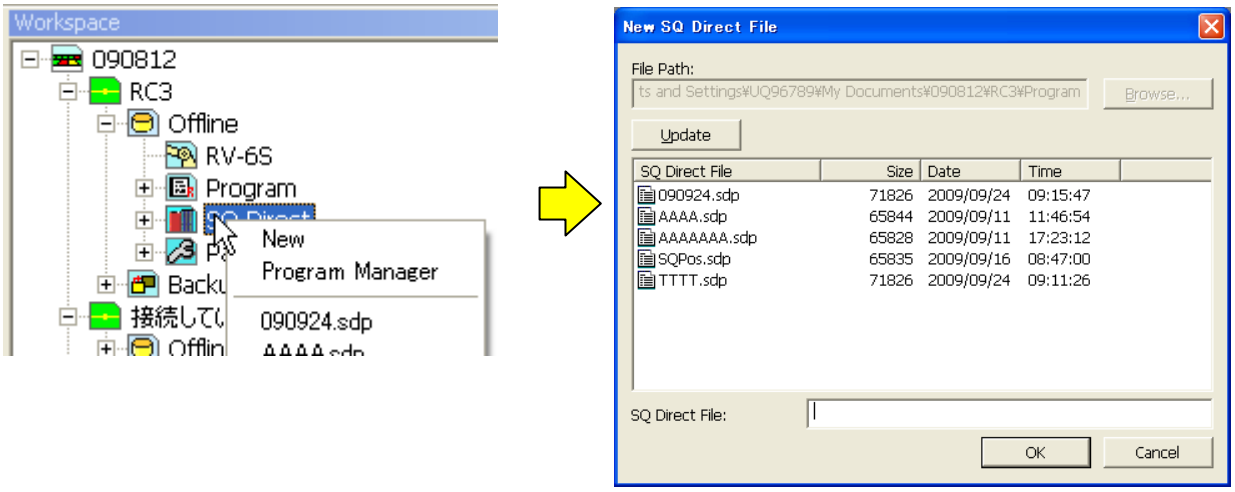


Figure 9-4 position edit screen for SQ Direct (Online)

After you input SQ Direct file name, and click [OK] button.

Caution

About SQ Direct restoration folder.

SQ Direct Files are managed by each project in the personal computer. The folder named automatically as follows.

Workspace folder/project name/Program

If you want another folder, please use copy function in program management.

9.4. Program management

You can copy, delete, compare and rename SQ Direct file.

After selecting target program in project-tree, and click right button with the mouse.
Then right button menu is displayed, and click [Program Manager].
Then the program manager screen is displayed.

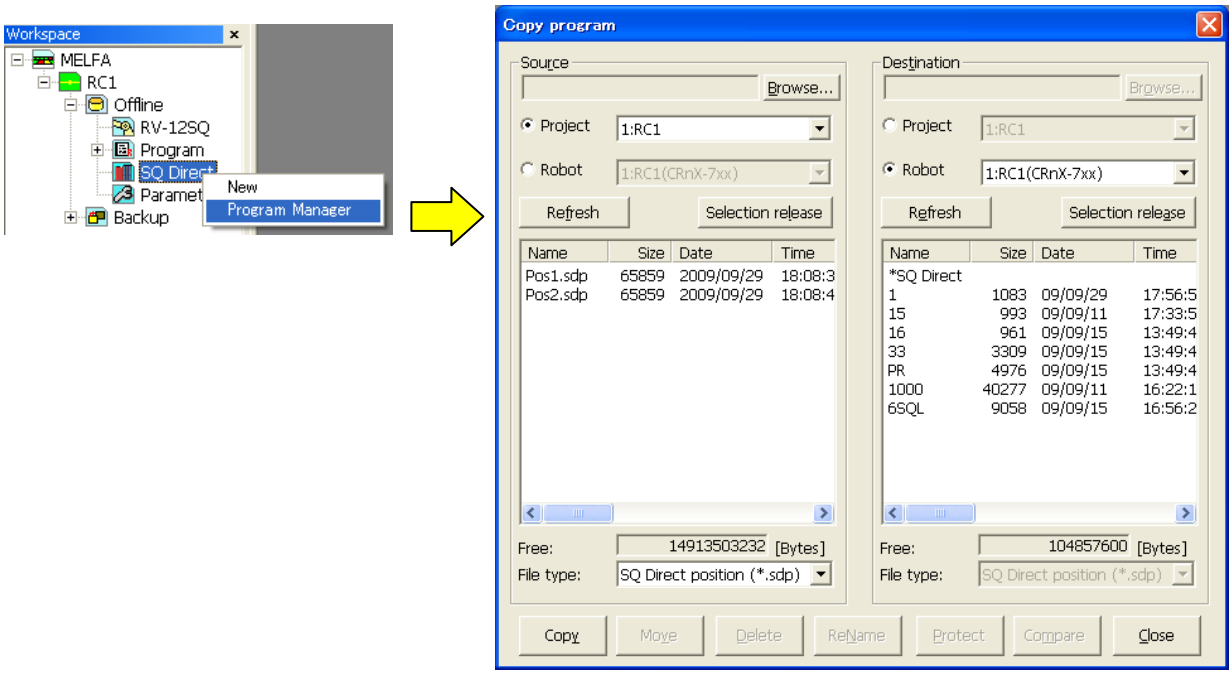


Figure 9-5 Launch program manager

Caution

As the edit operation is similar to the program management, the following page explains only different part.

Caution

1 to 999 Position data in the robot files for SQ Direct is shown as [*SQ Direct] in program manager.
“ * ” means that it prevent costomer to use as a file name by mistake.
“ * ” NOT means almighty.

9.4.1. List of SQ Direct files indication

When you can use SQ Direct, there are some differents in program management screen.

1. SQ Direct files in the project are displayed with [sdp] extention.
2. SQ Direct file in the robot file is displayed as [*SQ Direct].
3. [SQ Direct position(*.sdp)] is added in file type.

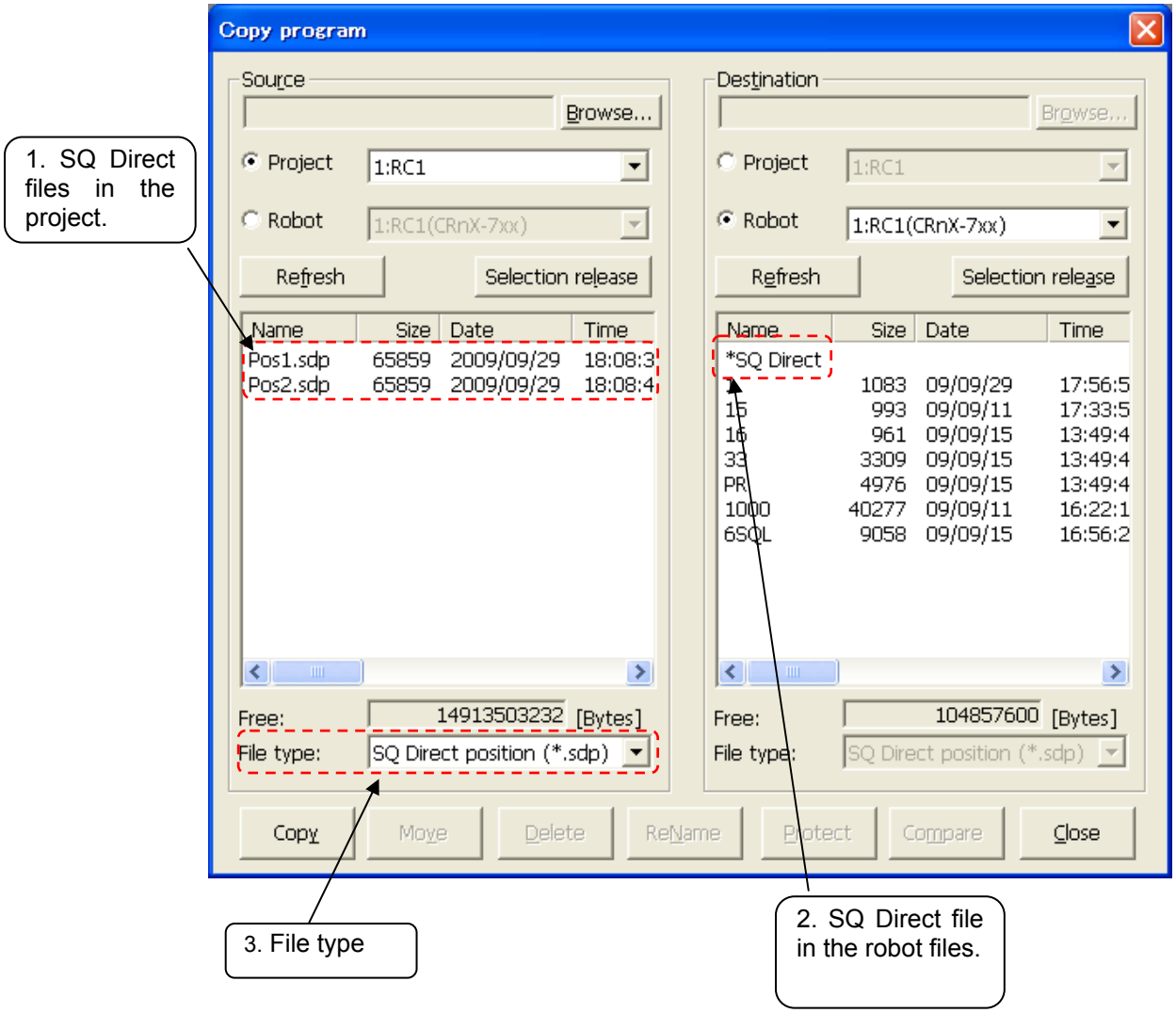


Figure 9-6 List of SQ Direct files indication

Restrictions

SQ Direct files in the personal computer can treat as robot program files similarly,
But there are some restrictions.

10.Setting Parameters

You can reference and rewrite parameter information set in a robot controller.
You can set parameters with the method of specifying parameter names and setting them or with the method of making the settings arranged by function.

⚠ Caution

When the password is registered in "parameter" by robot controller's security function, it is not possible to write the parameters to the robot controller.

When the password is registered in "parameter" by robot controller's security function, it is not possible to write the parameters to the robot controller.

○ : Enable、 × : Disable

	Item to which password of security function is registered.		
	Program	Parameter	File
Writing paraemters	○	×	○

Please delete the password of robot controller's security function when you operate these. Please refer to **"12.7.3 Delete the Password"** for the method of deleting the password.

Even if the security function has been turned on, it is possible to read the parameters.

The setting (register the password) and the release (delete the password) of robot controller's security function can be used with this software version 2.0 or later. Please refer to **"Table 12-15 Compliant version of this function and controller"** for robot controller's compliant version.

10.1. Editing from parameter list

You can reference and rewrite individual items of parameter information set in a robot controller by specifying the name of the parameter.

10.1.1. Starting

This is used in the state with the robot controller connected.
From the project tree, double-click [Online] -> [Parameter] -> [Parameter List].

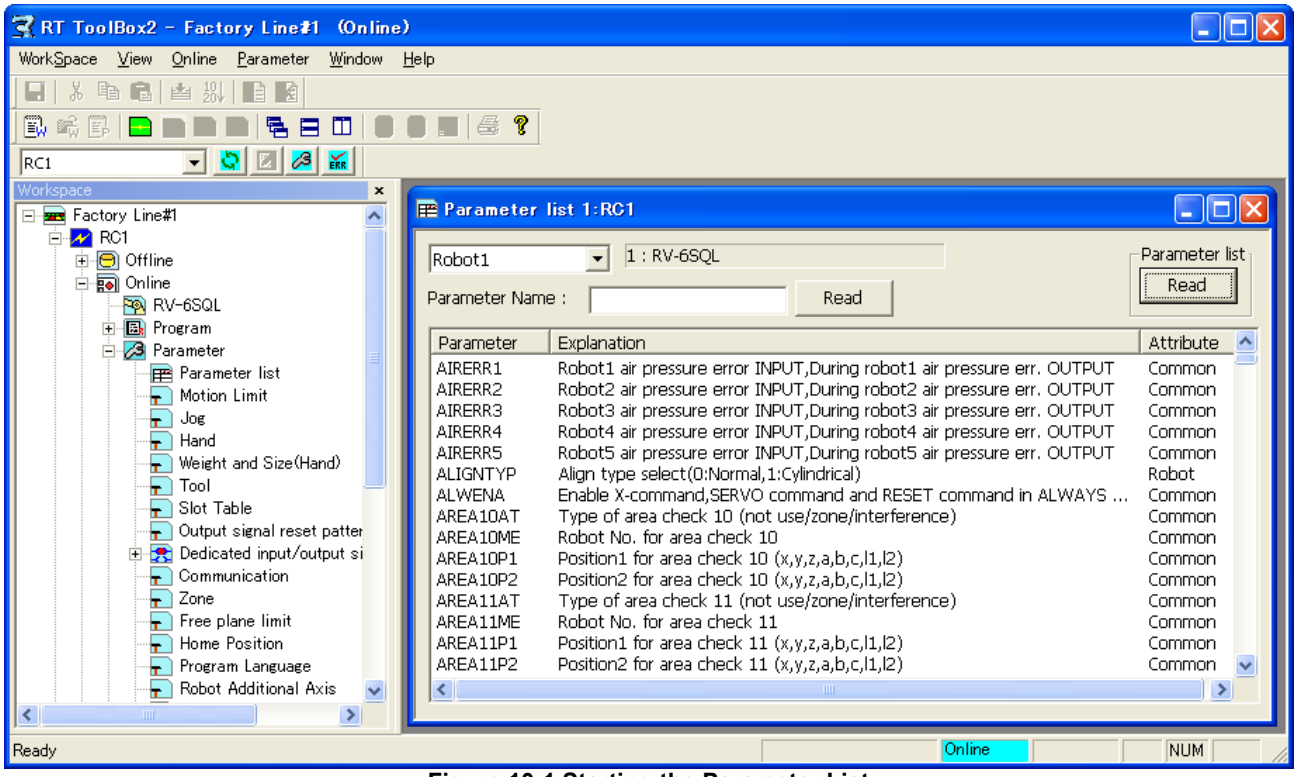


Figure 10-1 Starting the Parameter List

At this time, a confirmation message like the following concerning the parameter list is displayed.

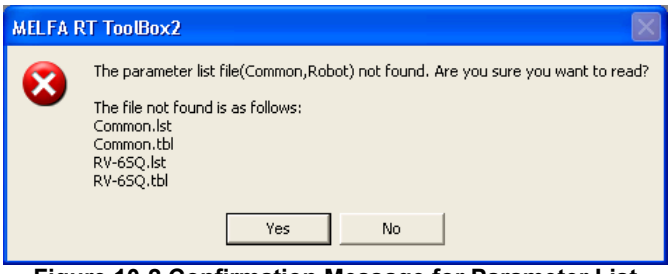


Figure 10-2 Confirmation Message for Parameter List

This window will appear in the following cases.

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

Memo

What is the parameter list?

The parameter list is a list of parameter information comprised of parameter names, explanatory text, etc. displayed on the parameter list screen. This parameter list can be downloaded from the controller. The version of the parameter list may vary with the version of the software on the controller. We recommend that you download the latest parameter list from the controller.

When parameter list reading is specified, the screen for selecting where to read it from is displayed.

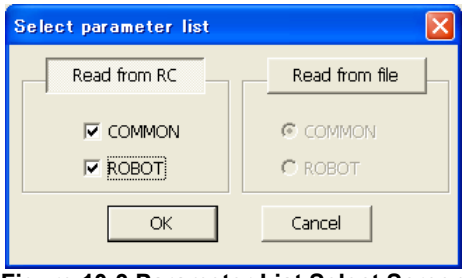


Figure 10-3 Parameter List Select Screen

Select either "Read from RC" or "Read from file", set the parameter list to be read, then click the [OK] button.

10.1.2. Parameter editing

Double-click a parameter displayed in the list or input its name, then click the [Read] button. The specified parameter information in the robot controller is displayed.

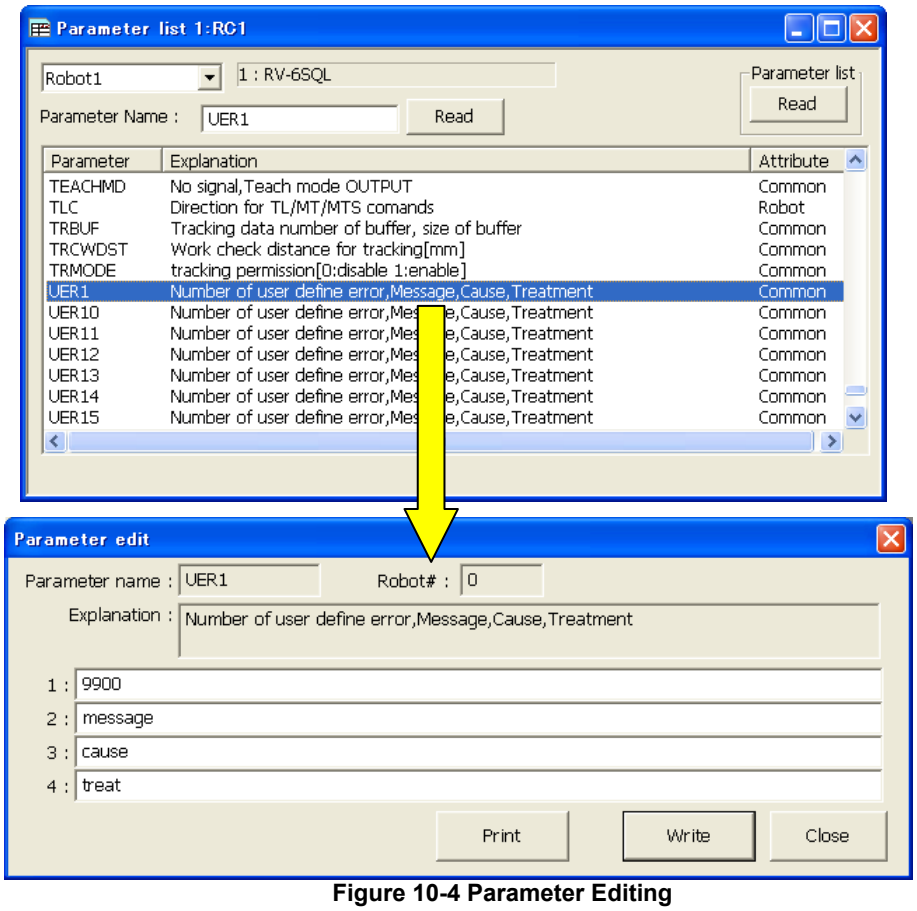


Figure 10-4 Parameter Editing

After you change a parameter, you can rewrite the specified parameter information in the robot controller by clicking the "Write" button.

You can print the displayed parameter information by clicking the [Print] button.

⚠ 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.

To put a changed parameter value into effect, switch the robot controller power Off, then On again.

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

10.1.3. Edit of parameter changed from initial value

It is possible to confirm the changed parameter by displaying the list of parameter changed from an initial value. This function has the limitation in this software version and the software version of the connected controller. Please refer to the table as follows.

Table 10-1 Compliant version of this function and controller

		Software version of robot controller		
		CR750-D/CRnD-700	CR750-Q/CRnQ-700	CRn-500
Version of this software	Ver.1.1 or earlier	not use	not use	not use
	Ver.1.2 or later	Ver.P6 or later	Ver.N6 or later	not use

When combination of “not use”, the button for the display switch is not displayed in the upper part of the screen

When the parameter list is displayed after connecting with the controller of corresponding version, the button for the display switch is displayed in the upper part of the screen.
When the parameter list screen is started, "All" has been selected. When "Changed" is selected, the list of the parameters that have been changed from initial value is displayed.
(However, according to the specification of the robot type, some parameters might be changed before shipment.)

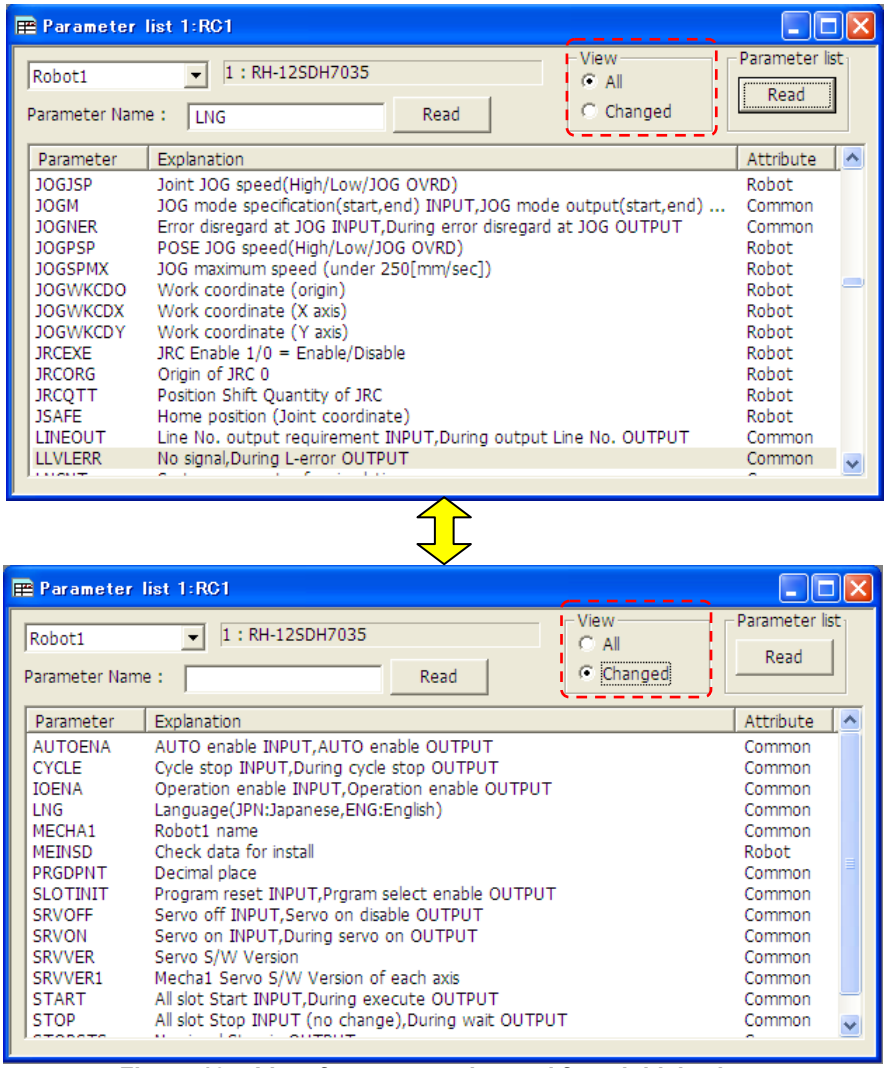


Figure 10-5 List of parameter changed from initial value

It is possible to print only the parameters changed from initial value with RT ToolBox2 version 1.3 or later. Please refer to **"10.9. Parameter printing”** in this manual for details.

10.1.4. Parameter list reading

If no parameter name is displayed on the parameter list screen, you can read the parameter list.
Click the parameter list [Read] button in the upper-right of the parameter list screen. The parameter list select screen is displayed.

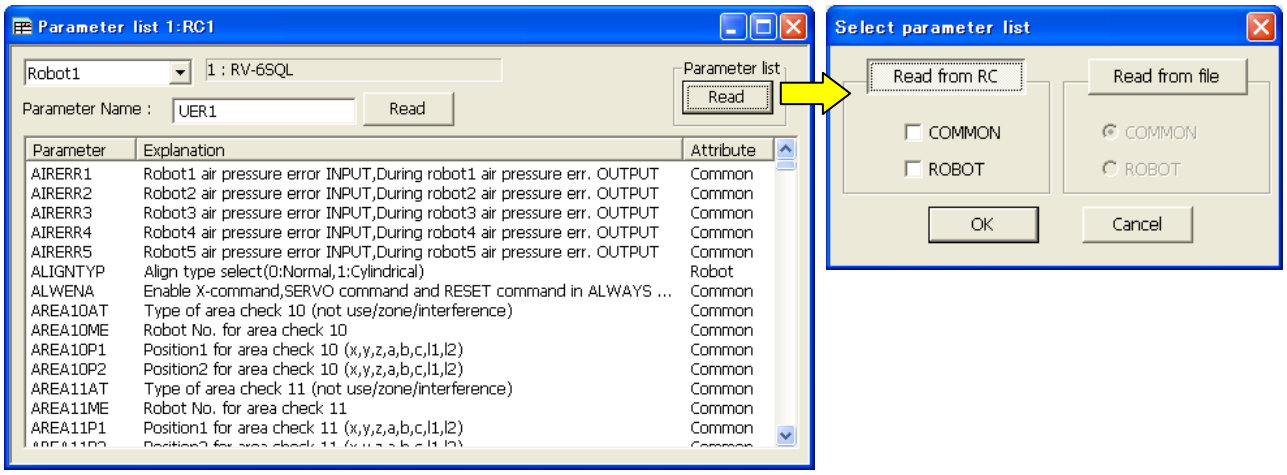


Figure 10-6 Parameter List Reading

Select the source to read from ("Read from RC" or "Read from file"), then set the parameter list to read and click the [OK] button.

10.1.5. Finding parameters

You can find a character string in the displayed parameter list. With the "Parameter List" screen active, click on the menu bar [Parameter] -> [Find]. The character string find screen is displayed.

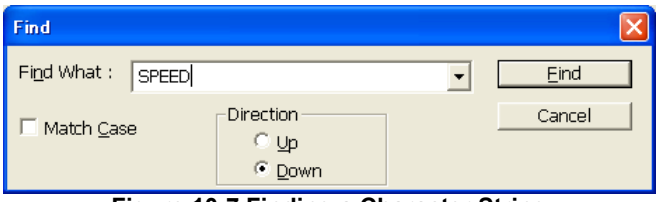


Figure 10-7 Finding a Character String

Input the character string to search for, and then click the [Find] button. Parameters that include the input character string are displayed.

10.2. Robot Controller Operation Modes for Parameter Writing

With CRn-500 series robot controllers, when you write parameters to the robot controller, controller software version may place restrictions on the operating mode in which you can write. For details, see below.

However, parameters cannot be written while any program with any startup condition other than Always has been started. In such a case, stop the program, then write the parameters.

Table 10-2 Download Operating Modes for Writing (for CRn-500 series only)

CRn-500 series robot controller	Operating mode		
	TEACH	Auto (OP)	Auto (Ext)
J1 edition or later	○	○	○
H7 edition or earlier	○	×	×

○: Writing possible ×: Writing impossible

10.3. Movement Parameters

10.3.1. Motion limit parameter

Set the operating range of the robot
Set parameters while connected to the robot controller.
From the project tree, double click the target project [Online] -> [Parameter] -> [Movement parameter] -> [Motion limit].
After you change the parameter value, you can rewrite the operating range parameter in the robot controller by clicking the [Write] button.

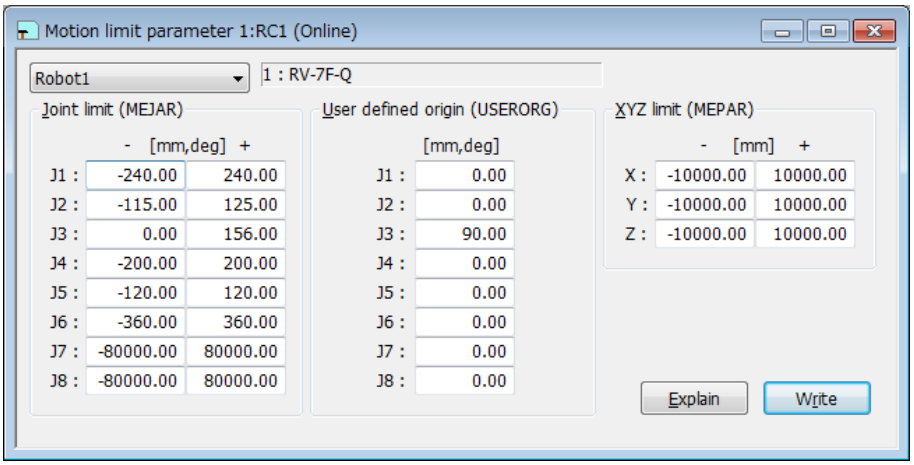


Figure 10-8 Motion limit parameter (Ver.1.2 or later)

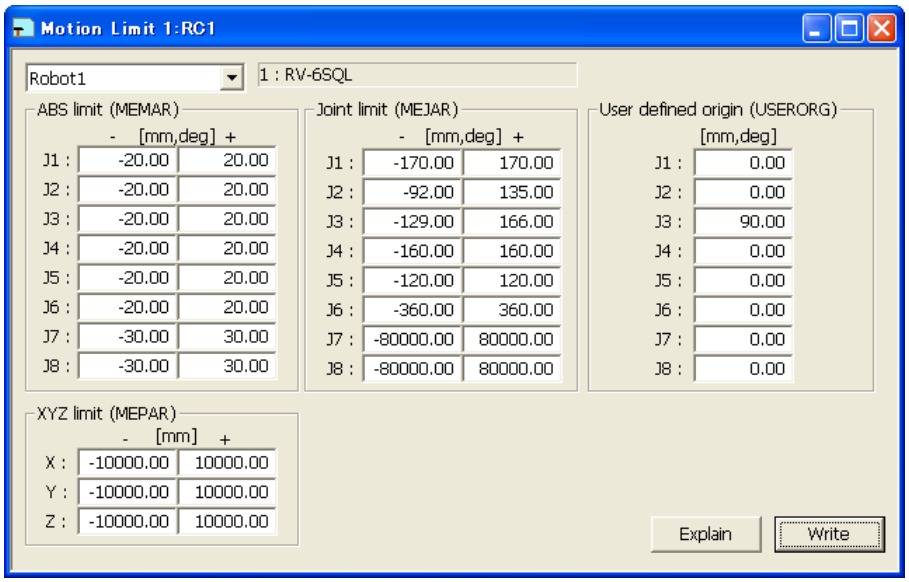


Figure 10-9 Motion limit parameter (Ver.1.1 or earlier)

You can reference explanations of displayed parameters by pressing the [Explain] button.

10.3.2. Jog parameter

Set the speeds for joint jogging and orthogonal jogging.
Set parameters while connected to the robot controller. From the project tree, double click the target project [Online] -> [Parameter] -> [Movement parameter] -> [Jog].
After you change the parameter value, you can rewrite the jog parameter in the robot controller by clicking the [Write] button.

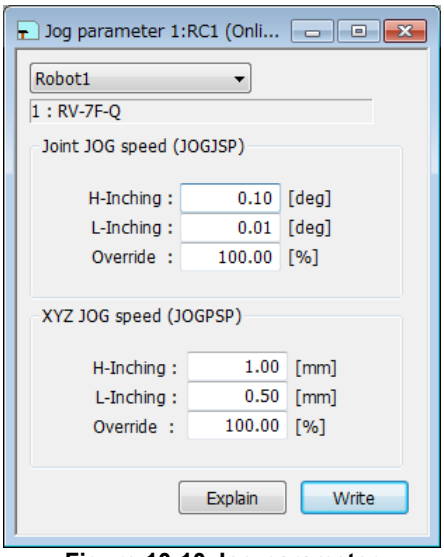


Figure 10-10 Jog parameter

You can reference explanations of displayed parameters by pressing the [Explain] button.

10.3.3. Parameters of the Hand

Set the parameters about the Hand of the robot.

10.3.3.1. 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.

Set parameters while connected to the robot controller.

From the project tree, double click the target project [Online] -> [Parameter] -> [Movement parameter] -> [Hand] -> [Hand parameter].

After you change the parameter value, you can rewrite the parameters concerning the hand in the robot controller by clicking the [Write] button.

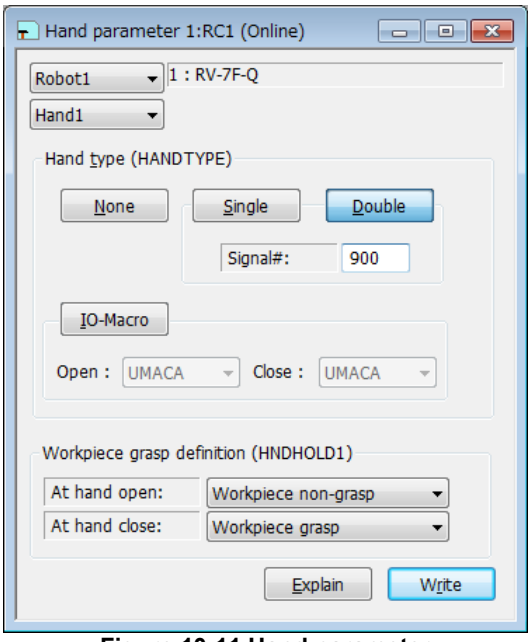


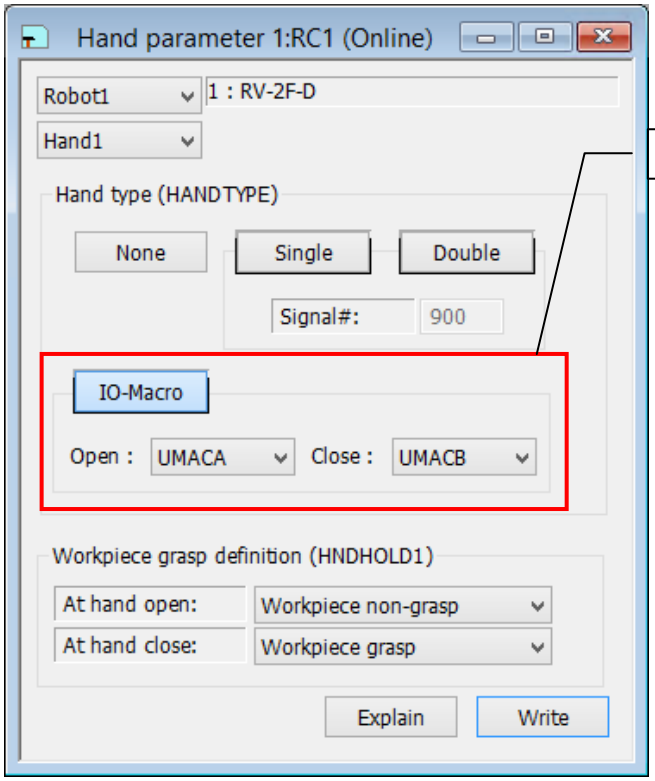
Figure 10-11 Hand parameter

You can reference explanations of displayed parameters by pressing the [Explain] button.

Hand macro function

You can specify the macro name of UMACA – UMACZ to HANDTYPE parameters, by providing a subroutine L_UMACA – L_UMACZ the appropriate user base program (PRGUSR parameter), you run the hand macro open and close operation from TB.

1. Parameter setting



HANDTYPE = UMACA/UMACB, , , , , , ,

2. Macro programing (User base program)

```
1 *L_UMACA    ' Open Hand 1
2 M_Out(900)=1
3 M_Out(901)=0
4 Return
5 *L_UMACB    ' Close Hand 1
6 M_Out(900)=0
7 M_Out(901)=1
8 Return
```

L_MACA subroutine is executed on the open operation of the hand 1

L_MACB subroutine is executed on the close operation of the hand 1

It is possible to subroutine, to describe signal output (e.g. M_Out(900)=1), variable assignment (e.g. M_Data=1) and the timer (Dly 0.5).

Figure 10-12 Hand macro settings

10.3.4. Weight and size parameter

You can set the conditions for the hand mounted on the robot and the conditions for the work the robot grasps. Set parameters while connected to the robot controller.
From the project tree, double click the target project [Online] -> [Parameter] -> [Movement parameter] -> [Weight and size].
After you change the parameter value, you can rewrite the weight and size parameters in the robot controller by clicking the [Write] button.

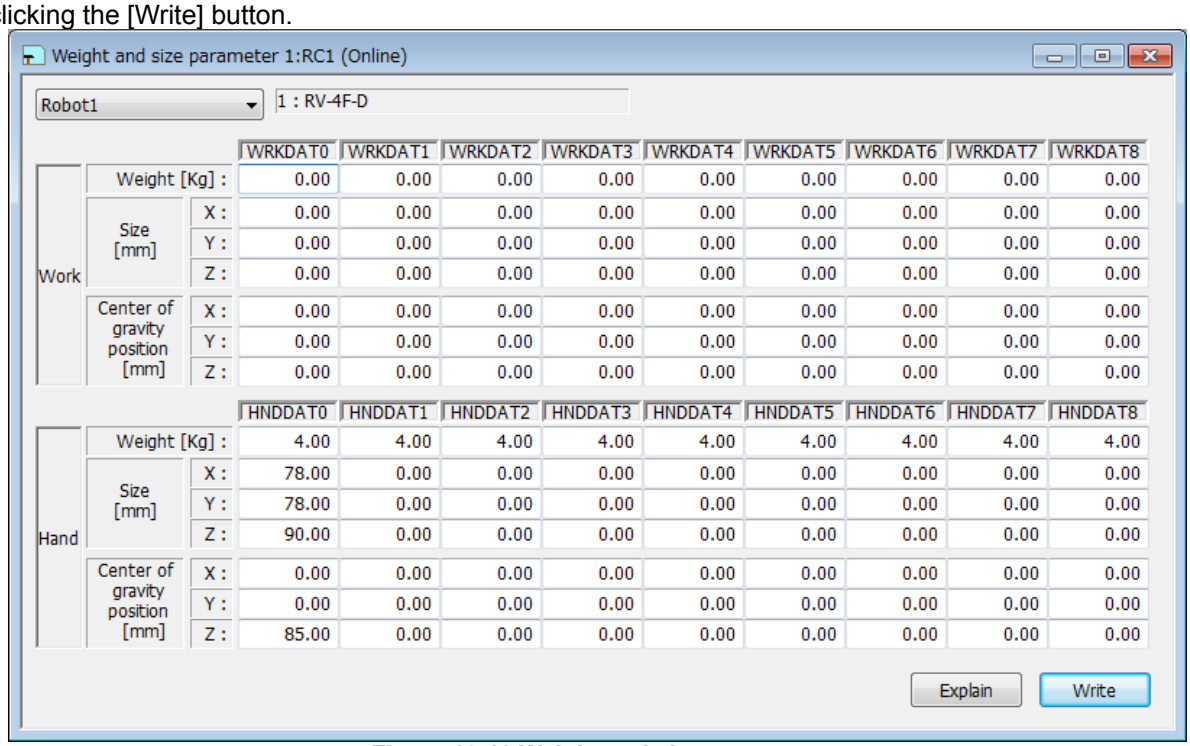


Figure 10-13 Weight and size parameter

You can reference explanations of displayed parameters by pressing the [Explain] button.

10.3.5. Tool parameter

Set the standard tool coordinates and standard base coordinates. Set parameters while connected to the robot controller.

From the project tree, double click the target project [Online] -> [Parameter] -> [Movement parameter] -> [Tool].

After you change the parameter value, you can rewrite the tool parameters in the robot controller by clicking the [Write] button.

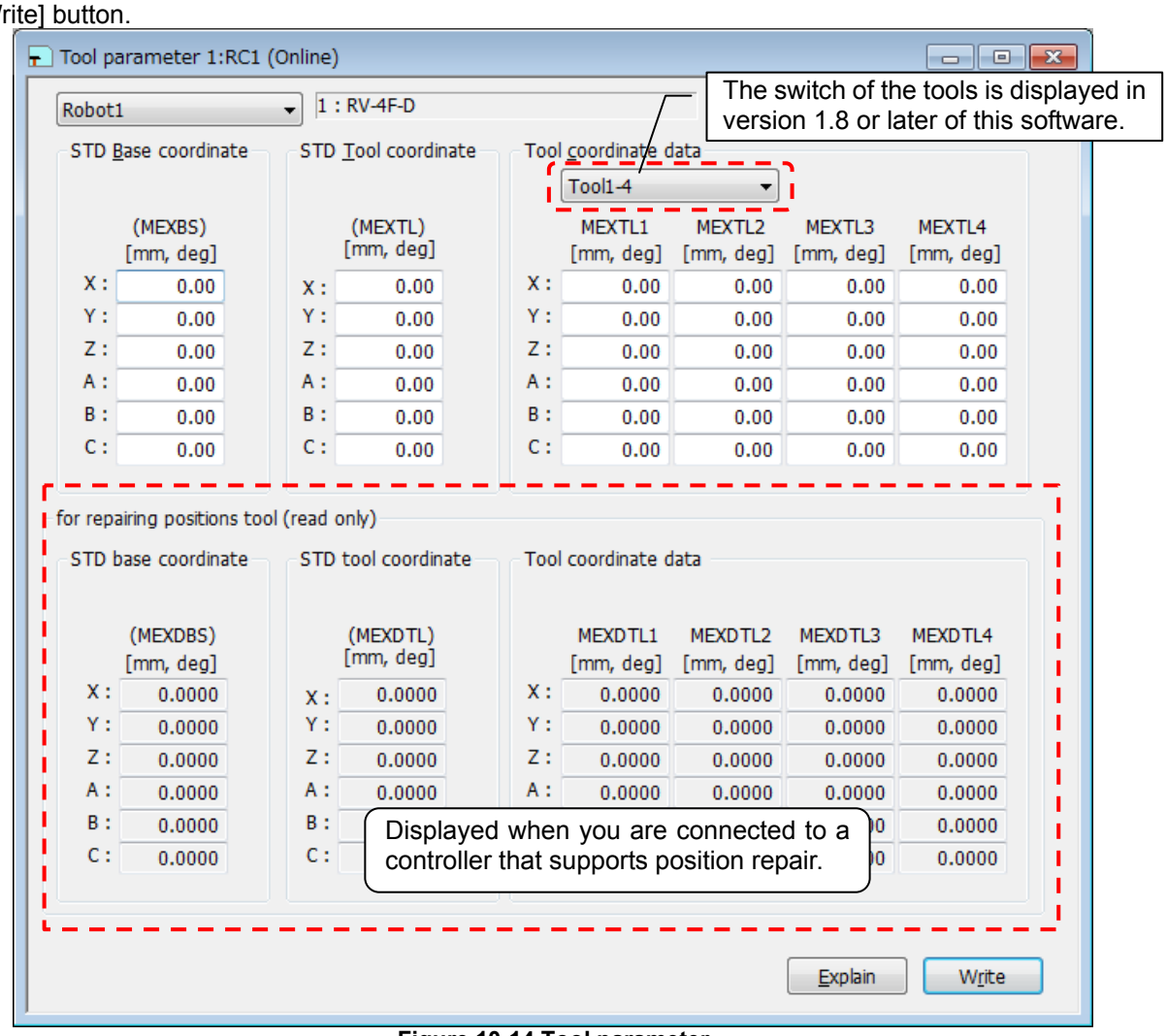


Figure 10-14 Tool parameter

10.3.6. User-defined area parameter

You can specify the region (cuboid) defined with two points in the robot XYZ coordinates and set the behavior for when the robot enters this region. You can set up to 8 User-defined area.

Set parameters while connected to the robot controller.
From the project tree, double click the target project [Online] -> [Parameter] -> [Movement parameter] -> [User-defined area].
After you change the parameter value, you can rewrite the parameters in the robot controller by clicking the [Write] button.

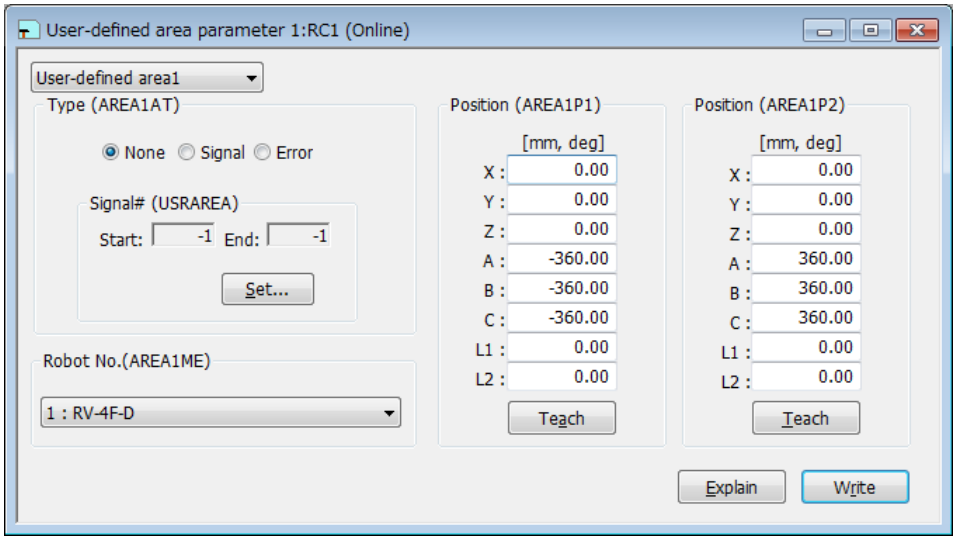


Figure 10-15 User-defined area parameter

You can reference explanations of displayed parameters by pressing the [Explain] button.

10.3.7. Free plane limit parameter

You can set the overrun limit for using the robot on a free plane.
Set parameters while connected to the robot controller.
From the project tree, double click the target project [Online] -> [Parameter] -> [Movement parameter] -> [Free Plane Limit].
After you change the parameter value, you can rewrite the parameters in the robot controller by clicking the [Write] button.

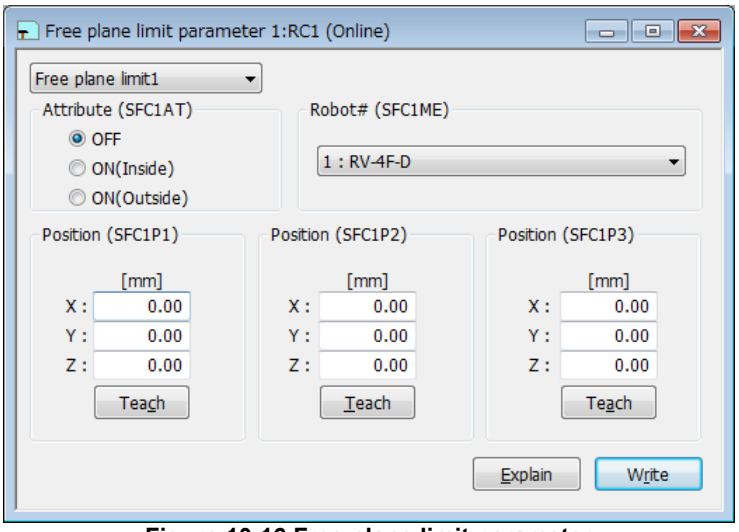


Figure 10-16 Free plane limit parameter

You can reference explanations of displayed parameters by pressing the [Explain] button.

10.3.8. Home position parameter

Set the position of the escape point.
Set parameters while connected to the robot controller.
From the project tree, double click the target project [Online] -> [Parameter] -> [Movement parameter] -> [Escape Point].
After you change the parameter value, you can rewrite the parameters in the robot controller by clicking the [Write] button.

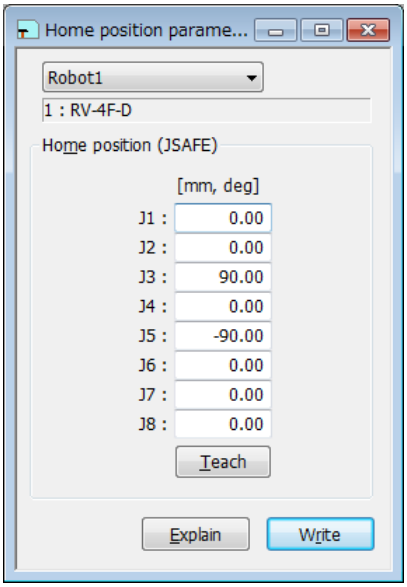


Figure 10-17 Home position parameter

You can reference explanations of displayed parameters by pressing the [Explain] button.

10.3.9. Robot additional axis parameter

You can set information related to addition axes of robots.
Set parameters while connected to the robot controller.
From the project tree, double click the target project [Online] -> [Parameter] -> [Movement parameter] -> [Robot additional axis].
After you change the parameter value, you can rewrite the parameters in the robot controller by clicking the [Write] button.

(1) In the case of using version 3.01B or later

You can set an addition axis by reading the profile of an electric actuator (SMC Ltd. THK Ltd. etc.). Please download the profile from the homepage of each company.

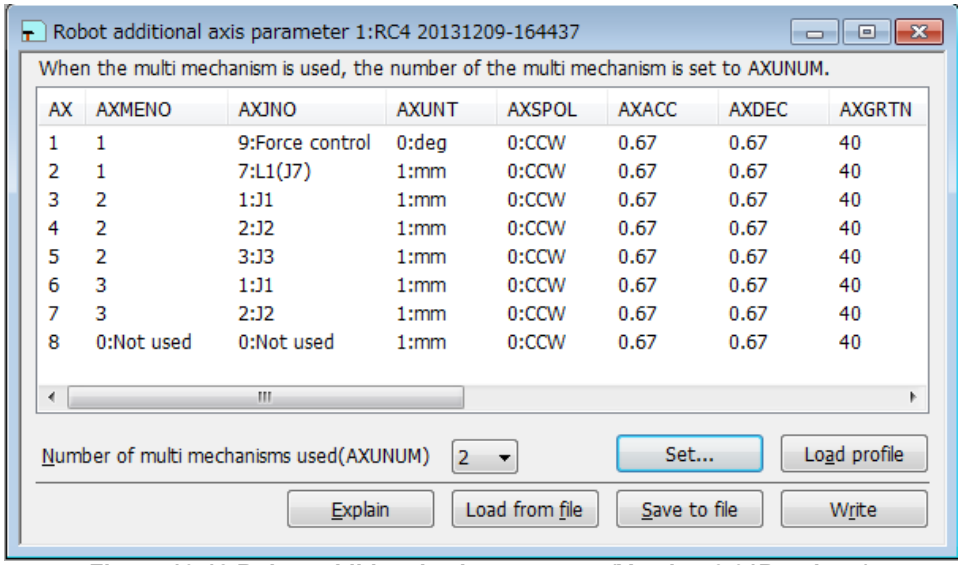


Figure 10-18 Robot additional axis parameter (Version 3.01B or later)

You can load the profile to selected axis by pressing the [Load profile] button.
You can reference explanations of displayed parameters by pressing the [Explain] button.
You can read Additional Axis data saved in the file by pressing the [Read from file] button.
You can save Additional Axis parameter to the file by pressing the [Save to file] button.
You can edit the information of the selected axis by pressing the [Set] button.

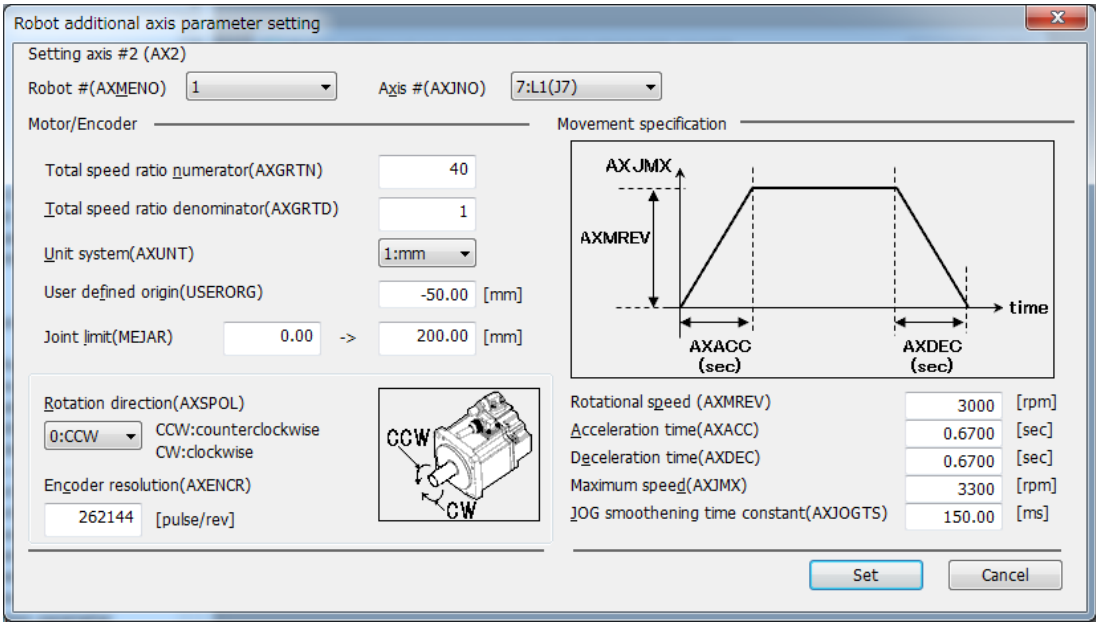


Figure 10-19 Robot additional axis parameter setting (Version 3.01B or later)

10.3.10. Collision detection parameter

You can set information related to the robot's collision detection functions.
Set parameters while connected to the robot controller.
From the project tree, double click the target project [Online] -> [Parameter] -> [Movement parameter] -> [Collision detection].
After you change the parameter value, you can rewrite the parameters in the robot controller by clicking the [Write] button.

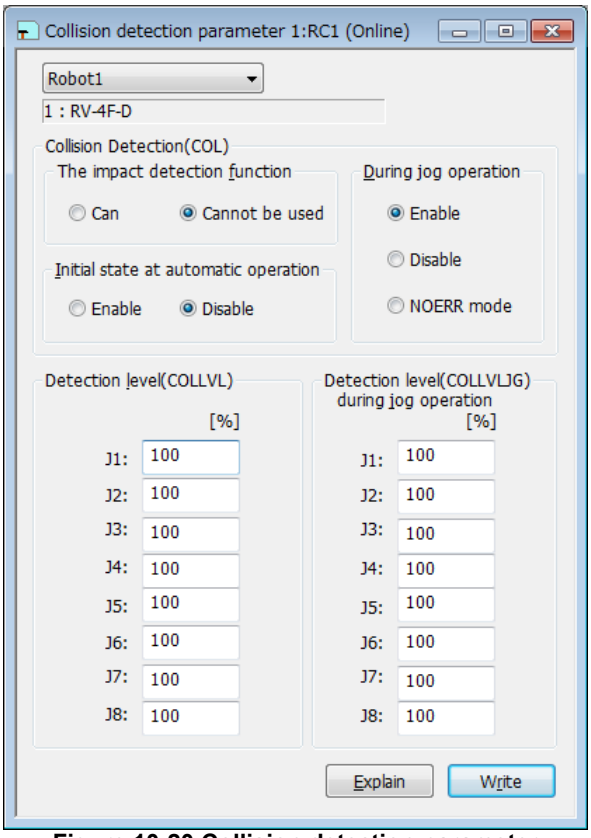


Figure 10-20 Collision detection parameter

You can reference explanations of displayed parameters by pressing the [Explain] button.

10.3.11. Warm-up operation parameter

You can set information related to the robot's warm-up function.
Set parameters while connected to the robot controller.
From the project tree, double click the target project [Online] -> [Parameter] -> [Movement parameter] -> [Warm-up].
After you change the parameter value, you can rewrite the parameters in the robot controller by clicking the [Write] button.

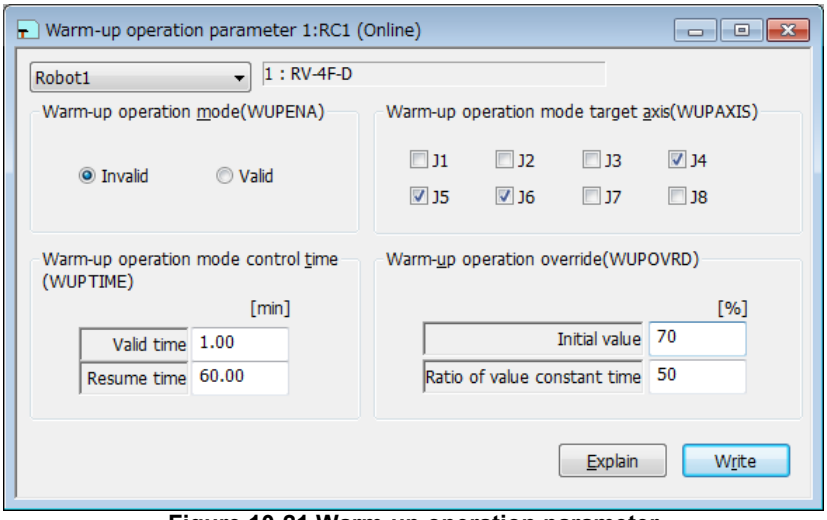


Figure 10-21 Warm-up operation parameter

You can reference explanations of displayed parameters by pressing the [Explain] button.

10.3.12. Movement parameter

You can set information related to the optimum acceleration/deceleration for robot operation and set compliance errors.
The information that can be set concerning movement parameters depends on the robot controller connected.

Table 10-3 The controller which you can set information related to optimum acceleration/deceleration for robot operation and set compliance errors

	CR750/700 series	CRn-500 series
Maximum acceleration/deceleration correction ratio	Can be used with all versions	J2 edition or later
Compliance error function settings		H6 edition or later
Optimum acceleration/deceleration setting		G1 edition or later
Direction of gravity		H4 edition or later

Set parameters while connected to the robot controller.
From the project tree, double click the target project [Online] -> [Parameter] -> [Movement parameter] -> [Movement].
After you change the parameter value, you can rewrite the parameters in the robot controller by clicking the [Write] button.

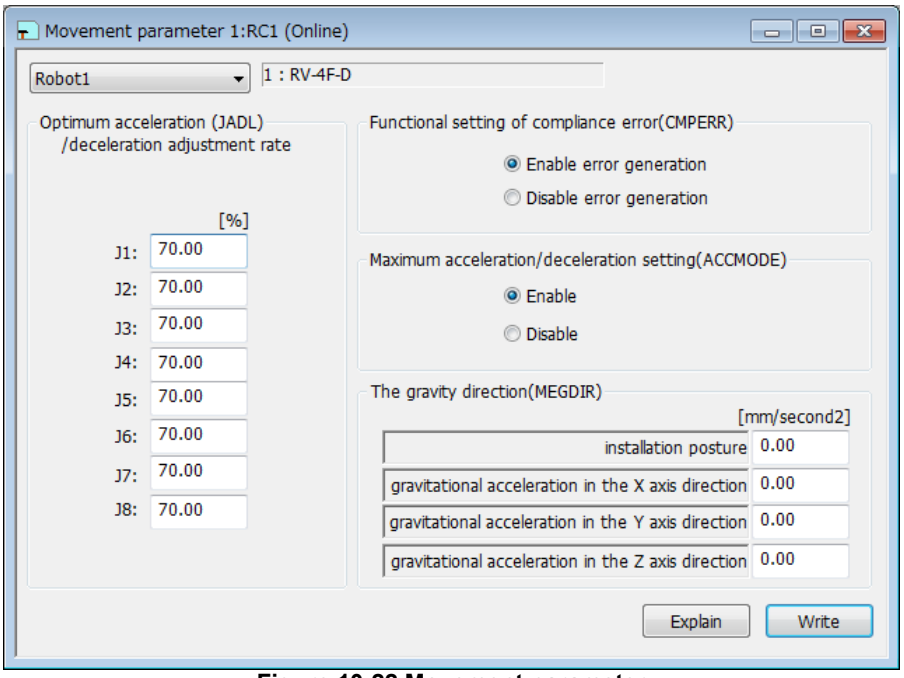


Figure 10-22 Movement parameter

You can reference explanations of displayed parameters by pressing the [Explain] button.

10.3.13. Work coordinate paramater

Work coordinate parameters define the coordinate system for the work jog.8 work coordinates can define.
This function can be used with Version 1.5 or later of this software.

Table 10-4 The controller that can use the work jog

Robot controller	Software version of robot controller
CR750-D/CRnD-700	Ver.N8 or later
CR750-Q/CRnQ-700	Ver.P8 or later

Set parameters while connected to the robot controller.
From the project tree, double click the target project [Online] -> [Parameter] -> [Movement parameter] -> [Work coordinate].
After you change the parameter value, you can rewrite the parameters in the robot controller by clicking the [Write] button.

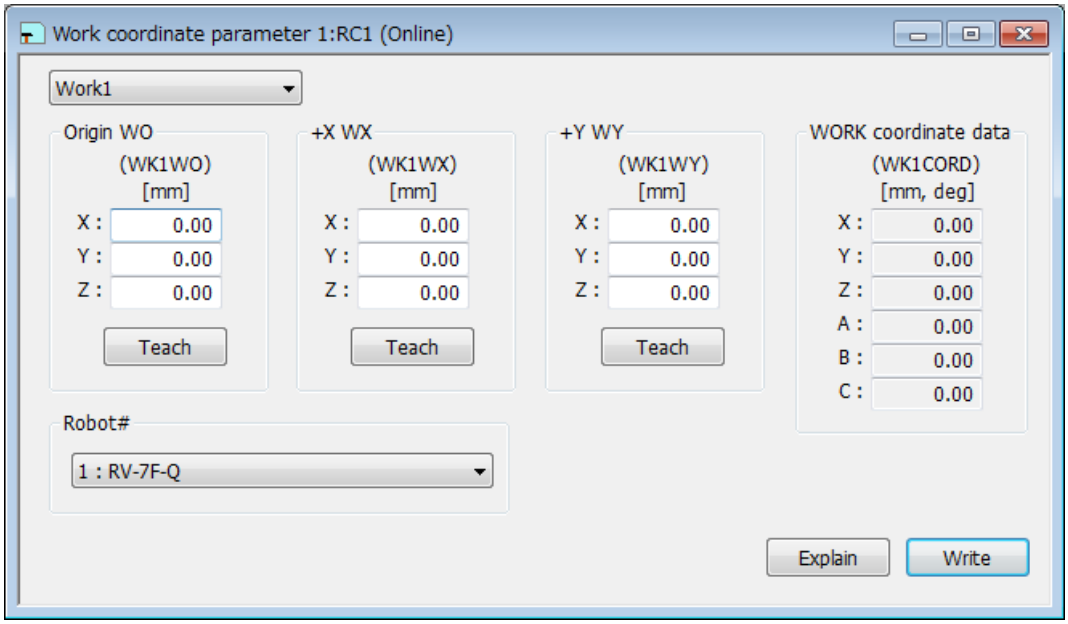


Figure 10-23 Work coordinate parameter

Work coordinates are defined by “Origin WO”, “+X WX” and “+Y WY”.

You can reference explanations of displayed parameters by pressing the [Explain] button.

These parameters cannot be set by the offline editing.

10.3.14. Parameters of Force control

You can set parameters of force control in PC and robot controllers.
The force control function can be used with Version 2.10L or later of this software.
For details of these parameters, refer to the user's manual of the force control function.

10.3.14.1. Force sensor parameter

From the project tree, double-click the target project [Online] -> [Parameter] -> [Movement parameter] -> [Force control] -> [Force sensor].
Set the parameters, [Assign sensor], [Sensor coordinates], [Filter time constant], [Restriction], and [Tolerance level] which are used by the force control function.

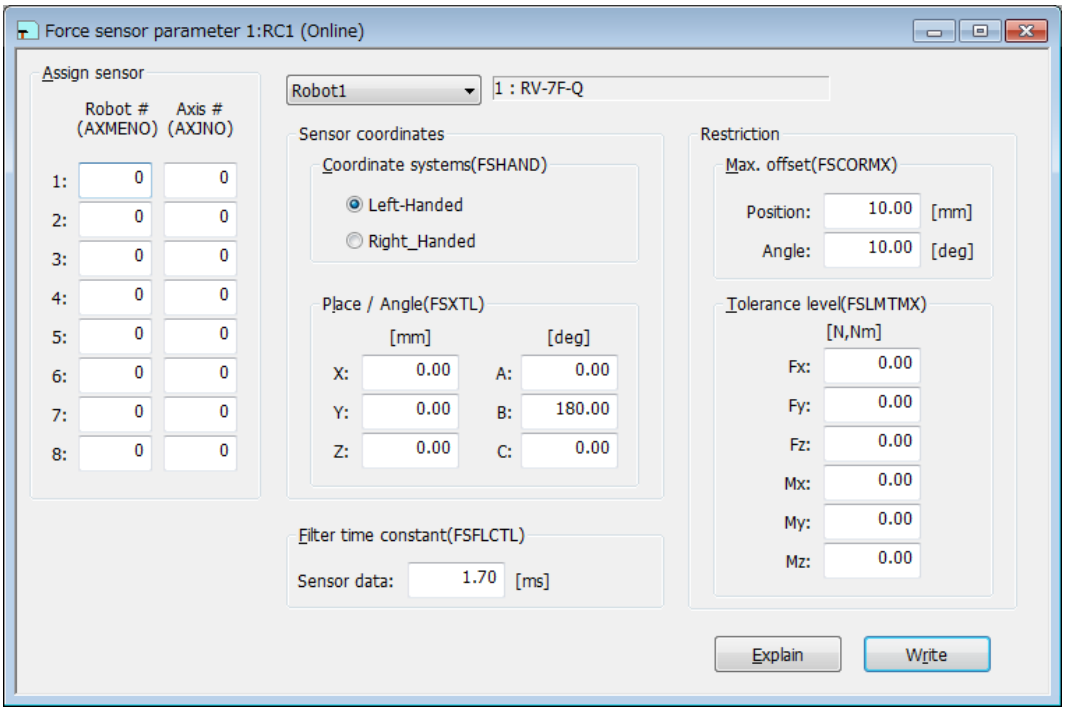


Figure 10-24 Force sensor parameter

You can reference explanations of displayed parameters by pressing the [Explain] button.

After you change the parameter values, you can rewrite the parameters in the robot controller by clicking the [Write] button.

10.3.14.2. Force control mode parameter

From the project tree, double-click the target project [Online] -> [Parameter] -> [Movement parameter] -> [Force control] -> [Force control mode].
Set the parameters, [Coordinate system], [Control mode of axes], [Stiffness coefficients], and [Dumping coefficients] which are used by the control mode of force control function.

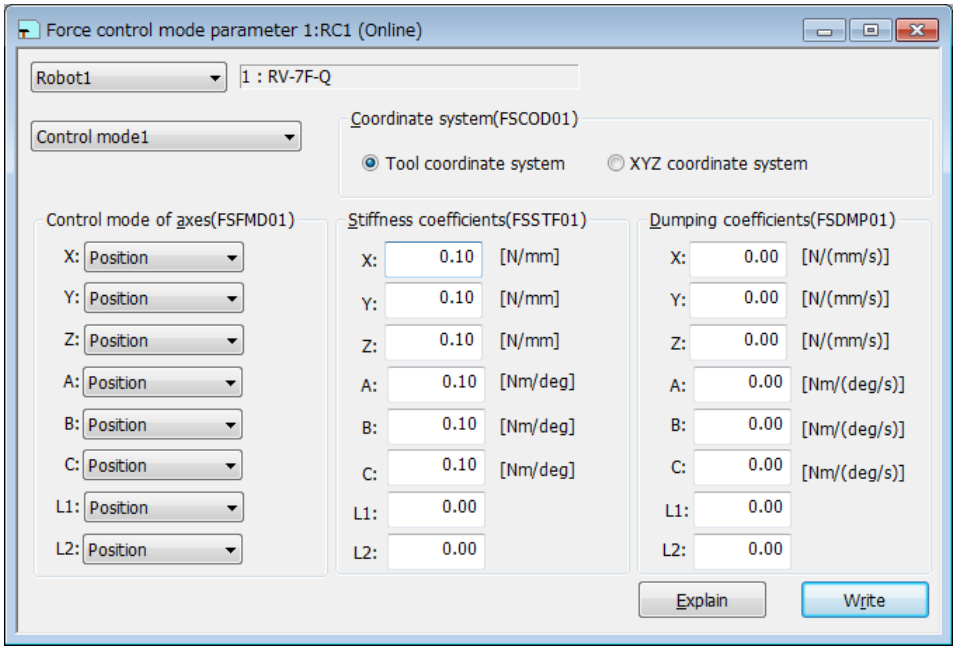


Figure 10-25 Force control mode parameter

You can reference explanations of displayed parameters by pressing the [Explain] button.

After you change the parameter values, you can rewrite the parameters in the robot controller by clicking the [Write] button.

10.3.14.3. Force control characteristics parameter

From the project tree, double-click the target project [Online] -> [Parameter] -> [Movement parameter] -> [Force control] -> [Force control characteristics].
Set the parameters, [Force gain], [Force cmd.], and [Force detection] which are used by the control characteristics of force control function.

“Speed condition” tab is displayed in this software version 2.20W or later. The controller which can set the parameters [Mode switch judgment] and [Speed command] is as follows.

Table 10-5 The controller which can set the parameters [Mode switch judgment] and [Speed command]

Robot controller	Software version of the robot controller
CR750-D/CRnD-700	Ver.S3g or later
CR750-Q/CRnQ-700	Ver.R3g or later

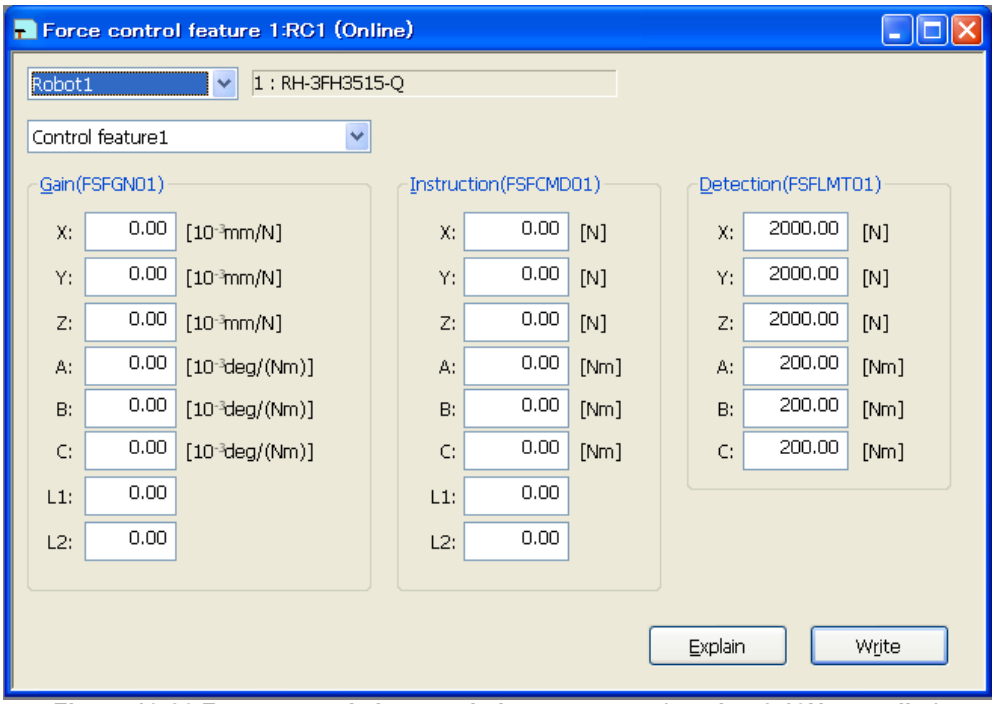


Figure 10-26 Force control characteristics parameter (version 2.10N or earlier)

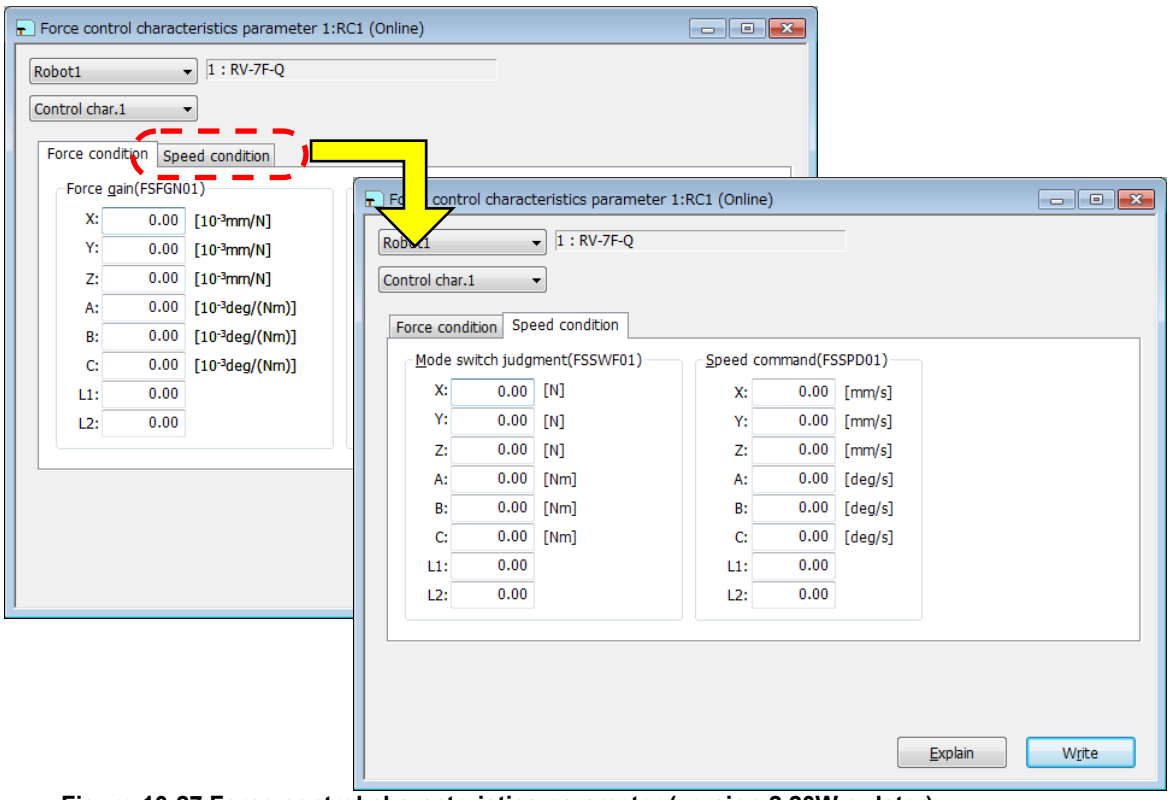


Figure 10-27 Force control characteristics parameter (version 2.20W or later)

You can reference explanations of displayed parameters by pressing the [Explain] button.

After you change the parameter values, you can rewrite the parameters in the robot controller by clicking the [Write] button.

10.3.14.4. Force log parameter

From the project tree, double-click the target project [Online] -> [Parameter] -> [Movement parameter] -> [Force control] -> [Force log setting].
Set the parameters, [Configuration] and [FTP setting] which are used by the force control function.

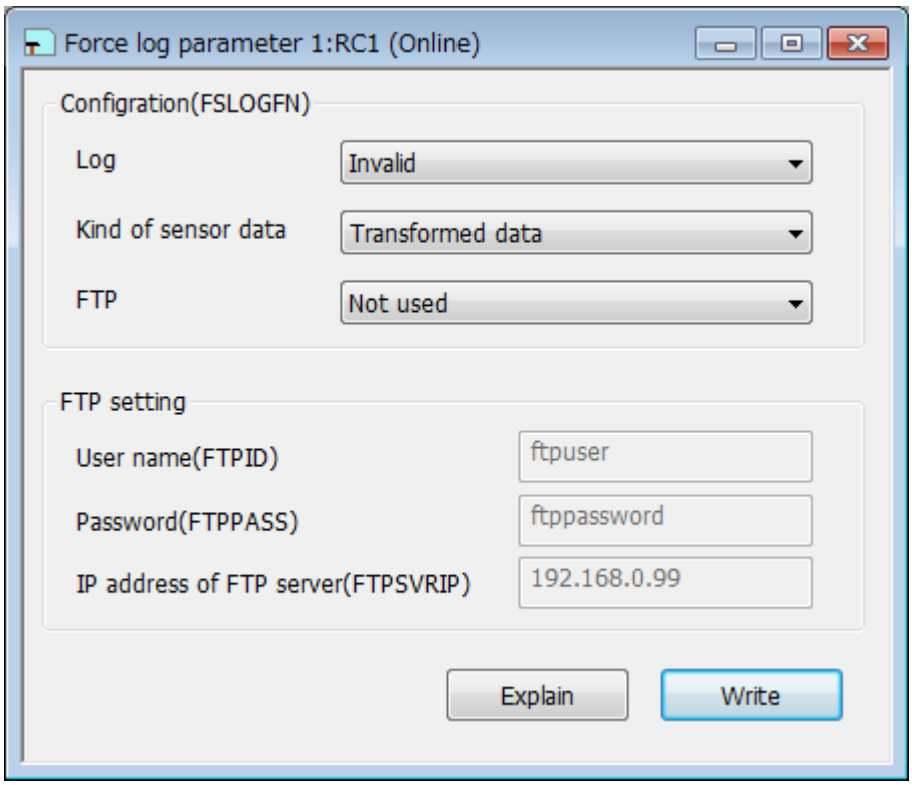


Figure 10-28 Force log parameter

You can reference explanations of displayed parameters by pressing the [Explain] button.

After you change the parameter values, you can rewrite the parameters in the robot controller by clicking the [Write] button.

10.3.15. Parameters of Collision avoidance

You can set parameters of collision avoidance in PC and robot controllers.
For details of these parameters, refer to the robot controller's operations manual, see **"Detailed explanations of functions and operations"**.

10.3.15.1. Collision avoidance area parameter

From the project tree, double-click the target project [Online] -> [Parameter] -> [Movement parameter] -> [Collision avoidance] -> [Collision avoidance area].
You can set information related to the Collision avoidance area.
This function can be used with Version 2.40S or later of this software.
The controller which can set the parameters [Collision avoidance area] is as follows.

Table 10-6 The controller and the robot model which can set the parameters [Collision avoidance area]

Robot controller	Software version of the robot controller	Robot model
CR750-Q/CRnQ-700	Ver.R3a or later (*1)	RV-F, RH-F

(*1) The version that corresponds to the cylinder model is Ver.R3m or later.

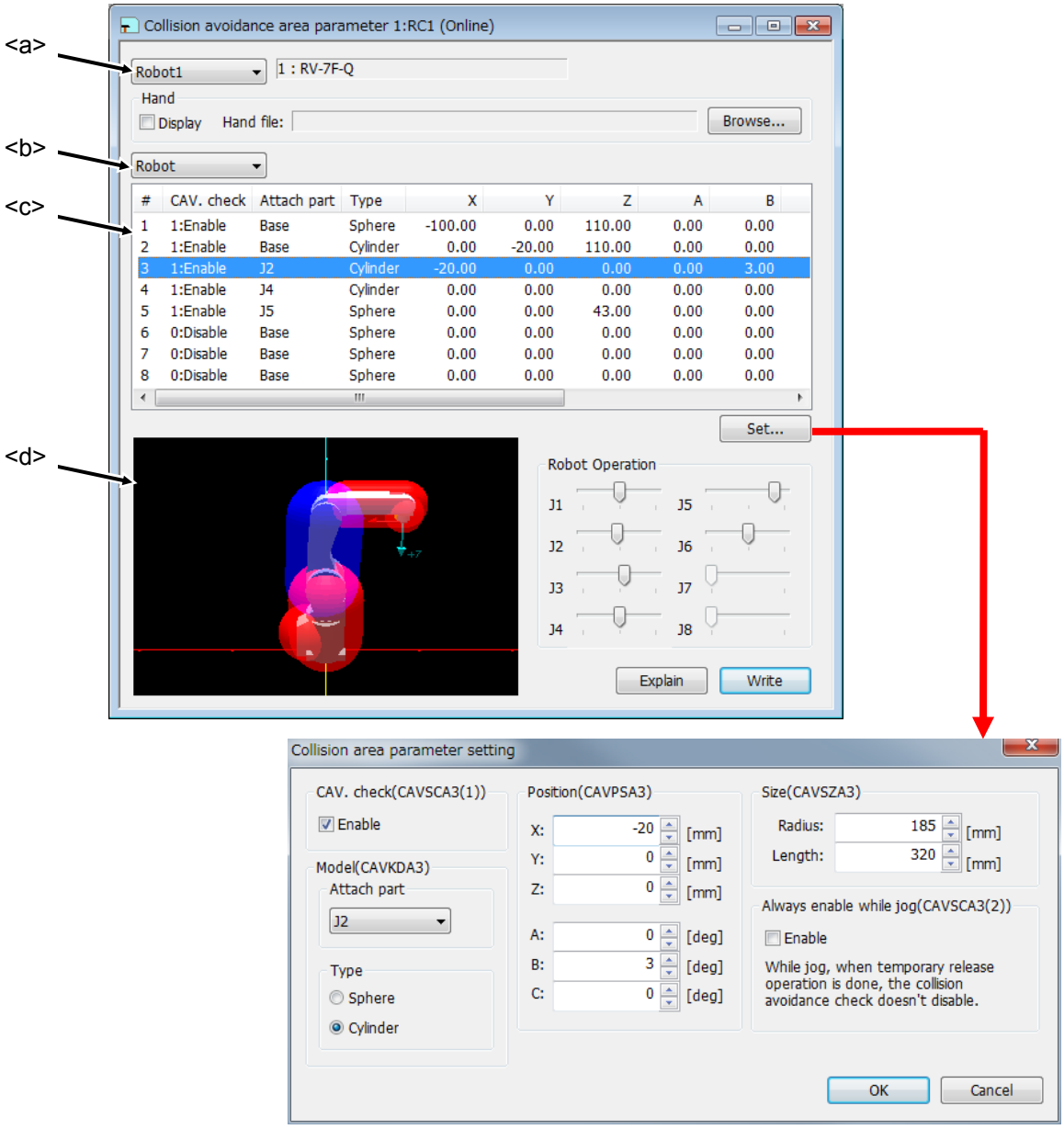


Figure 10-29 Collision avoidance area parameter

You can switch the robot by the combo box<a>.
You can switch the collision avoidance area type (robot/hand/work) by the combo box<b>.
If you select one collision avoidance area from the list<c>, and click set button or double-click list, the dialog for the collision avoidance area setting is displayed. The selected collision avoidance area becomes displayed in blue color on the 3D model<d>.

After you change the parameter values, you can rewrite the parameter in the robot controller by clicking the [Write] button.

The perspective of 3D model<d.> can be changed as follows.

Table 10-7 3D Model Perspective Change Operations

Viewpoint of changing	Mouse operations on the graphic
Rotation	While clicking the left button, move left/right → Rotation around Z axis Move up/down → Rotation around X axis Move left/right while clicking the left + right buttons → Rotation around Y axis
Move	Move up/down/left/right while clicking the right button
Enlargement/reduction	Move up/down/left/right while clicking pressing [Shift] key and clicking the left button A similar operation can be used by the mouse wheel with Version 3.01B or later of this software.

If you operate slider of [Robot Operation], the robot of 3D model<d> is moved.

When a tick mark (for true) is set in the [Display] checkbox and a hand file is set, the robot hand is displayed on 3D model<d>. Refer to "**16.3.11 Hand**" for designing the robot hand.

You can reference explanations of displayed parameters by pressing the [Explain] button.

10.4. Program Parameters

10.4.1. Slot table parameter

Slot tables set the operating conditions of each task slot during multi-task operation.
Set parameters while connected to the robot controller.
From the project tree, double click the target project [Online] -> [Parameter] -> [Program parameter] -> [Slot Table].
After you change the parameter value, you can rewrite the operating range parameter in the robot controller by clicking the [Write] button.

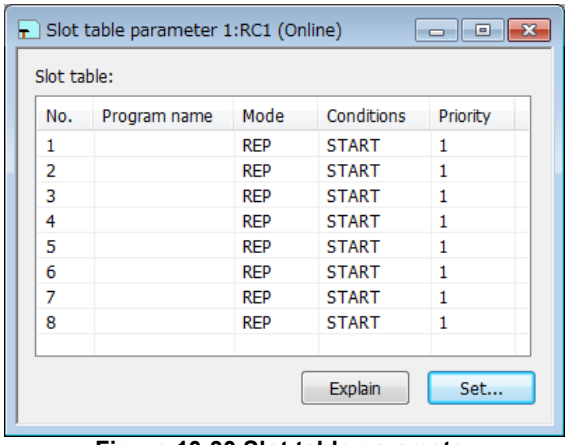


Figure 10-30 Slot table parameter

Select the task slot number you are changing and click the [Set] button.

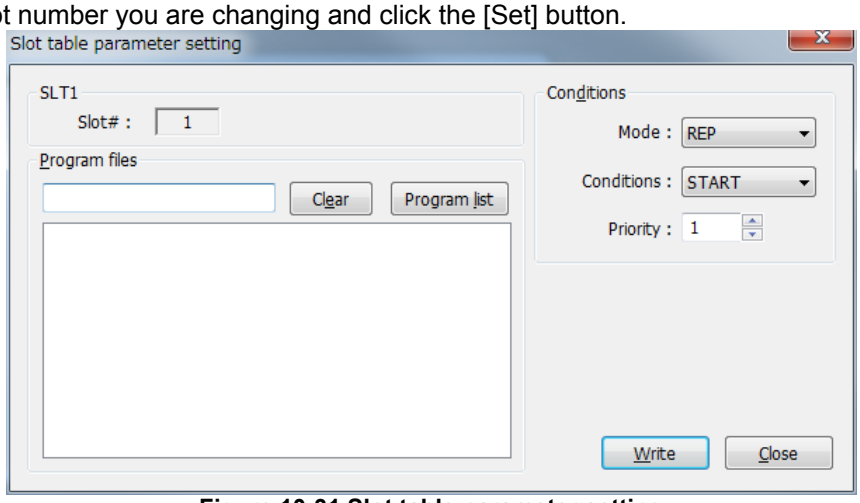


Figure 10-31 Slot table parameter setting

When the modification window appears, set the program name, operating conditions, startup conditions and task priority, and then click [Write].

You can reference explanations of displayed parameters by pressing the [Explain] button.

10.4.2. Program language parameter

You can set the robot program language used in a robot controller (MELFA-BASIC V/MELFA-BASIC IV/Movemaster commands). From the project tree, double click the target project [Online] -> [Parameter] -> [Program parameter] -> [Program language].
After you change the parameter value, you can rewrite the parameters in the robot controller by clicking the [Write] button.

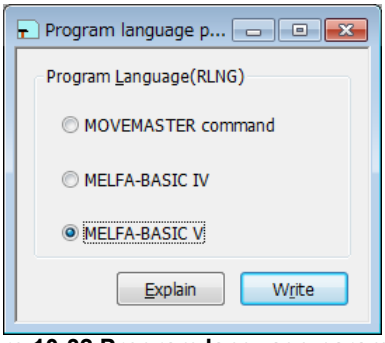


Figure 10-32 Program language parameter

You can reference explanations of displayed parameters by pressing the [Explain] button.

For the usable robot program languages, see **"Table 7-1 Robot Program Languages for Each Controller"**.

Caution

About MELFA-BASIC V

MELFA-BASIC V. can only be used with CRn-700 series robot controllers.

About Movemaster commands

The Movemaster commands are restricted by the robot models that can be used. For details on whether you can use Movemaster commands with your robot, refer to its standard specifications.

10.4.3. Command parameter

You can set parameters related to robot programs.
Set parameters while connected to the robot controller.
From the project tree, double click the target project [Online] -> [Parameter] -> [Program parameter] -> [Command].
After you change the parameter value, you can rewrite the parameters in the robot controller by clicking the [Write] button.

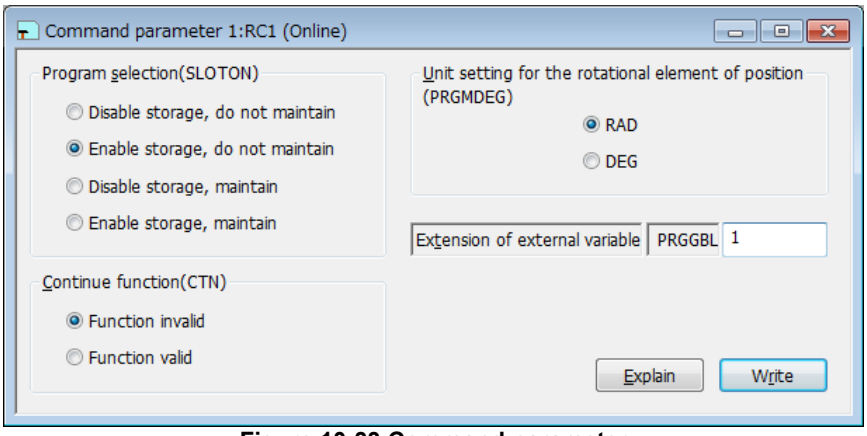


Figure 10-33 Command parameter

You can reference explanations of displayed parameters by pressing the [Explain] button.

10.4.4. User error parameter

You can set the message, cause, and recovery method for user errors set with a program.
Set parameters while connected to the robot controller.
From the project tree, double click the target project [Online] -> [Parameter] -> [Program parameter] -> [User error].

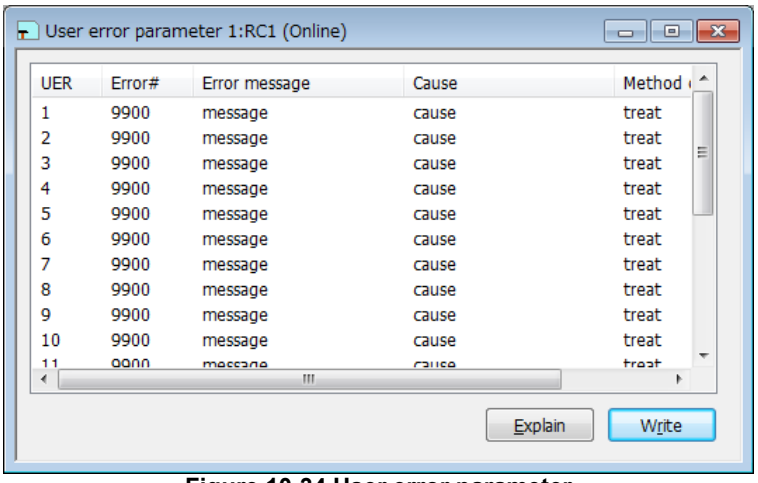


Figure 10-34 User error parameter

Double click the error number from the list. The "User error parameter setting" edit screen is displayed.

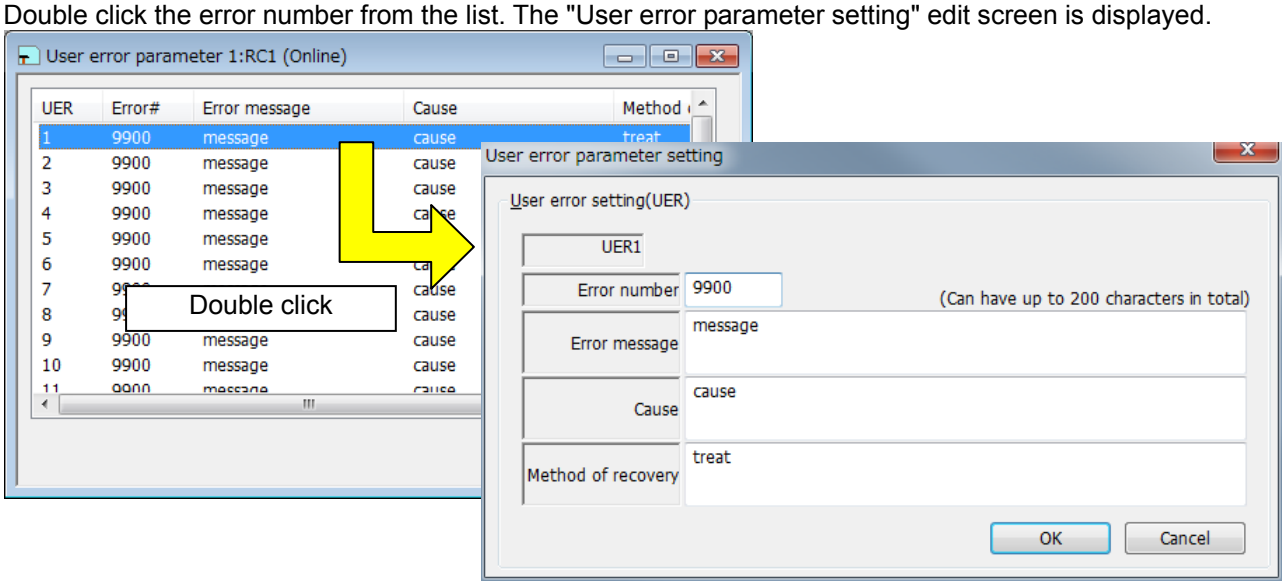


Figure 10-35 User error parameter setting

Input the error number, error message, cause, and recovery method, then click the [OK] button. The user errors input to the list are displayed.
At this time, input an error number from "9000" – "9200".
After you confirm the parameter value, you can rewrite the parameters in the robot controller by clicking the [Write] button.
Please note that the list display is not sorted by error number.

You can reference explanations of displayed parameters by pressing the [Explain] button.

10.5. Signal Parameters

10.5.1. Output signal reset pattern parameter

These parameters set the operation when resetting the general-purpose output signals such as the CLR instruction and dedicated input (OUTRESET).
Set parameters while connected to the robot controller.
From the project tree, double click the target project [Online] -> [Parameter] -> [Signal parameter] -> [Output signal reset pattern].

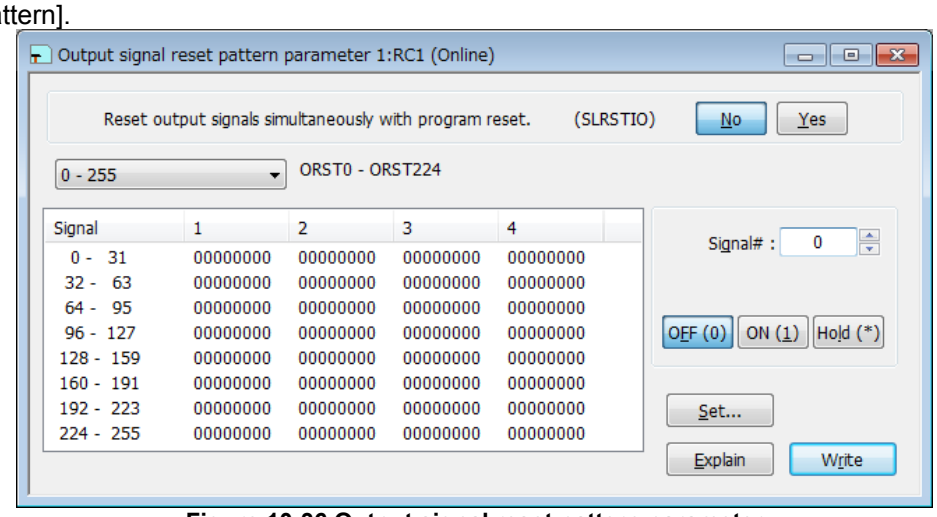


Figure 10-36 Output signal reset pattern parameter

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. After you changed the parameter value, you can rewrite the output signal reset parameter in the robot controller by clicking the [Write] button.

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

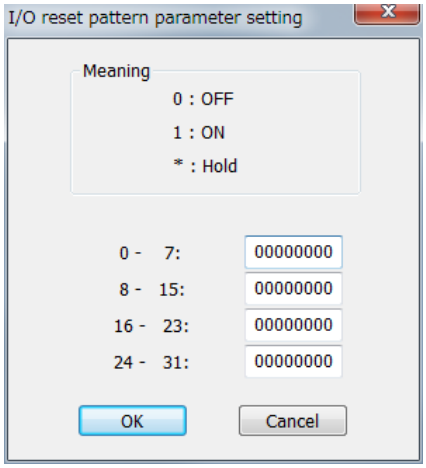


Figure 10-37 I/O reset pattern parameter setting

You can reference explanations of displayed parameters by pressing the [Explain] button.

⚠ Caution

Read the parameter list of the connecting controller.

Use this screen after reading the parameter list file of the connecting controller. And you can see the output signals corresponding to the function of the connecting controller. You can read the parameter list file on the “Parameter list” screen.

10.5.2. Assigning Dedicated Input/Output Signals

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.
Set parameters while connected to the robot controller.

10.5.2.1. General1 parameter

From the project tree, double click the target project [Online] -> [Parameter] -> [Signal parameter] -> [Dedicated input/output signals assignment] -> [General1].
After you change the parameter value, you can rewrite the parameters in the robot controller by clicking the [Write] button.

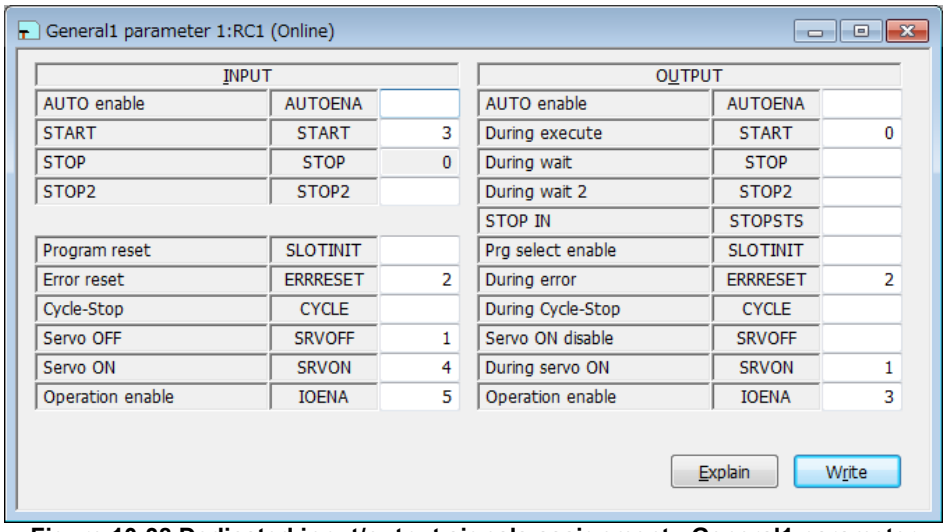


Figure 10-38 Dedicated input/output signals assignment - General1 parameter

You can reference explanations of displayed parameters by pressing the [Explain] button.

10.5.2.2. General2 parameter

From the project tree, double click the target project [Online] -> [Parameter] -> [Signal parameter] -> [Dedicated input/output signals assignment] -> [General2].
After you change the parameter value, you can rewrite the parameters in the robot controller by clicking the [Write] button.

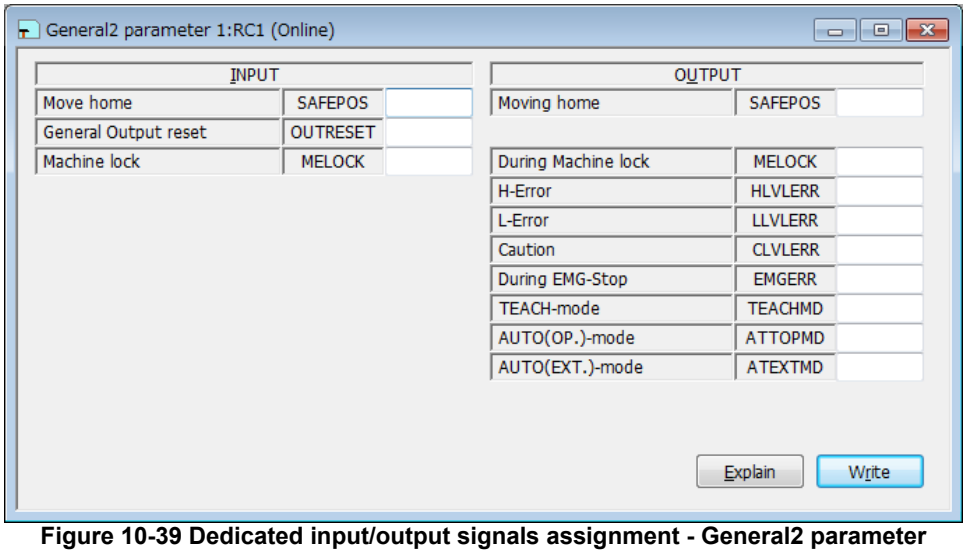


Figure 10-39 Dedicated input/output signals assignment - General2 parameter

You can reference explanations of displayed parameters by pressing the [Explain] button.

10.5.2.3. Data parameter

From the project tree, double click the target project [Online] -> [Parameter] -> [Signal parameter] -> [Dedicated input/output signals assignment] -> [Data].
After you change the parameter value, you can rewrite the parameters in the robot controller by clicking the [Write] button.

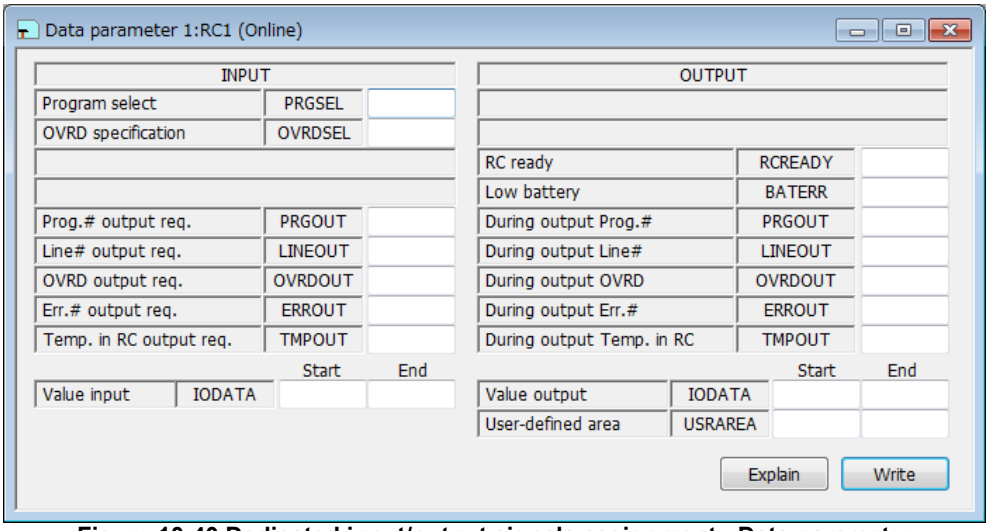


Figure 10-40 Dedicated input/output signals assignment - Data parameter

"Temp. in RC output req" and "During output Temp in RC" parameter is available with Ver.1.6.1 or later of this software. Moreover, the software version of the controller which can use this parameter is as follows.

Table 10-8 The controller which you can set the parameters about "Temp. in RC output reg." and "During output Temp. in RC"

Controller	S/W Ver. of the controller
CR750-D/CRnD-700	Ver.S1c or later
CR750-Q/CRnQ-700	Ver.R1c or later

You can reference explanations of displayed parameters by pressing the [Explain] button.

10.5.2.4. Jog parameter

From the project tree, double click the target project [Online] -> [Parameter] -> [Signal parameter] -> [Dedicated input/output signals assignment] -> [Jog].
After you change the parameter value, you can rewrite the parameters in the robot controller by clicking the [Write] button.

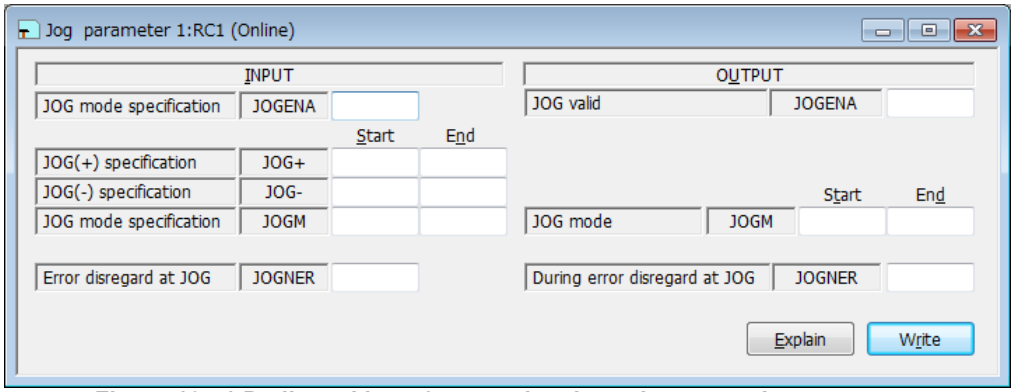


Figure 10-41 Dedicated input/output signals assignment - Jog parameter

You can reference explanations of displayed parameters by pressing the [Explain] button.

JOGNER(JOG command INPUT signal, During JOG OUTPUT signal) can be used with Version J2 or later of the CRn-500 series controller, or CR750/700 series controller

10.5.2.5. Hand parameter

From the project tree, double click the target project [Online] -> [Parameter] -> [Signal parameter] -> [Dedicated input/output signals assignment] -> [Hand].
After you change the parameter value, you can rewrite the parameters in the robot controller by clicking the [Write] button.

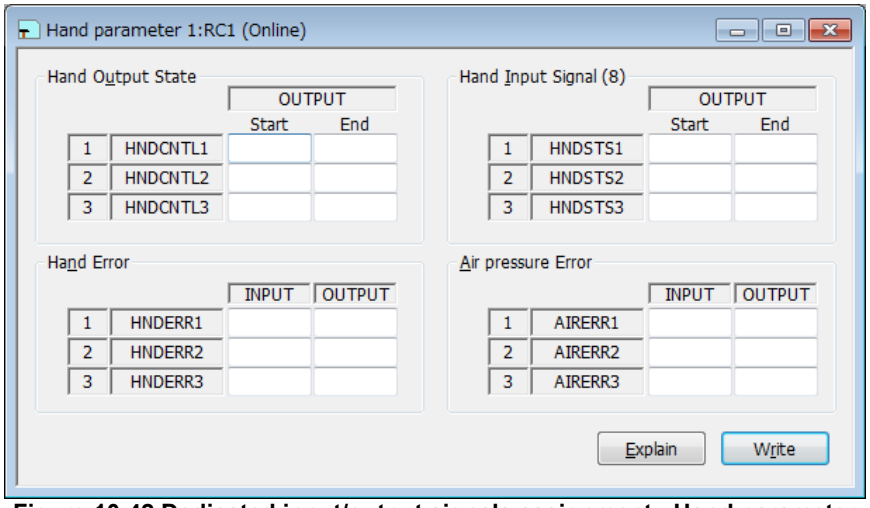


Figure 10-42 Dedicated input/output signals assignment - Hand parameter

You can reference explanations of displayed parameters by pressing the [Explain] button.

10.5.2.6. Warm up parameter

The warm-up operation parameters can be set when you are connected to a CRn-500 series robot controller ofJ8 edition or later or a CR750/700 series robot controller.
From the project tree, double click the target project [Online] -> [Parameter] -> [Signal parameter] -> [Dedicated input/output signals assignment] -> [Warm up].
After you change the parameter value, you can rewrite the parameters in the robot controller by clicking the [Write] button.

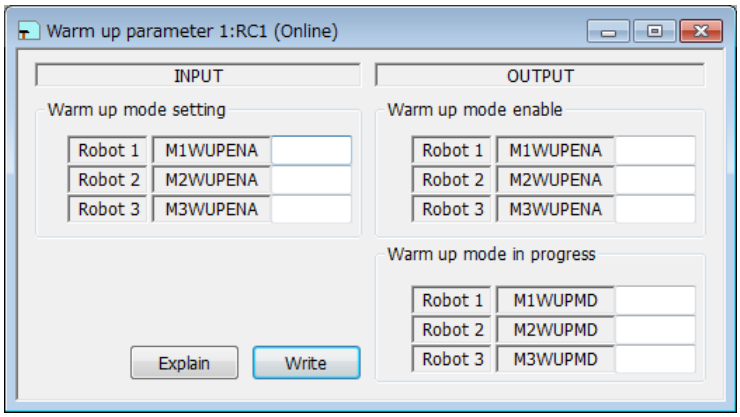


Figure 10-43 Dedicated input/output signals assignment – Warm up parameter

You can reference explanations of displayed parameters by pressing the [Explain] button.

10.5.2.7. Start (each slot) parameter

From the project tree, double click the target project [Online] -> [Parameter] -> [Signal parameter] -> [Dedicated input/output signals assignment] -> [Start (each slot)].
After you change the parameter value, you can rewrite the parameters in the robot controller by clicking the [Write] button.

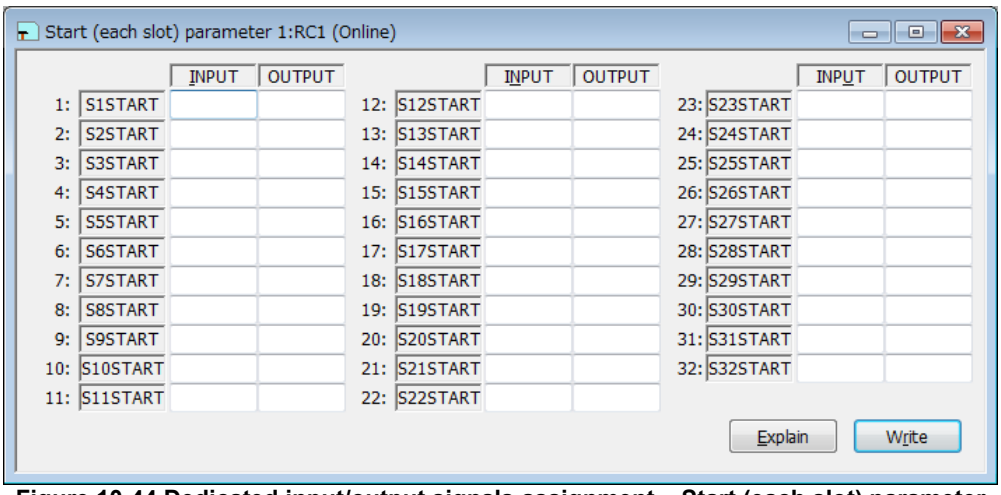


Figure 10-44 Dedicated input/output signals assignment – Start (each slot) parameter

You can reference explanations of displayed parameters by pressing the [Explain] button.

10.5.2.8. Stop (each slot) parameter

From the project tree, double click the target project [Online] -> [Parameter] -> [Signal parameter] -> [Dedicated input/output signals assignment] -> [Stop (each slot)].
After you change the parameter value, you can rewrite the parameters in the robot controller by clicking the [Write] button.

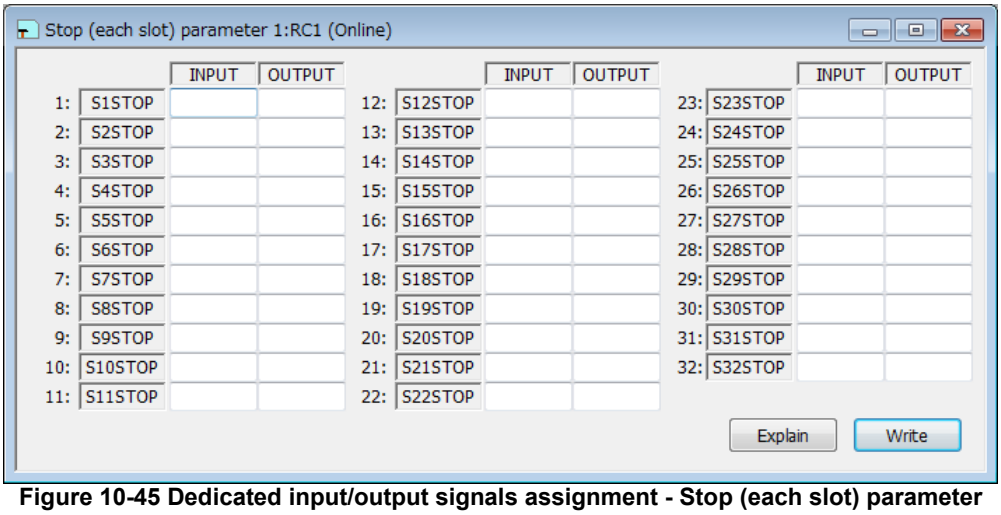


Figure 10-45 Dedicated input/output signals assignment - Stop (each slot) parameter

You can reference explanations of displayed parameters by pressing the [Explain] button.

10.5.2.9. Servo On/Off (each robot) parameter

From the project tree, double click the target project [Online] -> [Parameter] -> [Signal parameter] -> [Dedicated input/output signals assignment] -> [Servo On/Off (each robot)].
After you change the parameter value, you can rewrite the parameters in the robot controller by clicking the [Write] button.

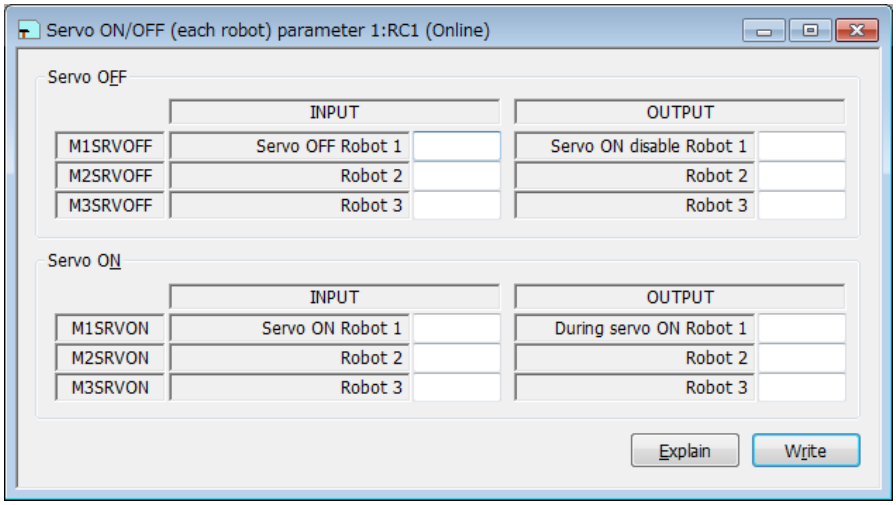


Figure 10-46 Dedicated input/output signals assignment – Servo ON/OFF (each robot) parameter

You can reference explanations of displayed parameters by pressing the [Explain] button.

10.5.2.10. Machine lock (each robot) parameter

From the project tree, double click the target project [Online] -> [Parameter] -> [Signal parameter] -> [Dedicated input/output signals assignment] -> [Machine lock (each robot)].
After you change the parameter value, you can rewrite the parameters in the robot controller by clicking the [Write] button.

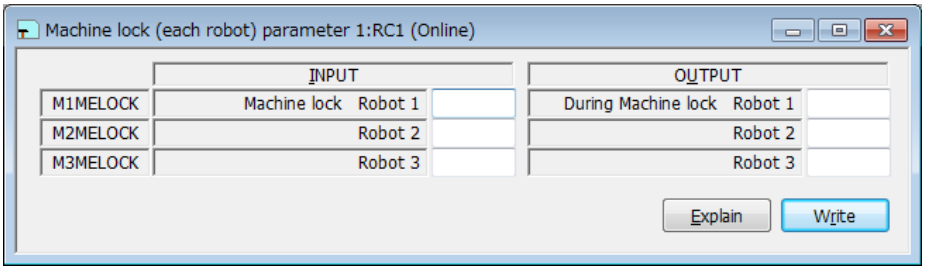


Figure 10-47 Dedicated input/output signals assignment - Machine lock (each robot) parameter

You can reference explanations of displayed parameters by pressing the [Explain] button.

10.6. Communication Parameters

10.6.1. RS-232 parameter

These parameters set up the communication environment of the RS-232 interface of the robot controller.
Set parameters while connected to the robot controller.
From the project tree, double click the target project [Online] -> [Parameter] -> [Communication parameter] -> [RS-232].
After you change the parameter value, you can rewrite the parameters in the robot controller by clicking the [Write] button.

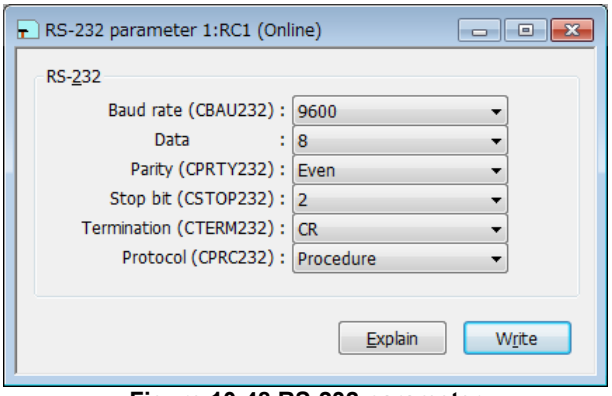


Figure 10-48 RS-232 parameter

You can reference explanations of displayed parameters by pressing the [Explain] button.

10.6.2. Ethernet parameter

You can set robot controller Ethernet information.
Set parameters while connected to the robot controller.
From the project tree, double click the target project [Online] -> [Parameter] -> [Communication parameter] -> [Ethernet].

The “Ethernet” screen is different with versions of this software.

(1) In the case of using version 3.00A or later
Click a menu. The screen corresponding to the selected menu is displayed.
After you change the parameter value, you can rewrite the parameters in the robot controller by clicking the [Write] button.
You can reference explanations of displayed parameters by pressing the [Explain] button.

10.6.2.1. IP address

You can set the parameters related to IP address in the robot controller.

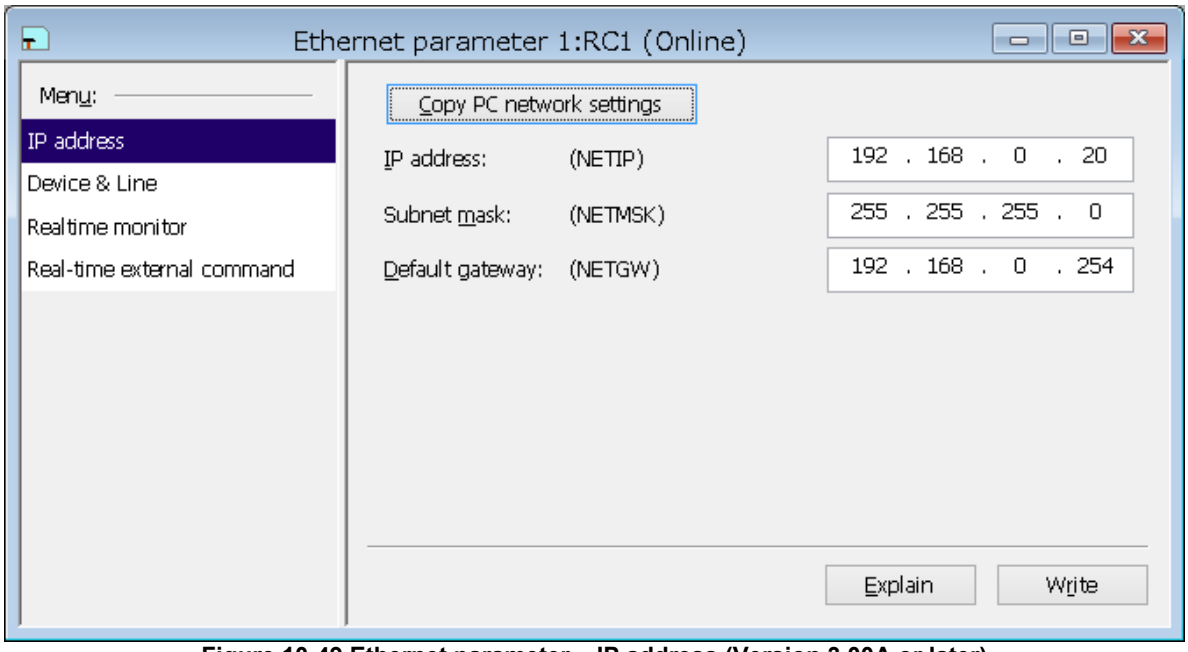


Figure 10-49 Ethernet parameter – IP address (Version 3.00A or later)

You can copy network settings of the computer to the screen by clicking the [Copy PC network settings] button.

10.6.2.2. Device & Line

You can set the parameters related to devices and lines in the robot controller.

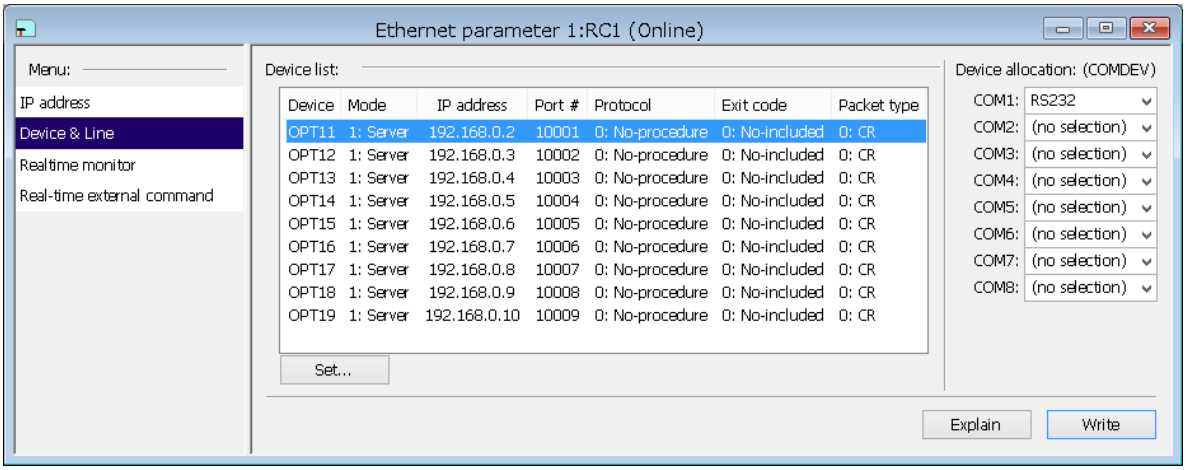


Figure 10-50 Ethernet parameter – Device & line (Version 3.00A or later)

Select the device to edit and click the [Set] button. The “Device parameter setting” screen is displayed.

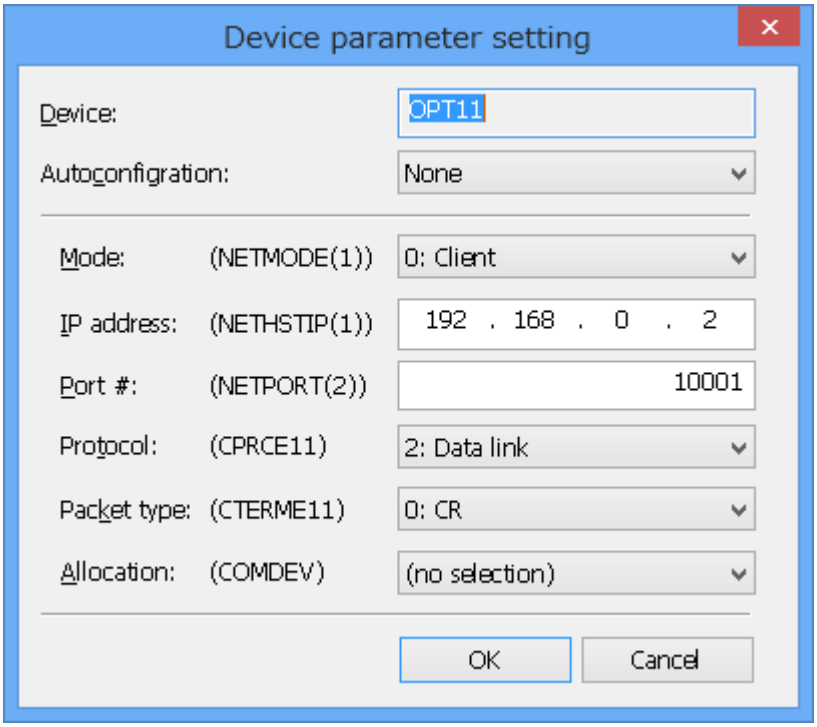


Figure 10-51 Ethernet parameter – Device parameter setting (Version 3.00A or later)

If you select the [MELFA-3D Vision] or [Network Vision Sensor (2D)] item from the [Autoconfiguration] combobox, contents of the screen take on the value corresponding to the selected item.

10.6.2.3. Realtime monitor

You can set the parameters related to the “Realtime monitor” function in the robot controller.
The controller which you can use the “Realtime monitor” function is as follows.

Table 10-9 The controller which you can set the parameters about the “Realtime monitor” function

Robot controller	Software version of the robot controller
CR750-D/CRnD-700	Ver. S3q or later
CR750-Q/CRnQ-700	Ver. R3q or later

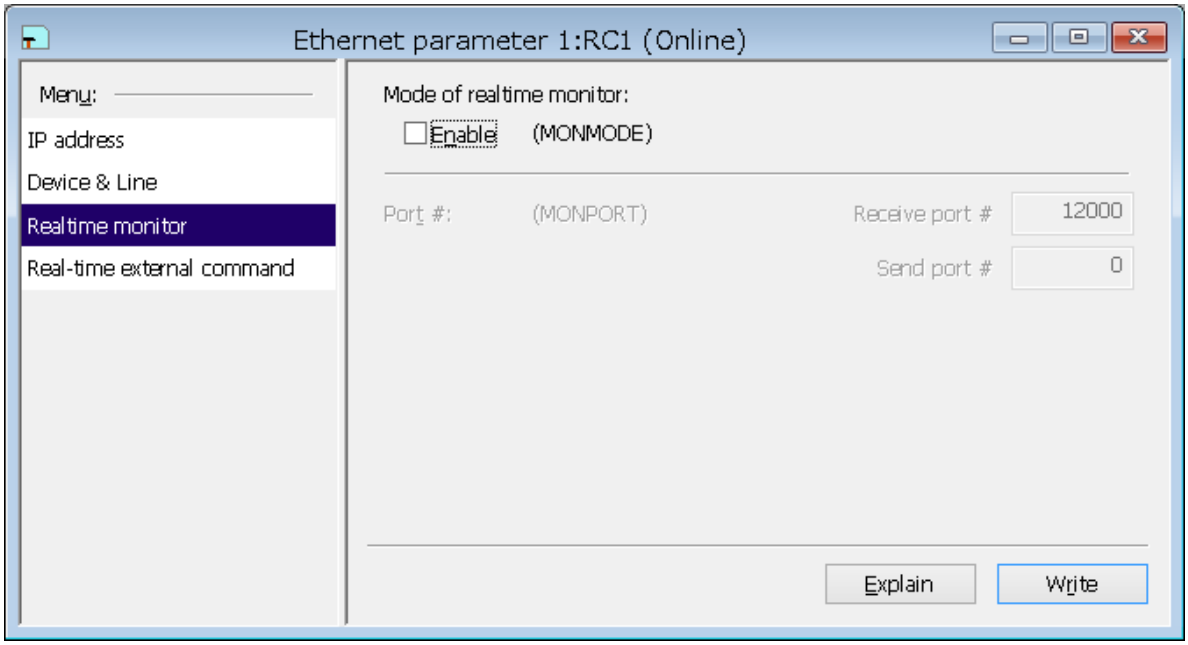


Figure 10-52 Ethernet parameter – Realtime monitor (Version 3.00A or later)

10.6.2.4. Real-time external command

You can set the parameters related to communication settings for the real-time external command in the robot controller.

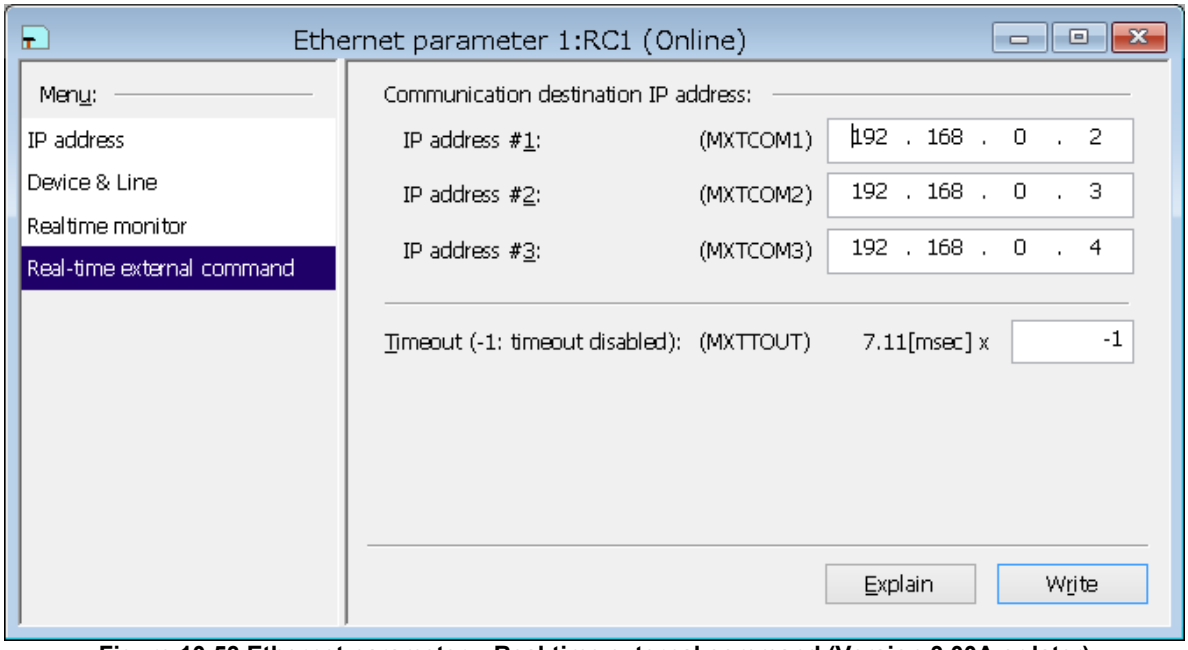


Figure 10-53 Ethernet parameter – Real-time external command (Version 3.00A or later)

(2) In the case of using version 2.50C or earlier

After you change the parameter value, you can rewrite the parameters in the robot controller by clicking the [Write] button.

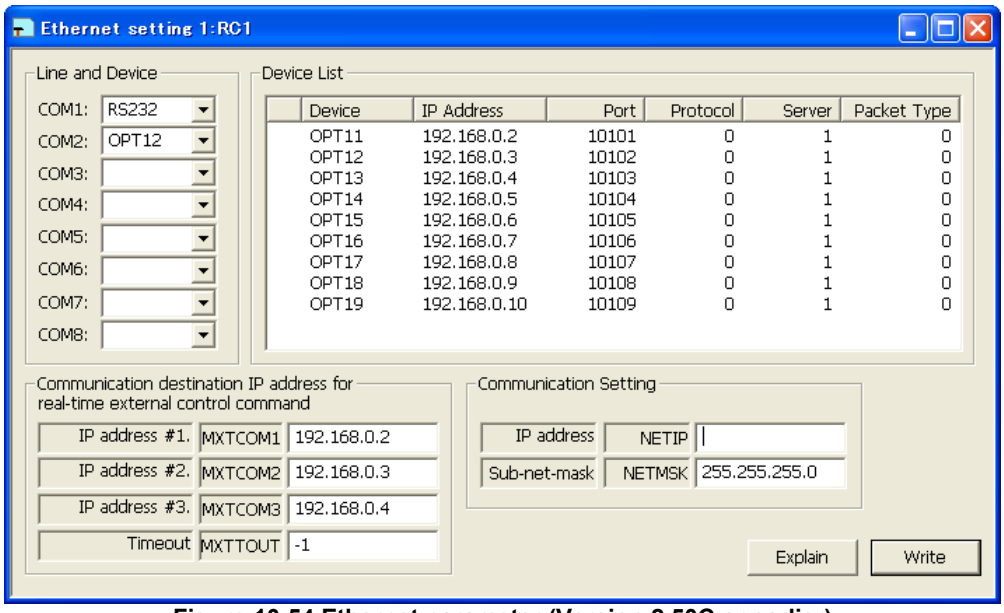


Figure 10-54 Ethernet parameter (Version 2.50C or earlier)

You can reference explanations of displayed parameters by pressing the [Explain] button.

Select the device to edit and double click. A screen is displayed for setting a variety of device information.

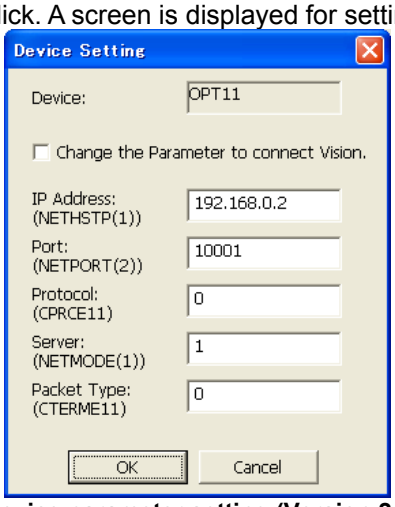


Figure 10-55 Device parameter setting (Version 2.50C or earlier)

If you check the [Change the Parameter to connect Vision] checkbox, the items from "Port" downward take on the values for a network vision sensor.

Caution

Using a CRn-500 series robot controller

When using Ethernet with a CRn-500 series robot controller, the "Ethernet interface" option is required.

10.7. Field Network Parameters

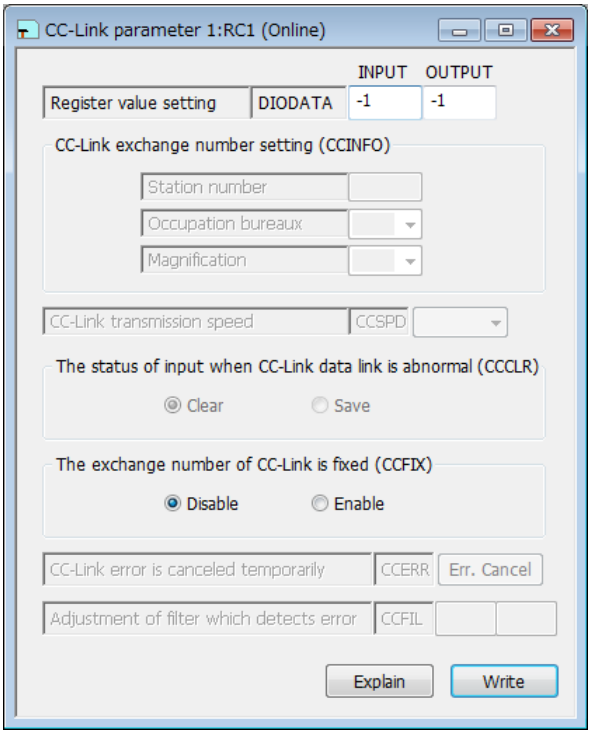
10.7.1. CC-Link parameter

Set the information of CC-Link in the robot controller. This function can be used with Version 1.3 or later of this software.

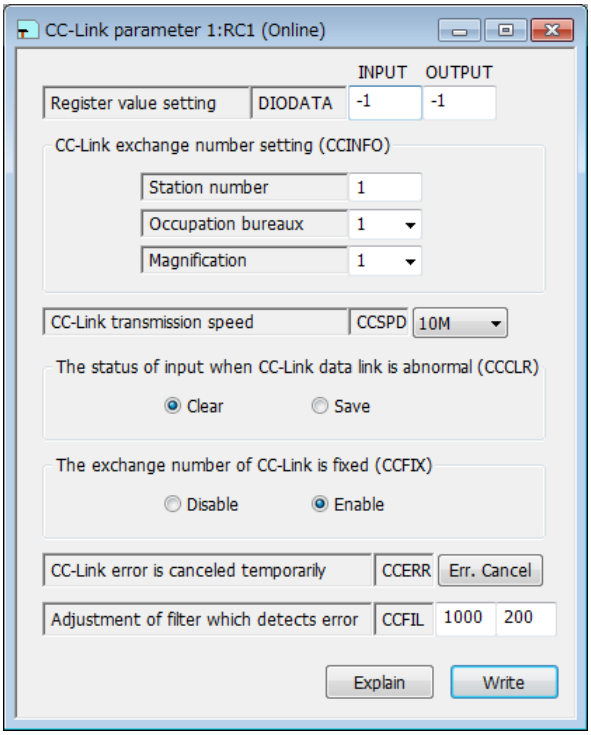
Caution

This function can only be used with a CRn-500 series or CRnD-700 series robot controller. Also, this function can not be used with CRnQ-700 series robot controller. If you use CRnQ-700 series robot controller, please set it with the software of the PLC.

Set parameters while connected to the robot controller.
From the project tree, double click the target project [Online] -> [Parameter] -> [Field network parameter] -> [CC-Link].
After you change the parameter value, you can rewrite the parameter in the robot controller by clicking the [Write] button.



CRn-500 series robot controller



CRnD-700 series robot controller

Figure 10-56 CC-Link parameter

You can reset the error of the CC-Link interface card by pressing the [Err. Cancel] button. After that the same error doesn't occur. It is valid while the power supply of the Robot Controller is ON. When the power supply is turned OFF, the error comes to occur.

You can reference explanations of displayed parameters by pressing the [Explain] button.

10.7.2. PROFIBUS parameter

Set the information of PROFIBUS in the robot controller. This function can be used with Version 1.3 or later of this software.

Caution

This function can only be used with a CRn-500 series or CRnD-700 series robot controller. Also, this function can not be used with CRnQ-700 series robot controller. If you use CRnQ-700 series robot controller, please set it with the software of the PLC.

Set parameters while connected to the robot controller.
From the project tree, double click the target project [Online] -> [Parameter] -> [Field network parameter] -> [PROFIBUS].
After you change the parameter value, you can rewrite the parameter in the robot controller by clicking the [Write] button.

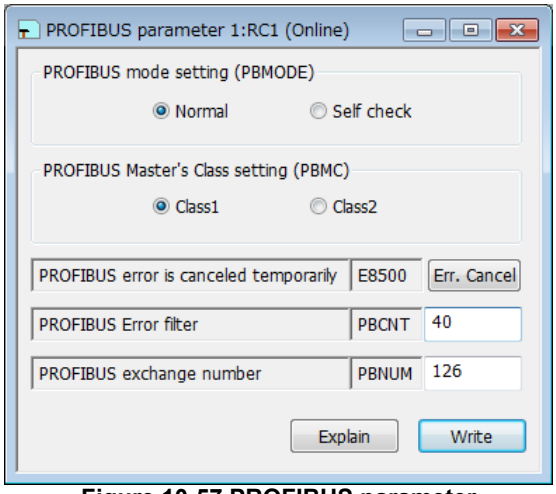


Figure 10-57 PROFIBUS parameter

You can reset the error of the PROFIBUS interface card by pressing the [Err. Cancel] button. After that the same error doesn't occur. It is valid while the power supply of the Robot Controller is ON. When the power supply is turned OFF, the error comes to occur.

You can reference explanations of displayed parameters by pressing the [Explain] button.

10.7.3. PROFINET parameter

Set the information of PROFINET in the robot controller. This function can be used with version 3.00A or later of this software.

Caution

This function can only be used with CR750-D/CRnD-700 series robot controller. Also, this function cannot be used with CR750-Q/CRnQ-700 series robot controller. If you use CR750-Q/CRnQ-700 series robot controller, please set it with the software of the PLC.

Set parameters while connected to the robot controller.
From the project tree, double click the target project [Online] -> [Parameter] -> [Filed network parameter] -> [PROFINET].
After you change the parameter value, you can rewrite the parameter in the robot controller by clicking the [Write] button.

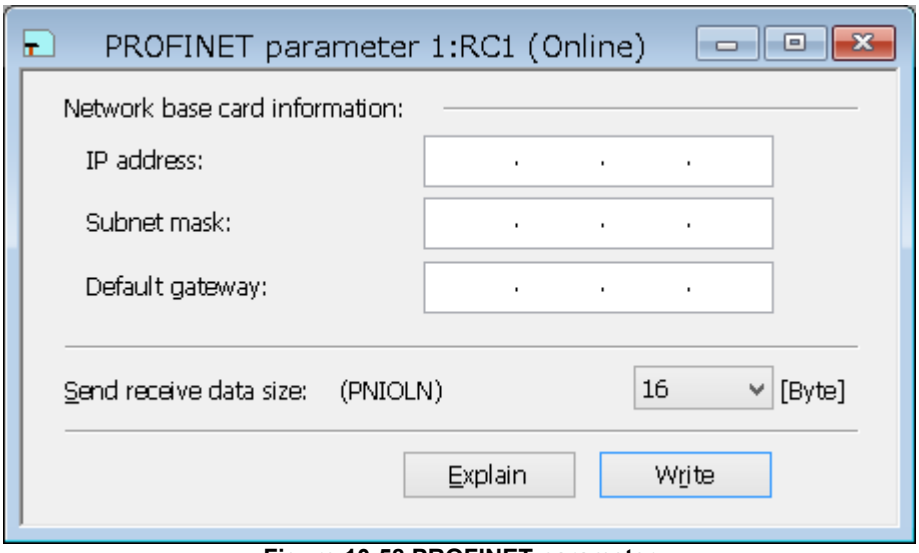


Figure 10-58 PROFINET parameter

You can reference explanation of displayed parameters by pressing the [Explain] button.

When the PROFINET IO 2-Port module is mounted, in “Network base card information”, contents of the option card information are displayed. When the module is not mounted, nothing is displayed.

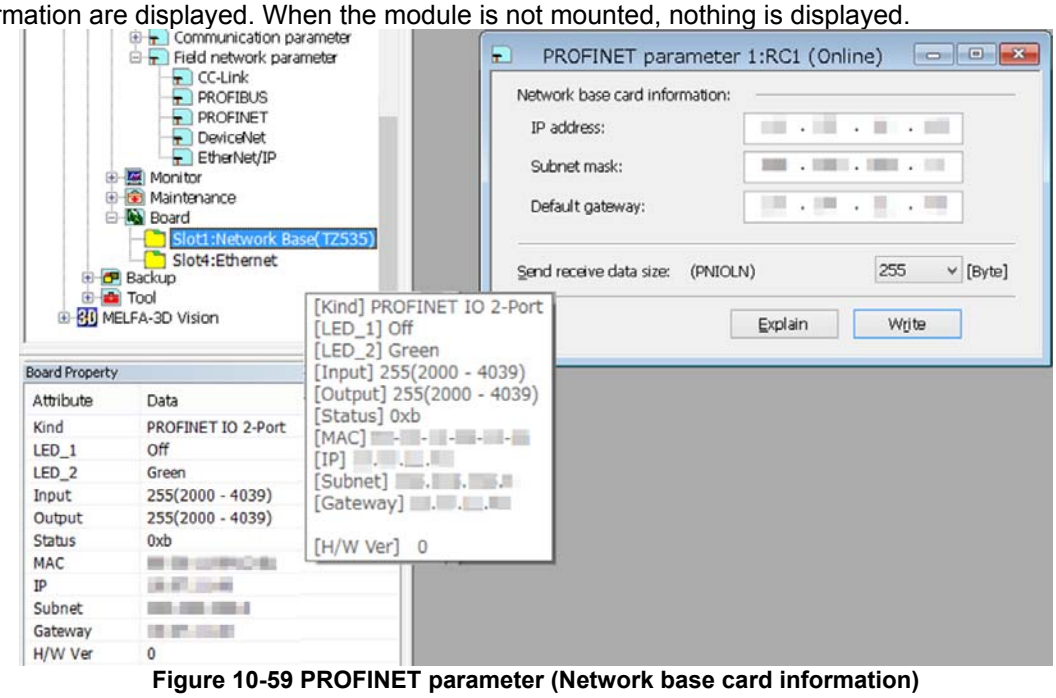


Figure 10-59 PROFINET parameter (Network base card information)

10.7.4. DeviceNet parameter

Set the information of DeviceNet in the robot controller. This function can be used with version 3.00A or later of this software.

Caution

This function can only be used with CR750-D/CRnD-700 series robot controller. Also, this function cannot be used with CR750-Q/CRnQ-700 series robot controller. If you use CR750-Q/CRnQ-700 series robot controller, please set it with the software of the PLC.

Set parameters while connected to the robot controller.
From the project tree, double click the target project [Online] -> [Parameter] -> [Filed network parameter] -> [DeviceNet].
After you change the parameter value, you can rewrite the parameter in the robot controller by clicking the [Write] button.

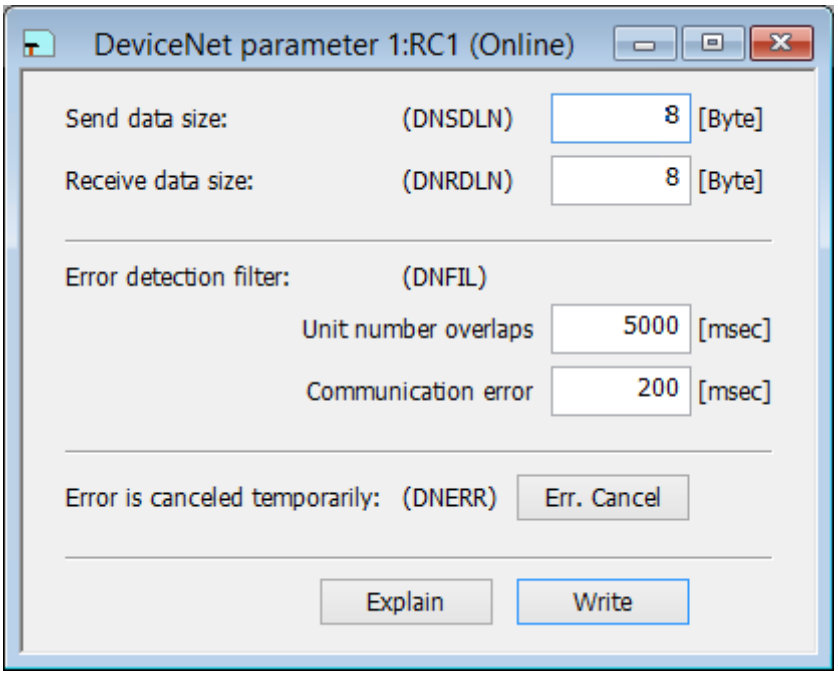


Figure 10-60 DeviceNet parameter

You can reset the error of the DeviceNet interface card by pressing the [Err. Cancel] button. After that the same error doesn't occur. It is valid while the power supply of the robot controller is ON. When the power supply is turned OFF, the error comes to occur.

You can reference explanation of displayed parameters by pressing the [Explain] button.

10.7.5. EtherNet/IP parameter

Set the information of EtherNet/IP in the robot controller. This function can be used with version 3.00A or later of this software.

Caution

This function can only be used with CR750-D/CRnD-700 series robot controller. Also, this function cannot be used with CR750-Q/CRnQ-700 series robot controller. If you use CR750-Q/CRnQ-700 series robot controller, please set it with the software of the PLC.

Set parameters while connected to the robot controller.
From the project tree, double click the target project [Online] -> [Parameter] -> [Filed network parameter] -> [EtherNet/IP].
After you change the parameter value, you can rewrite the parameter in the robot controller by clicking the [Write] button.

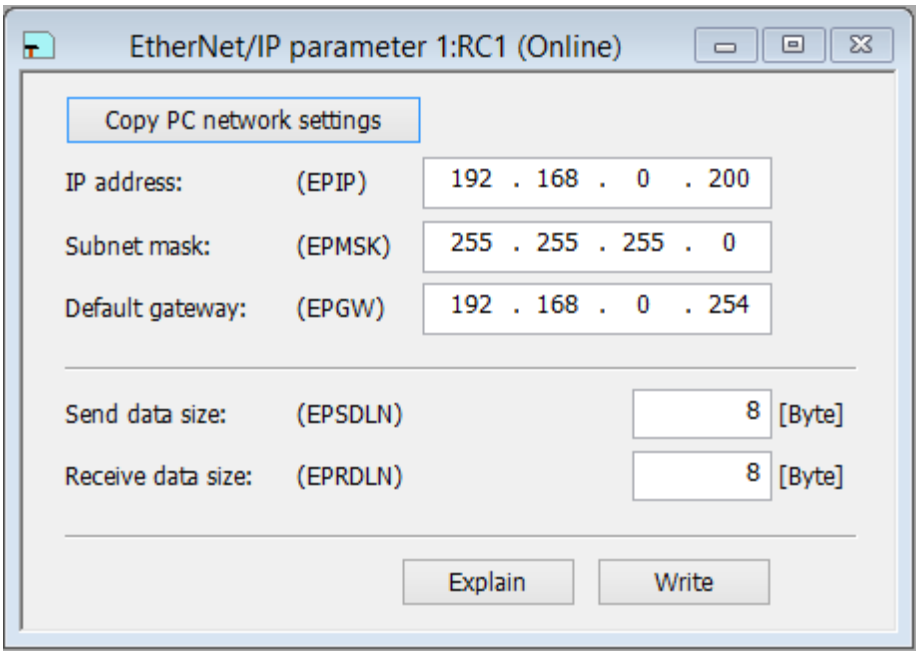


Figure 10-61 EtherNet/IP parameter

You can copy network settings of the computer to the screen by clicking the [Copy PC network settings] button.

You can reference explanation of displayed parameters by pressing the [Explain] button.

10.8. PLC Cooperation Parameters

10.8.1. Multiple CPU parameter

You can set the parameters related to the Multiple CPU to use the CR750-Q/CRnQ-700 series robot controller.
These parameters can be set when you are connected to CR750-Q/CRnQ-700 series robot controller.
This function is available from RT ToolBox2 Ver.1.1 or later.

Set parameters while connected to the robot controller.
From the project tree, double click the target project [Online] -> [Parameter] -> [PLC cooperation parameter] -> [Multiple CPU].
After you change the parameter value, you can rewrite the parameters in the robot controller by clicking the [Write] button.

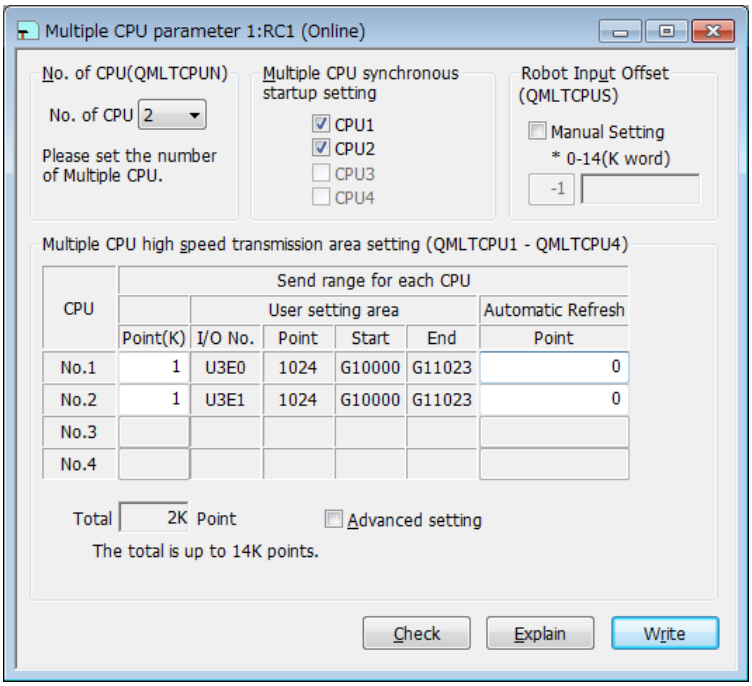


Figure 10-62 Multiple CPU parameter

You can reference explanations of displayed parameters by pressing the [Explain] button.
You can check the number of points input and range of total by pressing the [Check] button.

Please refer to the manual of Universal model QCPU (QCPU User's Manual (Multiple CPU System)) for details of Multiple CPU setting.

10.8.2. IO unit parameter

You can set information related to the I/O unit of the PLC.
Set parameters while connected to the robot controller.
This function can be used with Version 2.10L or later of this software.

Set parameters while connected to the robot controller.
From the project tree, double-click the target project [Online] -> [Parameter] -> [PLC cooperation parameter] -> [IO unit].

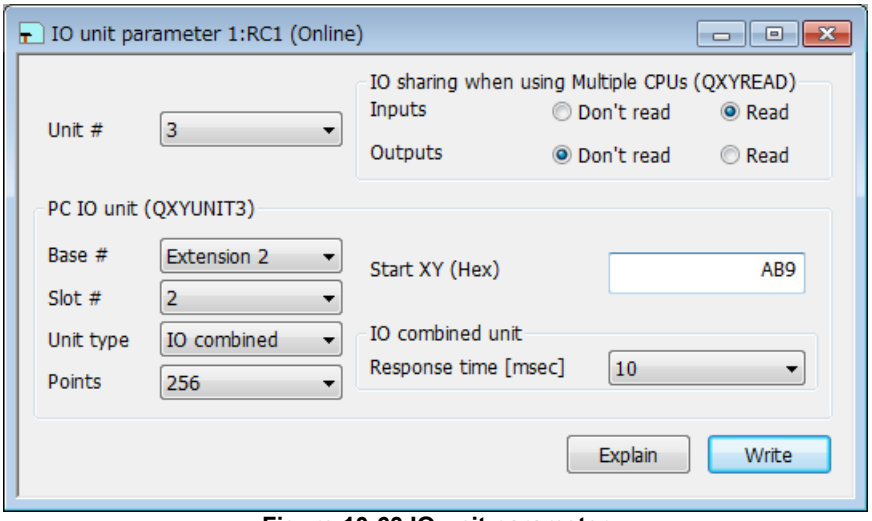


Figure 10-63 IO unit parameter

When a unit number in [Unit #] is specified, the parameter of the specified unit number is displayed in the PC IO unit.
In the [IO sharing when using Multiple CPUs], it is set up whether XY signals read or they don’t read

You can reference explanations of displayed parameters by pressing the [Explain] button.

After you change the parameter values, you can rewrite the parameters in the robot controller by clicking the [Write] button.

10.9. Parameter printing

You can print the parameter values held in a robot controller.

Display the parameters to print, then click on the menu bar [Workspace] -> [Print]. The print screen is displayed, so check the printer, then click the [OK] button. Printing starts.
Also, you can click on the menu bar [Workspace] -> [Print Preview] to look at the print image.

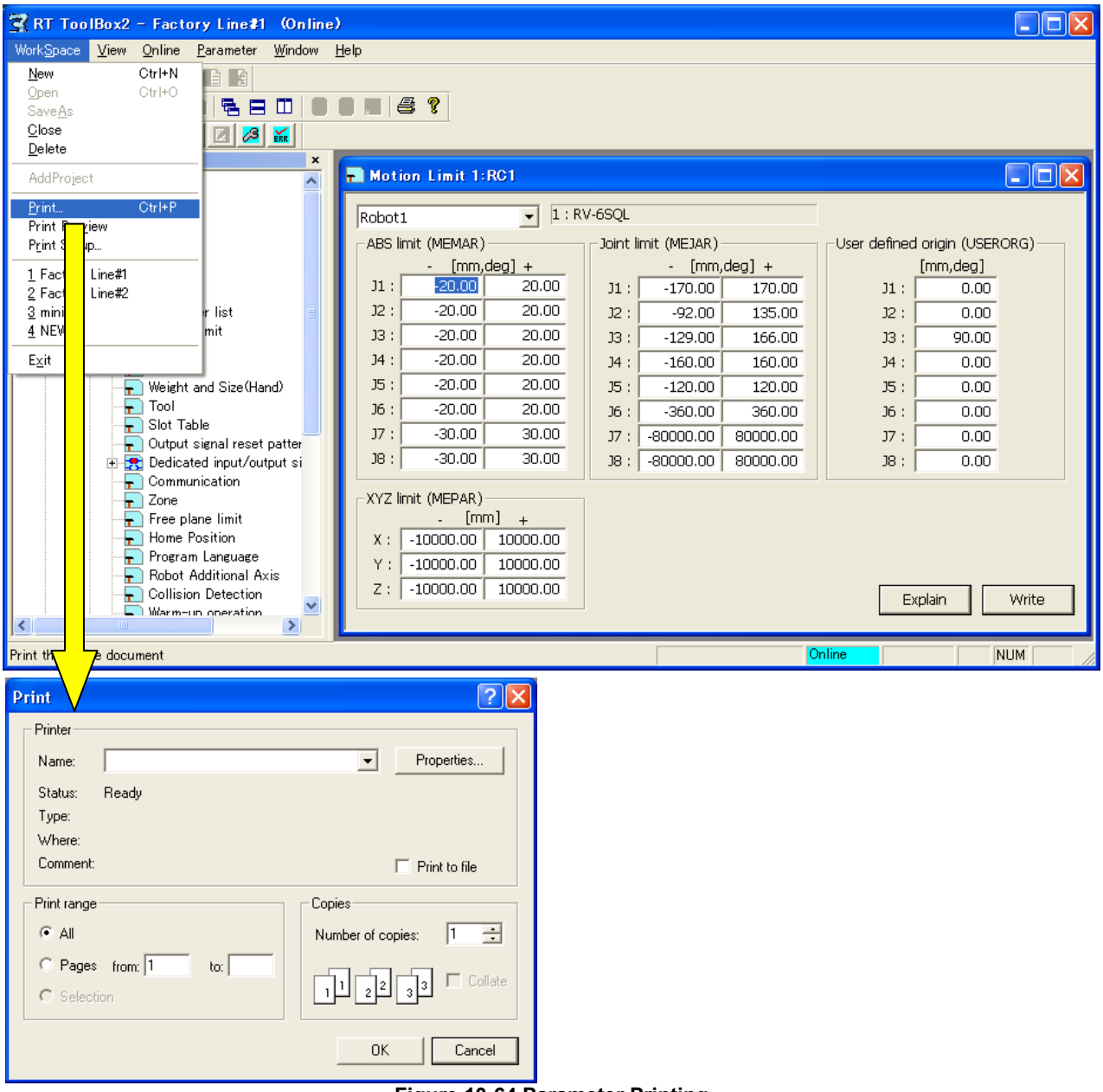


Figure 10-64 Parameter Printing

Caution

Install the printer beforehand.

Install the printer beforehand. For details on the installation method for the printer, refer to the operations manuals for your printer and computer.

It is possible to print only the parameter changed from initial value. This function can be used with Version 1.3 or later of this software. This function has the limitation in this software version and the software version of the connected controller. Please refer to the table as follows.

Table 10-10 Compliant version of this function and controller

	Robot controller		
	CR750-D/CRnD-700	CR750-Q/CRnQ-700	CRn-500
Software version of robot controller	Ver.P6 or later	Ver.N6 or later	not use

After selecting “Changed” in View group on the Parameter list screen, click [Workspace] -> [Print] on the menu bar. The screen for the print is displayed. Click [OK] button after confirming the printer. The print is begun.

Moreover, you can see the print image by clicking [Workspace]->[Print Preview] on the menu bar.

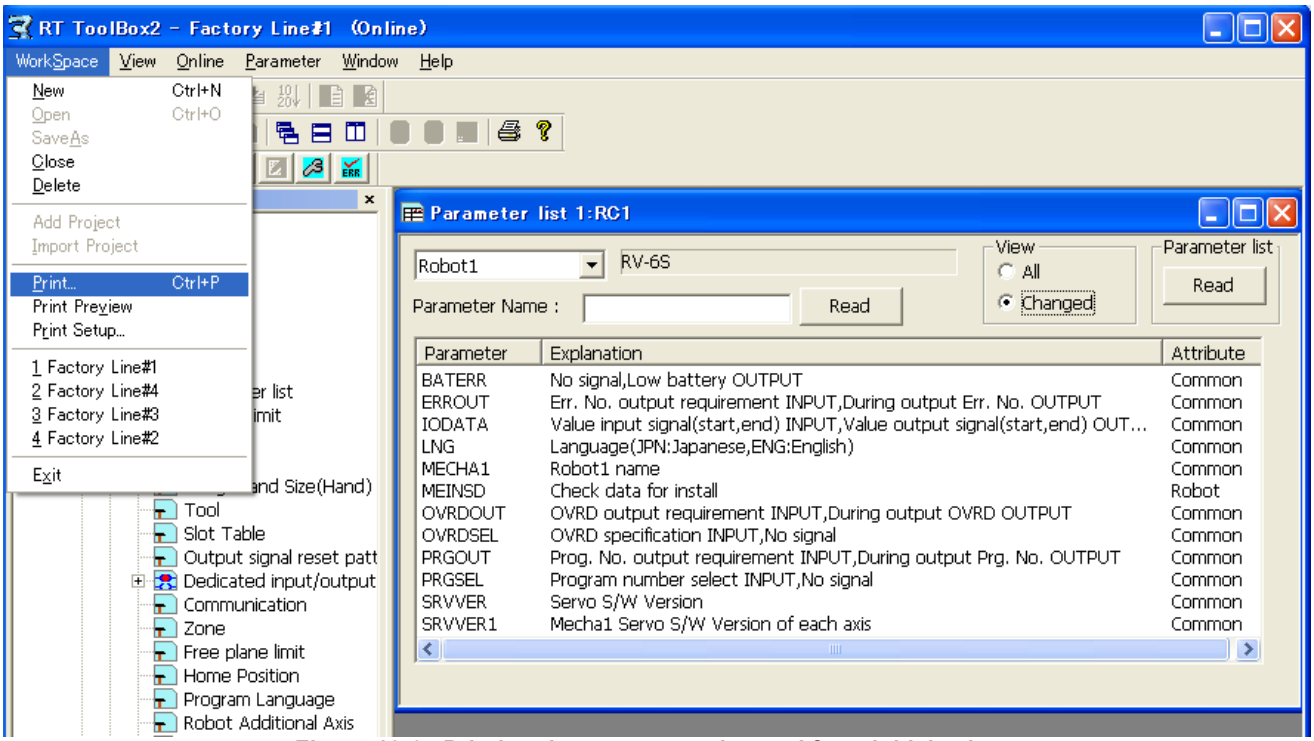


Figure 10-65 Printing the parameter changed from initial value

10.10. Offline editing of parameters

It is possible to make newly the parameters of robot and preserve them in the file without connecting this software to the robot controller. The file which read to the personal computer by the batch backup or the parameter backup can be edited directly, and it can be edited by copying.

The file of these parameters edited by offline can be written to the robot controller by using the restoration function.

This function can be used with the software Ver.1.4 or later. However, the function of restoring this parameter file to the robot controller can be used with the software Ver.1.1 or later.

10.10.1. Compliant version

The version of the robot controller and this software that corresponds to the offline editing of the parameter is as follows.

Table 10-11 Compliant version of the robot controller

	Subject robot controller	Compliant version
1	CR750-D/CRnD-700 series	Ver.P6k or later
2	CR750-Q/CRnQ-700 series	Ver.N6e or later
3	CRn-500 series	Ver.K9 or later

Table 10-12 Compliant version of this software

	Function	Version of RT ToolBox2
1	Offline editing	Ver.1.4 or later
2	The parameter file made by the offline editing is restored by the backup and the restoration function.	Ver.1.1 or later

⚠ Caution

Please use Ver.1.1 or later of this software,
if you restore the parameter edited by offline.

It is possible to restore the parameters edited by offline in the function of backup/restore. The robot controller might not operate correctly, if the parameters edited without connecting the robot controller were restored with the software earlier than Ver.1.1. Please use this software Ver.1.1 or later to restore the parameter edited without connecting the robot controller.

10.10.2. Creating the new parameter file

For creating the new parameter file, select [Offline] -> [Parameter], then click the right mouse button.
The right button menu is displayed, so click [New].

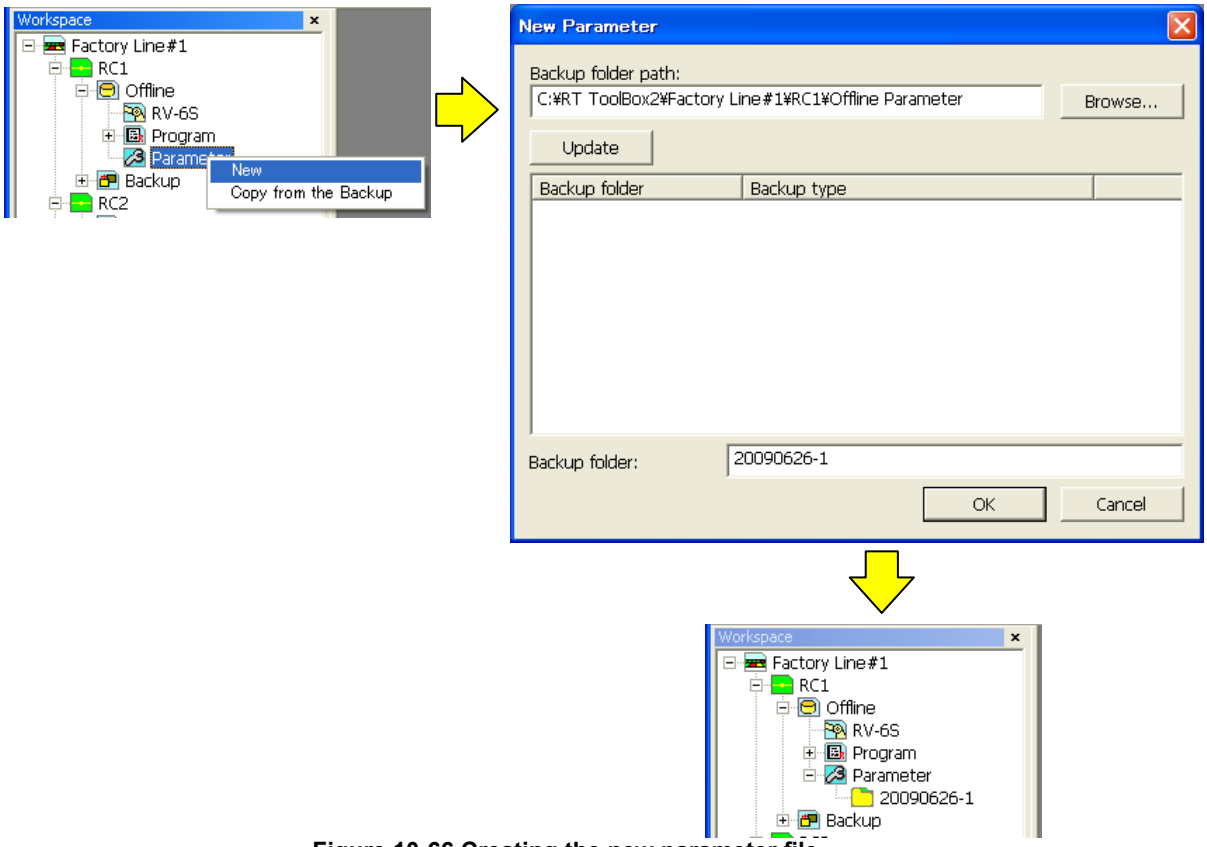


Figure 10-66 Creating the new parameter file

After inputting the backup folder name, click the [OK] button.
Please refer to **"10.10.4 Offline editing of parameter"** for the edit of the parameter.

⚠ Caution

Folder in which Parameter edited by offline are preserved.

Because the parameter is composed of some files, the parameter edited by offline is preserved in one folder.

The folder where the parameter files is stored in follows:

/Workspace folder/project name/Offline Parameter

Please change [Place of the backup folder] with the reference button when preserving it in a place other than the above.

10.10.3. Edit of parameter backed up

It is not possible to edit directly the parameter files read to the personal computer by "All files" or "Parameter" of the backup function. Please edit these parameter files after copying them by "Copy from the Backup". The folder of the same name is made under [Offline]->[Parameter] in the project tree when it is copied.

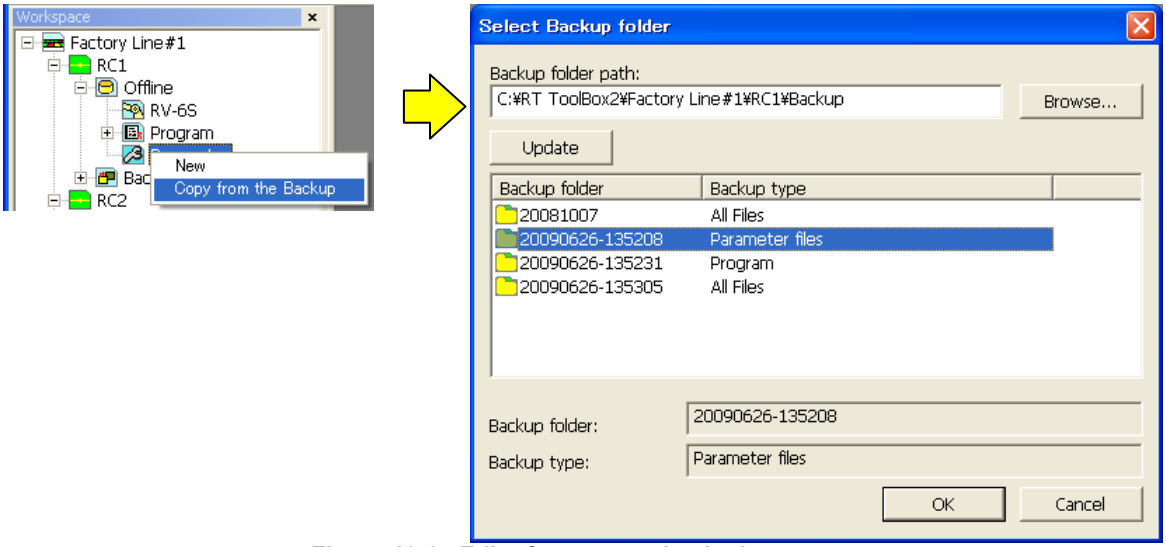


Figure 10-67 Edit of parameter backed up

Please refer to **"10.10.4 Offline editing of parameter"** for the edit of the parameter.

10.10.4. Offline editing of parameter

When the parameter file for the offline editing is made by "10.10.2 Creating the new parameter file" or “10.10.3 Edit of parameter backed up”, the file name is displayed in "Parameter" of the project tree. Select the edited parameter folder, and click the right mouse button. Select the parameter to edit with the mouse. Please refer from "10.1 Editing from parameter list" to "10.7.2 PROFIBUS parameter" for the setting method of each parameter.

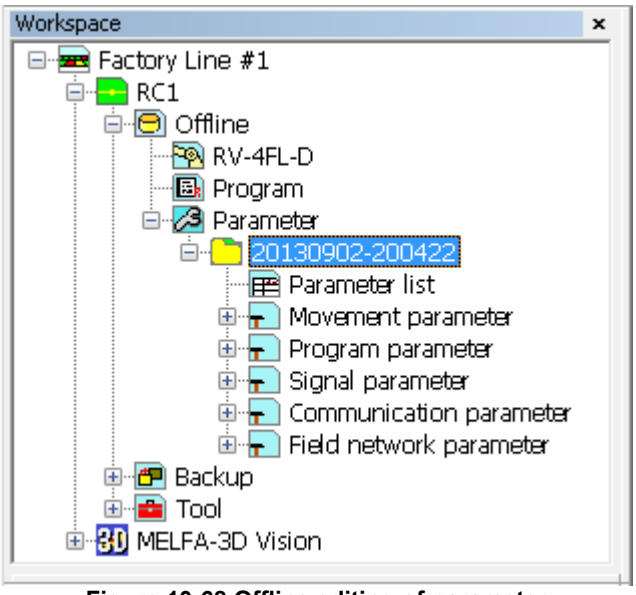


Figure 10-68 Offline editing of parameter

When the parameter was set outside the range of the value, it is not written in the file and it makes an error.

⚠ Caution

About Offline editing of parameter screen.

You cannot use a function which gets information from Robot controller such as instruct Button in the offline editing of parameter screen.

10.10.5. Restoring the edited parameter to the robot controller

Open the target parameter in the project tree with [Offline] -> [Parameter], and select the parameter folder, and then click the right mouse button. The right button menu is displayed, so click [Restore]. After the restore window is displayed, confirming the model of the robot and restore them.

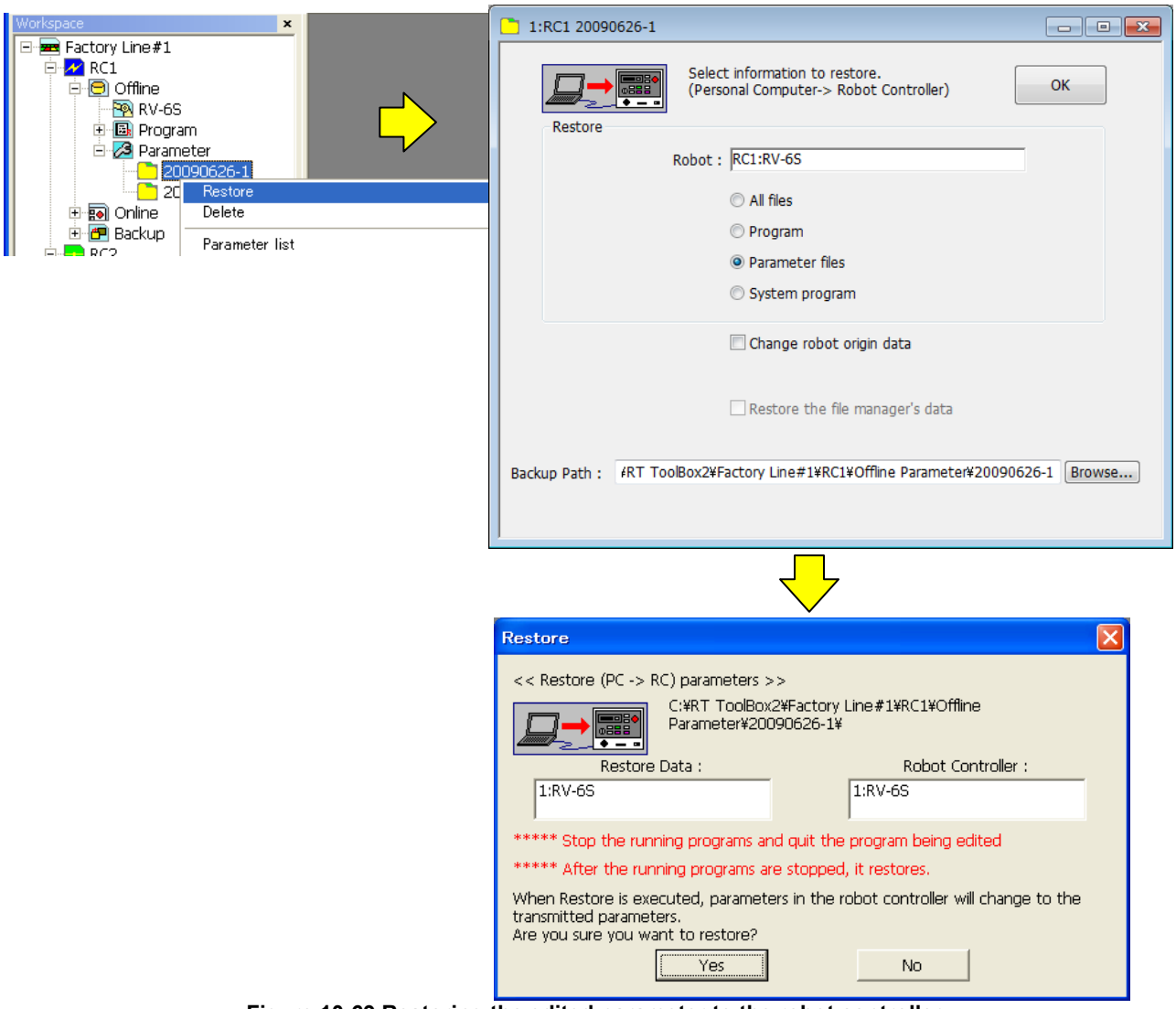


Figure 10-69 Restoring the edited parameter to the robot controller

⚠ Caution

All parameters in the robot controllers are changed, when the parameters edited by offline are restored.

All parameters in the robot controllers are changed, when the parameters edited by offline are restored. These parameters are initialized when the parameters set beforehand in the robot controller is not in the file edited by offline.

Moreover, it is possible to restore the edited parameter by using the restoration function of the backup. Select [Online]->[Backup] in the project tree, and click the right mouse button. The right button menu is displayed, so click [Restore]. After changing "Backup path" to the parameter folder edited by offline, restore them. The folder for the offline editing is as follows.

Workspace folder/project name/Offline Parameter

However, this function can be used with the software Ver.1.1 or later.

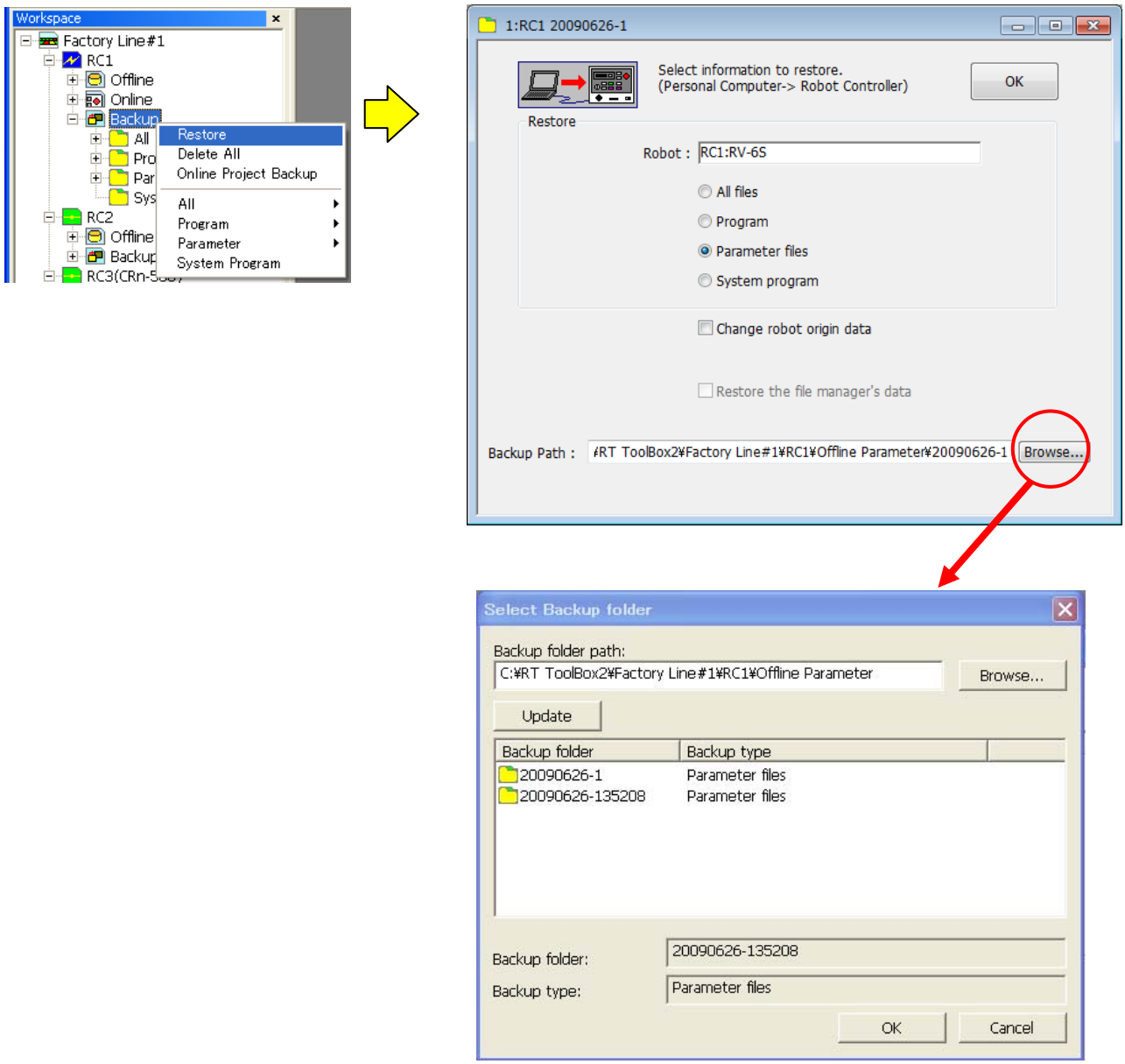


Figure 10-70 Restoring of parameter file by using backup function

10.10.6. Deletion of parameter folder edited by offline

Open the target parameter in the project tree with [Offline] -> [Parameter], and click the right mouse button. The right button menu is displayed, so click [Delete]. The delete contribution is displayed.

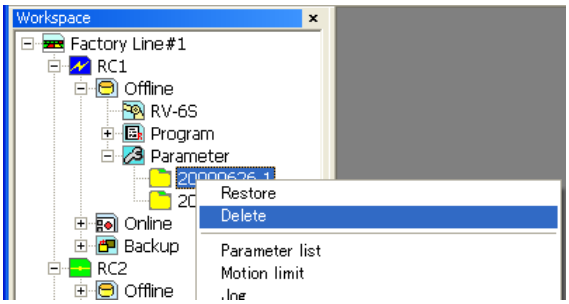


Figure 10-71 Deletion of parameter folder edited by offline

Caution

You can not delete the parameter files being edited currently.

It is not possible to delete the parameter folder when as much as one screen for the offline editing is opened. In that case, the error is displayed.

Caution

Once the parameter folder is deleted,
it cannot be recovered.

11.Status Monitoring

You can set various information in the currently connected robot controllers to be constantly displayed.
The monitor functions are roughly divided into the following three.

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.

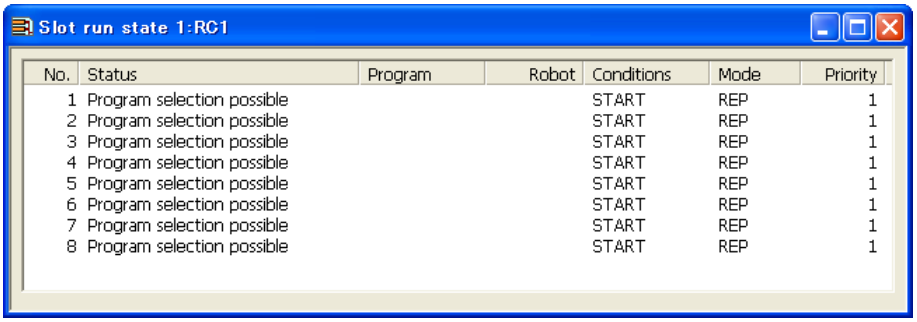
Table 11-1 Summary of Each Monitor

	Monitor name	Explanation
Robot movement monitor	Slot run state	The operation state of each slot 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.
	Movement State	The current position information and hand open/close state of each connected mechanism can be confirmed.
	Error	The currently occurring error can be confirmed. The history of the errors that have occurred can be confirmed.
	3D Monitor	You can display the robot and its movements in 3D to check them.
Signal monitor	General signals	You can check the statuses of signals input to the robot controller from outside equipment and signals output from the robot controller to outside equipment. Pseudo-input and forced output of signals are also possible.
	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).
	Stop signal	The stop signal input into the robot controller can be confirmed.
	Registers (CC-Link)	You can monitor the input registers and output registers for the CC-Link functions. Pseudo-input and forced output of registers are also possible.
	IO unit monitor	You can monitor XY devices of IO unit.
Operating 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.

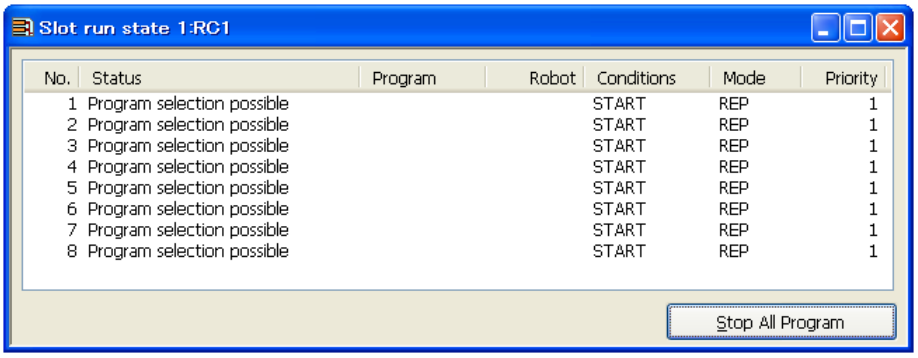
11.1. Robot Operation Monitoring

11.1.1. Slot operation status

The state of the slots in the robot controller can be monitored.
From the project tree, double click the target project [Online] -> [Monitor] -> [Movement Monitor] -> [Slot Status].
It is possible to stop All slots for which the start condition is "ALWAYS" by clicking [Stop All Program] button with Version 1.6 or later of software.
It is necessary to stop all slots to edit the program for which the start condition is "ALWAYS".



Version 1.5.1 or earlier



Version 1.6 or later

Figure 11-1 Slot Run Status

The No. of displayed slots is determined with the parameters.

11.1.2. Program monitoring

Information on the running program can be monitored.
From the project tree, click the target project [Online] -> [Monitor] -> [Movement Monitor] -> [Program Monitor], then double click the "Task slot" to monitor.

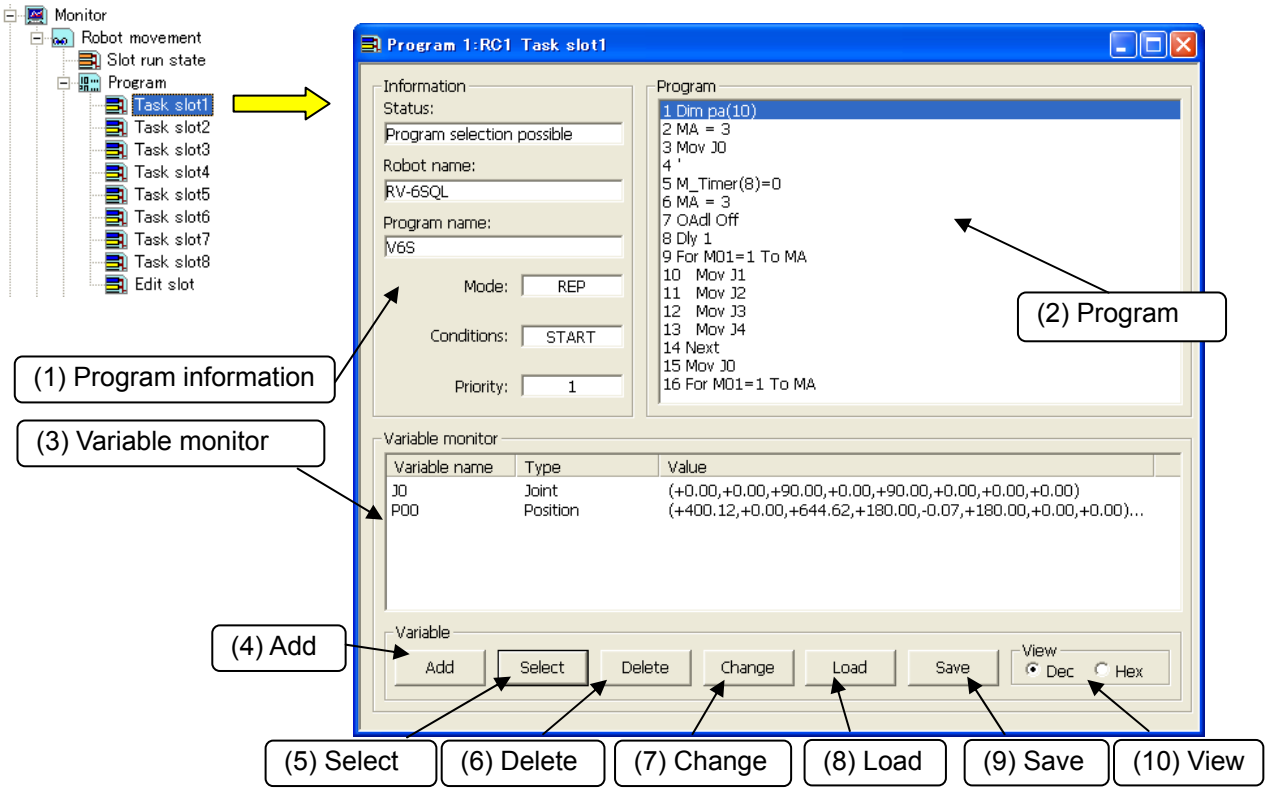


Figure 11-2 Program monitor

(1) Program information
You can check the currently selected program name and operation status and the name of the currently connected robot model.

(2) Program
The currently selected program is displayed. The currently executing line is displayed inverted.

(3) Variable monitor:
You can check the names of variables being used in the selected program. You can select the variables to monitor with the buttons displayed at the bottom of the screen.

(4) Adding variables

This adds more variables to monitor.

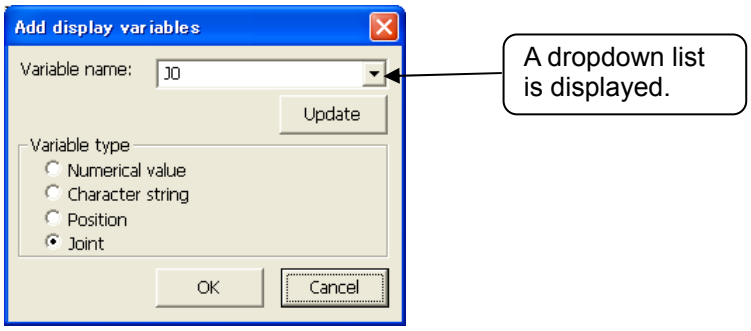


Figure 11-3 Add Variables

Input the variable name or select it from the dropdown menu, set the variable type, then click the [OK] button.

The variables being used in the program are displayed in a dropdown list. When you select variables from the dropdown list, the variable type is automatically selected.

(5) Selecting variables

You can batch select variables to monitor from the variable list used in the program.

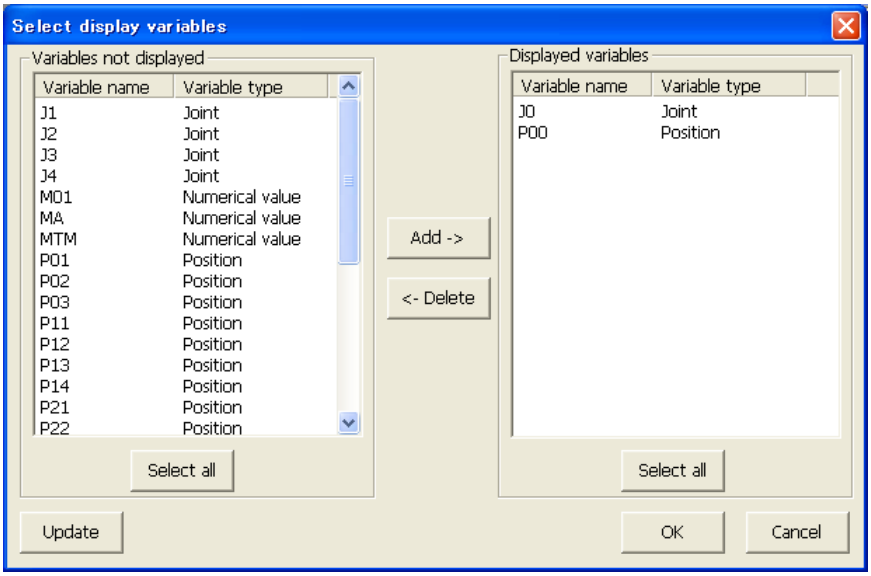


Figure 11-4 Variable Selection

The "variables not to display" are displayed in the list on the left side and the "variables to display" are displayed in the list on the right side. From the "variables not to display" list, select the variables to monitor, then click the [Add->] button. The selected variables are added to the "variables to display" list. If you select variables from the "variables to display" list, then click the [<-Delete] button, the selected variables are deleted from the "variables to display" list and added to the "variables not to display" list.

When you click the [OK] button, the variables registered in the "variables to display" list are displayed on the variables monitor and you can reference their values.

(6) Deleting variables

This deletes variables registered on the variables monitor from the monitor list. This operation does not delete the variables themselves from the program.

(7) Changing variables

You can change the values of variables registered on the variables monitor.

On the variables monitor, select the variables to change the values, then click the [Change] button.

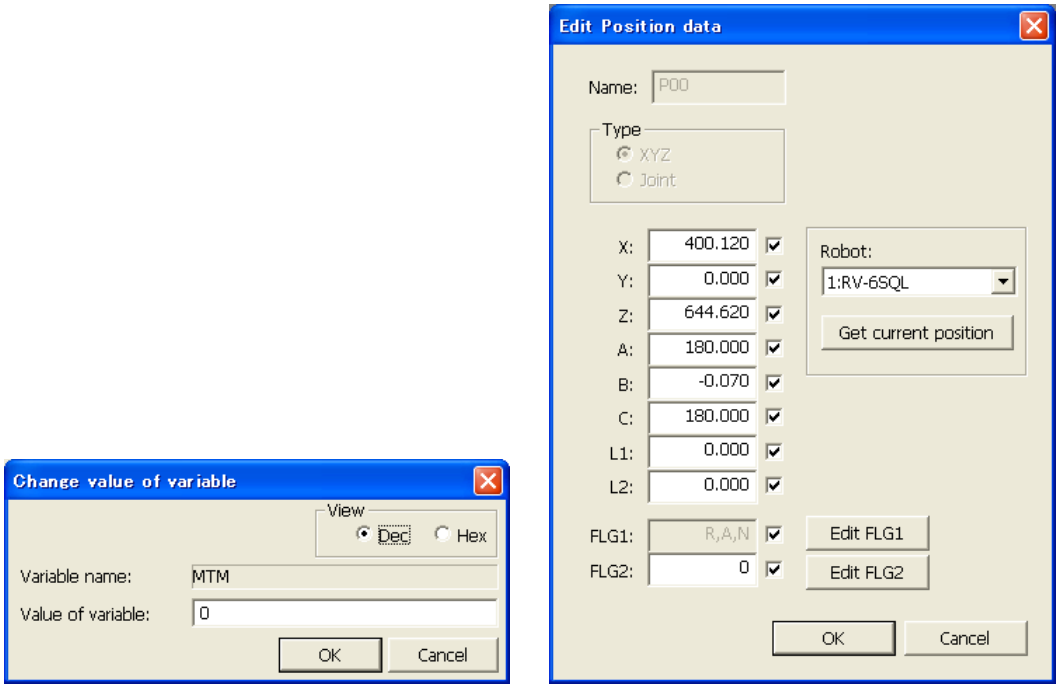


Figure 11-5 Changing Variable Values

After confirming the variable name, input the value of the variable, then click the [OK] button.

⚠ Caution

Be careful when changing the value of a variable.

When you change the value of a variable, the operation target position of the robot may change and result in a collision. This is particularly dangerous during robot operation, so check carefully before changing the value of a parameter.

(8) Load

You can load variables to be monitored on the variables monitor from a file.

When you click the [Load] button, you can load variable names and variable types and add them as variables to be monitored.

(9) Save

You can save as a file a list of the variables being monitored on the variables monitor.

When you click the [Save] button, you can save the names, types, and values of the variables currently being monitored into a file. This file is saved in text format.

(10) View

You can switch the values of the variables displayed on the variables monitor between hexadecimal display and decimal display.

The variables that can be displayed in hexadecimal, see below.

Table 11-2 16Variables that can be displayed in Hexadecimal

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.

11.1.3. Movement status

You can check the robot current position, destination position, hand open/close status, etc.

* Destination position corresponds with RT ToolBox2 Ver1.1 or later.

From the project tree, double click the target project [Online] -> [Monitor] -> [Movement Monitor] -> [Movement Status].

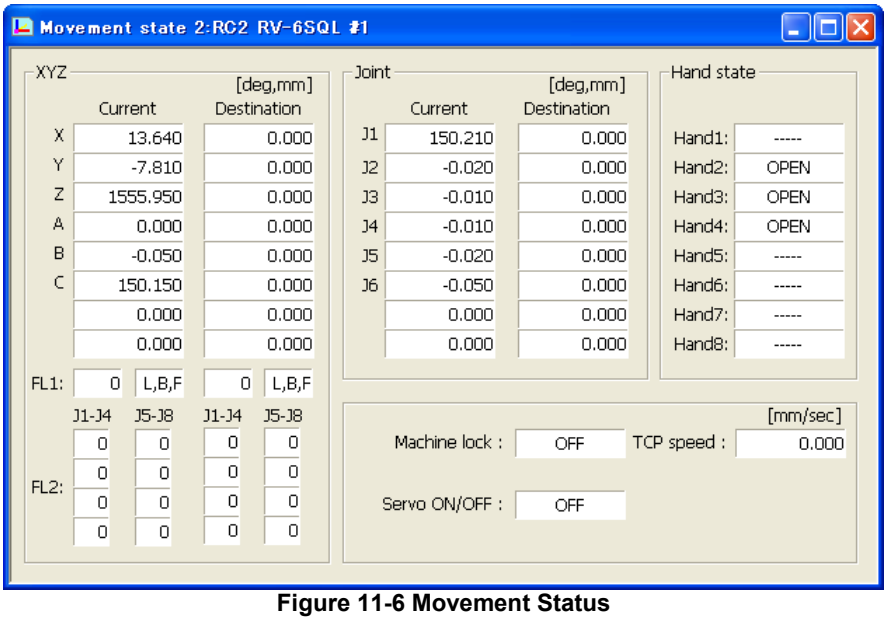


Figure 11-6 Movement Status

11.1.4. Errors

The errors currently occurring in the robot controller are displayed.

11.1.4.1. Referencing the current error

From the project tree, double click the target project [Online] -> [Monitor] -> [Movement Monitor] -> [Error].

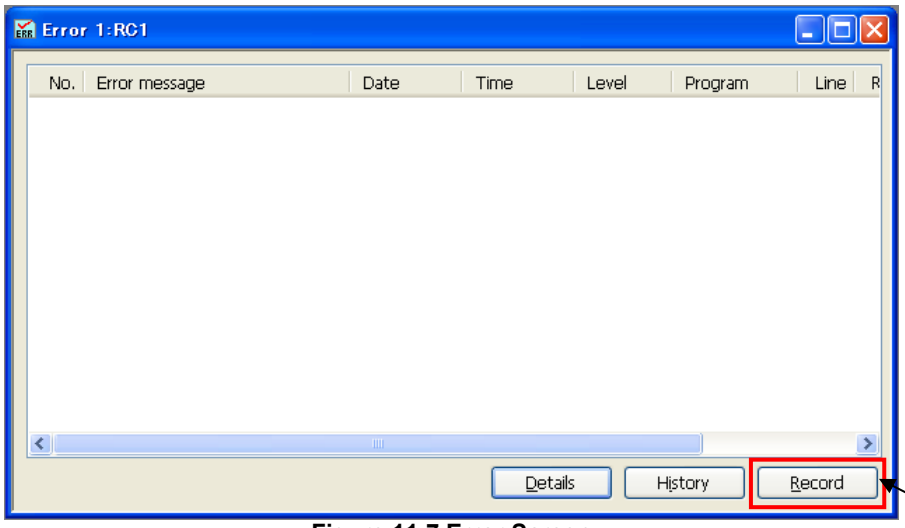


Figure 11-7 Error Screen

[Details] You can check details (cause and recovery method) on errors.
[History] You can reference the history of errors that have occurred.
[Record] You can reference the record of errors that have occurred. Note that this function can be used with Version 1.7 or later of this software and with Version R1j/S1j or later of. connected controller.

11.1.4.2. Details

You can check details (cause and recovery method) on errors. On the error screen, select an error, then either click the "Details" button or double click the error.

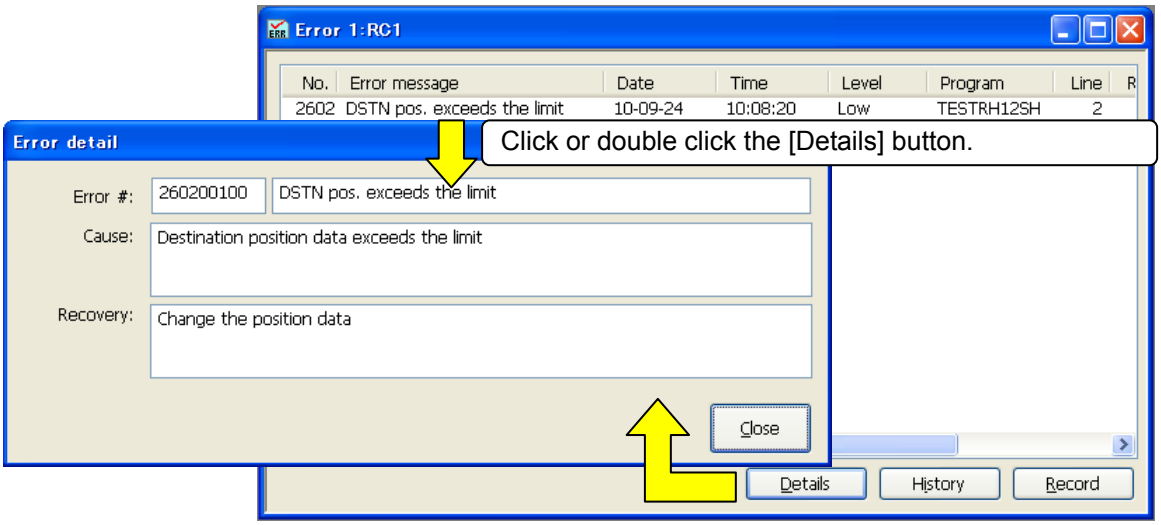


Figure 11-8 Error Details Screen

11.1.4.3. History information

The history of errors that have occurred in the past can be referred to.
You can check the error history in the robot controller for each error level (high level, low level, caution). You can also save the error history into a file.

Click the [History] button. After selecting the level to reference, click the [OK] button.

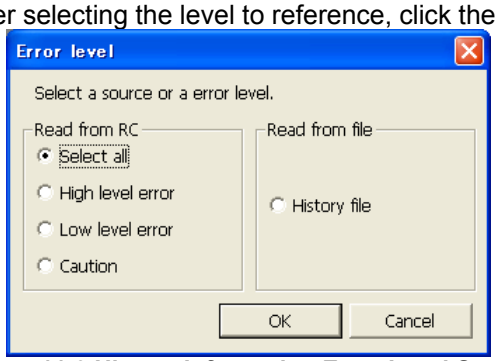


Figure 11-9 History Information Error Level Setting

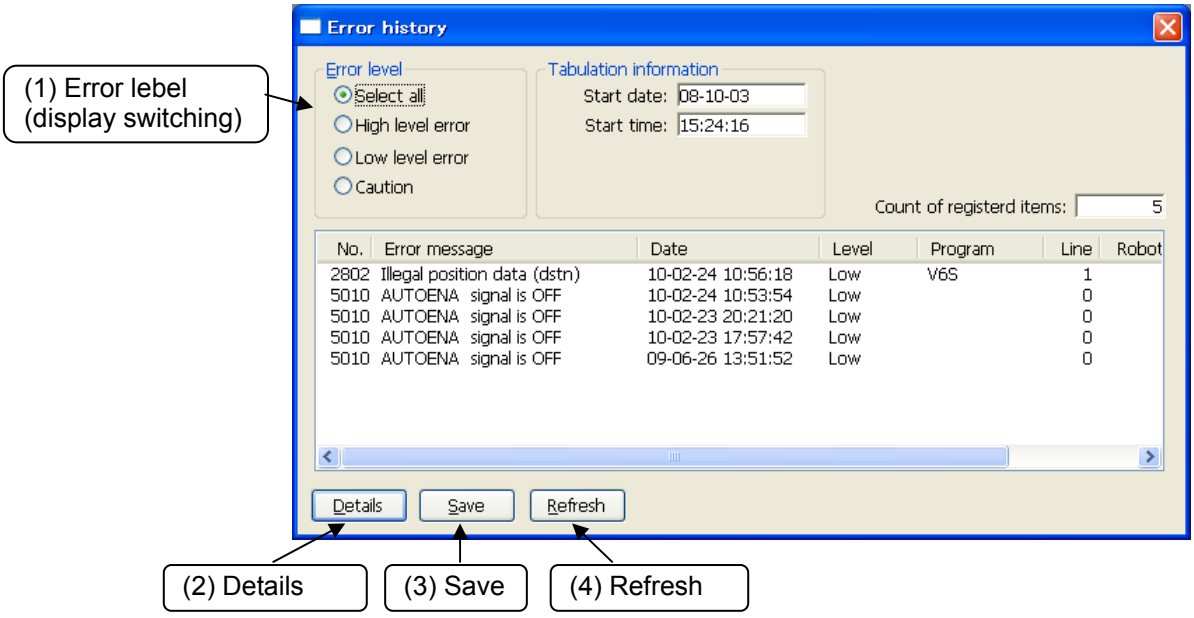


Figure 11-10 Error History

This display is not constantly displayed. To refresh information, click the [Refresh] button.

(1) Error level (display switching)
You can redisplay the displayed error history for each error level.

(2) Details
After selecting a displayed error, you can check the cause and recovery method for the error by clicking this button.
You can also check details by double checking a displayed error.

(3) Save
This saves the displayed error history information into a file. For the saved error history information, select "Read from file" with **"Figure 11-9 "**. Refer to **"Figure 11-11 "** on the screen, after you selected “From history file”.
This file is saved in text format. You can also print it with Notepad or other general text editors.
The file name of the error history file is set by, "Controller's serial number"_"Present data"_"Present time".

Example of file name: AR0703001_20100924_092623.txt

(4) Refresh
If you refresh error history, click the [Refresh] button.

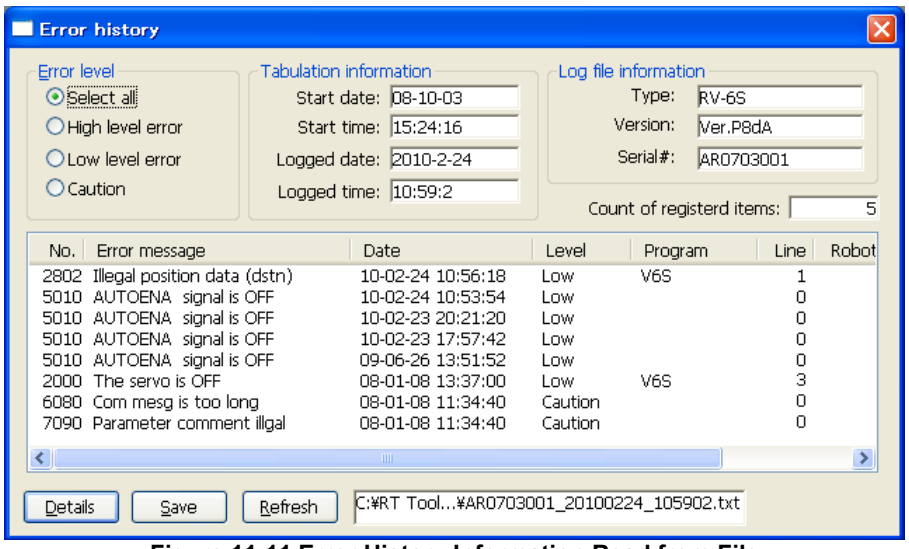


Figure 11-11 Error History Information Read from File

11.1.4.4. Record information

The record of errors that have occurred in the past can be referred to.
You can check the error record in the robot controller for each error level (high level, low level, caution). You can also save the error record into a file.

⚠ Caution

Timing from which error information is registered in error record

When you reset the error, error information is registered in the robot controller's error record file.
Please note that the occurring error is not registered in error record when the power supply is turned off without doing error reset.

The software version of the controller which can use this function is as follows.

Controller	S/W Ver. of the controller
CR750-D/CRnD-700	Ver.S1j or later
CR750-Q/CRnQ-700	Ver.R1j or later

Click the [Record] button. After selecting the level to reference, click the [OK] button.

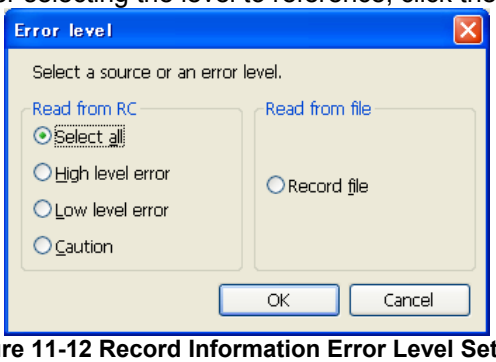


Figure 11-12 Record Information Error Level Setting

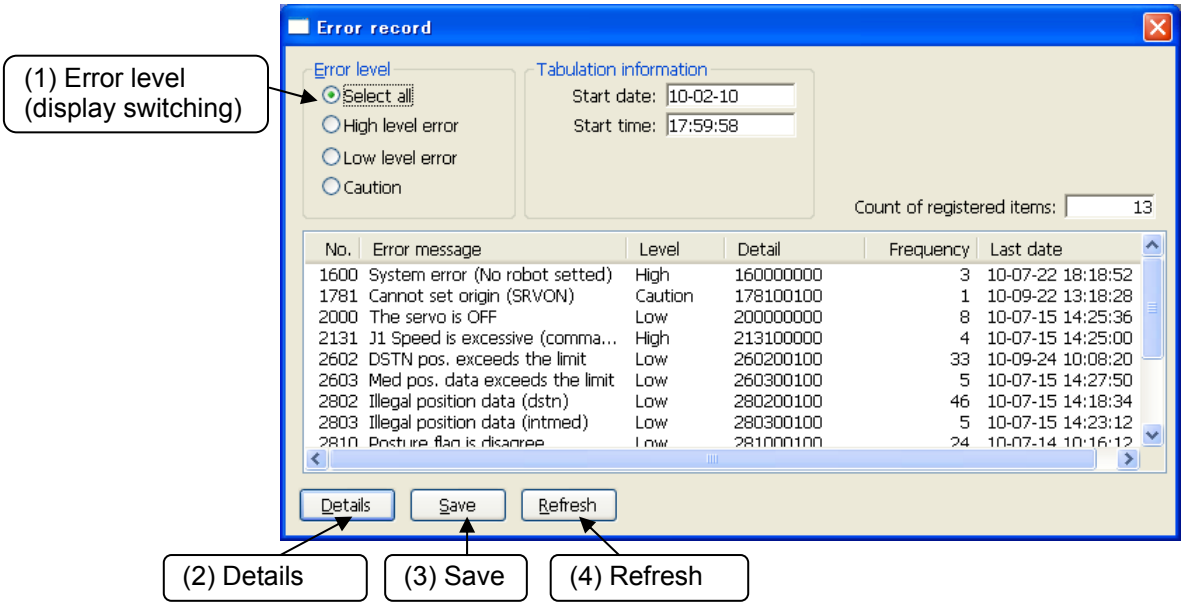


Figure 11-13 Error record

This display is not constantly displayed. To refresh information, click the [Refresh] button.

(1) Error level (display switching)
You can redisplay the displayed error record for each error level.

(2) Details

After selecting a displayed error, you can check the details of occurred history of the selected error can be confirmed.

You can also check details by double checking a displayed error.

However, detailed information cannot be confirmed when reading from the error record file.

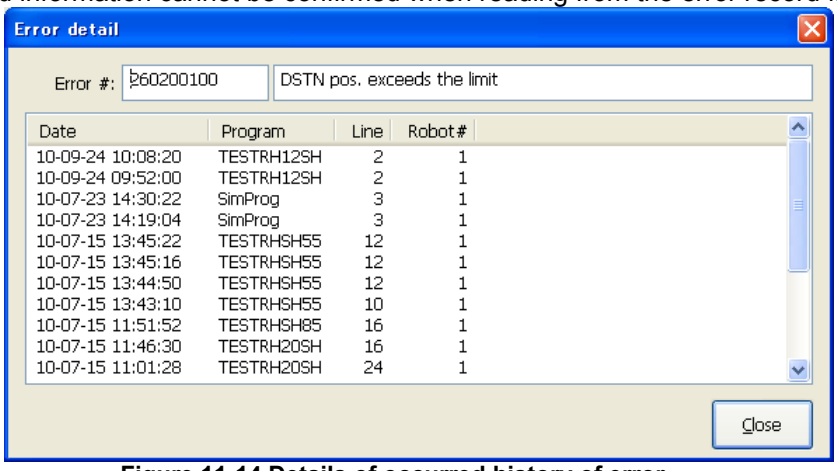


Figure 11-14 Details of occurred history of error

(3) Save

This saves the displayed error record information into a file. For the saved error record information, select "Read from file" with **"Figure 11-9** ". Refer to **"Figure 11-15"** on the screen, after you selected “From record file”.

This file is saved in text format. You can also print it with Notepad or other general text editors.

The file name of the error record file is set by, "Controller's serial number"_"Present data"_"Present time"_”Character string that shows error record, "REC".”.

Example of file name: AR0703001_20100924_092623REC.txt

(4) Refresh

If you refresh error record, click the [Refresh] button.

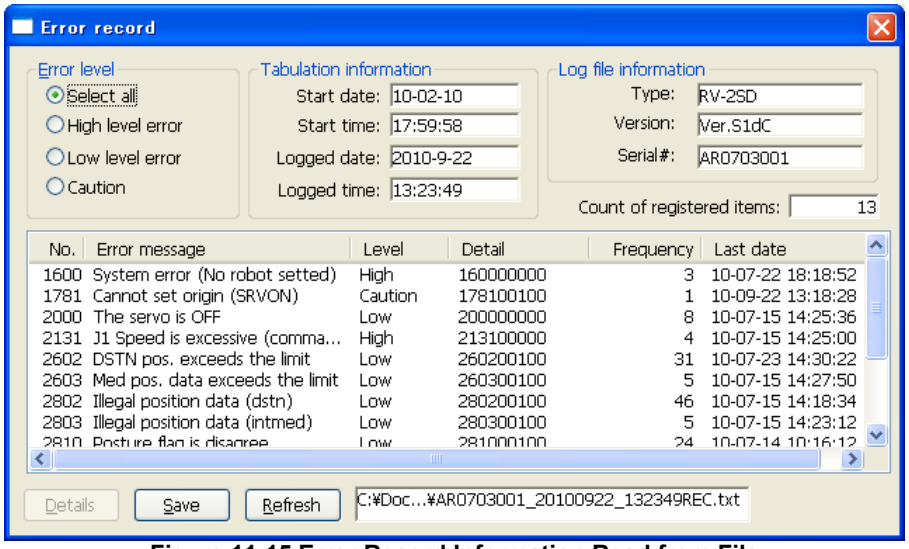


Figure 11-15 Error Record Information Read from File

11.1.5. 3D Monitor

You can display the robot and its movements in 3D to check them.
From the project tree, either double click the target project [Online] -> [<Robot model name>] or select [3D Monitor] with the mouse right button menu. The robot 3D display screen is displayed. If the "display travel table setting" is made for the project, the travel table is also displayed.

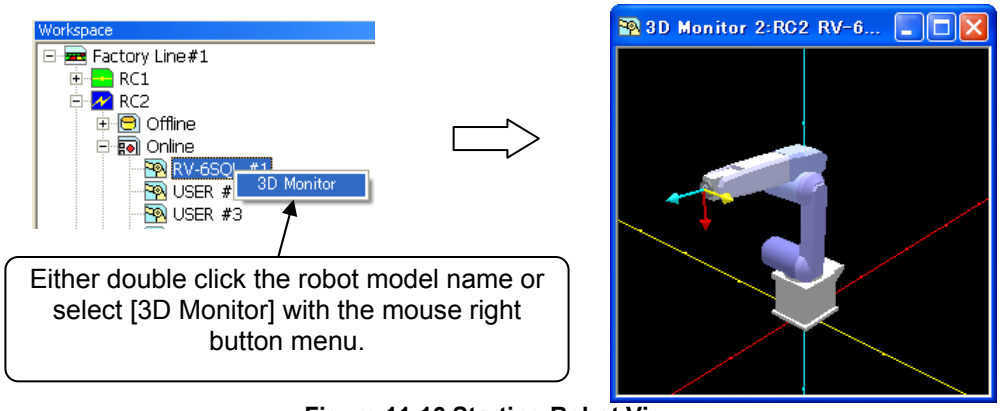


Figure 11-16 Starting Robot View

You can change the robot view perspective with mouse operation.

Table 11-3 Robot View Perspective Change Operation

Perspective to change	Graphic mouse operation
Perspective rotation	While clicking the left button, move left/right→ Rotation around Z axis Move up/down→Rotation around X axis Move left/right while clicking the left + right buttons→ Rotation around Y axis
Perspective movement	Move up/down/left/right while clicking the right button
Graphic enlargement/reduction	Move up/down/left/right while clicking pressing [Shift] key and clicking the left button A similar operation can be used by the mouse wheel with Version 3.01B or later of this software.

You can change the enlargement/reduction mode with the following buttons of the toolbar, with Version 3.01B or later of this software.

Table 11-4 Change the enlargement/reduction mode in robot view

Button	Explanation of enlargement/reduction mode
	If you select this button, enlargement/reduction toward origin to the Robot View.
	If you select this button, enlargement/reduction toward screen center to the Robot View.

The change of the enlargement/reduction mode is applied in the operation of the following screens too.
- 10.3.15.1Collision avoidance area parameter
- 16.3.11Hand

11.2. Signal Monitoring

11.2.1. General signal

You can check the statuses of signals input to the robot controller from outside equipment and signals output from the robot controller to outside equipment.

From the project tree, double click the target project [Online] -> [Monitor] -> [Signal Monitor] -> [General Signals].

The upper level displays the status of input signals and the lower level displays the status of output signals.

A continuous range of signals to display can be set freely with [Monitor Settings].

Pseudo-input and forced output of registers are also possible.

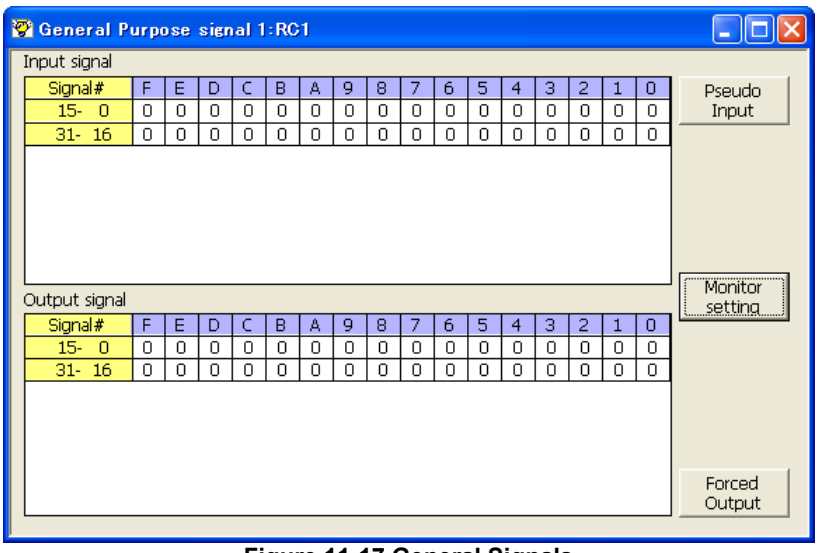


Figure 11-17 General Signals

11.2.1.1. Monitor settings

For the displayed signals, the continuous range can be set freely.

Set the lead numbers for the input signal number and output signal numbers to display, set their respective display ranges on the line, and then click the [OK] button.

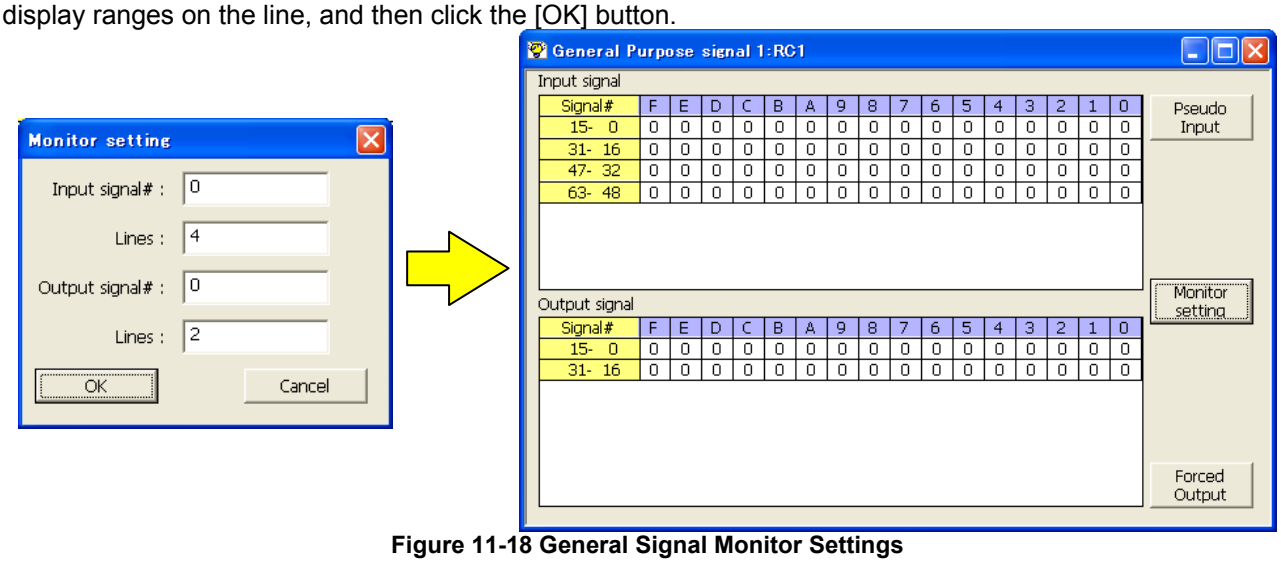


Figure 11-18 General Signal Monitor Settings

11.2.1.2. Pseudo-input

Pseudo-input means signals that are input to the robot controller from the computer, not from outside equipment.

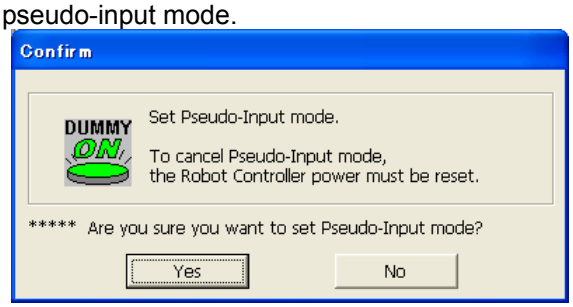
Click the [Pseudo-Input] button. A screen for inputting pseudo signals is displayed.

⚠ Caution

While the robot controller is in pseudo-input mode, signal input from outside devices is not accepted.

To use pseudo-input, put the robot controller into pseudo-input mode. While the robot controller is in pseudo-input mode, the robot controller does not accept signal input from outside devices.

Click the [Pseudo-Input] button. The confirmation message below is displayed before the robot controller goes into pseudo-input mode.



To release a robot controller from pseudo-input mode, switch the power for the robot controller Off, then On again.

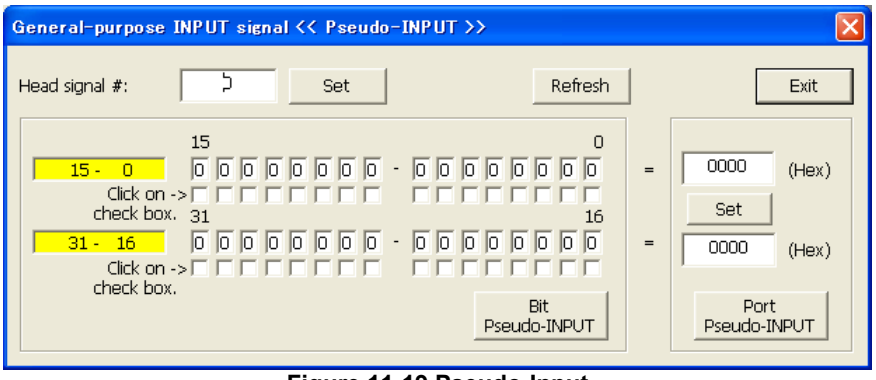


Figure 11-19 Pseudo-Input

① First, read the signals you want to pseudo input.
You can set 32 signals at the same time. Input the head number for the signals you want to read, and then click the [Set] button.

② The input statuses of the 32 signals starting from the specified head signal number are displayed. Set the pseudo-input status, and then click the [Bit Pseudo-INPUT] button.

③ You can specify the hexadecimal values and make pseudo input for the 32 signals starting from the head signal number.
Input the values in hexadecimal, and then click the [Port Pseudo-INPUT] button.

11.2.1.3. Forced output

You can force signals to outside equipment from robot controllers.
Click the [Forced Output] button. A screen for forcibly outputting signals is displayed.

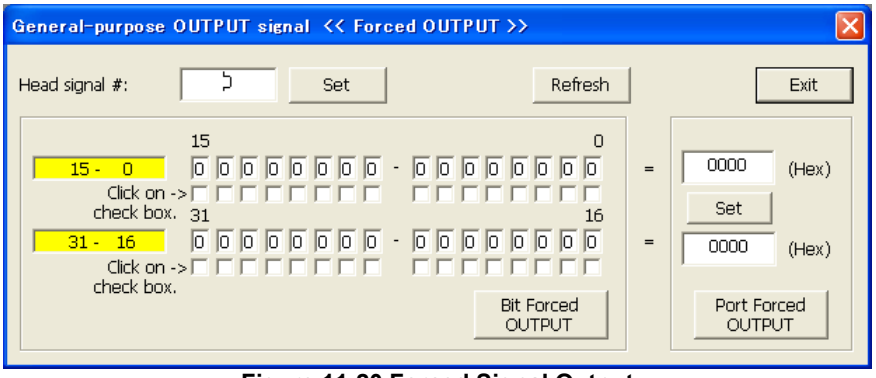


Figure 11-20 Forced Signal Output

① First, read the signals you want to forcibly output.
You can output 32 signals at the same time. Input the head number for the signals you want to read, and then click the [Set] button.
② The output statuses of the 32 signals started from the specified head signal number are displayed. Set the output status, and then click the [Bit Forced OUTPUT] button.
③ You can specify the hexadecimal value and force output for the 32 signals starting from the head signal number.
Input the values in hexadecimal, then click [Port Forced OUTPUT] button.

Caution

Forced signal output

- Signal numbers assigned (used) as dedicated output signals cannot be forcibly output.
- Forced output is possible if the robot controller mode is either [AUTOMATIC] or [MANUAL] (for a CRn-500 series robot controller, [TEACH], [AUTO (OP)], OR [AUTO (EXT.)]), but if even one program is running, forced output is not possible. (Except an ALWAYS program)

11.2.2. Named signals

You can give names to general input/output signals and check their statuses.

With "Named signals", you can check the status of dedicated input/output signals and named general input/output signals. When starting up, you can load a definition file for named signals in the robot controller. From the project tree, double click the target project [Online] -> [Monitor] -> [Signal Monitor] -> [Named Signals].

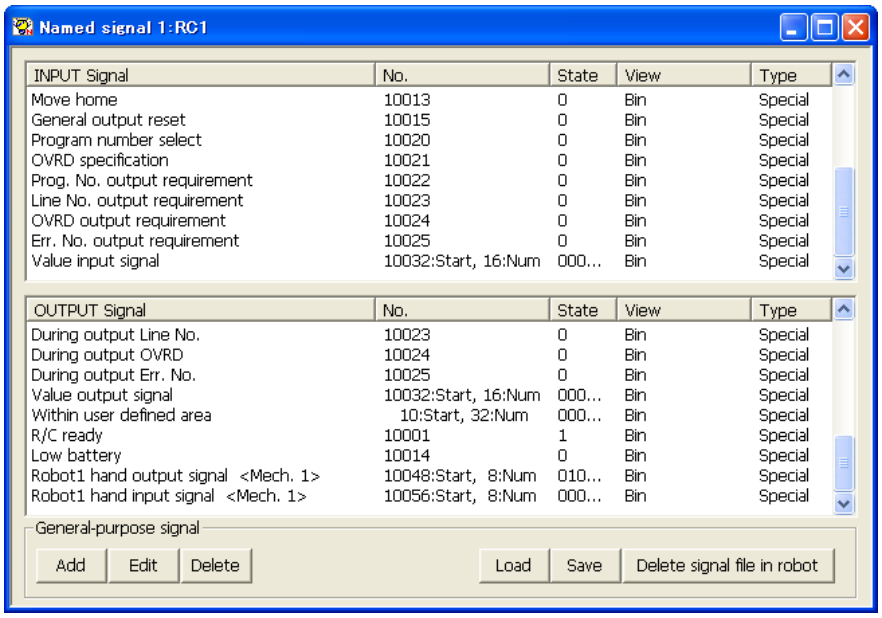


Figure 11-21 Named Signal

[Add]	:	This registers a new general input/output signal name.
[Edit]	:	This changes the setting for an existing general input/output signal selected in the list.
[Delete]	:	This deletes a signal selected in the list.
[Load]	:	This loads a file defining saved named signals in the robot controller and in the computer.
[Save]	:	This saves the information on the set named signals to the robot controller or computer.
[Delete signal file in robot]	:	This deletes the named signal information in the robot controller.

11.2.2.1. Adding new named signal or revising one

To add a new named signal, click the [Add] button. To revise one, select the signal to be revised from the list and click the [Edit] button.

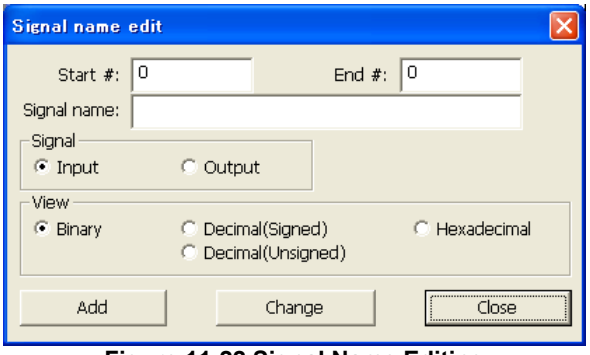


Figure 11-22 Signal Name Editing

Input the general signal numbers and names, select the signal type and display method, then when adding a new named signal, click the [Add] button. The set signal is added to the list.

The [Add] and [Change] buttons do not close the "Signal name edit" screen, so you can continue to add more signals.

11.2.2.2. Deleting a named signal

Select the signals to delete from the list. You can select multiple signals by clicking them while holding down the [Ctrl] key or the [Shift] key on the keyboard.

However, dedicated input/output signals can not be deleted.

Also, you can not delete input signals and output signals at the same time. Finally, delete the select signals in the list with a mouse click.

11.2.2.3. Named signal definition information reading

When you click the [Load] button, a message asking you to confirm that you want to delete a registered general input/output signal is displayed.

This message asks you to confirm that you want to clear the current general input/output signal display.

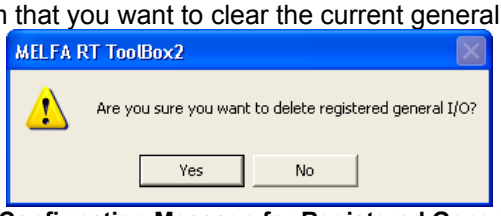


Figure 11-23 Deletion Confirmation Message for Registered General Input/Output Signal

If you select [Yes] on this confirmation screen, the "Select locate" screen asking you to select the load source is displayed.

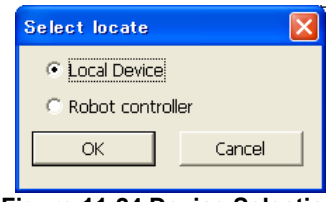


Figure 11-24 Device Selection

Select the device to load from, then click the [OK] button.

If you select the local device, the screen for selecting a file in the computer is displayed.

If you select the robot controller, the named signal definition file is loaded from the robot controller.

11.2.2.4. Saving definition information for named signals to a controller

When you click the [Save] button, the "Select locate" screen asking you to select the save destination is displayed.

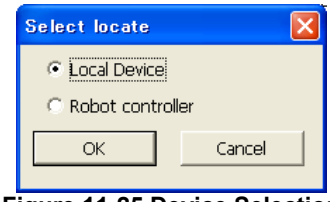


Figure 11-25 Device Selection

Select the device to save to, then click the [OK] button.

If you select the local device, the screen for selecting a file in the computer is displayed.

If you select the robot controller, the named signal definition file is saved to the robot controller.

11.2.3. Stop signal

You can reference the statuses of stop signals (stop/not stop) input to the robot controller.
From the project tree, double click the target project [Online] -> [Monitor] -> [Signal Monitor] -> [Stop Signals].

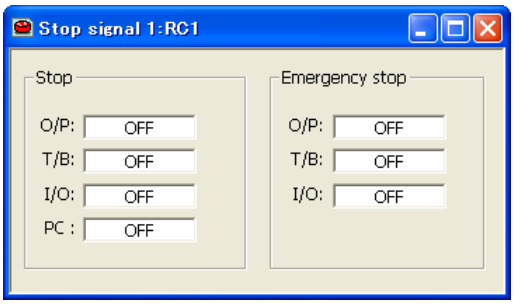


Figure 11-26 Stop Signal

11.2.4. Register (CC-Link)

⚠ Caution

This can only be used if the CC-Link option card is mounted in the robot controller.

This function can only be used with a CRn-500 series or CRnD-700 series robot controller with the CC-Link option card mounted. Also, this function can no be used with CRnQ-700 series robot controllers.

You can check the statuses of registers input to the robot controller from outside equipment and registers output from the robot controller to outside equipment.

From the project tree, double click the target project [Online] -> [Monitor] -> [Signal Monitor] -> [Register (CC-Link)].

The left side of the screen displays the status of input registers and the right side displays the status of output registers.

A continuous range of registers to display can be set freely with [Monitor Settings].
Pseudo-input and forced output of registers are also possible.

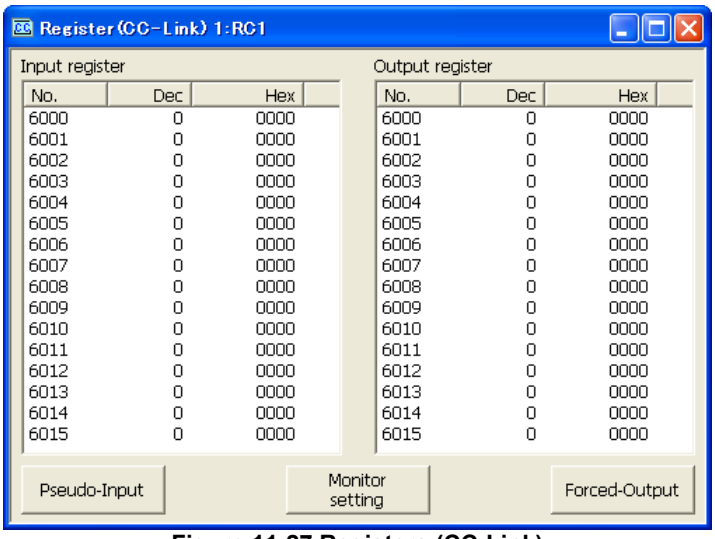


Figure 11-27 Registers (CC-Link)

11.2.4.1. Monitor setting

A continuous range of registers to display can be set freely.

Set the lead numbers for the input register number and output register numbers to display, set their respective display ranges on the line, then click the [OK] button.

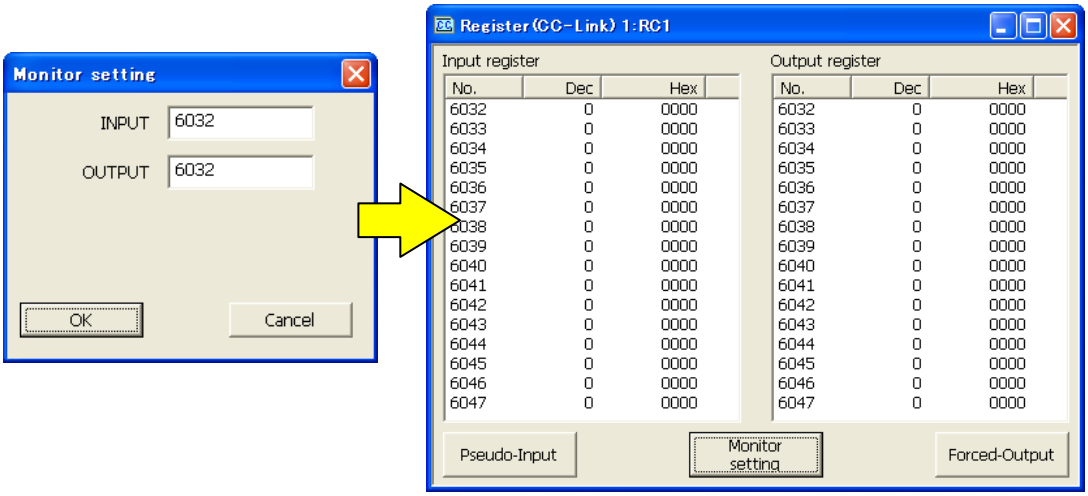


Figure 11-28 Registers (CC-Link) Monitor Settings

11.2.4.2. Pseudo-input

Pseudo-input means registers that are input to the robot controller from the computer, not from outside equipment.

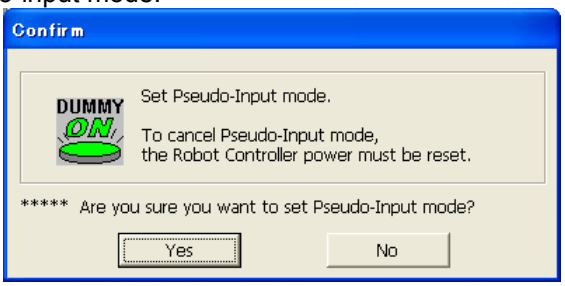
Click the [Pseudo-Input] button. A screen for inputting pseudo signals is displayed.

⚠ Caution

While the robot controller is in pseudo-input mode, register input from outside devices is not accepted.

To use pseudo-input, put the robot controller into pseudo-input mode. While the robot controller is in pseudo-input mode, the robot controller does not accept register input from outside devices.

Click the [Pseudo-Input] button. The confirmation message below is displayed before the robot controller goes into pseudo-input mode.



To release a robot controller from pseudo-input mode, switch the power for the robot controller Off, then On again.

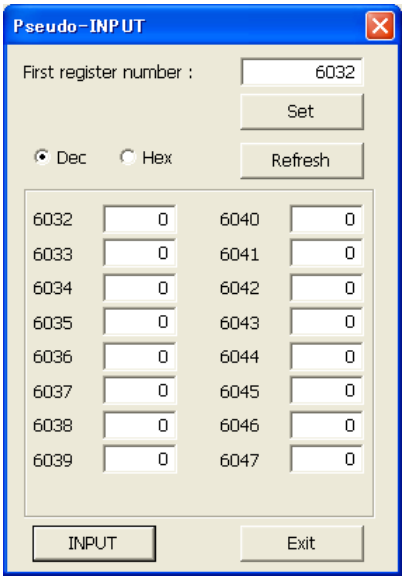


Figure 11-29 Pseudo-Input

(1) Read the signal you want to pseudo input.
You can set 16 registers at the same time. Input the head number for the signals you want to read, then click the [Set] button. The input statuses of the 16 registers starting from the specified head signal number are displayed.

(2) Set the pseudo-input status, and then click the [Input] button. The set register values are pseudo input to the robot controller.

(3) You can display and make pseudo input in hexadecimal for register values. If you have selected [Hex], input values as hexadecimals.

When you click the [Refresh] button, the latest register information is displayed.

11.2.4.3. Forced Output

You can forcibly output register values to outside equipment from robot controllers.
Click the [Forced Output] button. A screen for forcibly outputting registers is displayed.

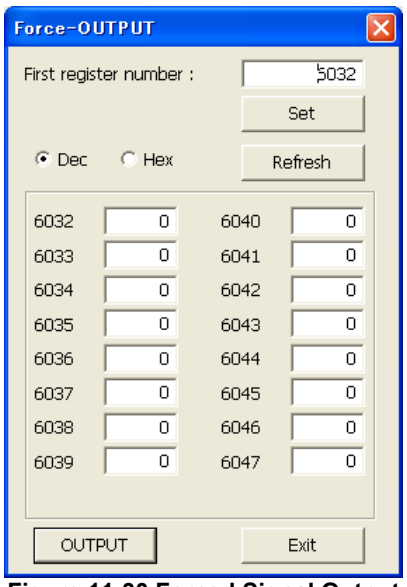


Figure 11-30 Forced Signal Output

(1) First, read the registers you want to forcibly output.
You can output 16 registers at the same time. Input the head number for the registers you want to forcibly output, then click the [Set] button. The output statuses of the 16 registers starting from the specified head register number are displayed.
(2) Set the output status, then click the [OUTPUT] button. The specified register values are forcibly output from the robot controller.
(3) You can also display and forcibly output register values in hexadecimal. If you have selected [Hex], input values as hexadecimals.

When you click the [Refresh] button, the latest register information is displayed.

Caution

Forced register output

Forced output is possible if the robot controller mode is either [AUTOMATIC] or [MANUAL] (for a CRn-500 series robot controller, [TEACH], [AUTO (OP)], OR [AUTO (EXT.)]), but if even one program is running, forced output is not possible. (Except an ALWAYS program)

11.2.5. IO unit monitor

You can monitor XY device variables of IO unit.

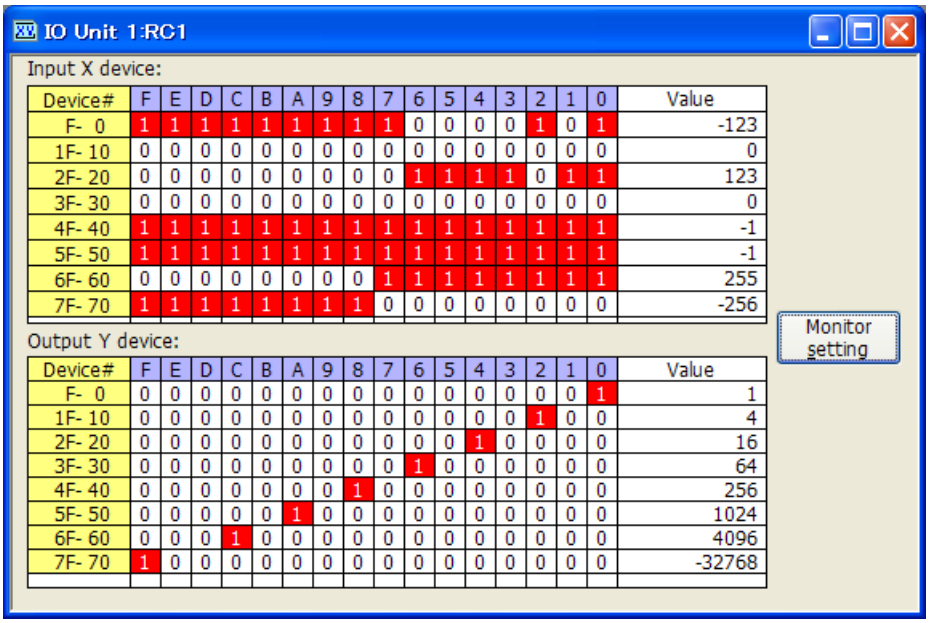
From the project tree, double-click the target project [Online] -> [Monitor] -> [Signal Monitor] -> [IO unit].

The status of input signals are displayed on the upper table, and the status of output signals are displayed on the lower table.

The signal values can display a 16-bit integer with a mark, or 32-bit integer with a mark by the decimal number or the hexadecimal number.

The signasl to display can set up the continuous range freely with [Monitor setting].

This function can be used with Version R3 or later of CR750-Q/CRnQ-700 robot controllers and Version 2.10L or later of this software.



Input X device:																	
Device#	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0	Value
F- 0	1	1	1	1	1	1	1	1	1	0	0	0	0	1	0	1	-123
1F- 10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2F- 20	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1	1	123
3F- 30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4F- 40	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	-1
5F- 50	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	-1
6F- 60	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	255
7F- 70	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	-256

Output Y device:																	
Device#	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0	Value
F- 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
1F- 10	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	4
2F- 20	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	16
3F- 30	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	64
4F- 40	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	256
5F- 50	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1024
6F- 60	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	4096
7F- 70	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-32768

Figure 11-31 IO unit monitor

11.2.5.1. Monitor setting

Click the [Monitor setting] button. The setting screen of PLC IO unit monitor is displayed.

Set the starting number of each device and set the number of lines to display. And, set the data size in display singles and the display method.

After setting, click the [OK] button.

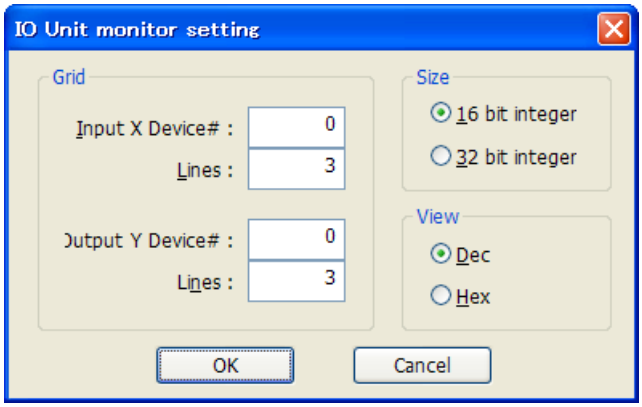


Figure 11-32 IO unit seting screen

11.3. Production Condition Monitoring

11.3.1. Operation hours

You can check the robot work time, battery usage time, etc.

From the project tree, double click the target project [Online] → [Monitor] → [Operation Monitor] → [Operation Time].

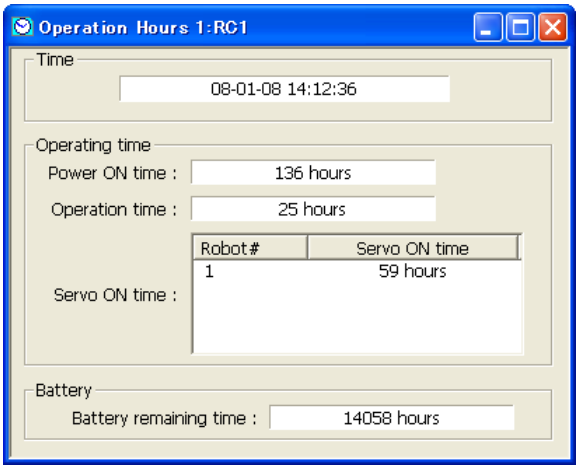


Figure 11-31 Operating Hours

You can initialize the battery remaining time with [Maintenance] → [Initialize]. For details on operation methods, see **"12.2.4 Initializing the battery remaining time"**.

11.3.2. Production information

You can check the latest tact time, run time, cycle count, and average tact time for each program in the robot controller. The latest tact time, run time, and average tact time can be measured up to 1193 hours (about 49 days).

From the project tree, double click the target project [Online] → [Monitor] → [Operation Monitor] → [Production Information].

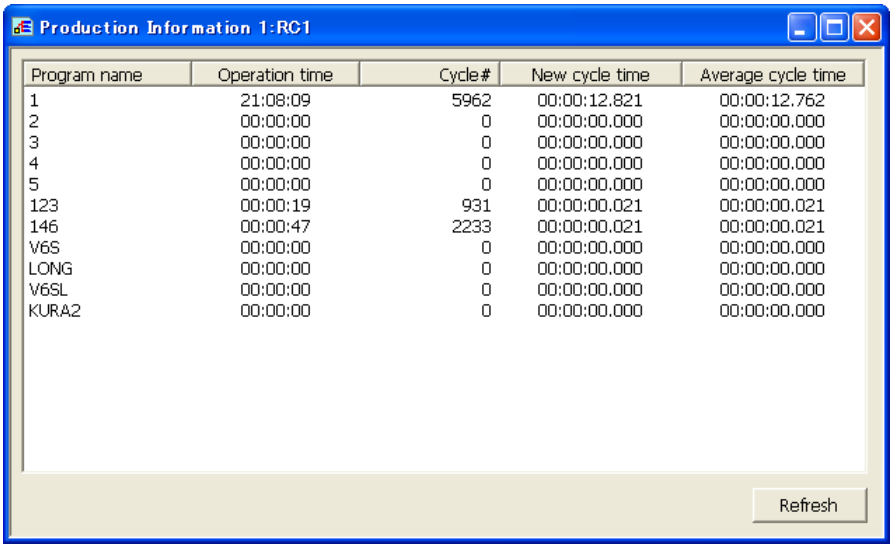


Figure 11-32 Production Information

The production information is not constantly updated. Click the [Refresh] button as necessary.

12. Maintenance

With maintenance, you can maintain the robot in various ways, including setting origin data and initializing various informations.

12.1. Setting Origin Data

You can save robot origin data to a file, edit it, and transfer it to a robot controller.

Set origin data while connected to the robot controller.
From the project tree, double click the target project [Online] → [Maintenance] → [Origin Data].

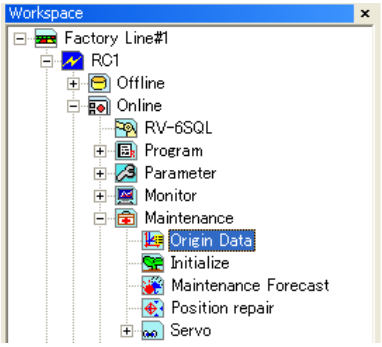


Figure 12-1 Starting up the Origin Data Setting Screen

Caution

About controller modes in which origin data can be read/written

The controller modes (TEACH/AUTO (Op.)/AUTO (Ext.)) in which origin data can be read/written depend on the CRn-500 series robot controller version. For details, see **"Table 10-1 Origin Data Reading Robot Control Operation Mode"** and **"Table 10-2 Origin Data Writing Robot Control Operation Mode"**.

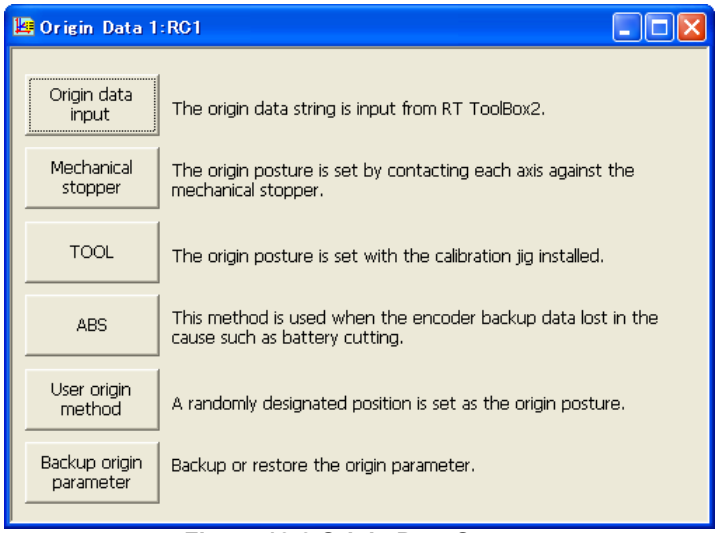


Figure 12-2 Origin Data Screen

* *About robot controller run modes when origin data is read/written*

With CRn-500 series robot controllers, when robot origin data is read/written using this software, there are restrictions on the controller run mode according to the robot controller software version.
Reference the table below.

(1) Reading

Table 12-1 Origin Data Reading Robot Control Operation Mode

CRn-500 series robot controller	Operating mode		
	TEACH	Auto (OP)	Auto (Ext)
J1 edition or later	○	○	○
H7 edition or earlier	×	×	○

○: Reading possible, ×: Reading not possible

(2) Writing

Table 12-2 Origin Data Writing Robot Control Operation Mode

CRn-500 series robot controller	Operating mode		
	TEACH	Auto (OP)	Auto (Ext)
J1 edition or later	○	○	○
G9 edition – H7 edition	○	×	○
G8 edition or earlier	○	×	×

○: Writing possible, ×: Writing not possible

12.1.1. Origin data input technique

You can save robot origin data to a file, edit it, and transfer it to a robot controller.
Click the origin data screen "origin data input technique" to display the screen.

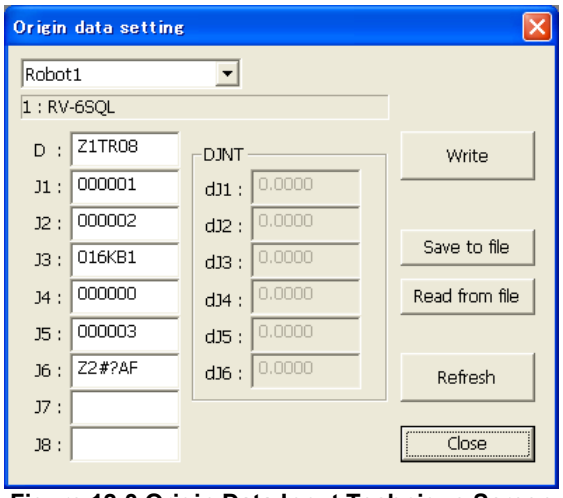


Figure 12-3 Origin Data Input Technique Screen

[Write]	:	Writes the origin data displayed on the screen to the robot controller.
[Save to file]	:	The displayed origin data can be saved to a file.
[Read from a file]	:	Stored origin data can be read from a file and displayed on the screen.
[Refresh]	:	Reads the origin data from a robot controller and displays the latest status.

Caution

Input the correct values for the J7 and J8 origin data.

For the J1-J6 axis origin data, the compatibility of values in the robot controller are checked but the J7 and J8 origin data are not checked. Always input correct values.
The J7 and J8 axis origin data is only displayed when there is a supported additional axis.

Memo

About DJNT (origin error) parameters

DJNT shows the origin position error. When revising the origin position using the position repair tool, the value is set in DJNT. (When not revising the origin position using the position repair tool, all the elements become 0. However, for RV-4A, the values are entered beforehand.)
DJNT is not released to general customers, so the values can not be directly changed.

About DJNT parameter display

Sometimes DJNT parameters are not displayed for certain robots (for example, robots that do not support the position repair function).

12.1.2. Mechanical stopper technique

This uses the robot mechanical stoppers to set the robot origin.
Click the origin data screen [Mechanical stopper] button to display the screen.

After moving the robot to a mechanical stopper origin position, select the axis to set the origin for with the checkbox, and then click the [Set origin] button.
"Last" displays the origin setting technique used the previous time. For some robot controller software versions, this is sometimes not displayed.

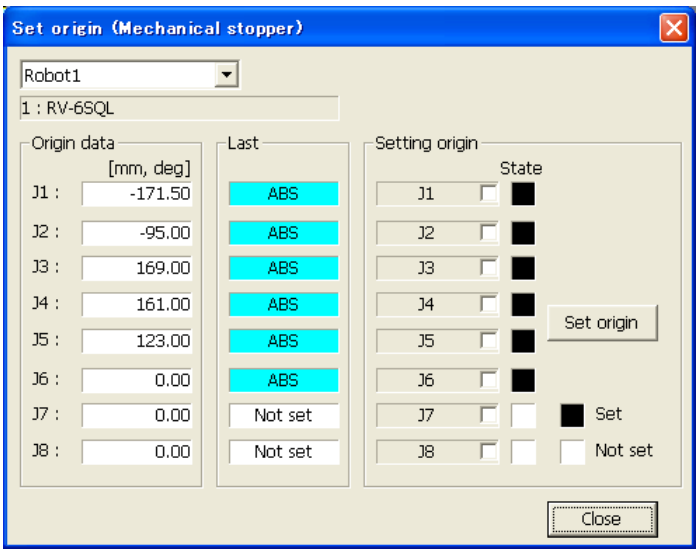


Figure 12-4 Origin Setting (Mechanical Stopper) Screen

12.1.3. Tool technique

This uses the origin setting tool to set the robot origin.
Click the origin data screen [Tool] button to display the screen.

After moving the robot to the tool origin position, select the axis to set the origin for with the checkbox, and then click the [Set origin] button.
"Last" displays the origin setting technique used the previous time. For some robot controller software versions, this is sometimes not displayed.

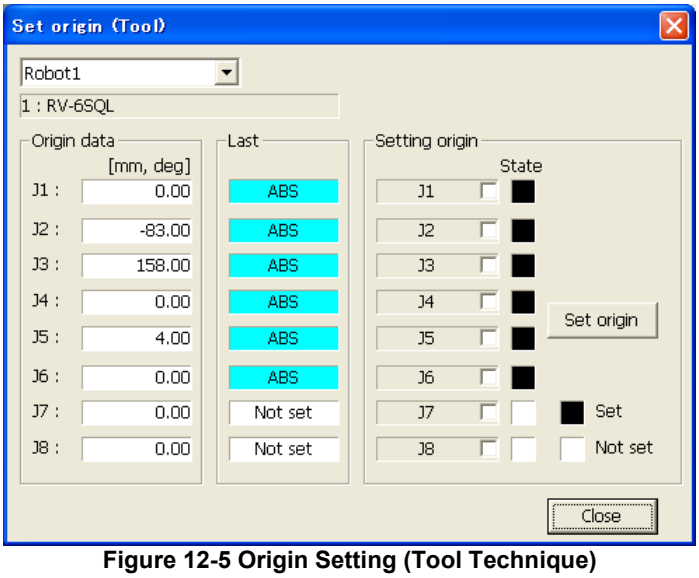


Figure 12-5 Origin Setting (Tool Technique)

12.1.4. ABS origin technique

This uses the robot's ABS origin position robot to set the robot origin.
Click the origin data screen [ABS] button to display the screen.

After moving the robot to the ABS origin position, select the axis to set the origin for with the checkbox, and then click the [Set origin] button.
"Last" displays the origin setting technique used the previous time. For some robot controller software versions, this is sometimes not displayed.

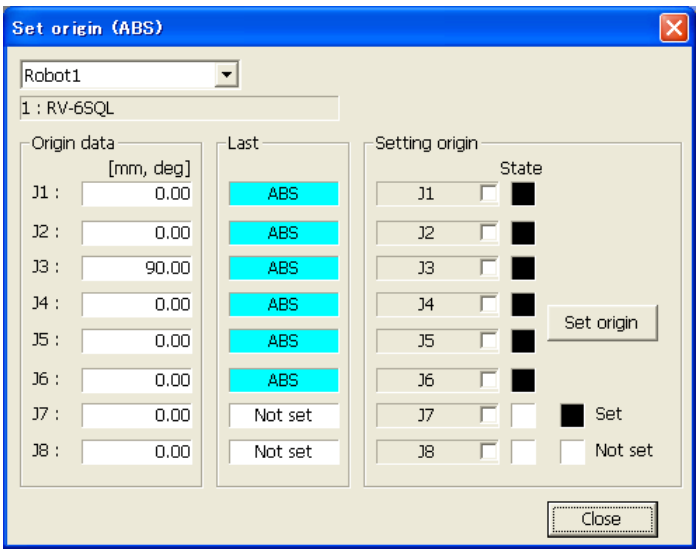


Figure 12-6 Origin Setting (ABS Origin Technique) Screen

12.1.5. User Origin Technique

This uses the robot user origin to set the robot origin.
Click the origin data screen [User origin method] button to display the screen.

After moving the robot to the user origin position, use the checkbox to select the axis to set the origin of, and then click the [Set origin] button.
"Last" displays the origin setting technique used the previous time. For some robot controller software versions, this is sometimes not displayed.

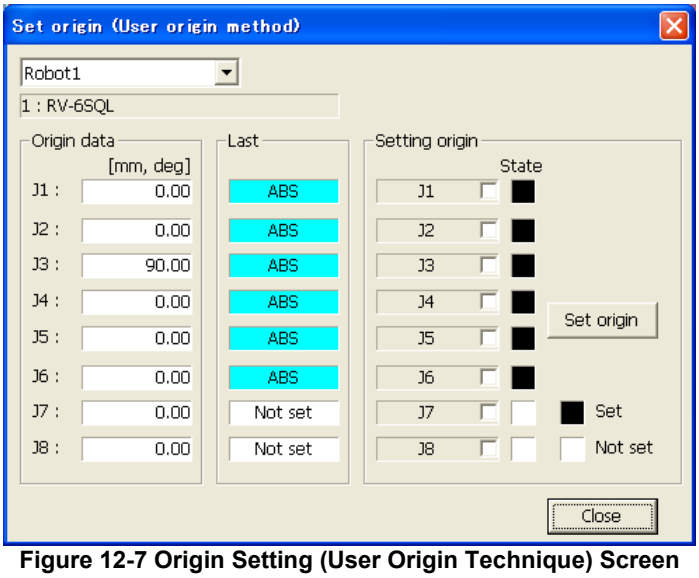


Figure 12-7 Origin Setting (User Origin Technique) Screen

12.1.6. Origin Parameter Backup

You can back up the parameters that make up the origin data. Also, you can transfer the backed-up data to a robot controller.

Click the origin data screen [Backup origin parameter] button to display the screen.

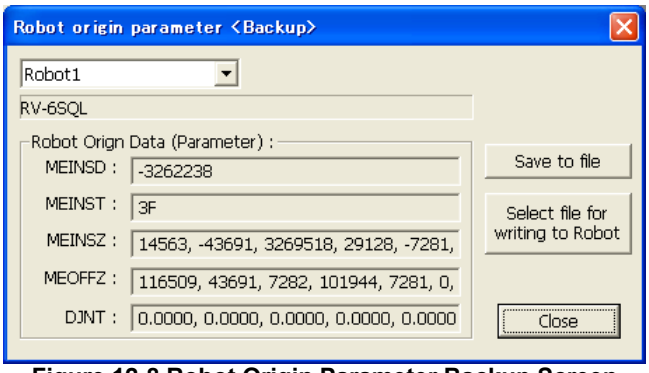


Figure 12-8 Robot Origin Parameter Backup Screen

[Save to file] : This saves origin parameters read from a robot controller (displayed parameters) to a file.

[Select file for writing to robot] : Transfer origin parameters stored in a file to a robot controller.
When transferring to a CRn-500 series robot controller with edition H7 or earlier, set "Teach" mode.

⚠ Caution

When the password is registered in "Parameter" by robot controller's security function, it is not possible to restore the origin data string to the robot controller by "origin parameter backup" screen.

When the password is registered in "Parameter" by robot controller's security function, it is not possible to restore the origin data string to the robot controller by "origin parameter backup" screen.

○ : Enable、 × : Disable

	Item to which password of security function is registered.		
	Program	Parameter	File
Restore the origin data	○	×	○

Please delete the password of robot controller's security function when you operate these. Please refer to **"12.7.3 Delete the Password"** for the method of deleting the password.

The setting(register the password) and the release(delete the password) of robot controller's security function can be used with this software version 2.0 or later. Please refer to **"Table 12-15 Compliant version of this function and controller"** for robot controller's compliant version.

12.2. Initialization

This initializes information in a robot controller.
Here, you can initialize the following information in a robot controller.
(1) Set the robot controller clock
(2) Initialize all programs in the robot controller
(3) Initialize the remaining battery time in the robot controller
(4) Check the serial number in the robot controller and set the serial number for the connected robot
(Serial number checking and setting can only be used with CR750/700 series robot controllers.)

12.2.1. Starting

Use the initialization function while connected to the robot controller.
From the project tree, double click the target project [Maintenance] → [Initialize].

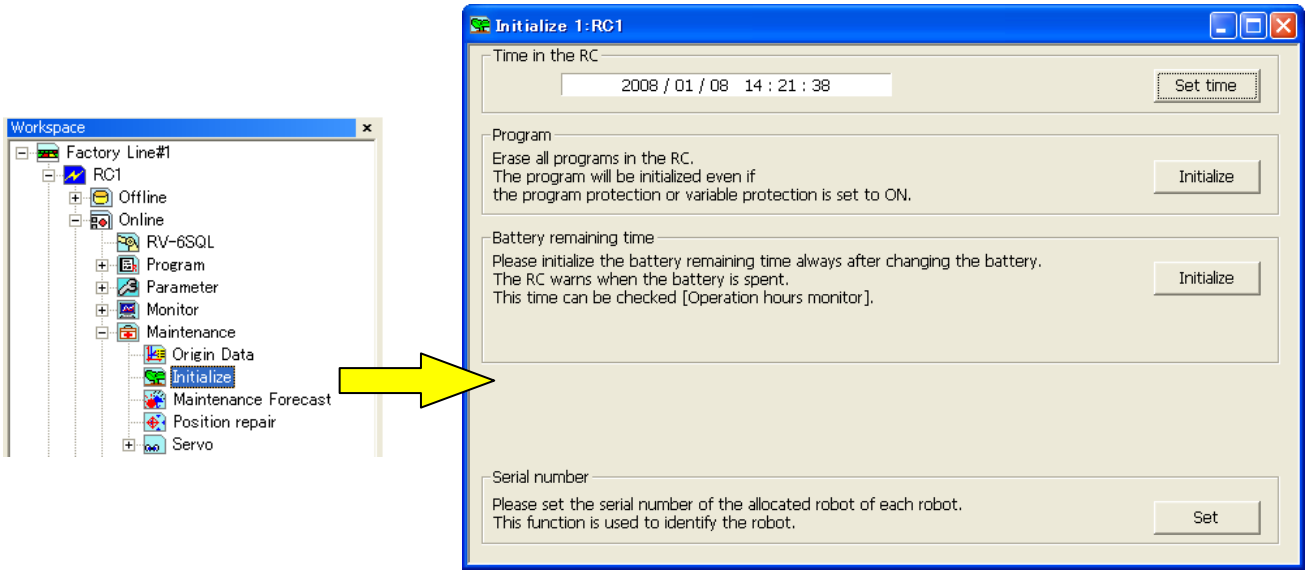


Figure 12-9 Starting Initialization Screen

12.2.2. Setting the time in the robot controller

You can set the robot controller clock.
On the initialization screen, click the [Set time] button.

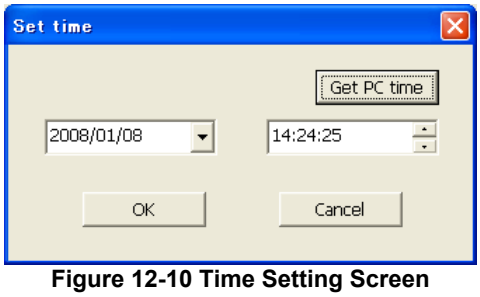


Figure 12-10 Time Setting Screen

Set the new date and time, then click the [OK] button.
You can set the current date and time from your computer by clicking the [Get PC time] button.

12.2.3. Deletion of all robot programs

This deletes all the programs in the robot controller.
On the initialization screen, click the program group [Initialize] button.
A confirmation screen is displayed, so input "Yes", then click the [OK] button.

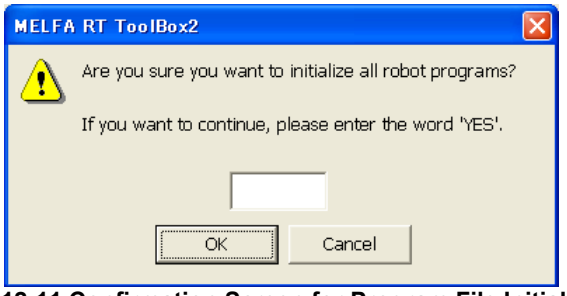


Figure 12-11 Confirmation Screen for Program File Initialization

Caution

When the password is registered in "program" by robot controller's security function, it is not possible to delete all the programs in the robot controller.

When the password is registered in "program" by robot controller's security function, it is not possible to delete all the programs (initialize the programs) in the robot controller.

○ : Enable、 × : Disable

	Item to which password of security function is registered.		
	Program	Parameter	File
Deletion of all robot programs.	×	○	○

Please delete the password of robot controller's security function when you operate these. Please refer to **"12.7.3 Delete the Password"** for the method of deleting the password.

The setting(register the password) and the release(delete the password) of robot controller's security function can be used with this software version 2.00A or later. Please refer to **"Table 12-15 Compliant version of this function and controller"** for robot controller's compliant version.

12.2.4. Initializing the battery remaining time

This initializes the remaining battery time in the robot controller.
On the initialization screen, click the remaining battery time [Initialize] button.
A confirmation screen is displayed, so input "Yes", then click the [OK] button.

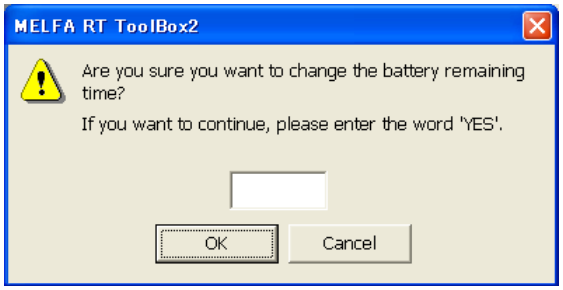


Figure 12-12 Confirmation Screen for Battery Time Remaining

Caution

Do not initialize unless the battery has been replaced.

Be careful. If you initialize the remaining battery time other than when the battery is replaced, it becomes impossible to reference a correct reading for the remaining battery time.

12.2.5. Serial number

This checks the serial number in the robot controller and sets the serial number for the connected robot
On the initialization screen, click the serial number group [Set] button.

This function can only be used with CR750/700 series robot controllers.
The first time you start up a CR750/700 series robot controller after purchase, the C0150 warning (robot main unit serial number not set) is generated. On this screen, set the robot main unit serial number.

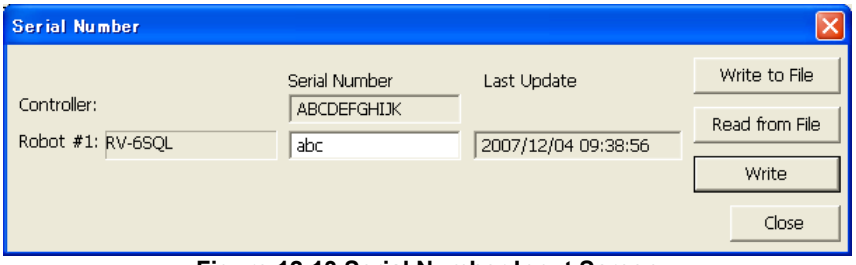


Figure 12-13 Serial Number Input Screen

12.3. Maintenance Forecasting

With "Maintenance forecasting", you can reference the parts replacement timing (greasing and battery and belt replacement) from operation data collected up till now in the robot 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.

12.3.1. Specifications

With CRn-500 series robot controllers, there are restrictions on the maintenance forecast functions according to robot models and versions supported. The robot controller software versions and models supported by the maintenance forecast function are as follows.

Table 12-3 Supported models and software versions

No.	Robot	CR750/700 series Robot controller	CRn-500 series Robot controller
1	RV-6S series RV-12S series	The supported models are not restricted	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
4	RV-2S series		-

12.3.2. Starting

Use the maintenance forecast function while connected to the robot controller.
From the project tree, double click the target project [Online] → [Maintenance] → [Maintenance Forecast].

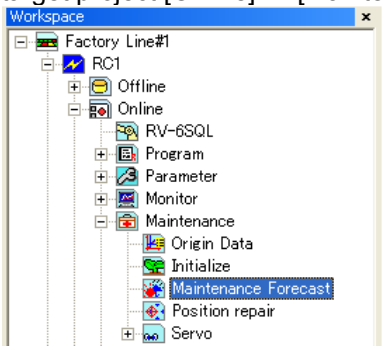


Figure 12-14 Starting Maintenance Forecasting

12.3.3. Forecasting

You can reference the "time until battery replacement", "time until regreasing, and time until belt replacement".

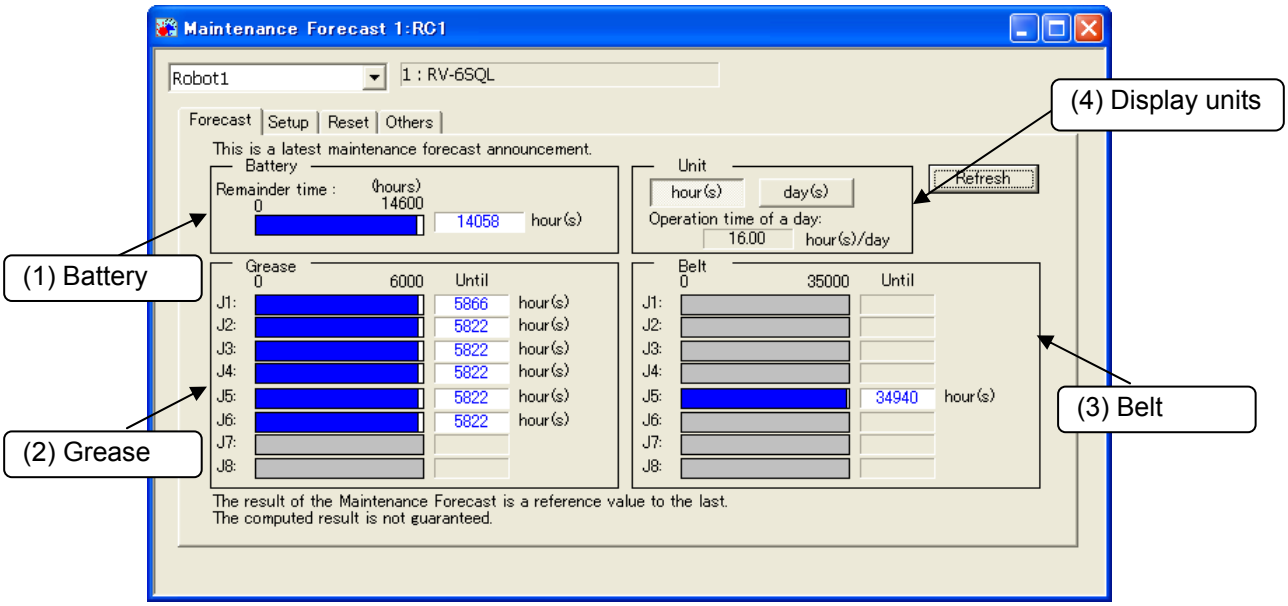


Figure 12-15 Forecast Screen

By clicking the [Refresh] button, you can reacquire information on maintenance from the robot controller.

(1) 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.)

(2) Grease
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.

(3) Belt
If the hours until belt replacement time has reached

the hours and bar graphs are displayed in orange.

(4) Display unit
You can switch the display units for "Grease" and "Belts" between hours and days. When days are selected as the display unit, the number of days of operation is calculated from the number of operating hours per day and that number of days is displayed.

12.3.4. Settings

Here, you can set the timing for collecting information concerning maintenance forecasts, the notification method, etc.

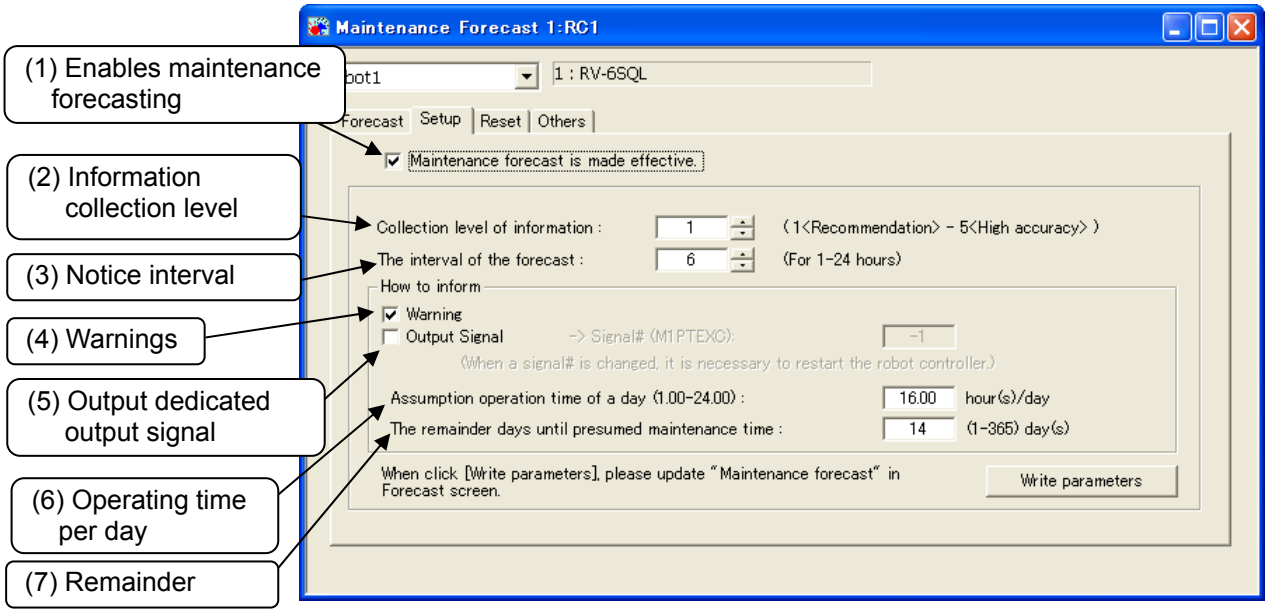


Figure 12-16 Setup

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 details on the setting items, see "Table 12-4 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.

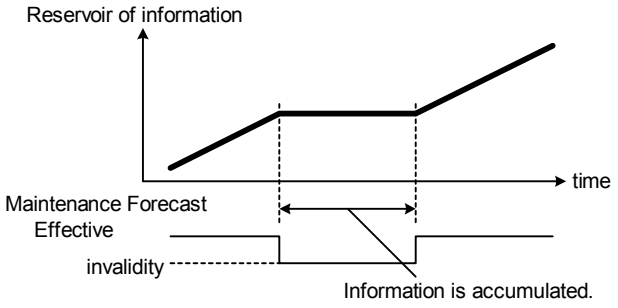


Table 12-4 Description of the Setup Screen

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

12.3.5. Reset screen

The information (about battery, grease and belt) for Maintenance Forecast kept in the controller can be reset.

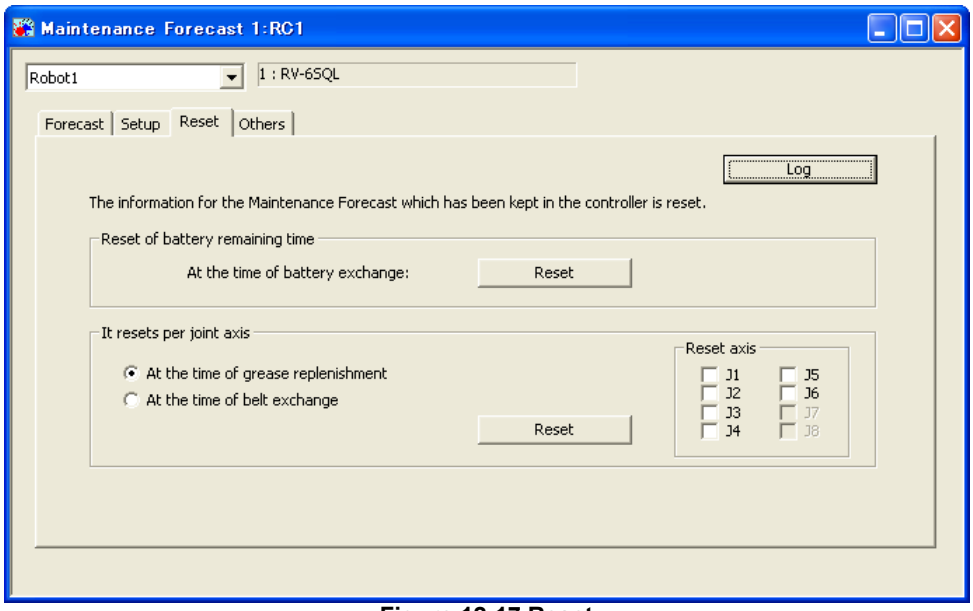


Figure 12-17 Reset

Table 12-5 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 remaining 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.

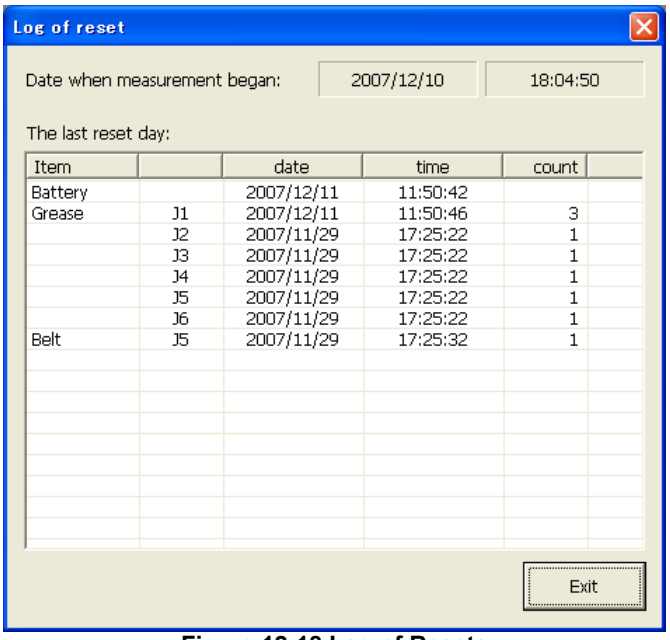


Figure 12-18 Log of Resets

12.3.6. Resetting maintenance forecast information with 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.

(1) Resetting the time of battery remaining

Table 12-6 Resetting the time of battery remaining

	Explanation	Operation
the time of battery remaining	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 remaining time after a battery has been replaced.	From the teaching box (R32TB) menu screen, execute "5. Settings and Initialization" → "1. Initialization" → Battery.

For details on the method for initializing the battery remaining time using the teaching box, in the robot controller's operations manual, see **"Detailed explanations of functions and operations".**

(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 12-7 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 with caution.

See “Controller INSTURCTION MANUAL – Detailed explanations of functions and operations” for how to input parameters using the teaching box.

12.3.7. 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.

Please Backup/Restore between controllers of the same version. When the version is different, the error might occur.

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.

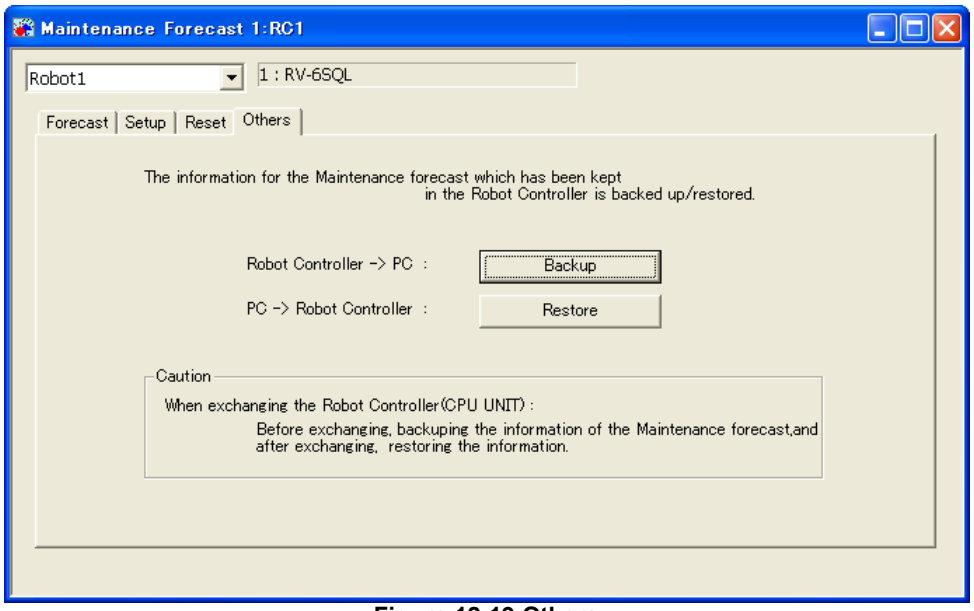


Figure 12-19 Others

12.4. Position repair Function

The position repair function is restricted by the usable models and controller software versions. See **"Table 12-9 Supported Robot Controllers and Model"**.

The "position repair function" is used when a tool is deformed by a collision or the origin is out of place because the motor has been replaced. Just reteaching part of the position data within the robot program makes it possible to use the previous position data in the controller. (Position repair generates parameters to correct the position deviation and corrects all the position data in the robot controller.)

However, please understand that there are some cases that position repair can not restore, such as applications requiring high precision and major mechanical damage to a robot from a collision.
Also, restrictions on a robot's degrees of freedom can make it impossible to recover with position repair.
Since vertical 5-axis robots and horizontal 4-axis robots are restricted as shown in **"Table 12-8 The limit by degree of freedom"**, positional deviations related to these restrictions can not be corrected with this function. In this case, either reteach manually or correct the deviating section (for example, by replacing a bent hand).

Table 12-8 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

The position repair function is only supported by MELFA-BASIC IV and MELFA-BASIC V.

The position repair function is only supported by MELFA-BASIC IV and MELFA-BASIC V. It cannot be used with Movemaster commands.

⚠ Caution

When the password is registered in "parameter" or "file" by robot controller's security function, it is not possible to operate Position repair Function.

When the password is registered in "parameter" or "file" by robot controller's security function, it is not possible to operate Position repair Function.

○ : Enable、 × : Disable

	Item to which password of security function is registered.		
	Program	Parameter	File
Position repair Function	○	×	×

Please delete the password of robot controller's security function when you operate these. Please refer to **"12.7.3 Delete the Password"** for the method of deleting the password.

The setting(register the password) and the release(delete the password) of robot controller's security function can be used with this software version 2.0 or later. Please refer to **"Table 12-15 Compliant version of this function and controller"** for robot controller's compliant version.

12.4.1. Specifications

The robot models and robot controller versions with which the position repair function can be used are as follows.

Table 12-9 Supported Robot Controllers and Models

No.	Robot model	CR750/700 series Robot Controller	CRn-500 series Robot Controller
1	Vertical 6-axis robot	The supported models are not restricted by the version	Version **J2** or later Only correction of origin data is supported in versions prior to **J2**.
2	Vertical 5-axis robot		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 **K4** or later Any versions prior to **K4** are not available. Moreover, This function cannot be used for the RH-AH series robot.

12.4.2. Starting

Use the position repair function while connected to the robot controller.
From the project tree, double click the target project [Online] → [Maintenance] → [Position repair].

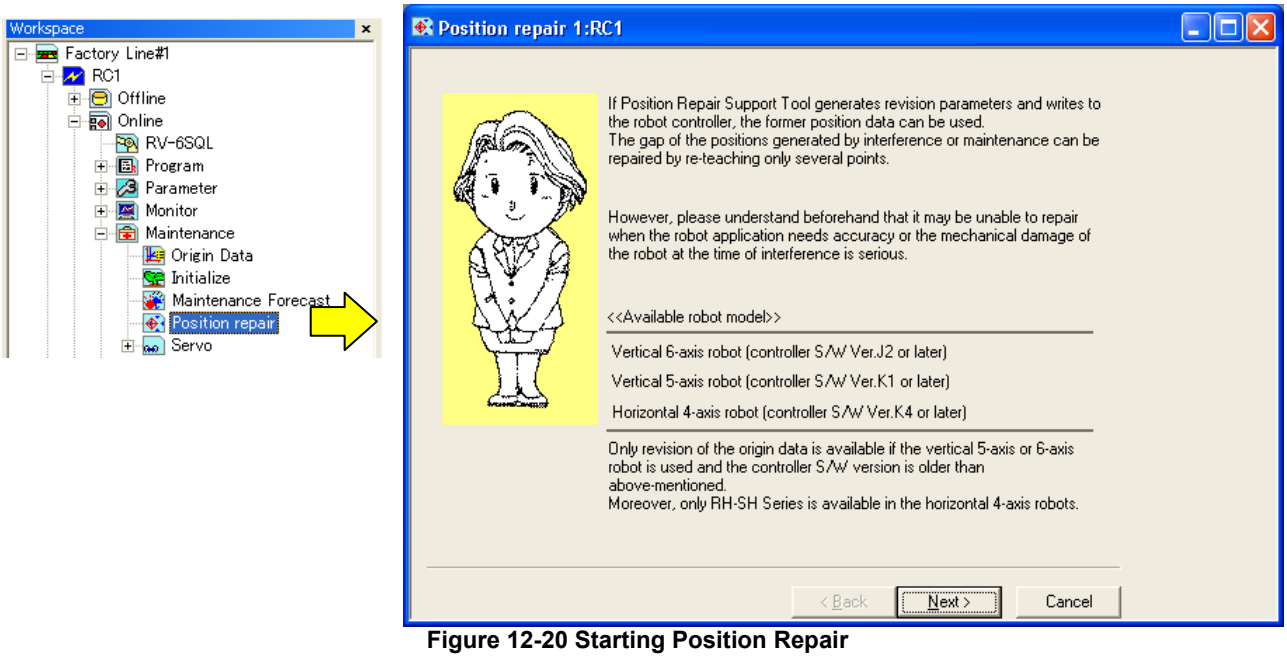


Figure 12-20 Starting Position Repair

12.4.3. Flow of operations

The position repair takes the form of a wizard. You can automatically generate the parameters by proceeding with operations according to the instructions on each screen. You can directly set parameter values.

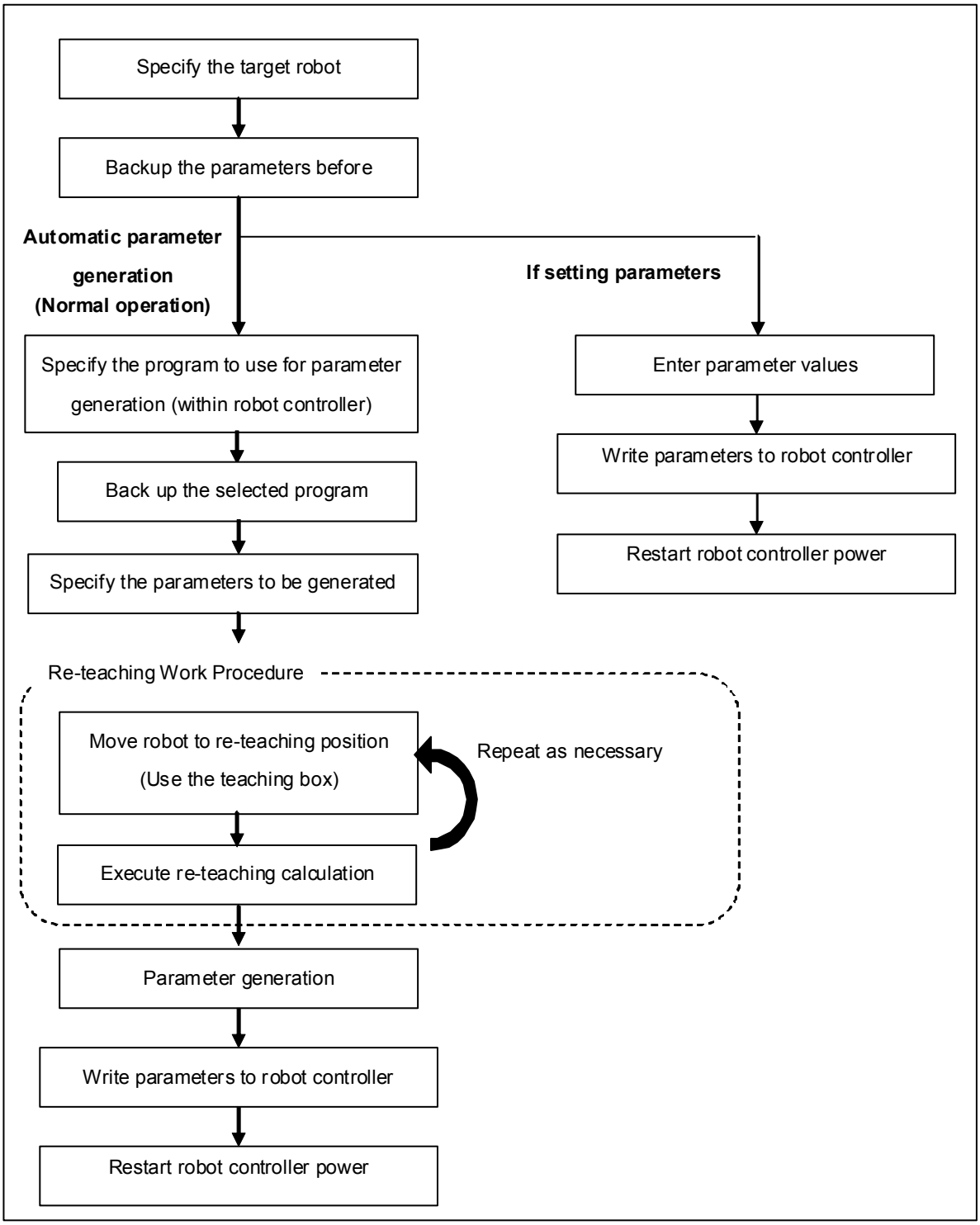


Figure 12-21 Operation Flow

The explanation follows the normal operations flow. For the explanation when setting parameter values, see **"12.4.16 Revision parameter editing".**

12.4.4. Introduction

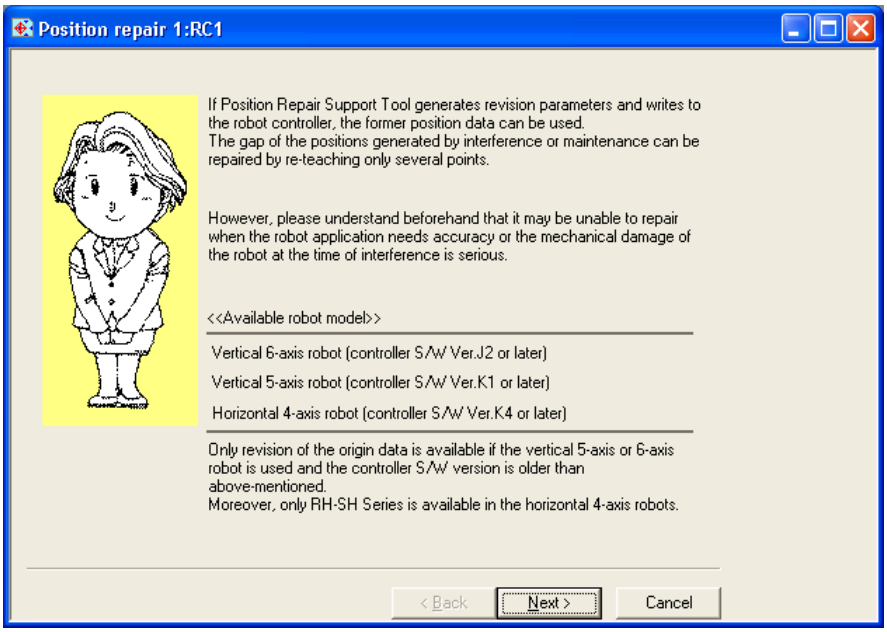
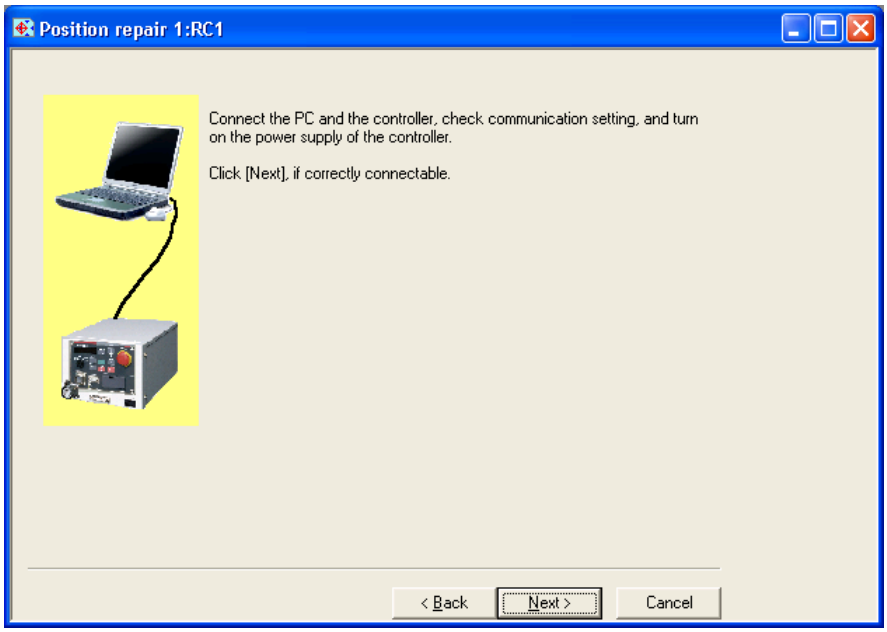


Figure 12-22 Starting Use Window

This is an explanation of the position repair function. Read it carefully, then click the [Next] button.

12.4.5. Communications settings



Check the communication settings and connected to the robot controller, click the [Next] button. For the setting method, see **"6 Connecting with the Robot".**

12.4.6. Robot selection and parameter backup

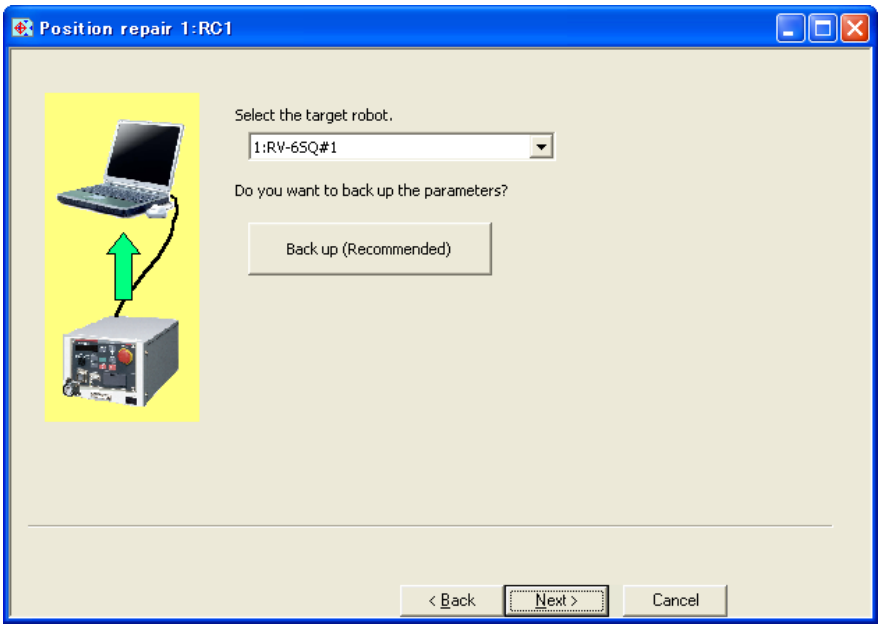


Figure 12-23 Robot and Backup Parameters Selection Window

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

Ver.1.1 or earlier	Controller number : Controller Name + Mechanism Name #Mechanism No.
Ver.1.2 or later	Controller number : Mechanism Name #Mechanism No.

Displayed only in multi-mechanism mode.

To backup parameters, click [Backup].
The dedicated backup screen starts. For more details on backups, see "14 Backup and Restore".
Backed up parameter files can be written back to a robot controller using the "backup/restore" functions of this software.

When the preparations are completed, click the [Next] button.

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.

12.4.7. Revision parameter generation procedure selection

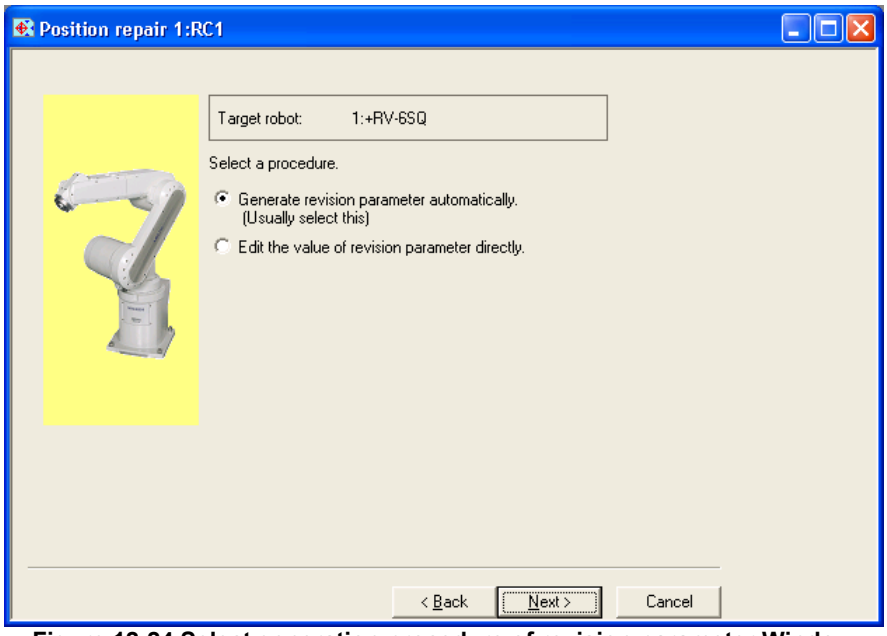


Figure 12-24 Select generation procedure of revision parameter Window

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.

12.4.8. Program selection

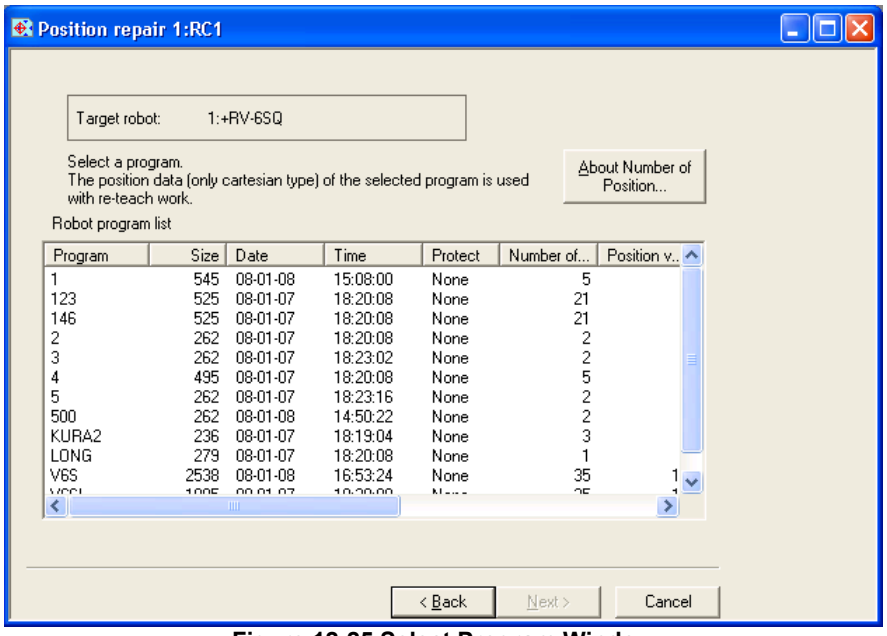


Figure 12-25 Select Program Window

Select the robot program to use for revision parameter generation, then click the [Next] button.
Here, perform the reteaching using the XYZ-coordinate position data in the selected program.

For details on the required position data numbers, see "Table 12-10 Selecting Revision Parameters".

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

12.4.9. Program reading and backing up

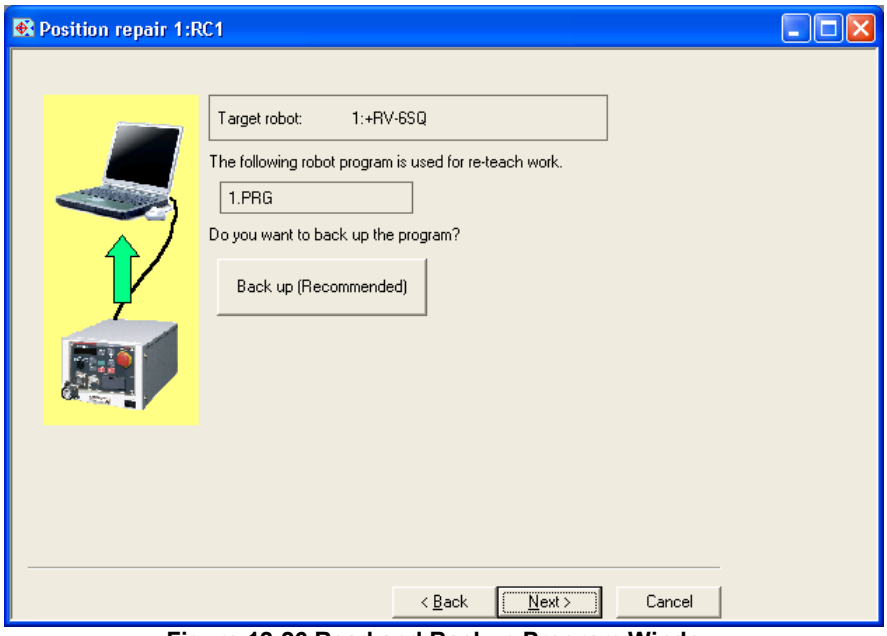


Figure 12-26 Read and Backup Program Window

To backup a program, click [Backup].
The special screen for backup is started. For details on backups, see "14 Backup and Restore".
You can use the backup/restore functions in this software to write a backed up parameter file back into a robot controller.

When the preparations are completed, click the [Next] button.

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.

12.4.10. Tool setting check

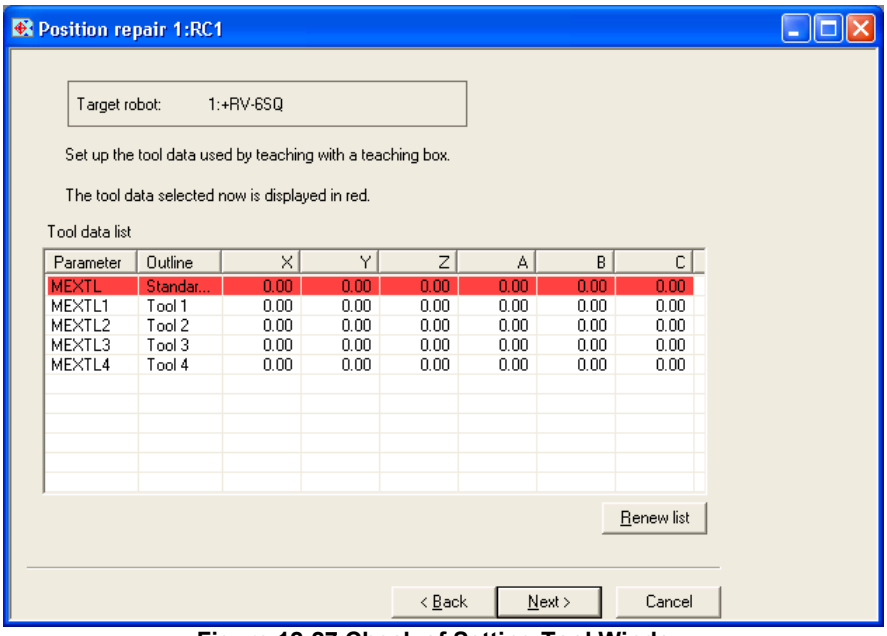


Figure 12-27 Check of Setting Tool Window

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 CRn-500 series 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.

12.4.11. Revision parameter selection

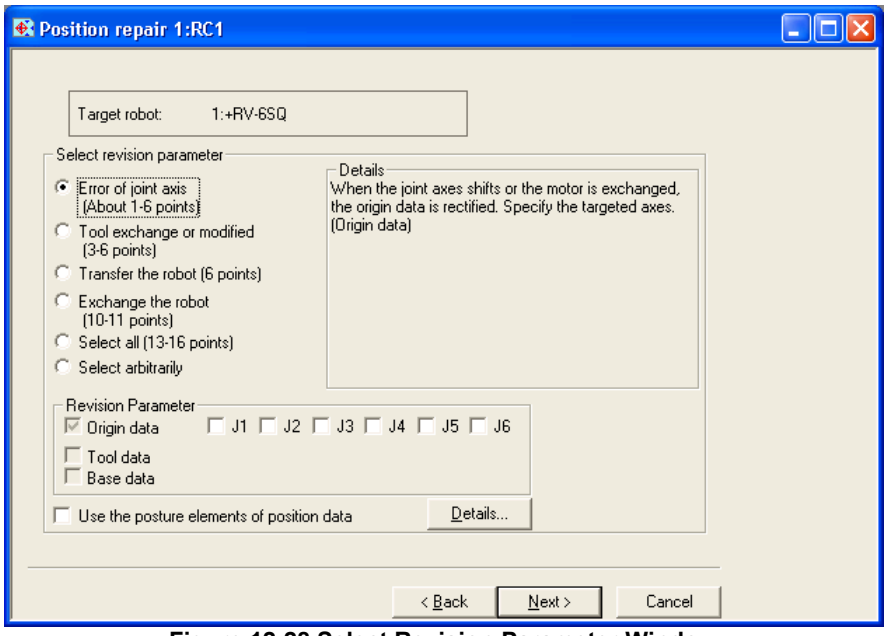


Figure 12-28 Select Revision Parameter Window

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 CRn-500 series robot controller's version is older than **J2**, only [Error of joint axis] can be selected.
Vertical 5-axis robot	If the CRn-500 series robot controller's version is older than **K1**, only [Error of joint axis] can be selected.
Horizontal 4-axis robot (RH-SH series only)	The CRn-500 series robot controller's any versions prior to **K4** are not available. (This function cannot be used for the RH-AH series robot.)

The supported models are not restricted by the version in CR750/700 series robot controller.

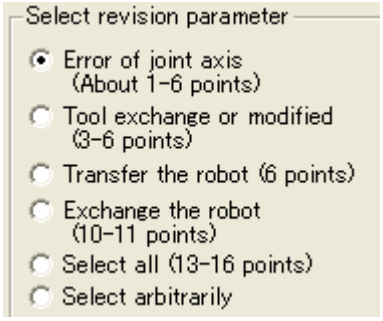
Click [Details] to see the description of the difference between checking and not checking [Use the posture elements of position data].

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

After choosing the revision parameters, click [Next].

12.4.11.1. Revision parameters

Parameters revised by items selected with "Select revision parameters" become as in "Table 12-10 Selecting Revision Parameters".



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**

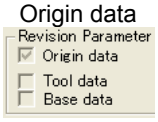
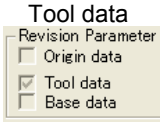
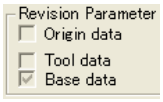
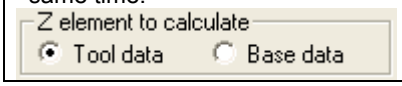
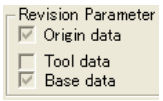
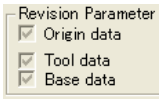
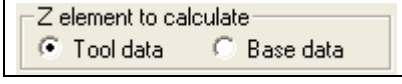
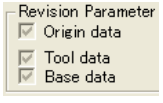
Some elements of revision parameter cannot be reflected because the Vertical 5-axis robot and horizontal 4-axis robot have the limitation.

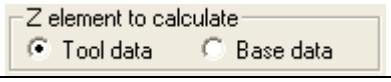
*** The case which condensed by the combination of robot mechanism and revision parameter**

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 12-10 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
5	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 basedata. * Origin data J3 and J4 are included in tooldata. * Select which to be requested because Z elements of tool data and base data are not corrected at the same time. 	Origin data Tool data Base data 	13 to 16 points	8 to 9 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
6	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. 				

* 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

12.4.11.2. Position data posture components

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

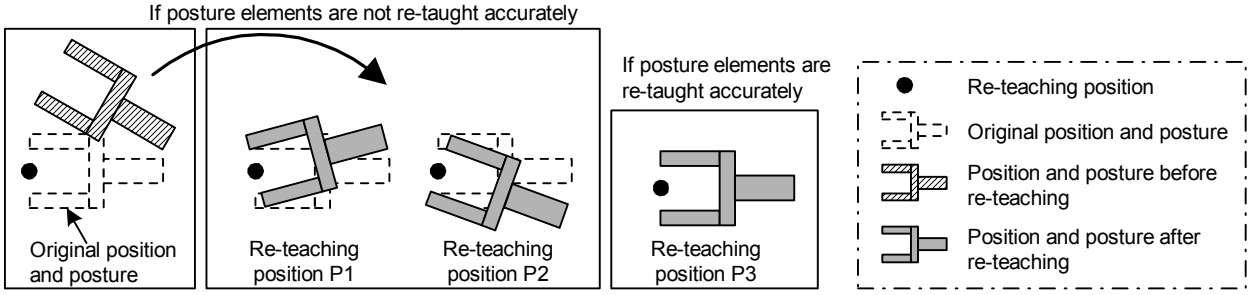
In case of the vertical 6-axis robot, the posture elements of position data are (A, B, C).
In case of the vertical 5-axis robot, the posture elements of position data are (A, B).
In case of the horizontal 4-axis robot, the posture element of position data is (C).

(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 some restrictions. For details, see **"Table 12-11 About Posture Elements of Re-teaching Position Data".**

Table 12-11 About Posture Elements of Re-teaching Position Data

Condition	Merit	Note
When using posture elements of position data ☑ Use the 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 ☐ Use the 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.

12.4.12. Reteaching work

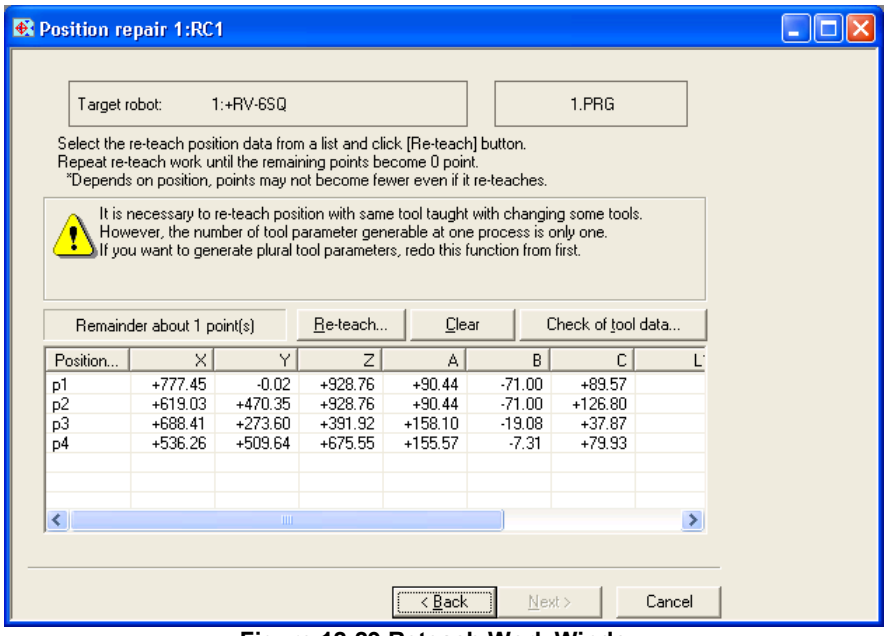


Figure 12-29 Reteach Work Window

[Remainder] Displays the number of remaining points until revision parameters are generated.

Remainder about 1 point(s)

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] 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.

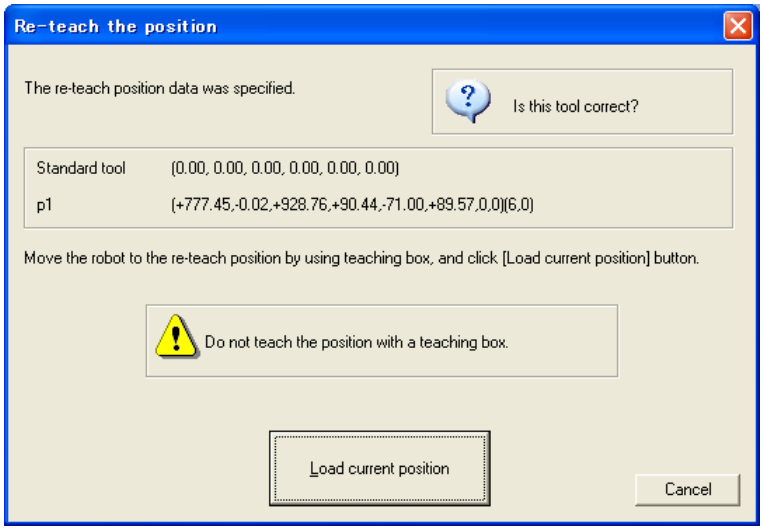


Figure 12-30 Re-teach the position Screen

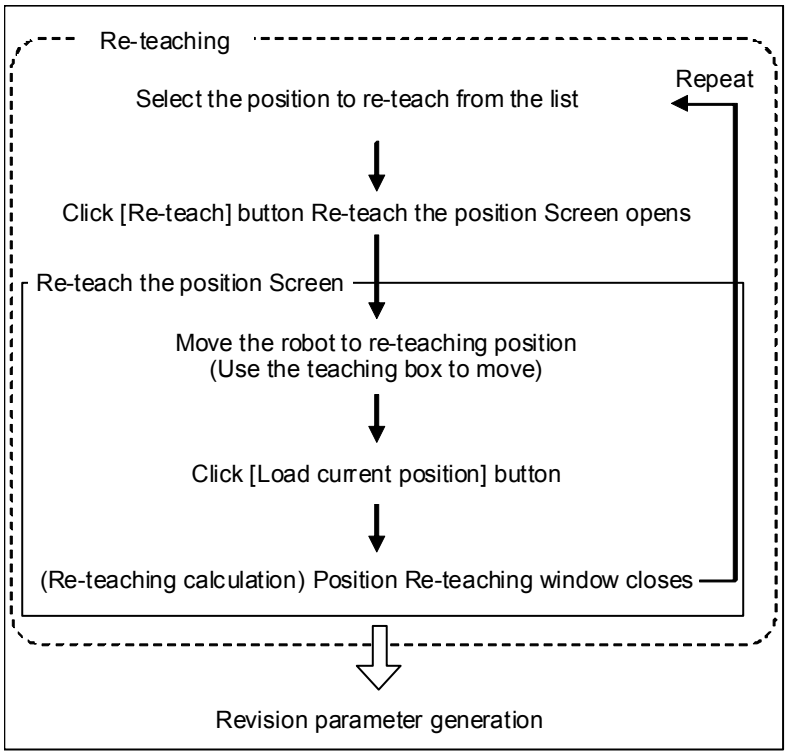


Figure 12-31 Re-teaching Work Procedure

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.

In 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.

When restoring the position with a robot with a travel axis, reteach at a position where the travel position becomes the same as in the original position travel axis data. (Move the robot so that the travel axis data becomes the same as the original position.) If the retaught position travel axis data differs from the original travel axis data, it is impossible to find the correct revision parameters.

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.

12.4.13. Writing parameters

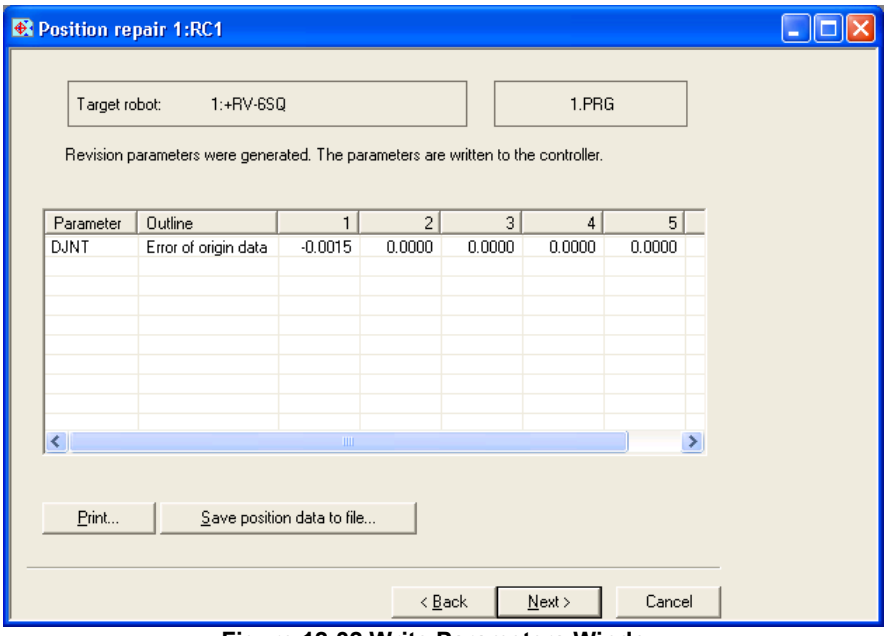


Figure 12-32 Write Parameters Window

[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.

12.4.14. Controller power supply Off, On

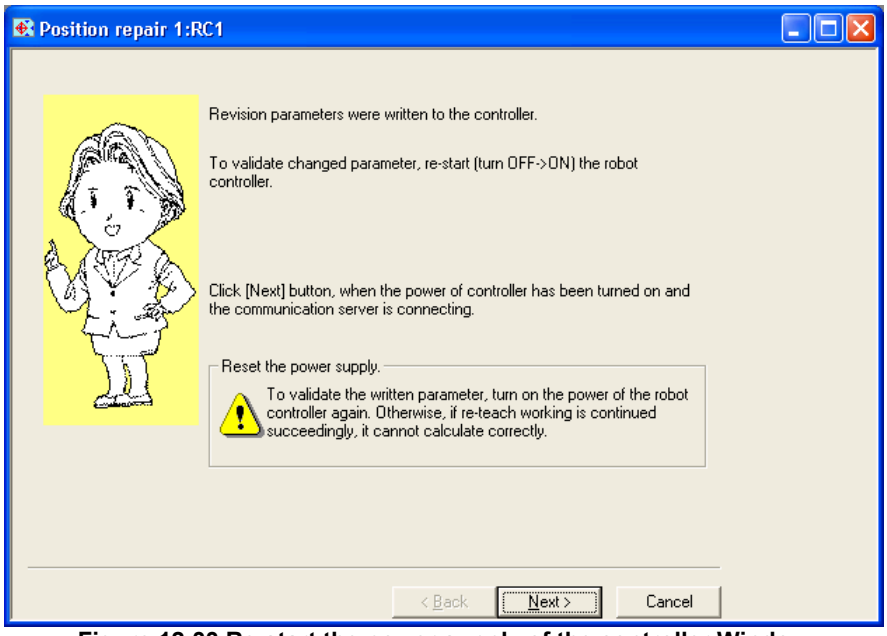


Figure 12-33 Re-start the power supply of the controller Window

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

12.4.15. Exit

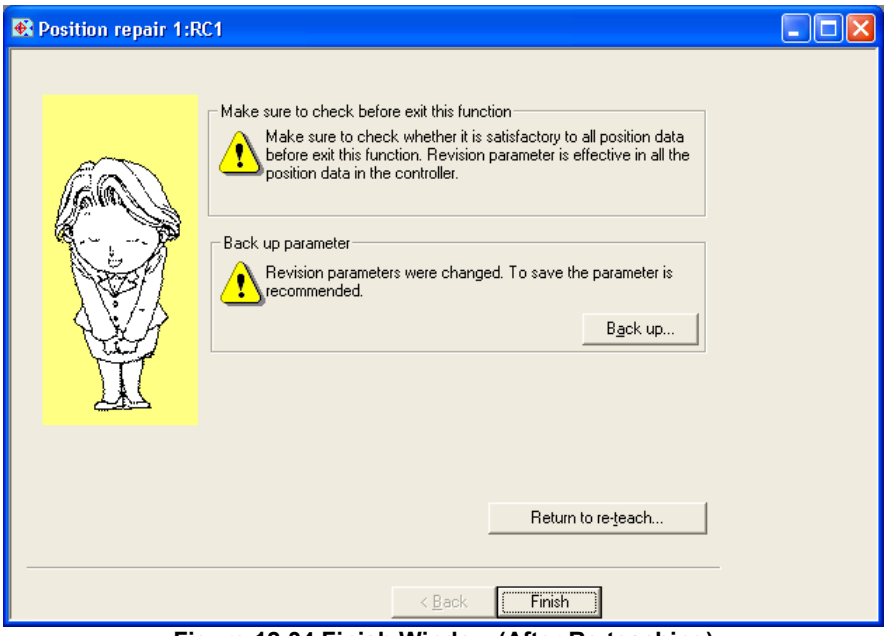


Figure 12-34 Finish Window (After Re-teaching)

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

⚠ Caution

Perform an operation check before exit this function.

Before exit this window, 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 Function has changed the revision parameters. Back up the parameters before exit this window.

⚠ 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 function cannot rectify the point.

12.4.16. Revision parameter editing

When you select "Edit the value of revision parameter directly" with "12.4.7 Revision parameter generation procedure selection", this screen is displayed.

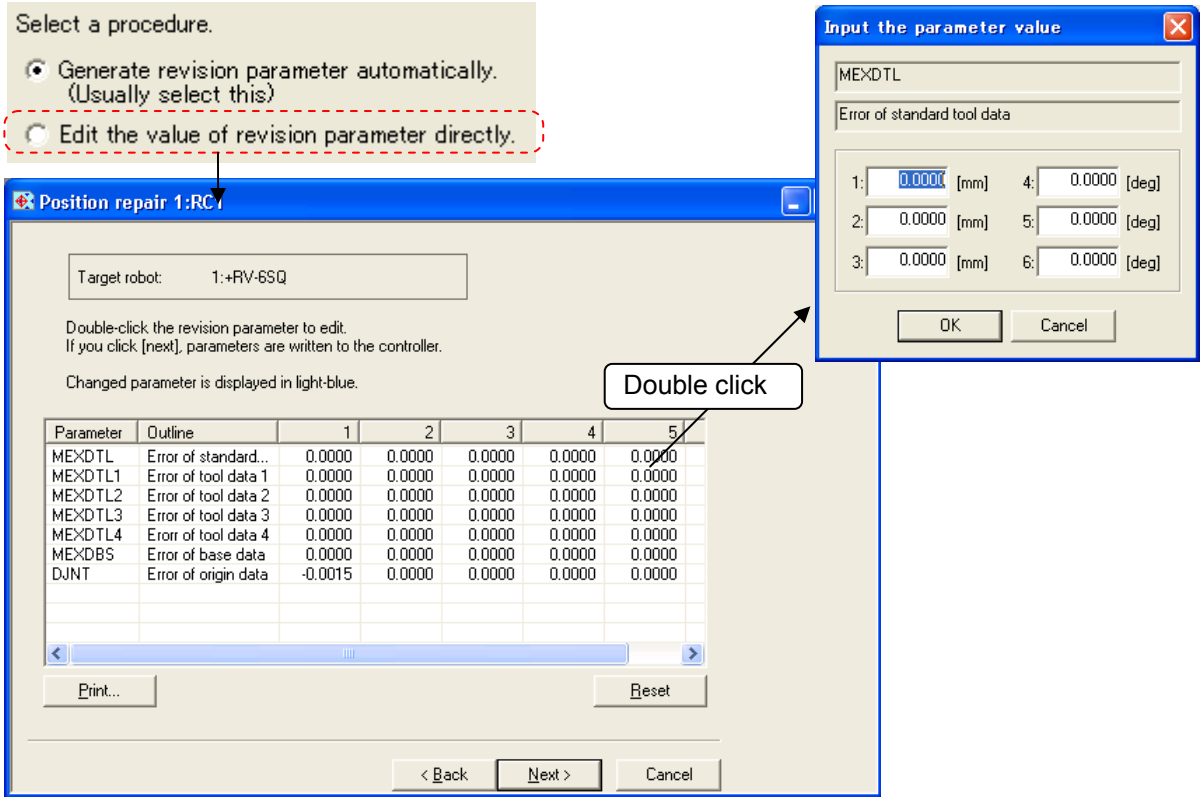


Figure 12-35 Edit Revision Parameters Window

[Print]	Prints the revision parameter information displayed in the list.
[Reset]	Reset 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 CRn-500 series 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.

12.5. Tool automatic calculation

With the “Tool automatic calculation”, the tool length is calculated automatically by teaching a same position by 3 to 8 points to the robot that is attaching an actual tool, and the value of a tool parameter (MEXTL) is set up.

This function can be used with Version 2.20W or later of this software. Refer to **“Table 12-12 Supported Robot Controllers and Models”**.

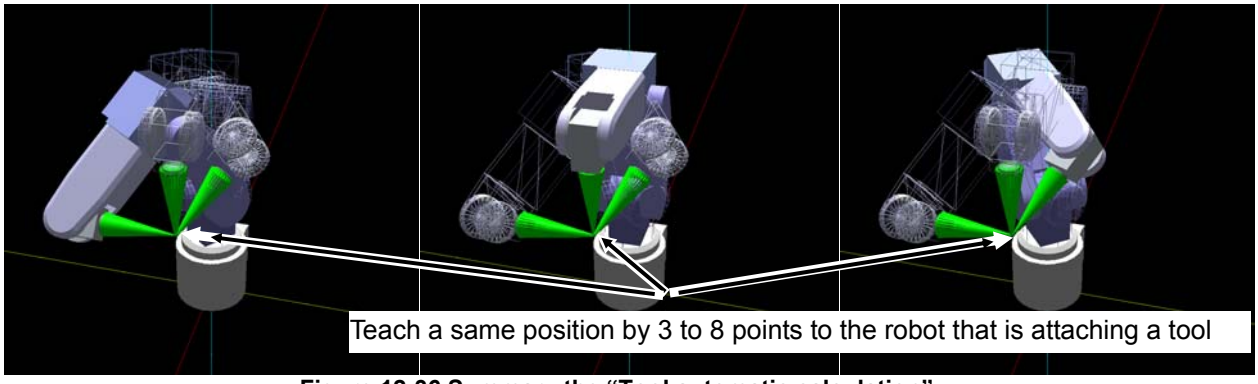


Figure 12-36 Summary the “Tool automatic calculation”

12.5.1. Specifications

The robot models and robot controller versions with which the “Tool automatic calculation” can be used are as follows.

Table 12-12 Supported Robot Controllers and Models

No.	Robot model	CR750/700 series Robot Controller	CRn-500 series Robot Controller
1	Vertical 6-axis robot	Version R3e/S3e or later	not use
2	Vertical 5-axis robot	not use	
3	Horizontal 4-axis robot	Version R3e/S3e or later	

12.5.2. Starting

The “Tool automatic calculation” is used in the state with the robot controller connected.

When the robot model and robot controller which have connected, correspond to this function, a [Tool automatic calculation] is displayed under [Maintenance] in the project tree. Double-click [Online] -> [Maintenance] -> [Tool automatic calculation] in the project tree.

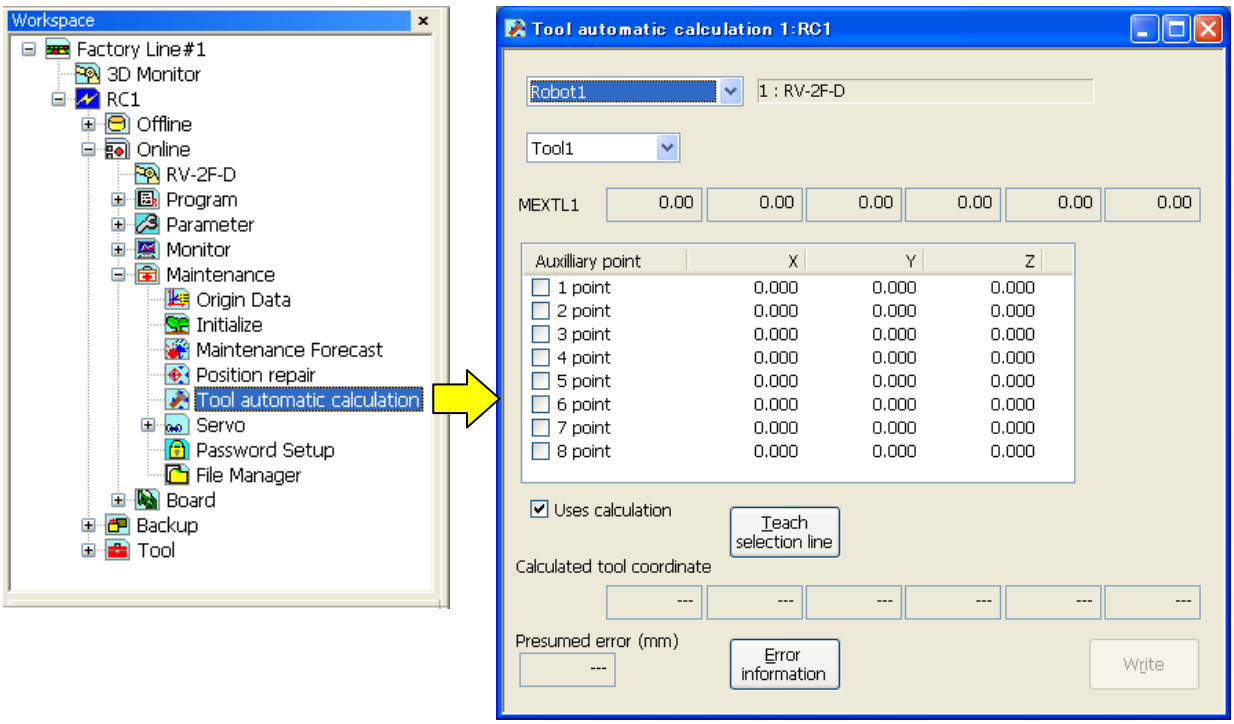


Figure 12-37 Starting the “Tool automatic calculation”

12.5.3. Flow of operations

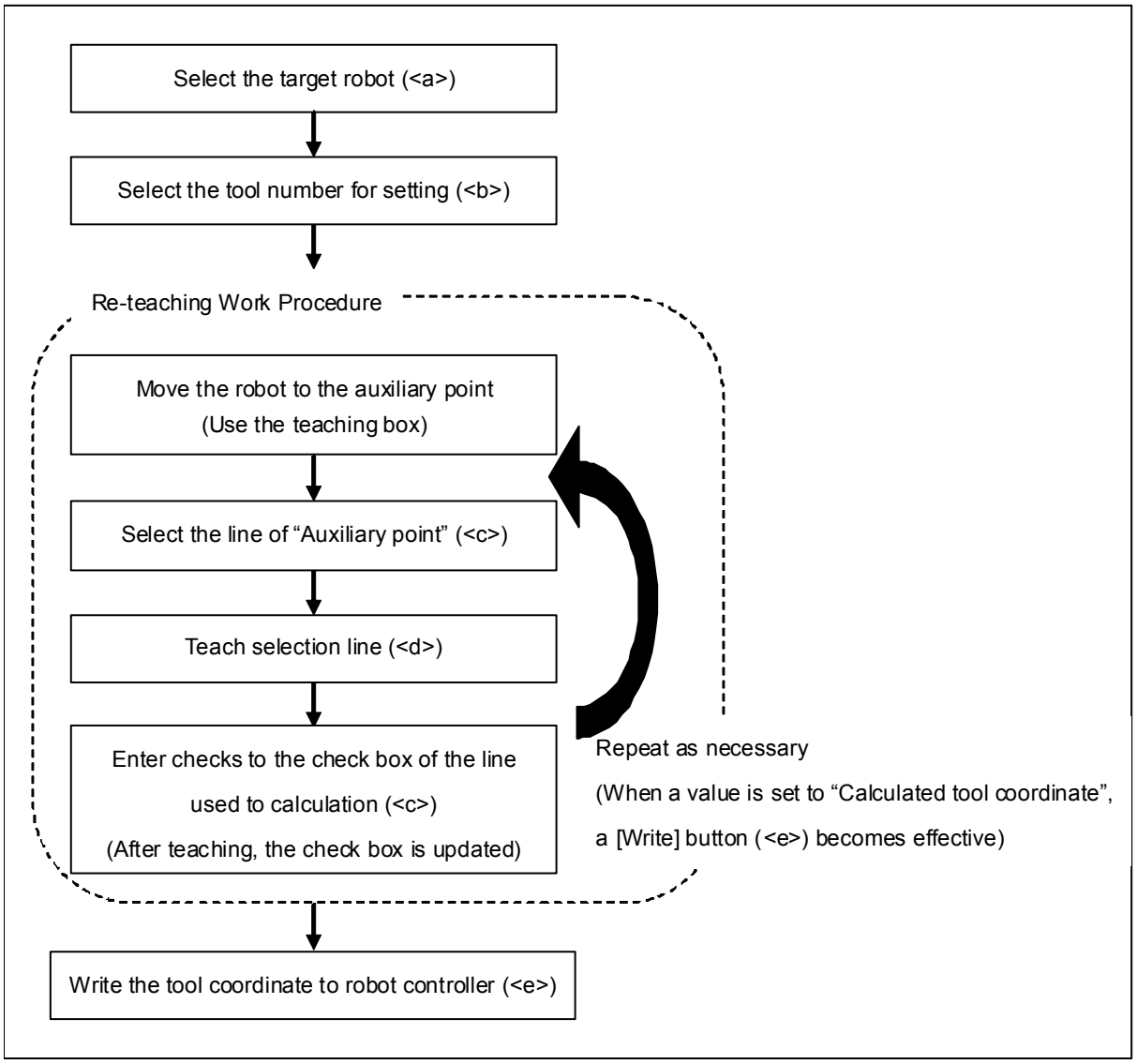


Figure 12-38 Operation Flow

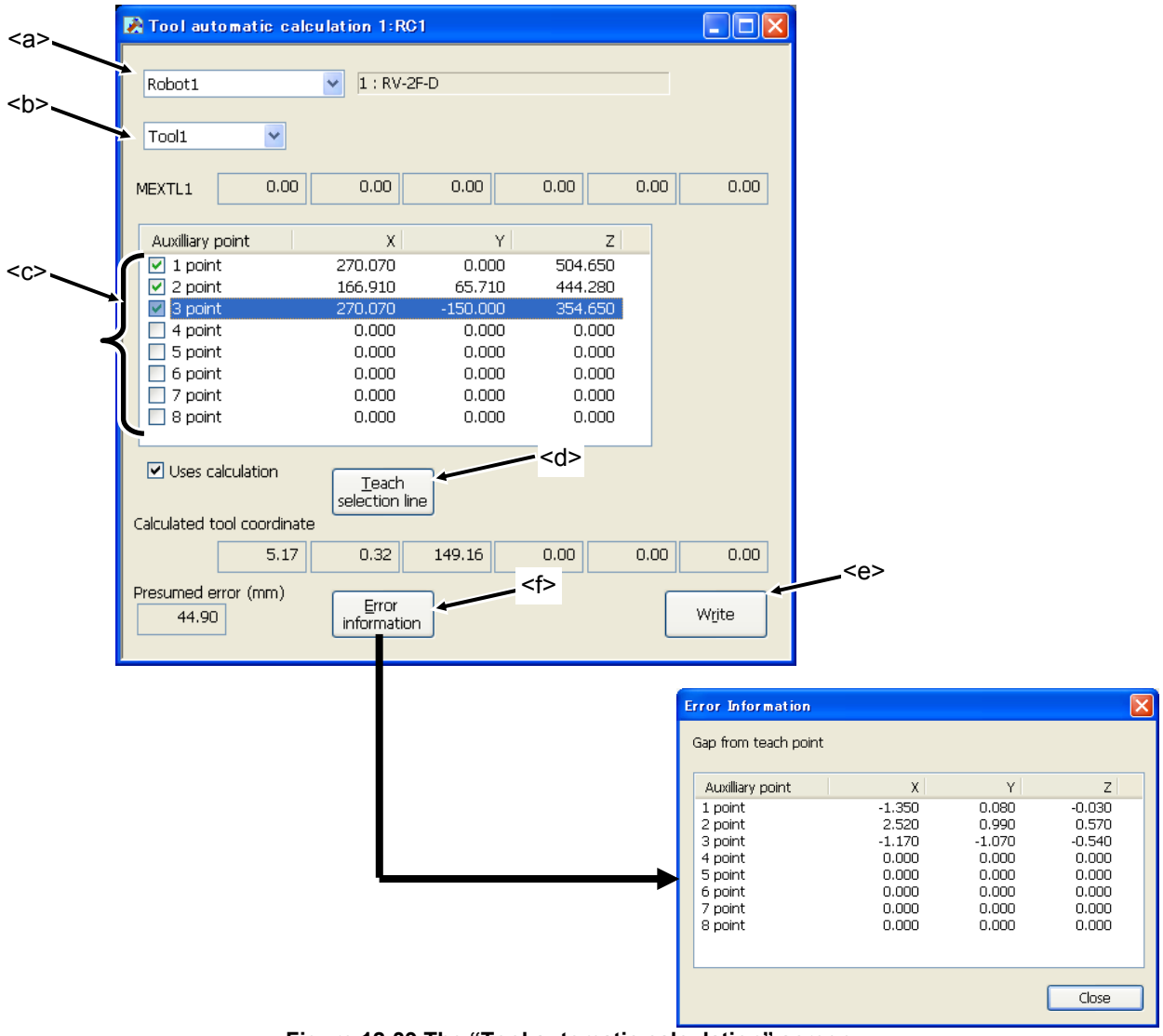


Figure 12-39 The "Tool automatic calculation" screen

Select the robot (<a>) and the tool number (<b>).

Move the robot which is attaching a tool. After selecting the line of "Auxiliary point" list (<c>), click a [Teach selection line] button (<d>). Teach a same position by 3 to 8 points with different posture.

When a value is set to "Calculated tool coordinate", a [Write] button (<e>) becomes effective. When the [Write] button (<e>) is clicked, the values of a tool parameter (MEXTL) are written to the robot controller.

When a [Error information] button (<f>) is clicked, it is possible to check the gap from a teaching point.

⚠ Caution

Teach the position with greatly different posture of the robot.

If the teaching points look like each other, the tool coordinate might be not computable.
(e.g. when only A axis is different)

12.6. Servo Monitor

This monitors servo information.

Table 12-13 Supported robot

		Supported robot		
		CR750/700	CR500	Simulation
Version	Ver.2.50C or earlier	All robot	All robot	Not available
	Ver.3.00A or later	All robot	All robot	RV-F/RH-F series

The servo data items can be monitored by simulation as follows.

Table 12-14 Supported servo data items by simulation

	Items	possible
1	Position feedback	○
2	Position in 1 rotation	×
3	Fdt command	×
4	Position droop	○
5	Max. position droop	○
6	Position command	○
7	Speed command	○
8	Speed feedback	○
9	Speed MAX.	○
10	Current cmd	○
11	Current feedback	○
12	Max. current cmd1	○
13	Max. current cmd2	○
14	RMS current	○
15	Tolerable cmd-	○
16	Tolerable cmd+	○
17	Axis load level	○
18	Max. axis load level	○
19	Encoder temp.	×
20	Motor power voltage	×
21	Motor power voltage (MAX)	×
22	Motor power voltage (MIN)	×
23	Regeneration level	×

12.6.1. Position (ABS)

Data concerning the position of each axis motor can be monitored.
The following data can be monitored.

- Position feedback
  Current motor rotation position is displayed by the pulse value of the encoder.
- Position in 1 rotation
  Present position in one rotation of the encoder is displayed.
  (It is not displayed in the CR750/700 series controller. It always becomes 0.)
- Fdt command
  The amount of the change of the position command between the control cycles is shown.
  (It is not displayed in the CR750/700 series controller. It always becomes 0.)
- Position droop
  The amount of deflection at the motor rotation position to a position command is shown.
- Max. position droop
  The maximum value of position droop after robot controller's power supply is turned on is displayed.
  When the [Reset] button on the screen is clicked, this value is reset in 0.
- Position command
  The command of the motor rotation position for the servo is displayed by the pulse value.

Click [Reset] button to reset all Servo Monitor.
This function can be used with Version 1.8 or later of this software.

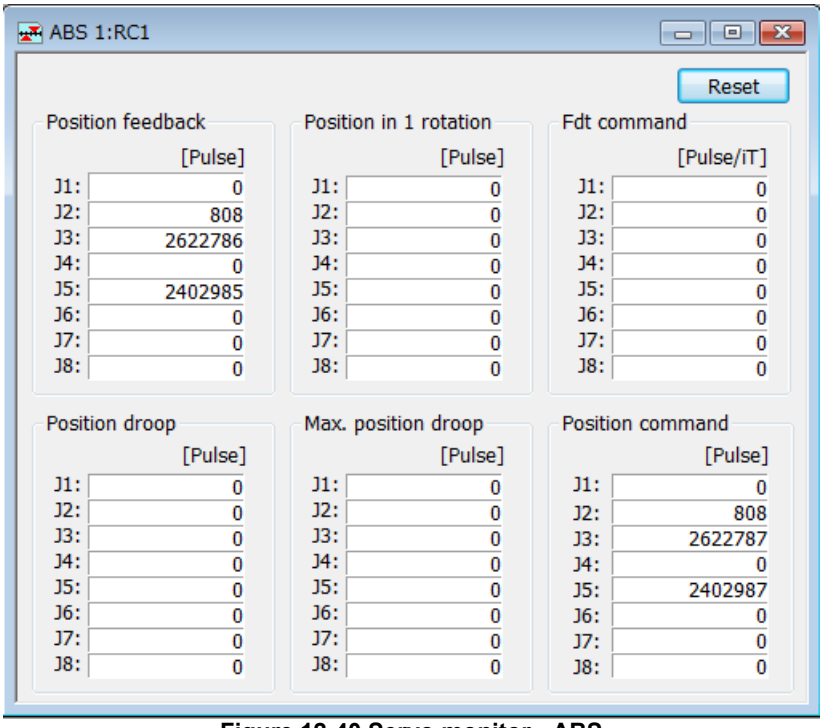


Figure 12-40 Servo monitor - ABS

12.6.2. Speed

The following data concerting the rotational speed of each axis motor can be monitored.

- Speed feedback
  A present motor speed is displayed by the unit of rpm.
- Speed MAX.
  The maximum value of the speed feedback after robot controller's power supply is turned on is displayed.
  When the [Reset] button on the screen is clicked, this value is reset in 0.
- Speed command
  The command of the motor speed is displayed by the unit of rpm.

Click [Reset] button to reset all Servo Monitor.
This function can be used with Version 1.8 or later of this software.

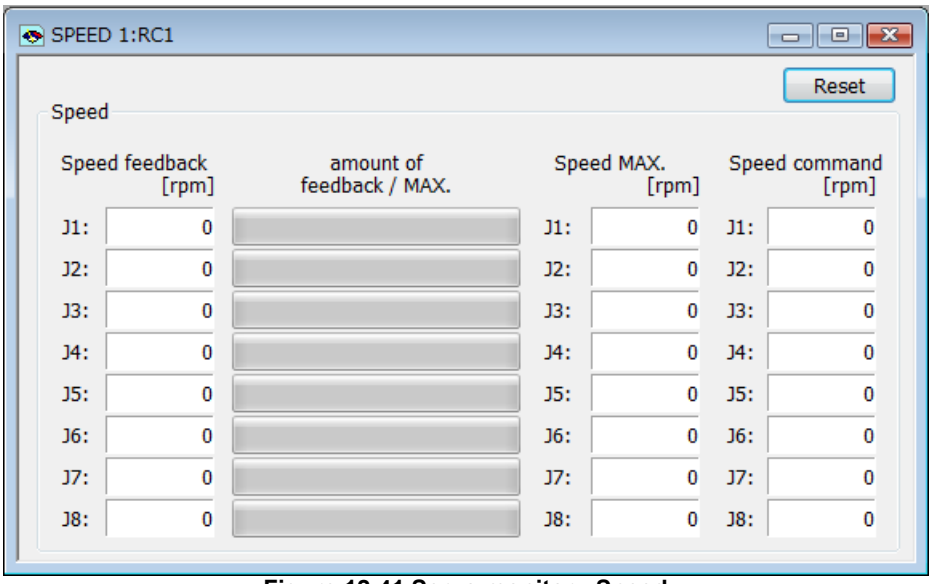


Figure 12-41 Servo monitor - Speed

12.6.3. Current

Data concerning the current value of each axis motor can be monitored.
The following data can be monitored.

- Current cmd
  The current command of the motor is displayed.
- Max. current cmd1
  The maximum value of the current command after robot controller's power supply is turned on is displayed.
  When the [Reset] button on the screen is clicked, this value is reset in 0.
- Max. current cmd2
  The maximum value of the current command for the last 2 seconds is displayed.
- Current feedback
  A present value of the motor current is displayed.
- Tolerable cmd-/+
  The limitation value of the minus side and the plus side of the current command set to the motor is displayed.
- RMS current
  Present RMS value of the motor current is displayed.

Click [Reset] button to reset all Servo Monitor.
This function can be used with Version 1.8 or later of this software.

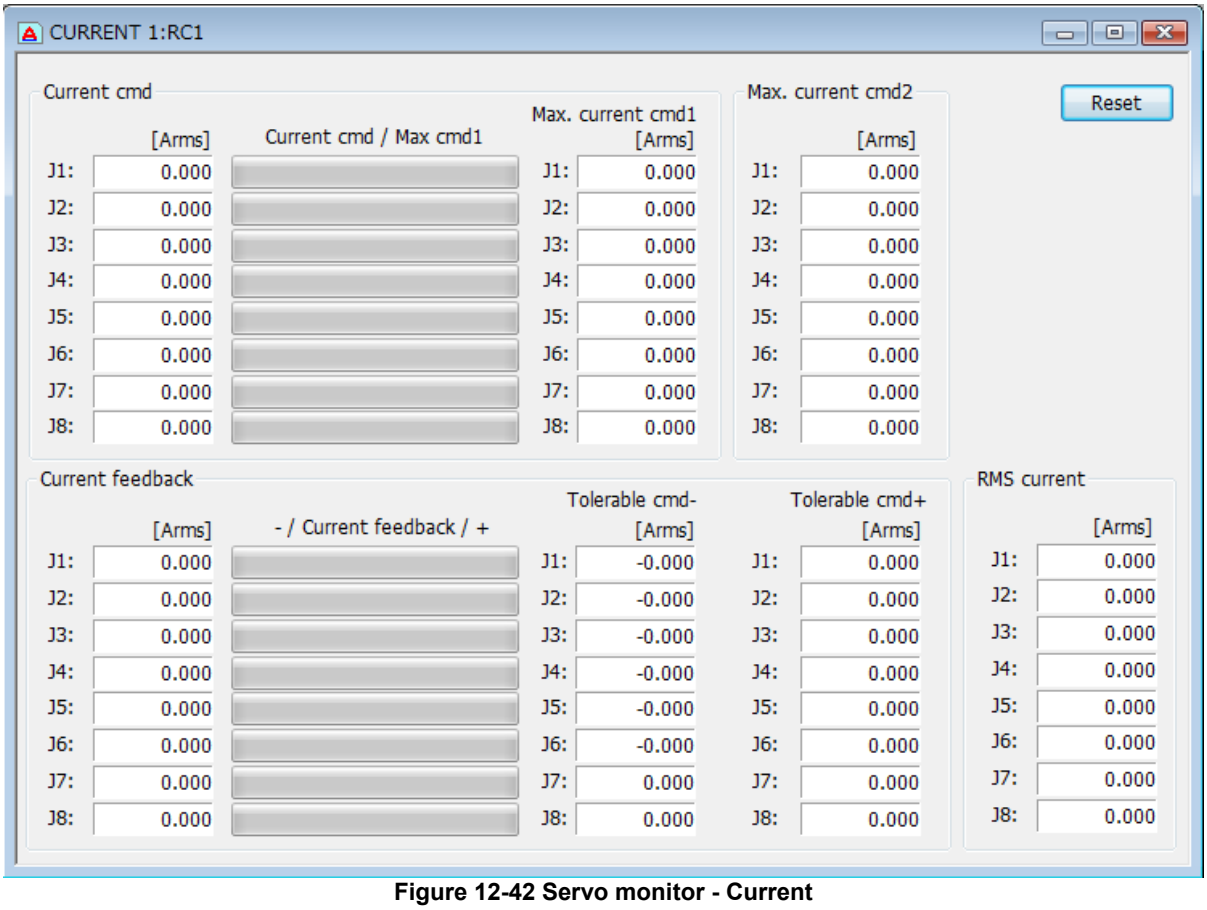


Figure 12-42 Servo monitor - Current

12.6.4. Load

The load state of each axis motor and the temperature of the encoder (Only the robot that corresponds to the function of the encoder temperature) can be monitored.

The following data can be monitored.

- Axis load level
  A preset load ratio of each motor is displayed as an alarm level.
  The overload error occurs when this value reaches 100%.
- Max. axis load level
  The maximum value of the axis load level after robot controller's power supply is turned on is displayed.
  When the [Reset] button on the screen is clicked, this value is reset in 0.

Click [Reset] button to reset all Servo Monitor.

The encoder temperature is not displayed with the software before Version 2.00A. And the robot controller that corresponds to the function of the encoder temperature is as follows.

Robot controller	Software version of the robot controller
CR750-D/CRnD-700	Ver.S3 or later
CR750-Q/CRnQ-700	Ver.R3 or later

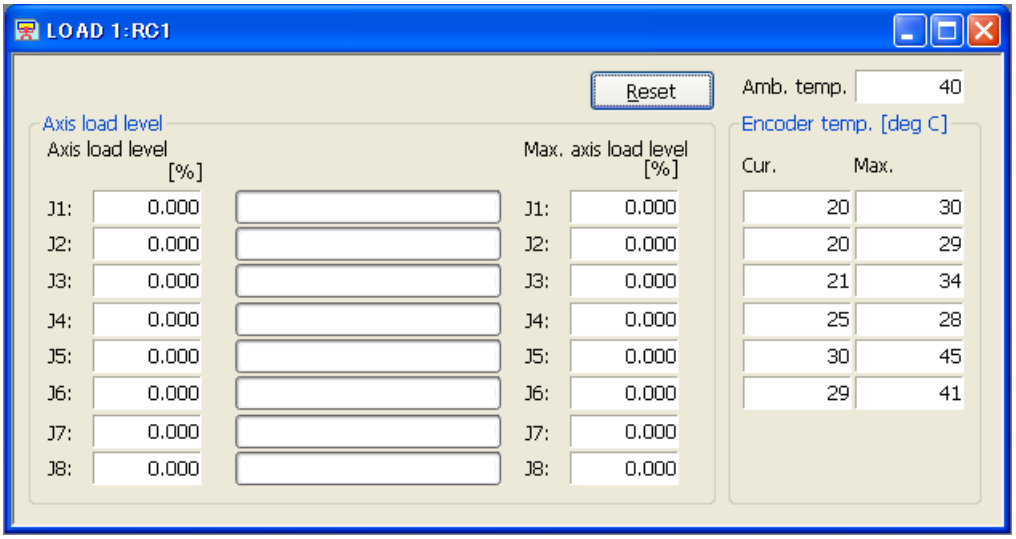


Figure 12-43 Servo monitor - Load

12.6.5. Power

The following data concerning robot controller's main circuit power supply can be monitored.

Motor power voltage
A present power-supply voltage value is displayed.
Motor power voltage (MAX)
The maximum value of the motor power voltage in servo ON is displayed.
When the [Reset] button on the screen is clicked, this value is reset in 0.
Motor power voltage (MIN)
The minimum value of the motor power voltage in servo ON is displayed.
When the [Reset] button on the screen is clicked, this value is reset in 0.
Regeneration level
The regenerative current value of each axis is displayed as an alarm level.
The excessive regeneration error occurs when this value reaches 100%.

Click [Reset] button to reset all Servo Monitor.
This function can be used with Version 1.8 or later of this software.

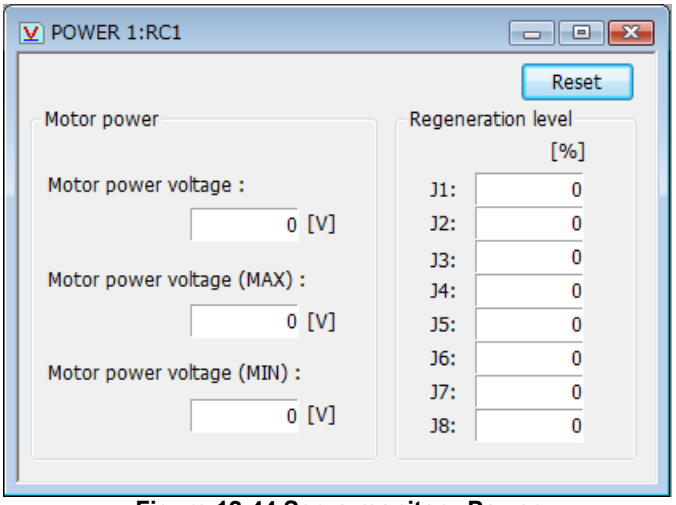


Figure 12-44 Servo monitor - Power

12.7. Security function of the robot controller (Password Setup)

It is possible to forbid to accessing the robot programs, parameters and files in the robot controller.
The security function can be achieved by setting the password to the robot controller. This function can be used with Version 2.00A or later of this software. And the software version of the robot controller which can be used is as follows.

Table 12-15 Compliant version of this function and controller

Robot Controller	Software version of robot controller
CR750-D/CRnD-700 series	S3
CR750-Q/CRnQ-700 series	R3
CRn-500 series	not use

The function that the password can be set is as follows. It is possible to setup the password to access of the program, parameters, and files individually. The factory default setting of "Password Setup" are off.

Table 12-16 Function that access is limited.

Type	Limited functions	Remarks
Program	・ Writing the programs.	
	・ Reading the programs.	
	・ Copying the programs.	
	・ Renaming the programs.	
	・ Deleting the programs.	
	・ Writing the position data for SQ Direct.	
	・ Reading the position data for SQ Direct.	
	・ Deletion of all robot programs.	
	・ File Manager	It is not possible to delete the file, or rename the file.
Parameter	・ Writing the parameters.	It is possible to read the parameters from the robot controller.
	・ Position repair function.	It is not possible to write the revision parameter created by “Position repair function” in the robot controller.
	・ Restore the origin data.	
	・ Restoring the program information	Program information is correctly restored though < Write the task slot# > error is displayed when program information is restored before this software version 1.8 or earlier.
File	・ Backup	
	・ Restore	
	・ Position repair function	

Use the registration, change, and the deletion of the password while connected to the robot controller. From the project tree, click on the menu bar [Online] → [Password Setup], or double click the target project [Online] → [Maintenance] → [Password Setup].

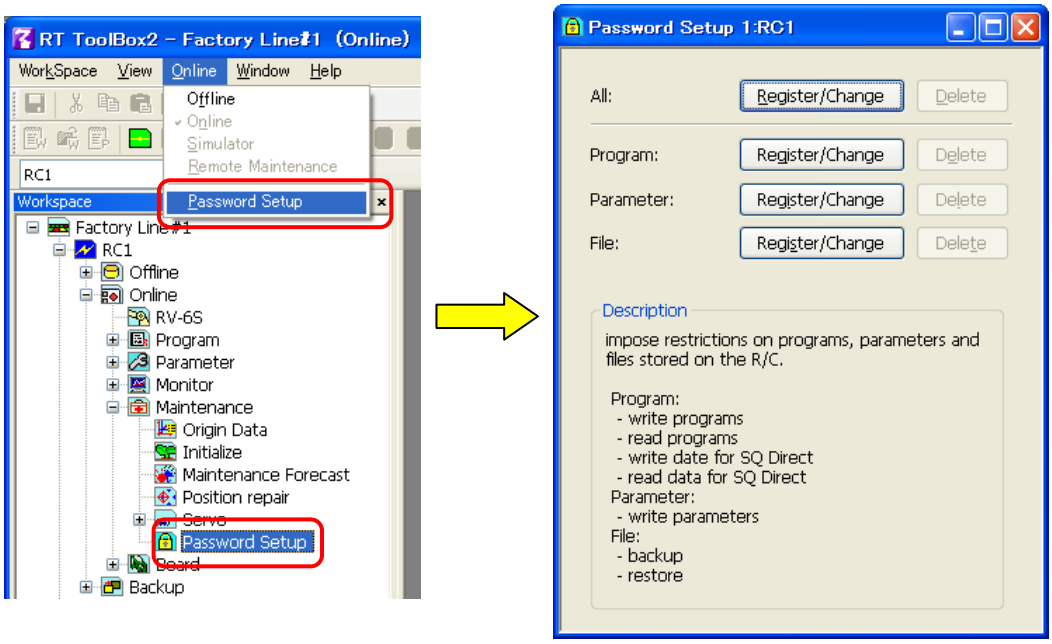


Figure 12-45 Password setup

When the security function has been turned on in the controller, the mark is displayed in the left of the button of the item to which access is forbidden.

(for example: Register/Change)

12.7.1. Register the Password

The password is registered to the robot controller.

Click the "Register/Change" button of the item to which register the password in "Password Setup" screen. After inputting the password in the "Register/Change Password" screen, click the [OK] button. The input password is displayed by "*".

Please input the password by 8 characters or more, and 32 characters or less. The character that can be used is as follows.

Table 12-17 Character that can be used by password

Character that can be used by password (8 characters or more, and 32 characters or less)	
Number (from 0 to 9) Alphabet (from A to Z, and from a to z)	(Notes)The capital letter and the small letter of the alphabet are distinguished.

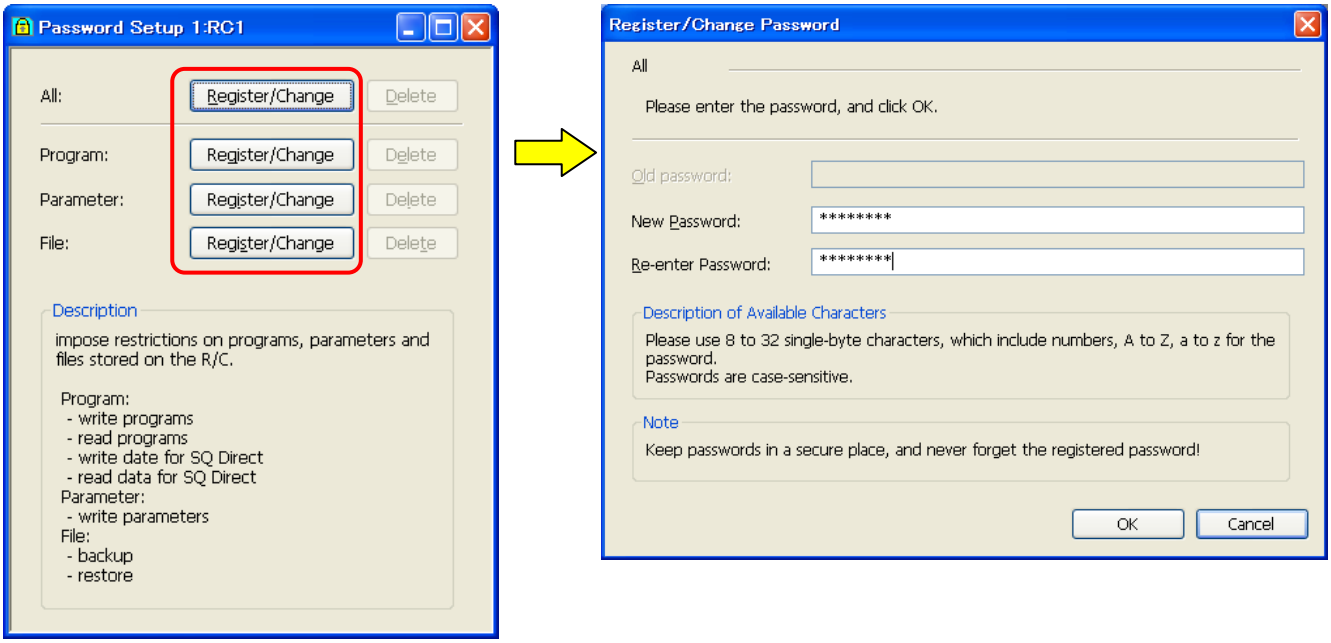


Figure 12-46 Register Password

⚠ Caution

Please note the management of the password enough.

It becomes impossible to release the security function of the robot controller when the password is forgotten. Please note the management of the password enough.

12.7.2. Change the Password

The password being set in the controller is changed.
Click the "Register/Change" button of the item to which change the password in "Password Setup" screen. After inputting a password set now and a new password in the "Register/Change Password" screen, click [OK] button.

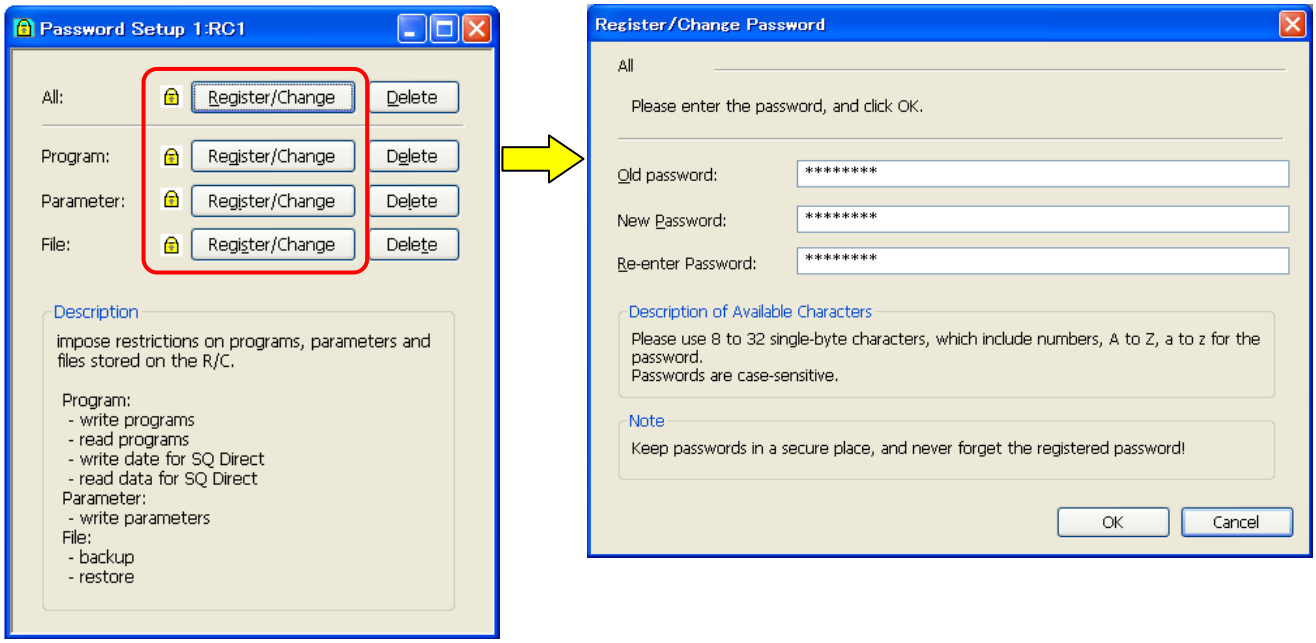


Figure 12-47 Change Password

When the password is changed by "All" button, it is necessary to register the same password to all items.

12.7.3. Delete the Password

The password being set in the controller is deleted.
Click the "Delete" button of the item to which delete the password in "Password Setup" screen. After inputting a password set now in the "Delete Password" screen, click [OK] button.

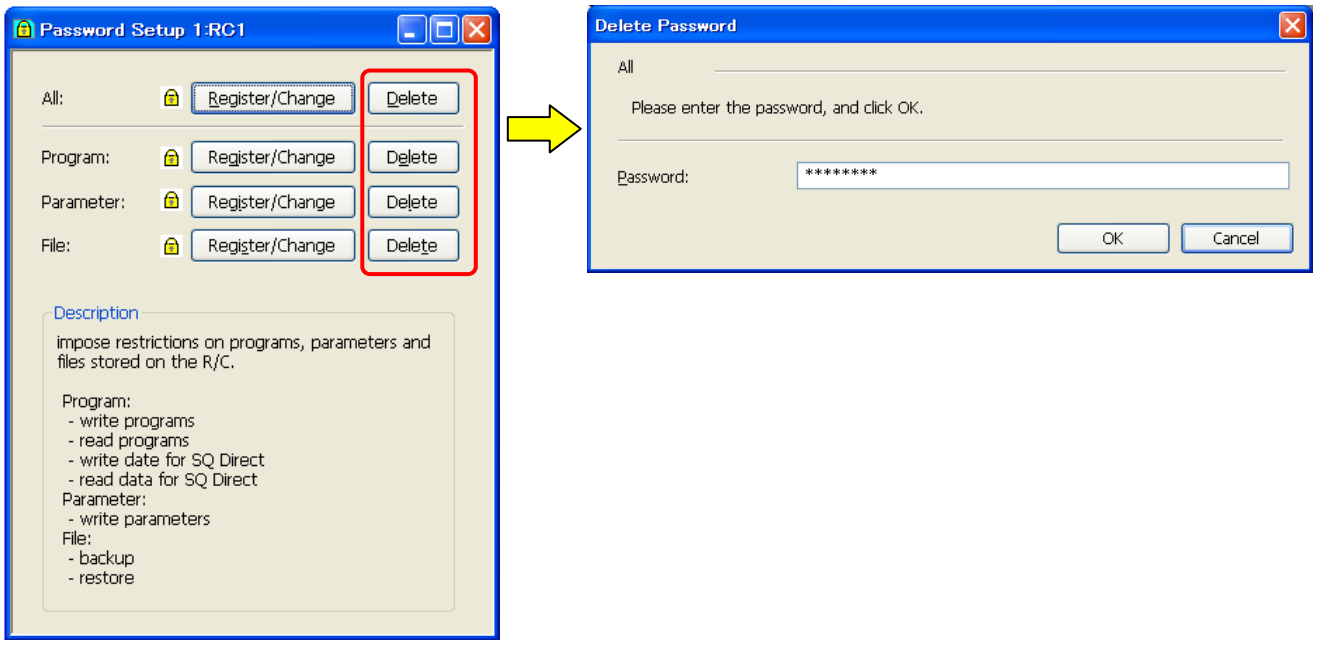


Figure 12-48 Delete Password

When the password is delete by "All" button, it is necessary to register the same password to all items.

12.8. File Manager

You can copy, delete and rename the file in the robot controller.
This function can be used with Version 2.20W or later of this software.

Double-click [Online] -> [Maintenance] -> [File Manager] in the project tree.

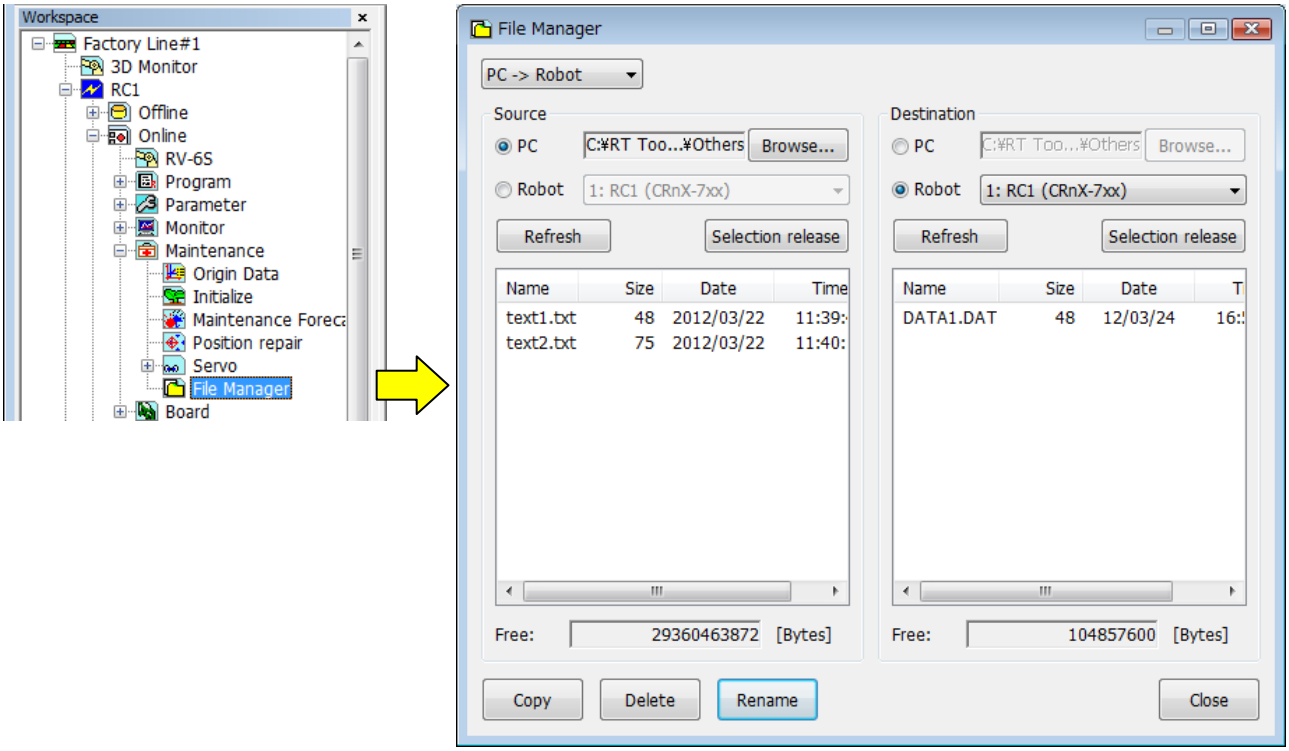


Figure 12-49Starting File Manager

⚠ Caution

If the robot controller's version is earlier than R3e/S3e:
You cannot delete or rename the file without an extension.

If the robot controller's version is earlier than R3e/S3e:
You cannot delete or rename the file of a name that is longer than 16 characters.

If the robot controller's version is earlier than R3e/S3e:
You cannot operate the file which '0' is attached at the head of a file name.

⚠ Caution

When the password is registered in “program” by robot controller's security function, the file cannot be deleted, or cannot be renamed.

When the password is registered in “program” by robot controller's security function, the file cannot be deleted, or cannot be renamed.

○ : Enable、 × : Disable

	Item to which password of security function is registered.		
	Program	Parameter	File
Delete the file Rename the file	×	○	○

Please delete the password of robot controller's security function when you operate these. Please refer to **"12.7.3 Delete the Password"** for the method of deleting the password.
The setting(register the password) and the release(delete the password) of robot controller's security function can be used with this software version 2.0 or later. Please refer to **"Table 12-15 Compliant version of this function and controller"** for robot controller's compliant version.

12.8.1. File list display

On the left and right lists, the lists are files of the displayed in the robot controller and the specified folder.

(1) Setup of transmission　　You can select “PC->Robot” or “Robot -> PC”.
(2) PC　　You can specify files in the personal computer.
(3) Robot　　You can specify a robot controller that is currently connected
(4) [Browse…]　　When you select [PC], you can specify any folder on the computer.

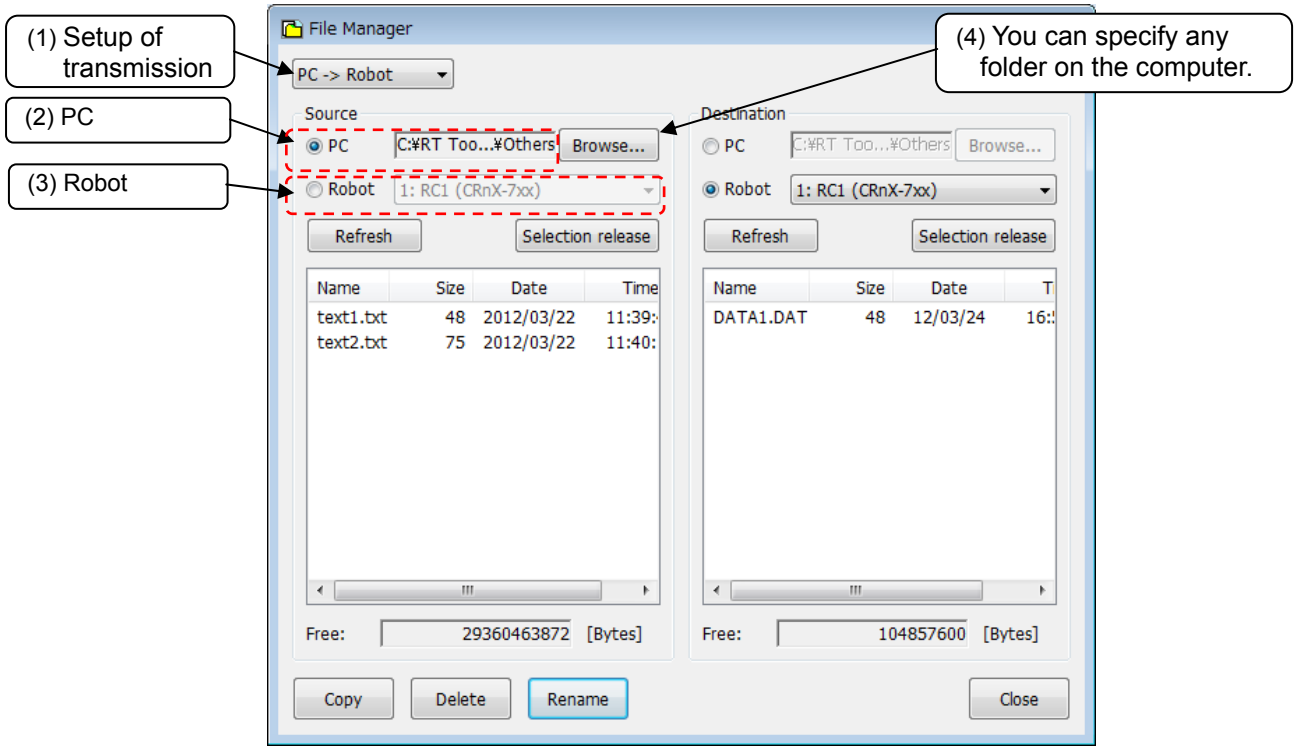


Figure 12-50 File list display

There are files which you cannot operate on this screen, such as robot programs, parameter files in the robot controller, etc. The file which cannot be operated is not displayed on a list. The file which cannot be operated on this screen is as follows.

Table 12-18 The file which cannot be operated on a file management screen, and its extension

No.	Files	File name or extension
1	Robot program files	.MB4/.MB5/.prg
2	Parameter files	.PRM
3	Error log files	AError.log
		CError.log
		HError.log
		LError.log
4	I/O Log (Input/Output)	IOLogInp.log
		IOLogOut.log
5	Trap function log files(program execution log files)	.trp
6	Servo data log files (This file is reconstructed at the time of the power supply ON.)	.sdl/.sdb
7	Force control log file (This file is deleted at the time of the power supply OFF.)	.fsl
8	Error record log files	TTLERROR.DAT
9		ERRORLOG.CSV
10	Command information file	COMMANDS.XML
11	System files (Backup information etc.)	.SYS
12	Serial information file (This file is created at the time of backup)	.ser

12.8.2. Copy

The files are copied.

Select the transmission source file names from the list at the left, and designate the transmission destination folder on the right side. The multiple transmission source files can be selected at the same time

Click [Copy] button after choosing the file to copy and setting up a transmission place. The file is copied after a copy confirmation message display.

When the file of a same name exists in a transmission place, an overwrite confirmation message is displayed.

12.8.3. Delete

The files are deleted.

Select the file to delete in the list. It is possible to select some files simultaneously. All the files selected by a list of both right and left are deleted. Click [Delete] button after selecting some files in the lists. A deletion confirmation message is displayed.

12.8.4. Rename

The file is renamed.

Select one file in the list. It is possible to select a file from both of the lists. Click [Rename] button, and input new file name in “Setup for Rename” dialog.

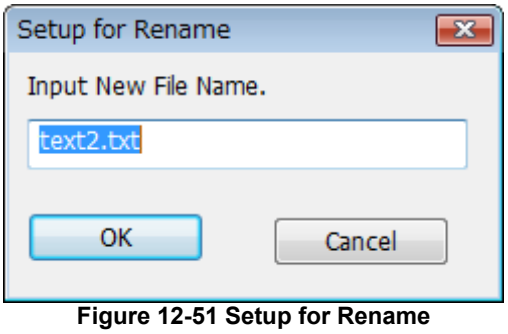


Figure 12-51 Setup for Rename

13. Option Card

You can check information on option cards mounted in the robot controller.

When you open [Option Card] on the project tree, the slots in which option cards are currently mounted and the option card names are displayed. If you place the mouse cursor on an option card name, the information for that option card is displayed.

If no option card is mounted on the robot controller, nothing is displayed.

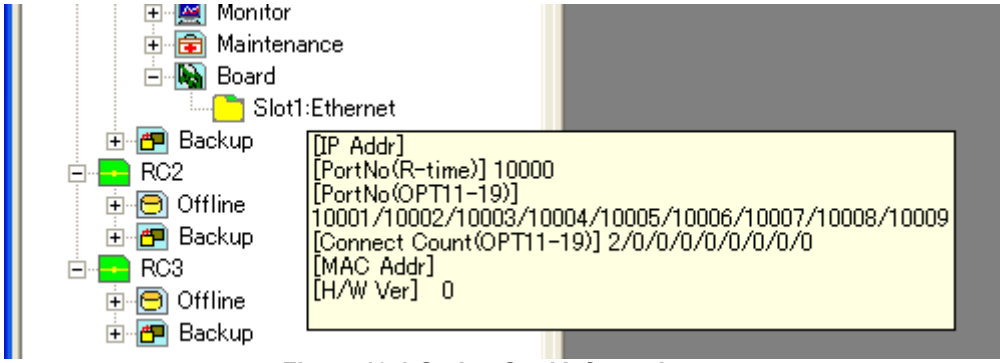


Figure 13-1 Option Card Information

14. Backup and Restore

You can back up information in a robot controller to the computer.
You can also restore backup information saved to the computer back into a 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.

⚠ Caution

Please do not pull out the cable while communicating.

Please never pull out the cable while communicating with the robot controller. If the communication cable is removed while communicating, the status of the robot controller or the personal computer might become abnormal. Please remove the cable when the status is not “Online” or this software exited.

Also when communicating by using the USB,
please do not pull out the USB cable
until the communication is completed.

⚠ 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:

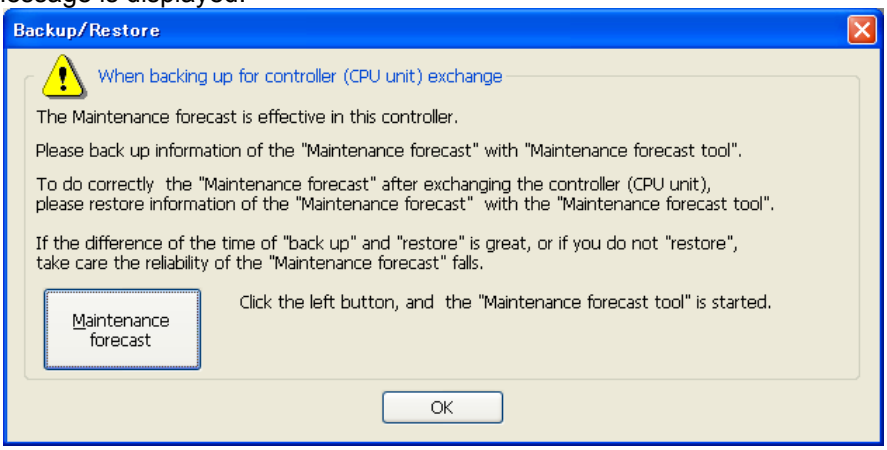


Figure 14-1 Backup When Maintenance Forecasting Information Is Enabled

* When using a CRn-500 series robot controller, maintenance forecasting is supported for software versions J2 and later.

⚠ Caution

When the password is registered in “file” by robot controller's security function, it is not possible to back up information in a robot controller to the personal computer, or to restore backup information saved to the computer back into a robot controller.

When the password is registered in “file" by robot controller's security function, it is not possible to back up the information in the robot controller to the personal computer or to restore backup information saved to the computer back into a robot controller.

○ : Enable, × : Disable

		Item to which password of security function is registered.		
		Program	Prameter	File
backup	All files	○	○	×
	Program	○	○	×
	Parameter files	○	○	×
	System program	○	○	×
Restore	All files	○	○	×
	Program	○	○	×
	Parameter files	○	○	×
	System program	○	○	×

Please delete the password of robot controller's security function when you operate these. Please refer to **"12.7.3 Delete the Password"** for the method of deleting the password.

The setting (register the password) and the release (delete the password) of robot controller's security function can be used with this software version 2.0 or later. Please refer to **"Table 12-15 Compliant version of this function and controller"** for robot controller's compliant version.

14.1. Backup(Robot -> PC)

You can save information in a robot controller to a file in the computer.
Use the backup function while RT ToolBox2 connected to the robot controller.

There are two methods for saving data as follows.
<1> Saving data from one robot controller.
<2> Saving data by batch processing from all robot controllers which connected with this software.
(Note that this function can be used with Version 1.3 or later of this software.)

⚠ Caution

Cautions for backups

When backing up system status variable values and program external variable values, switch the robot controller power Off, then On again, then perform the backup operations.

The files BKUP.SYS and MECHA.SYS are automatically created in the specified folder. These files record the saved robot controller mechanical information and save format. Be careful. If you delete or rewrite these files, this may make it impossible to restore them to the robot controller.

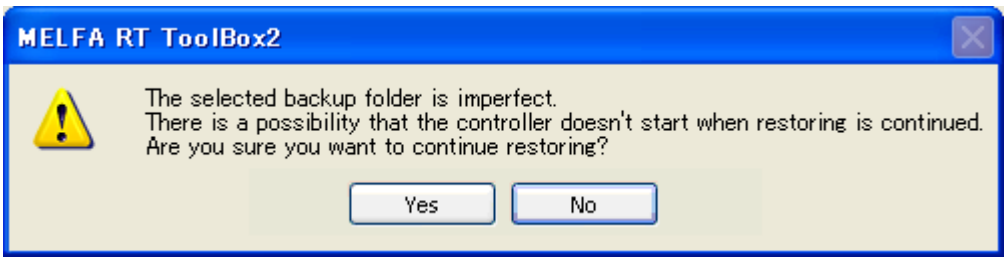
The objective of backup data is to back up robot controller information. However, with this software version 1.2 or later, it is possible to open a backed up program with program editor. Please refer to **"8.2.4 Opening a program in the backup data"** in this manual for details.

⚠ Caution

Cautions when backup is interrupted

Backup again when the communication fault occurs while backing up or the backup is interrupted clicking the “cancel” button.

"[NG]" is added to the head of folder name when the backup is interrupted. Do not restore the backup folder because the folder’s information is imperfect. There is a possibility that the controller doesn't start when restoring is continued. When you select the folder whose name has “[NG]” when restoring, the warning dialog as follows is displayed. Select “No” normally.
This function is available from RT ToolBox2 Ver.1.3.1 or later.



14.1.1. Saving data from one robot controller

(1) From the project tree, open the target project [Backup]. In the backup tree, "All file", "Program information", "Parameter files", and "System program" are displayed.

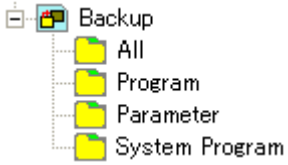


Figure 14-2 Backup Project Tree Diagram

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.

(2) Double click the items to backup.

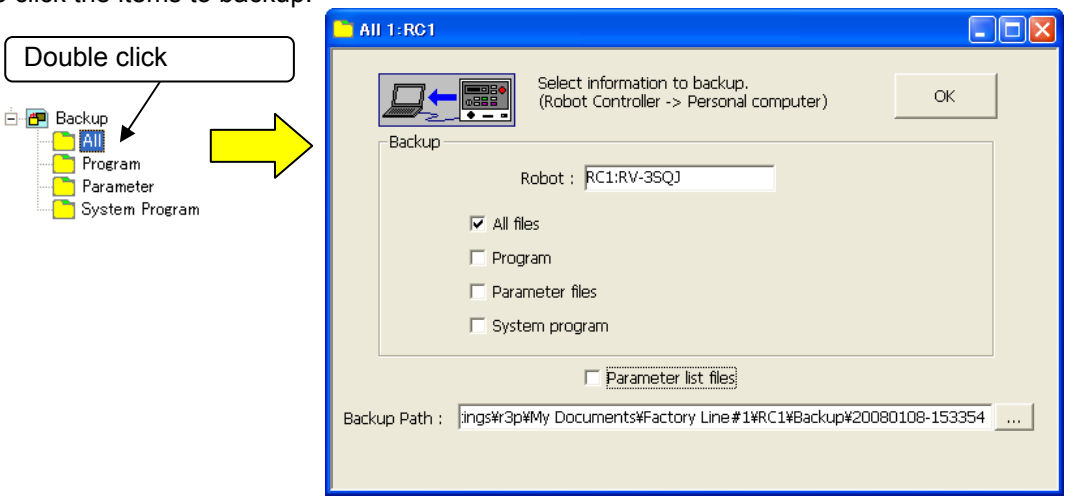


Figure 14-3 Backup (When Batch Is Selected)

[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.

(3) Specify the backup destination. The default value is the folder that created the workspace/project name/Backup/today's date and time.
You can change the backup destination folder with the […] button at the right of the displayed backup destination.

You can back up other items at the same time too by putting checkmarks in their checkboxes. In this case, the data is backed up to the selected backup destination, with the identifier by the backup type is added to the folder name. The identifiers are as follows.
All…ALL Program information…PRG Parameter information…PRM System program…SYS

The folder name at this time is displayed on the right side of the respective backup items.

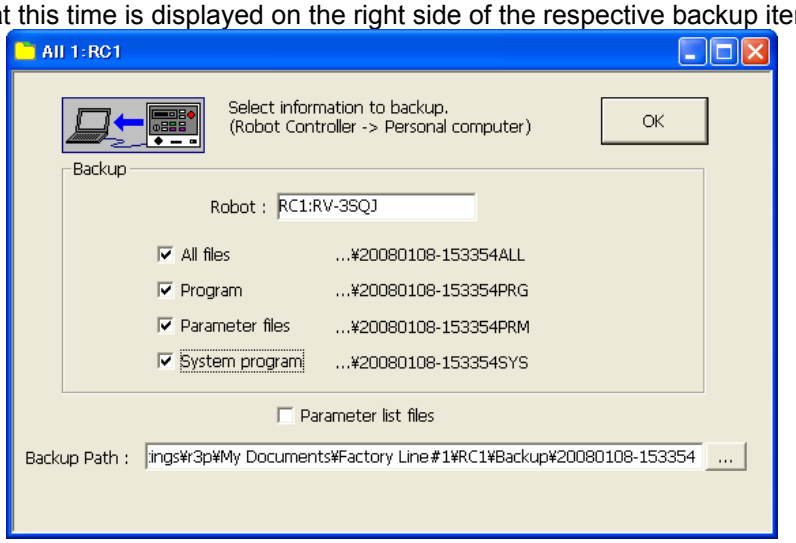


Figure 14-4 Backup (When Multiple Selected)

(4) Specify the back destination, then click the [OK] button.
The confirmation screen is displayed. When you confirm, then click [Yes], the backup is started.

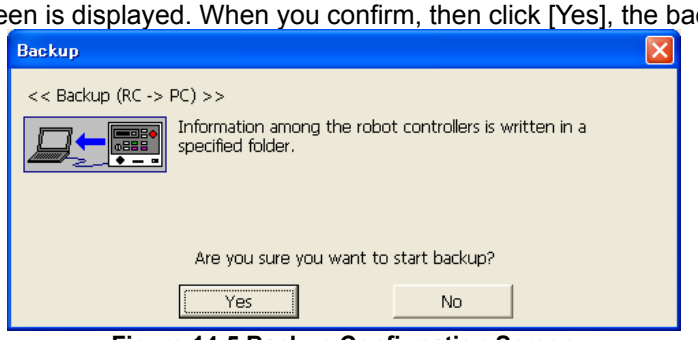


Figure 14-5 Backup Confirmation Screen

When the backup is completed, the backup data is displayed at [Backup] on the project tree.

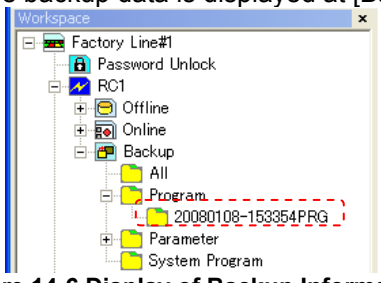


Figure 14-6 Display of Backup Information

14.1.2. Saving data from all robot controllers(Online Project Backup)

It is possible to save data by batch processing from all robot controllers which connected with RT ToolBox2. This function can be used with Version 1.3 or later of this software.

(1) After selecting the name of workspace, click the right button of mouse. Or, after selecting the "Backup" of the project that is online, click the right button of mouse. Select "Online project backup" in the right mouse button menu. The screen to select the item of backup is displayed.

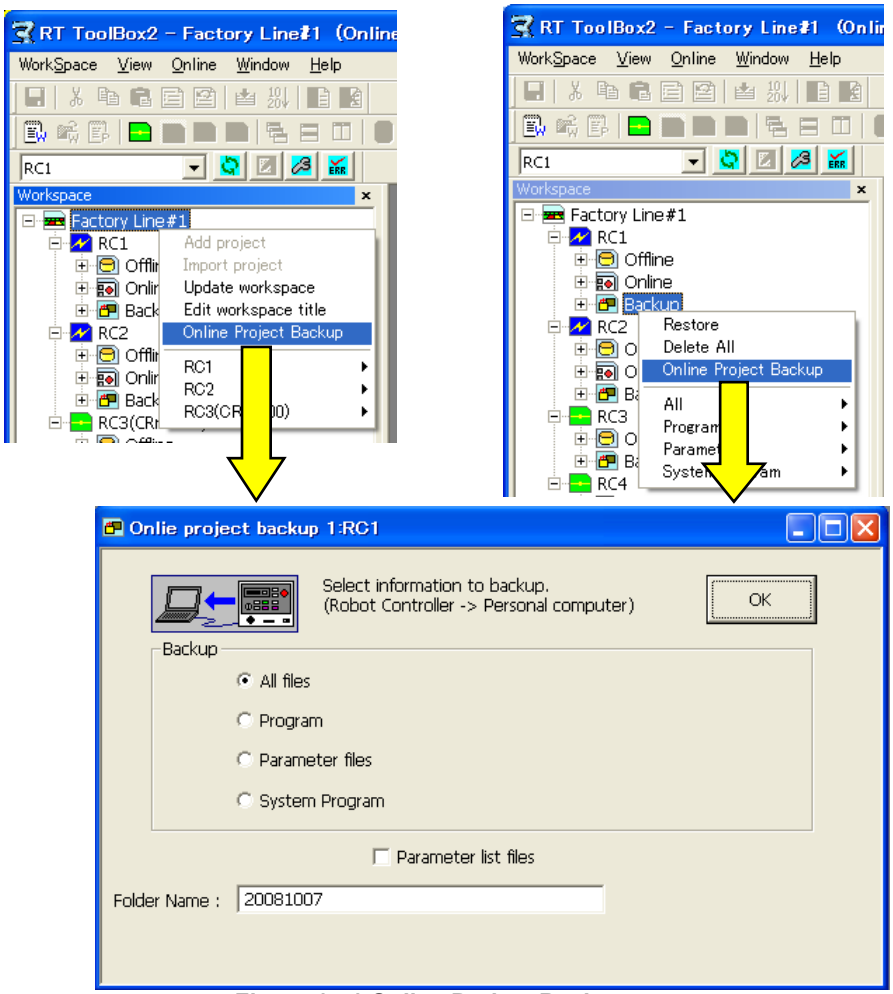


Figure 14-1 Online Project Backup

(2) Select the item of backup in "Backup" group. Input a folder name of the backup destination to "Folder Name", and click [OK] button.
The input folder name is added to "Backup" of each project.

The confirmation screen of the backup is displayed. After confirming, click [Yes] button. Then the communications for saving data is begun.

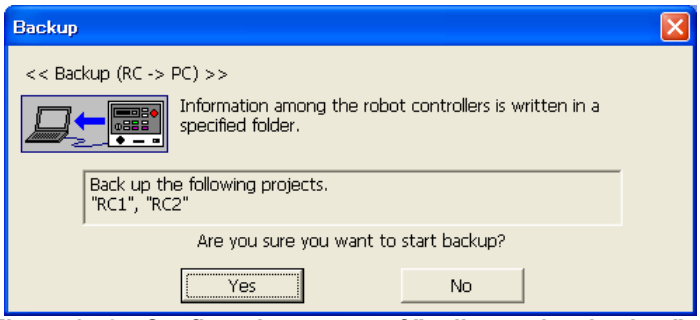


Figure 14-2 Confirmation screen of "online project backup"

(3) When the batch processing for saving data from all robot controllers is completed, the saving data is displayed in [Backup] of the project tree.

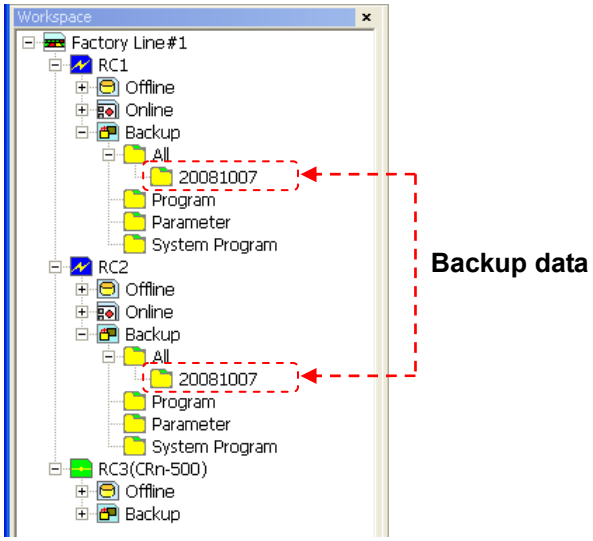


Figure 14-3 The information of saving data from all robot controllers by batch processing.

14.2. Restore (PC -> Robot)

You can take information back up to the computer and transfer it to robot controller information.
Use the restore function while connected to the robot controller.

Caution

Caution of when data backed up by selecting "All files" is individually restored.

In version 1.2 or later of this software, it is possible to restore the each item (Program, Parameter files and System program) of data backed up by selecting "All files".
At this time, the data files of the specified item are transferred to the robot controller, without making all information in the robot controller cleared (initialized).

(1) From the project tree, open the target project [Backup]. In the backup tree, the information back up for "All file", "Program information", "Parameter files", and "System program", respectively, is displayed.

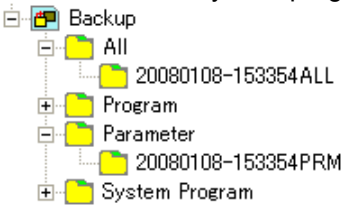


Figure 14-7 Backup Project Tree Diagram

(2) Select the information listed on the controller, then click the right mouse button. From the right mouse button menu, select [Restore].

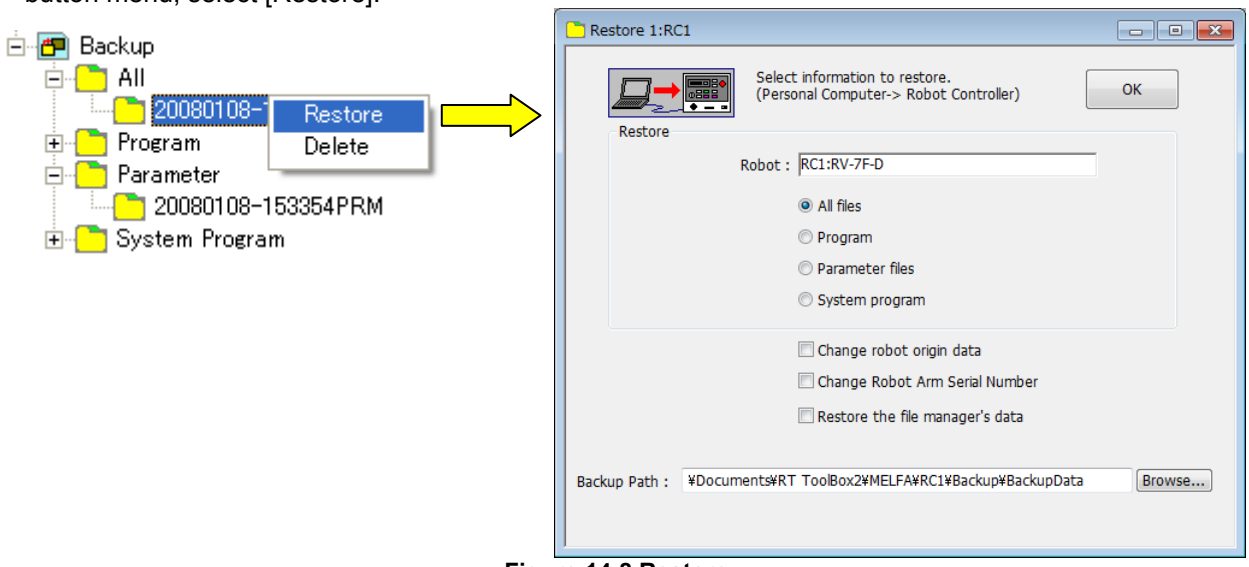
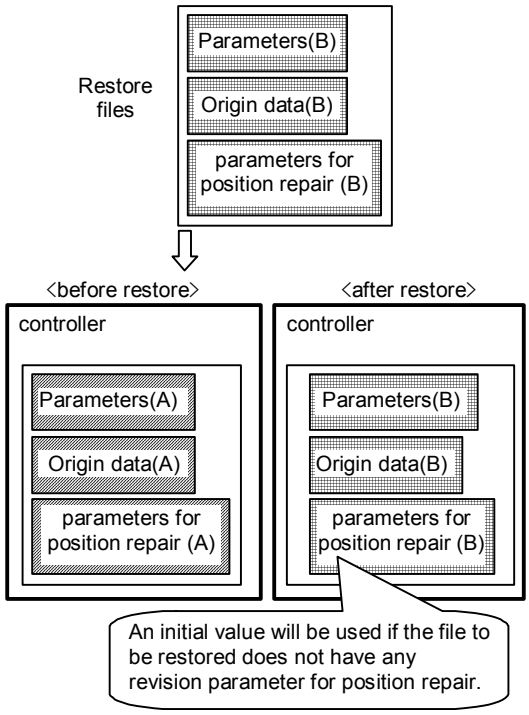
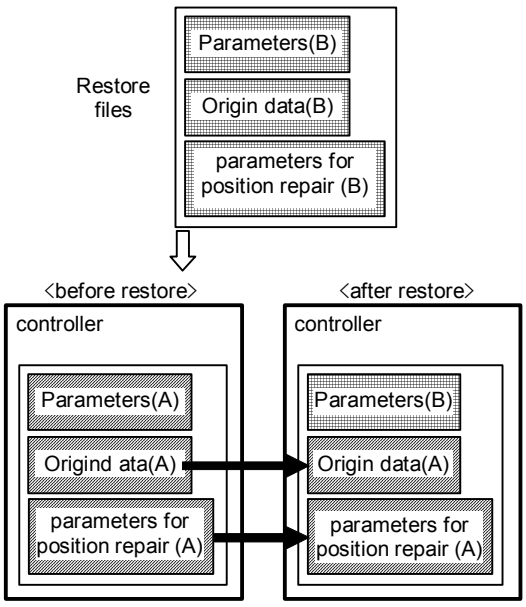


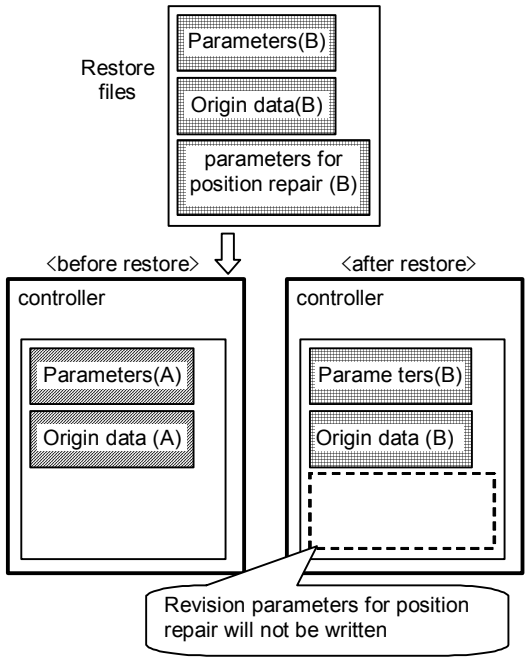
Figure 14-8 Restore

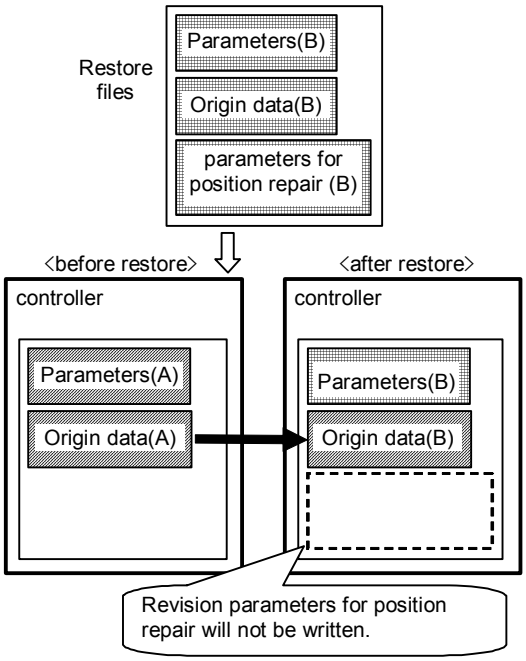
All Files	:	Transfers all files (except BKUP.SYS and MECHA.SYS) in the designated folder to the robot controller after all information in the robot controller is cleared (initialized).
Program	:	Transfers the robot program file in the designated folder to the robot controller.
Parameter Files	:	Transfers 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	:	This is backup information and it only valid when All or Parameter files is selected. Operations for when this checkbox is checked and when it is not are as in **"Table 14-1 ".**
Change Robot Arm Serial Number	:	If you check this checkbox, the robot main unit serial number is also rewritten.
Restore the file manager's data	:	If you check this checkbox, the data treated with file manager (refer chapter 12.8) is also restored. This function can be used with Version 3.00A or later of this software.

Table 14-1 Operations for "Change Robot Arm Serial Number Too"

<table>
<tr><th>Controller</th><th>Check ON
☑ Change robot origin data</th><th>Check OFF
☐ Change robot origin data</th></tr>
<tr><td>CR750/ 700 series
or
CRn-500 series J2 edition 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>CRn-500 series H7 edition 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>

Be careful. If communication is cancelled during a series of restore processing, the position revision parameters generated with the "Position repair" function and the origin data may be changed.

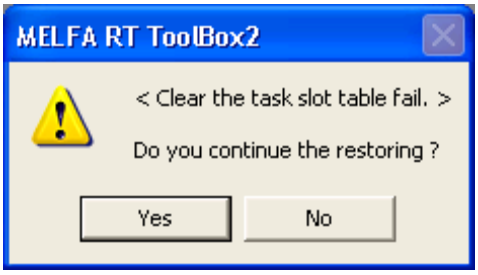
Caution

Precaution for Restore

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.



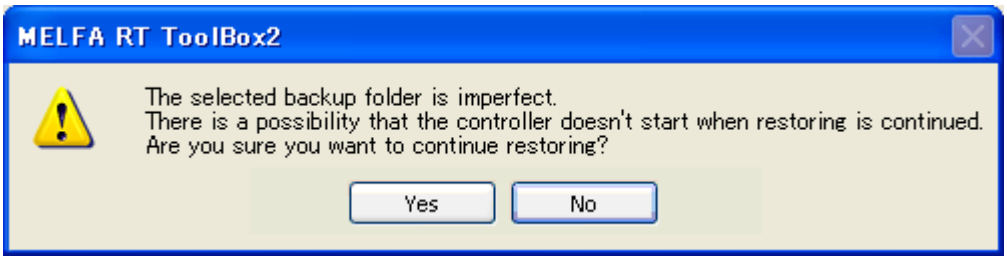
Caution

Do not restore the backup information whose name has "[NG]"

Do not restore the backup information whose name has "[NG]" because the folder's information is imperfect.

"[NG]" is added to the folder name when the communication fault occurs while backing up or the backup is interrupted clicking the "cancel" button. Do not restore the backup folder because the folder's information is imperfect. There is a possibility that the controller doesn't start when restoring is continued. When you select the folder whose name has "[NG]" when restoring, the warning dialog as follows is displayed. Select "No" normally.

This function is available from RT ToolBox2 Ver.1.3.1 or later.



14.3. Deleting Backup Data

You can delete the backed up information.
Select the information to delete, then click the right mouse button. From the right mouse button menu, select [Delete].

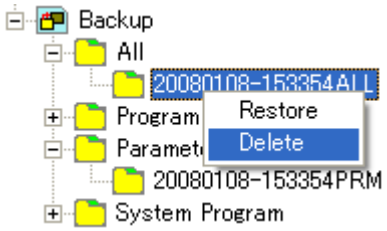


Figure 14-9 Deleting Backup Data

It is also possible to delete all the backup data.
Right click [Backup] for the target project. From the right mouse button, click "Delete All".

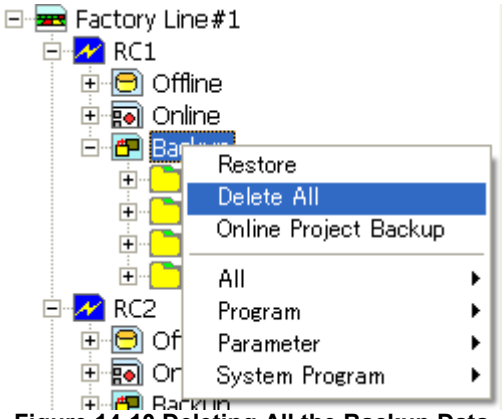


Figure 14-10 Deleting All the Backup Data

Caution

Be aware that once backup data is deleted, you can not restore it.

15. Tool function

15.1. Force control log file viewer

Force control log file viewer is the function to display the graph of log data of force control in PC and robot controllers.
From the project tree, double-click the target project [Tool] -> [Force control log file viewer].

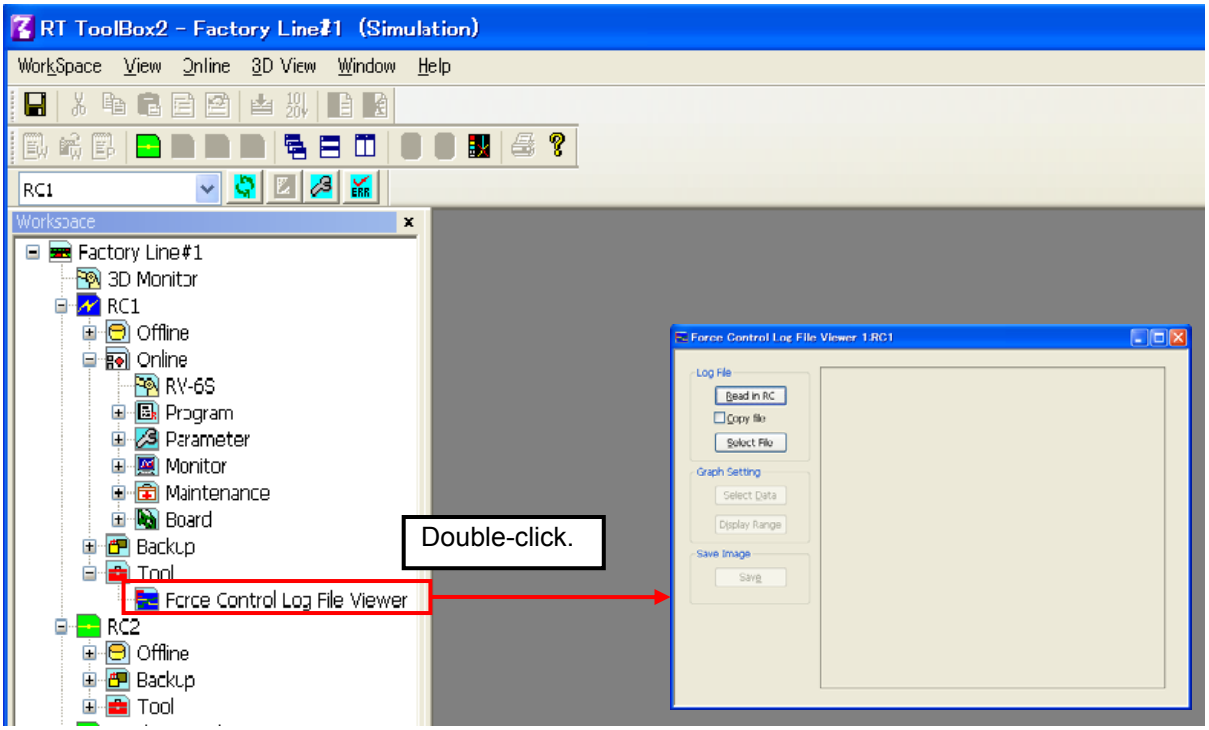


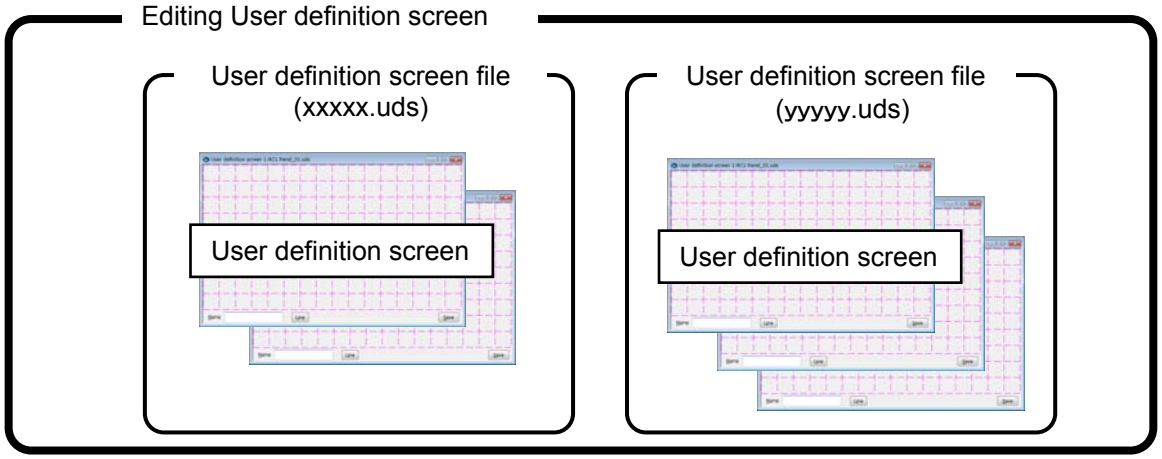
Figure 15-1 Force control log file viewer

This screen can be used when connected with a machine compliant with the force control function.
For details, refer to the user's manual containing complete description of the force control function.

15.2. User definition screen

It is possible to edit the user definition screen which can be operated by highly efficient T/B.
You can make the customized screen by arranging the parts such as the button and the lamp that synchronize with the I/O signal. You can make two or more pages of definition screens. These pages are managed by a file (called “User definition screen file”) as one group. It is possible to create two or more user definition screen files.

You can make the customized screen on T/B by arranging the parts such as the button and the lamp that synchronize with the I/O signal. You can make two or more pages of definition screens.



This screen can be used by the following usages.
- This screen is used as an operation monitor.
- When the state of T/B is enabling, the peripheral devices such as conveyers is made to work by the button on the screen.

T/B which you can use an user definition screen, and its software version are as follows.

Table 15-1 T/B which you can use an user definition screen, and its software version

T/B	Software version of T/B
R56TB	Version 2.2 or later
R57TB	Version 2.2 or later

This function can be used with Version 2.20W or later of this software.

Parts that can be displayed on the user definition screen are as follows.

List 15-2 List of parts

	Parts		Explanation
1	Button		The signal can be output from the robot controller by clicking the button. The signal can be output only in T/B Enabling state.
2	Lamp		The lamp can be turning on/off by the state of the I/O signal.
3	Robot information	Variable	The value of the specified variable can be displayed.
		Exe lines	The executing program lines can be displayed.
		Program name	The executing program name can be displayed.
		Exe line num.	The executing line number of the program can be displayed.
		Cur pos	Current positional data of the XYZ coordinate system can be displayed.
		Cur jnt	Current positional data of the joint coordinate system can be displayed.
4	Label		The character string can be displayed.

15.2.1. Creating a new User definition screen file

In order to create an user definition screen, it is necessary to create an user definition screen file.

After selecting [Tool]->[User definition screen] in the project tree, click the right button of mouse and select the "New" of right button menu. Click [OK] button after inputting a new file name. The user definition screen file created newly is added to the bottom row of [user definition screen].

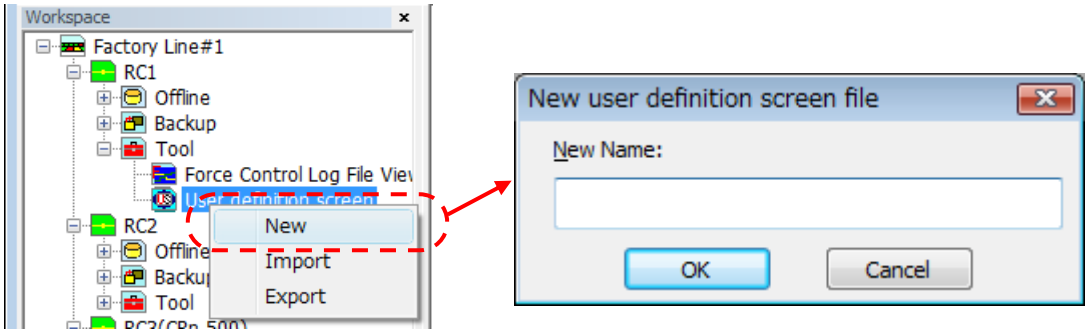


Figure 15-1 Creating a new User definition screen file

Caution

About User definition screen files

It is possible to create a user definition screen file name freely. But a user definition screen file is used as folder names in Windows, so you can not use characters that can not be used in Windows folders names (\ / : * ? " < > |).

An error occurs when the inputted user definition screen file already exists.

About the extension of an user definition screen file

The extension of the user definition screen file is ".uds". When an extension is omitted, or when the wrong extension is inputted, .uds extension is attached automatically.

15.2.2. Editing the page of user definition screen

Double-click [Tool] -> [User definition screen] -> [“User definition screen file”]->[“Page name”] in the project tree. The edit dialog of an user definition screen is displayed.

When you create a new user definition screen, after selecting [Tool]->[User definition screen] -> [“User definition screen file”]-in the project tree, click the right button of mouse and select the "New” of right button menu. A new “User definition screen” is displayed.

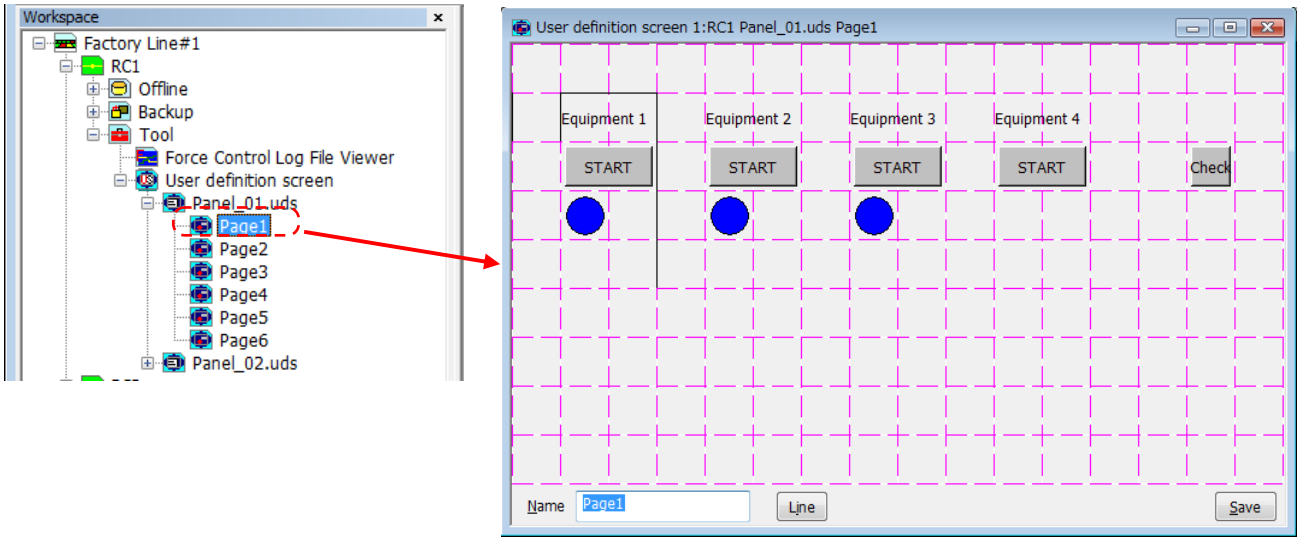


Figure 15-2 Editing the existing user definition screen

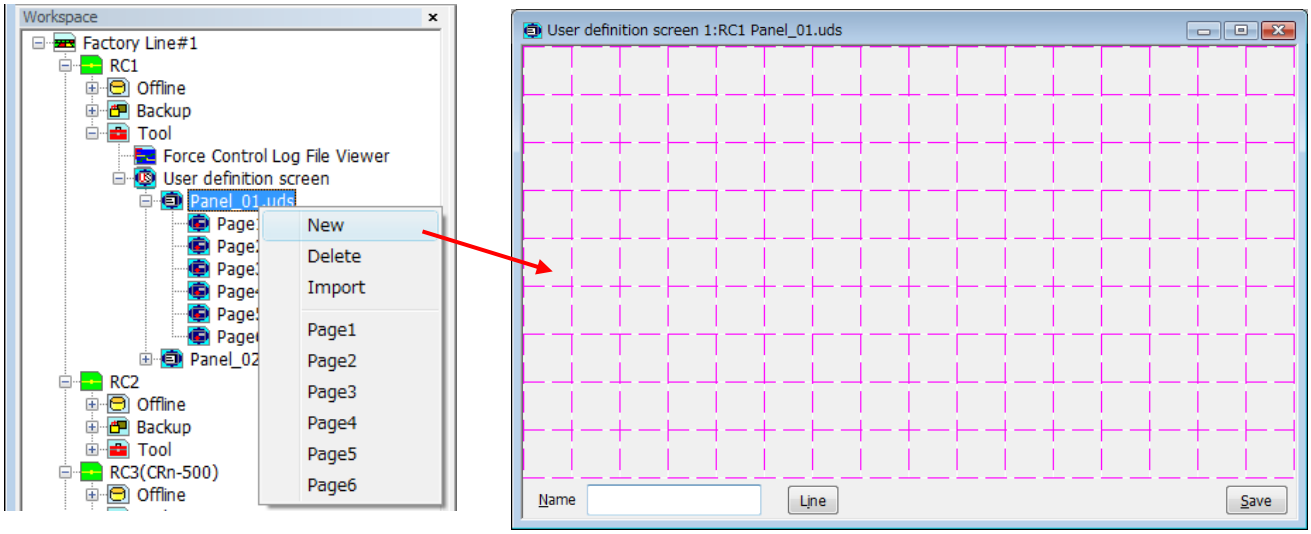
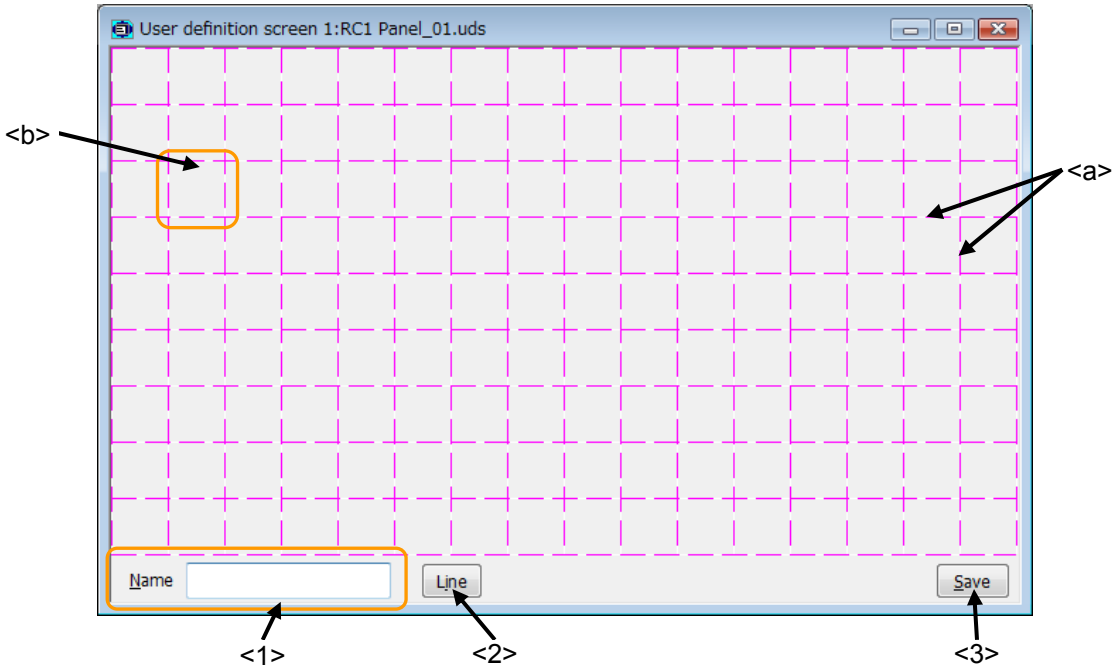


Figure 15-3 creating a new user definition screen

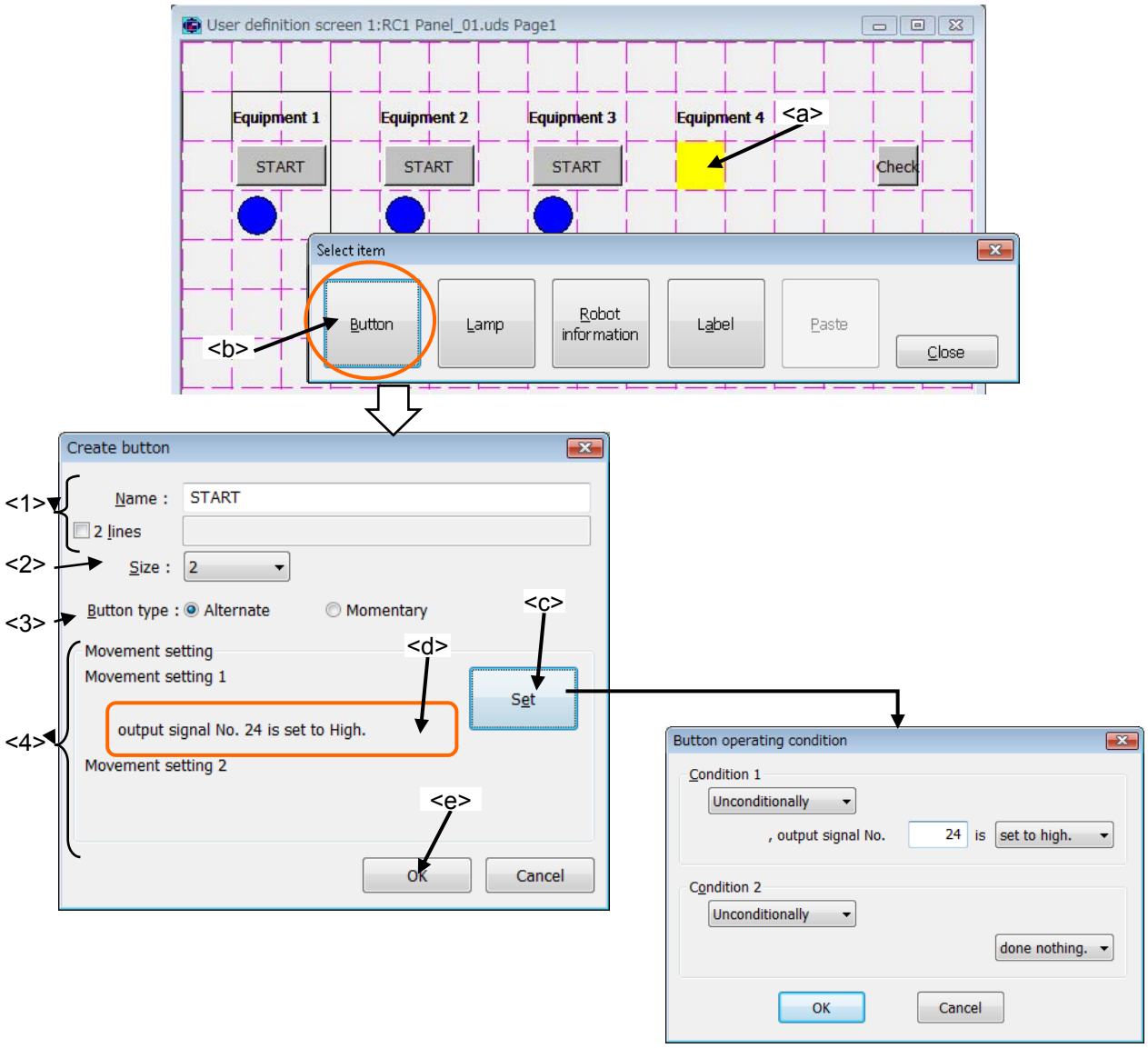
The grid line (<a>) is displayed in the edit display of the user definition screen. Each part can be registered with the block unit (<b>) delimited in this grid line.



<1> Name : Page name is set. The name can be input by [Edit] button.
<2> Line : The ruled line is drawn on "User definition screen".
<3> Save : The content of the edit is preserved.

15.2.2.1. Button

(1) Click the position (block) in which the button is made (<a>). Left side of the button is arranged in this position.
(2) After "Select item" window is displayed, click [Button] button (<b>).
(3) Set the button name, button size and the kind of button on "Create button" windows.
(4) The movement of when the button is clicked is set by [Set] button (<c>). The set content is displayed in "Movement setting" (<d>).
(5) After the setting is completed, click [OK] button (<e>).



<1> Name : The name of the button is set.
The button name can be input by [Button name edit] button.
The button name can be displayed by two lines by checking "2 lines".

<2> Size : The width of the button can be set.
The width of the button that can be set is 1/2/3.

<3> Button type : The kind of the button can be set.

Alternate	When the button is clicked once, the button keeps ON state. And when the button is clicked again, it returns to OFF state. The signal output is kept too.
Momentary	The button keeps ON state while it is being pushed.

<4> Movement setting : The condition and the signal output operation when the button ON can be set.

The condition can be selected as follows. Please set the signal number etc. when you make the signal state the condition. When the button is ON or OFF, the condition is judged.

- Unconditionally
- State of the specified Input signal
- State of the specified output signal

The signal output operation can be selected as follows. Please set the signal number etc. when you output the signal.

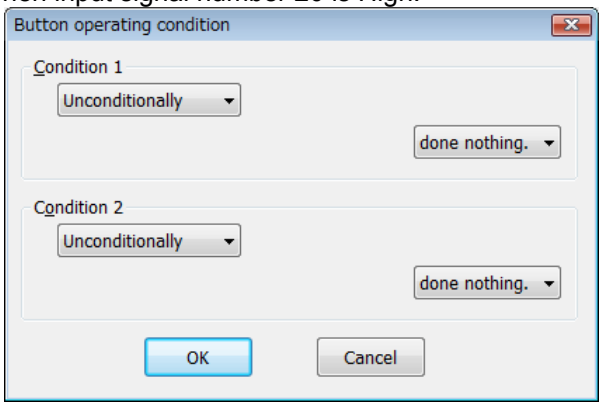
- Done nothing
- Output the specified output signal

Operation setting can be set up to two.
Two operation settings operate individually by using each condition.
Moreover, when High and Low are set to output to the same signal, and both conditions become true, the Condition2 is given priority.
If the operation is set signal output, when the button is OFF, the signal is output in the state opposite High/Low state at the time of ON.

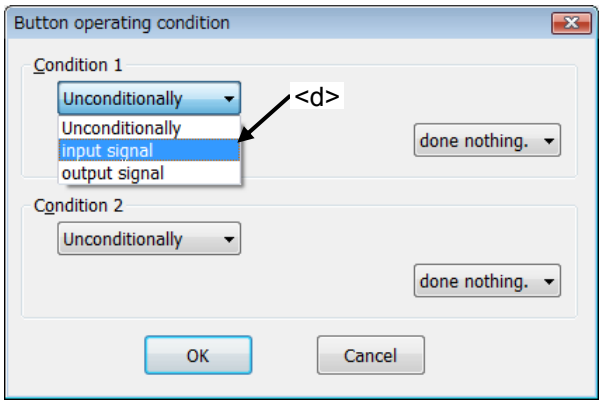
Example of setting the movement of button

For example:
The button that output signal number 20 to High when input signal number 20 is High.

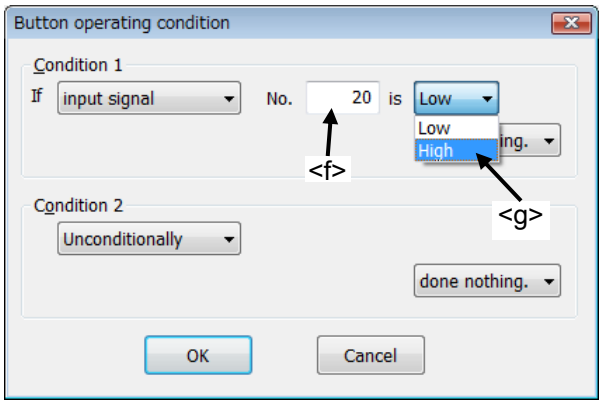
(1) A default value of “Button operating condition” window is shown in a right picture.



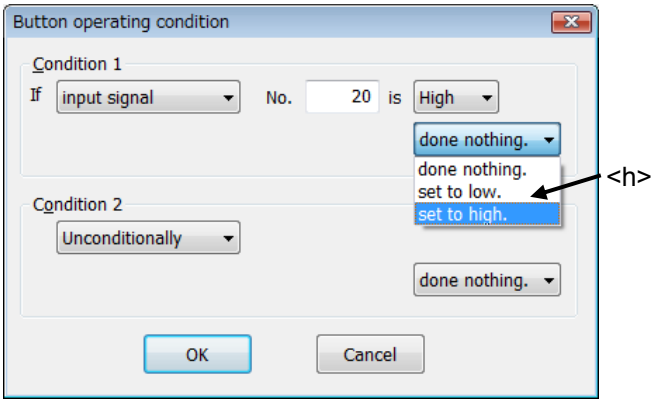
(2) Set the condition of operation.
Click <d>, and select the signal type.
When things except "Unconditionally" are selected, the input area of signal number and the combo box to select the state are displayed.
Now, select "input signal".



(3) Input "20" to signal number (<f>).
Click the state of the signal (<g>), and select "High".
Now, select "Input signal".

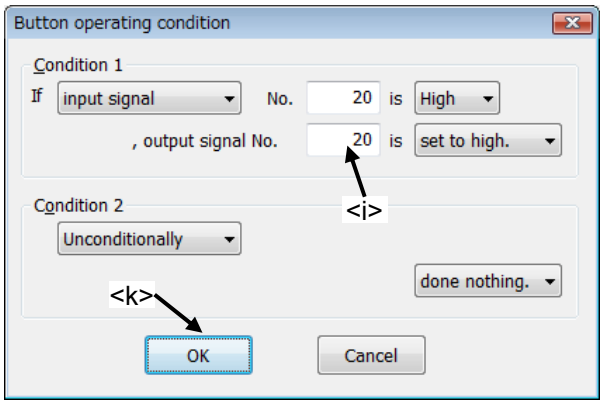


(4) Select "High" as signal operation of when clicking on a button (<h>).



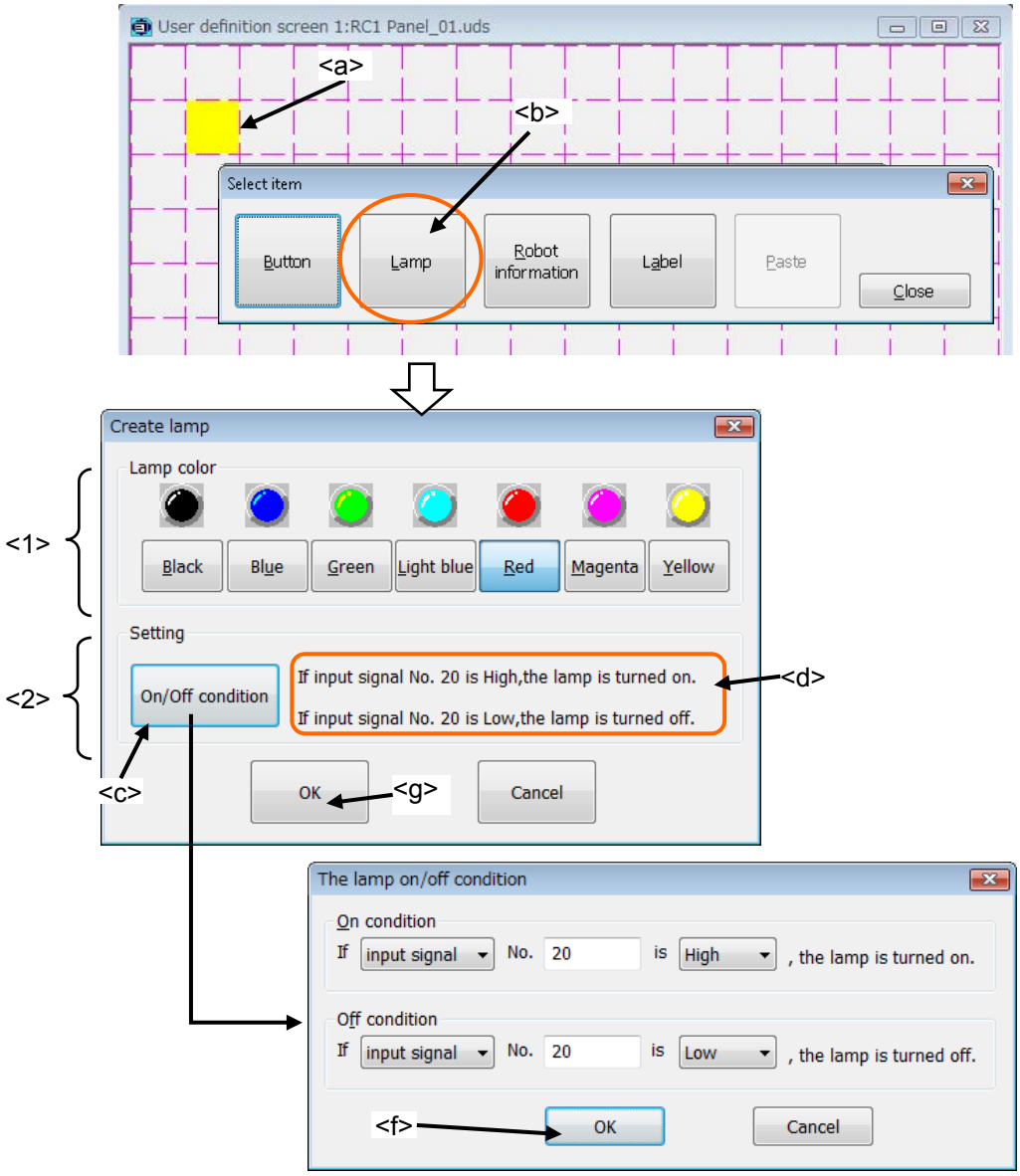
(5) The input area of output signal number is displayed.
Input "20" to the signal number (<i>).

(6) After the setting is completed, click [OK] button (<k>).



15.2.2.2. Lamp

(1) Click the position (block) in which the lamp is made (<a>). The lamp is arranged at this position.
(2) After “Select item” window is displayed, click [Lamp] button (<b>).
(3) Select the lighting color of the lamp on “Create lamp” window.
(4) Click [On/Off condition] button (<c>), and set the lighting condition and the turning off condition on "The lamp on/off condition” window.
After setting the lighting condition and the turning off condition, click [OK] button (<f>). The set content is displayed (<d>) in the right of the [On/Off condition] button.
(5) After setting the lamp color and lighting condition and the turning off condition, click [OK] button (<g>).



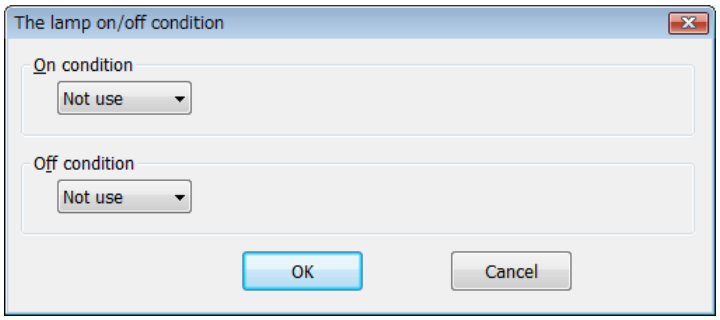
<1> Lamp color : The lighting color of the lamp can be selected.
<2> Setting : The condition of turning on / turning off the lamp can be set.
If only one condition is set, the lamp is operated like the other condition is set the opposite High/Low state to the same signal number.
Moreover, when both the ON condition and the OFF condition are true, the ON condition is given priority.

Example of setting lamp ON/OFF

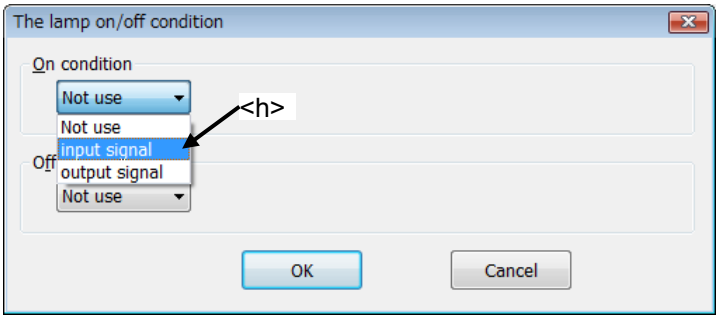
For example:

Lamp that is turned on when the input signal number 20 is High, and is turned off when the input signal number 20 is Low.

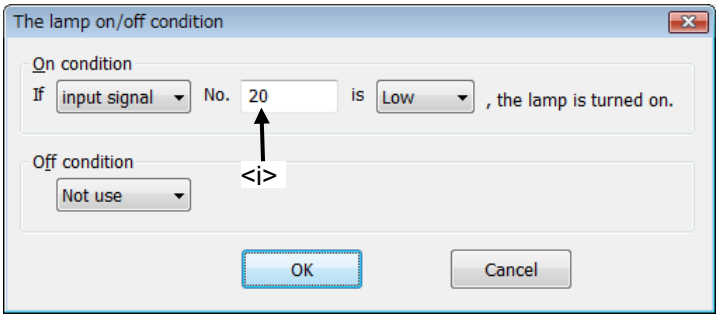
(1) A default value of “The Lamp on/off condition” window is shown in a right picture.



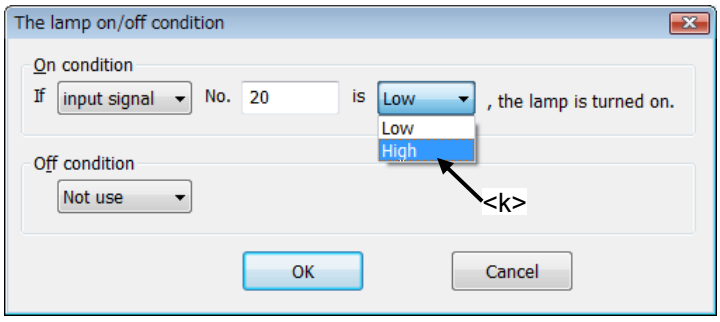
(2) Set “On condition”.
Click <h>, and Select the signal type.
Now, select “input signal”.



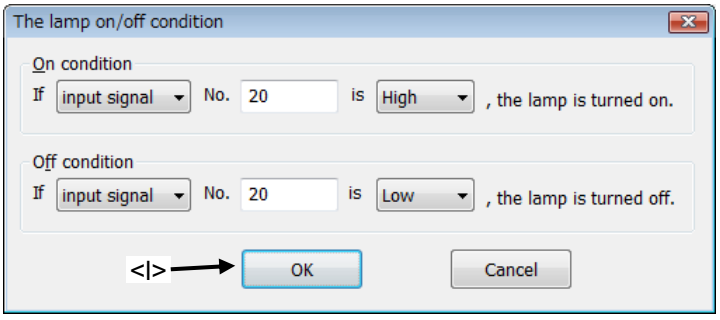
(3) Input “20” to signal number (<i>).



(4) Select "High" (<k>), as a state of signal to light the lamp.



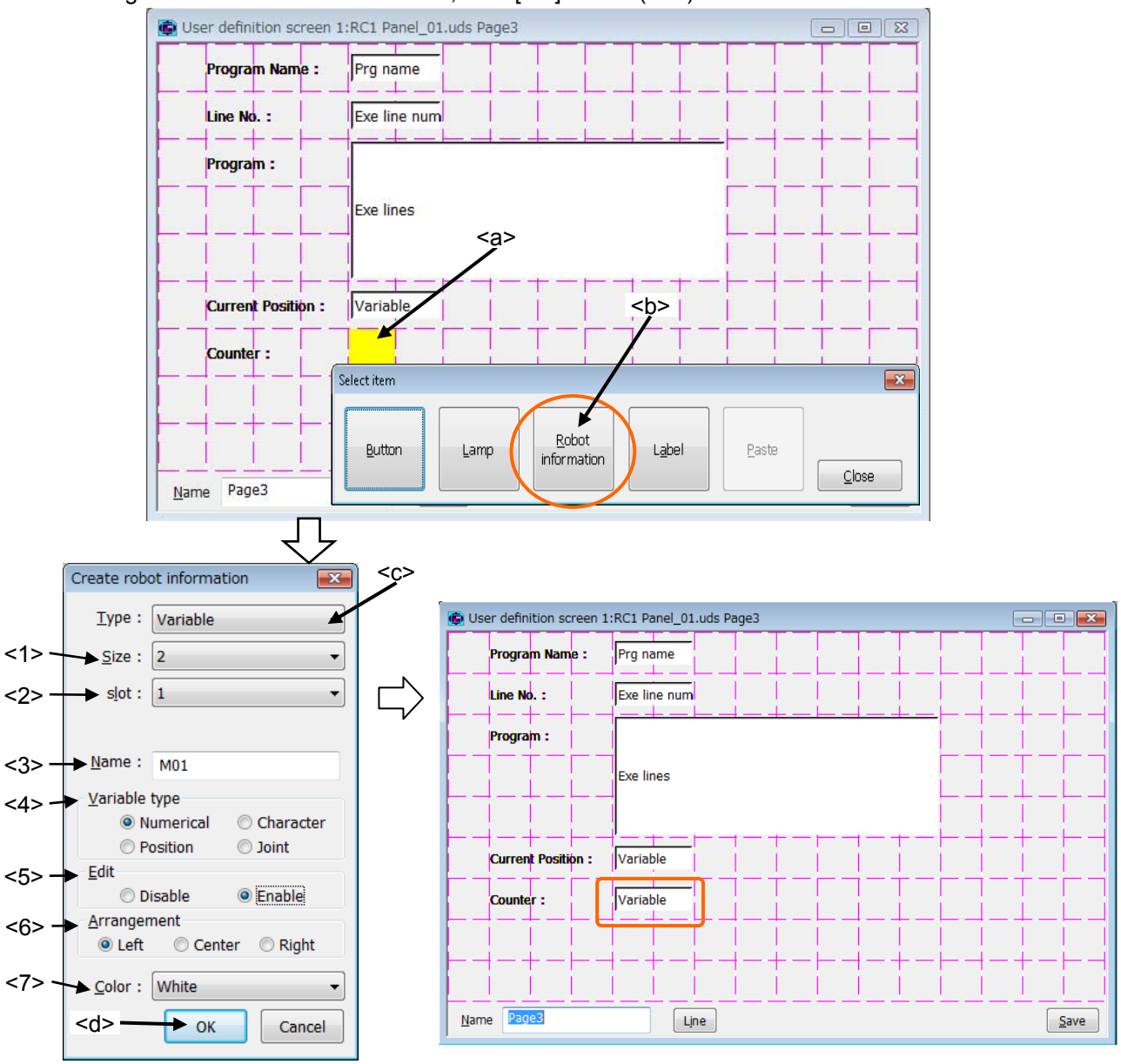
(5) Similarly, set the condition for turning off the lamp, and click [OK] button (<l>).



15.2.2.3. Variable

The value of the specified variable is displayed.

(1) Click the position (block) in which the variable is displayed (<a>). Left side of the variable is arranged in this position.
(2) After "Select item" window is displayed, click [Robot information] button (<b>).
(3) Select "variable" (<c>) as the type on “Create robot information” window.
(4) After setting the information of the variable, click [OK] button (<d>).

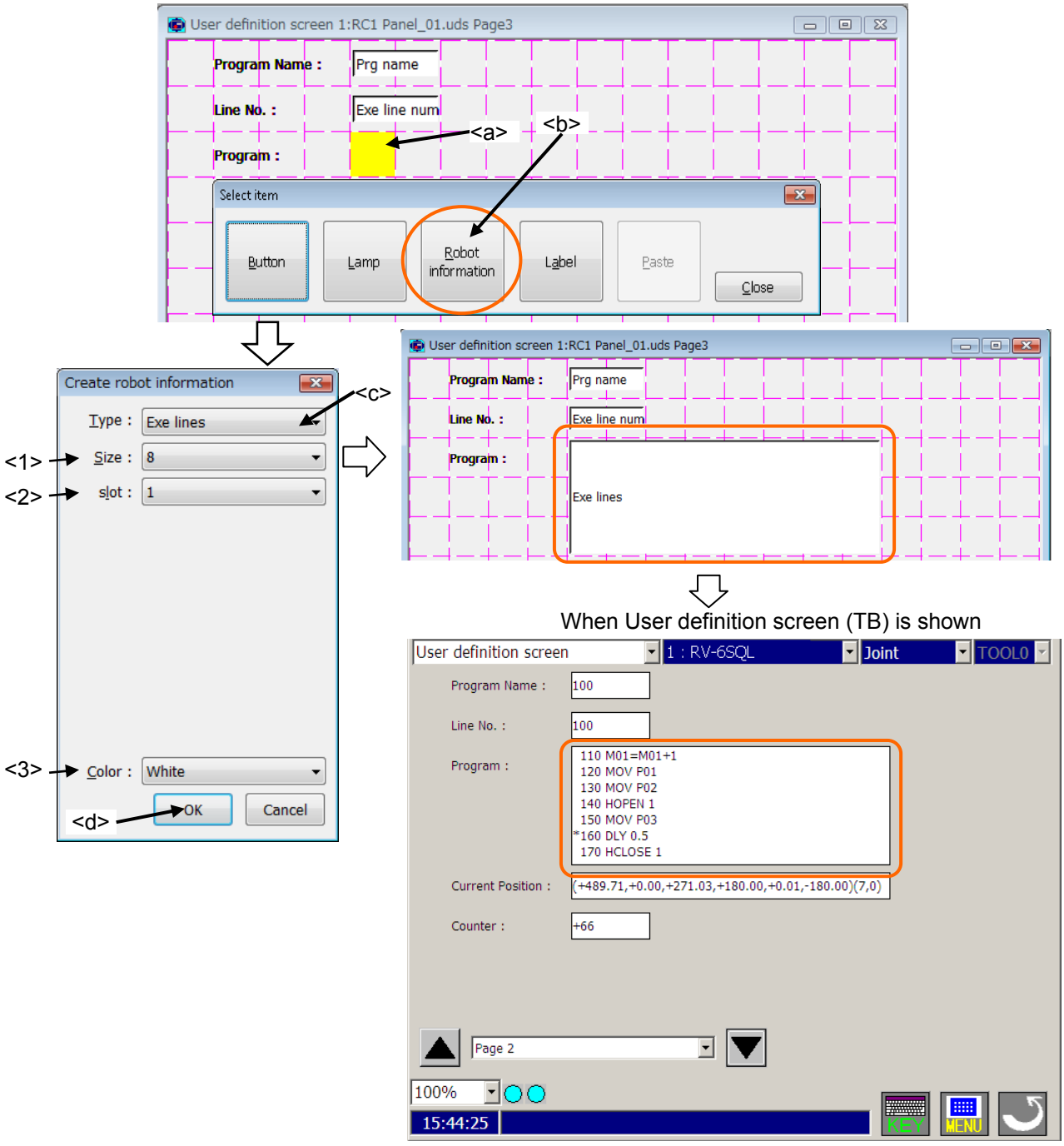


<1> Size	:	Set the width of box in which the variable is displayed. The value from 1 to 16 can be set.
<2> Slot	:	Select task slot number for which the variable is used. The range of slot number that can be set is different according to the system that uses it.
<3> Name	:	Set the variable name. Robot Status Variable also can be set.
<4> Variable type	:	Select the variable type.
<5> Edit	:	Select the edit permission of the variable. When set Enable, while displaying this screen, you can change the value of this variable by touching this parts and displaying the input value screen. (Only at T/B state is enabling.)
<6> Arrangement	:	Select the position in which the variable is arranged.
<7> Color	:	Select the background color of the area where the variable is displayed.

15.2.2.4. Program execution content

The content of the program being executed is displayed. The amount of 7 lines, the execution line, upper 3 lines and lower 3 lines, are displayed.

(1) Click the position (block) in which the content of the program is displayed (<a>). Left side of the content of the program is arranged in this position.
(2) After "Select item" window is displayed, click [Robot information] button (<b>).
(3) Select "Exe line" (<c>) as the type on “Create robot information” window.
(4) After setting the information on the content of the program, click [OK] button (<d>).

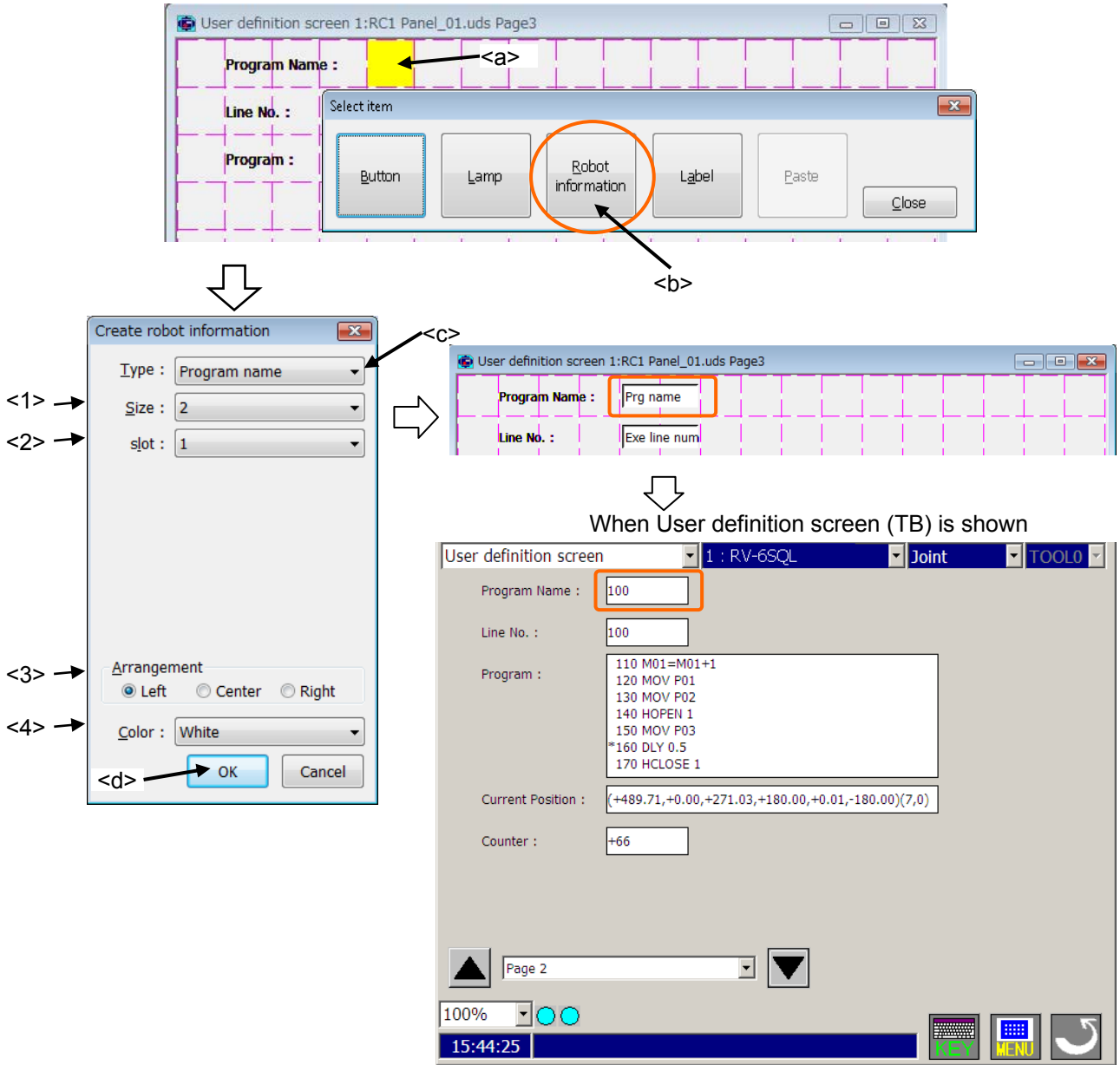


<1> Size : Set the width of box in which the content of program is displayed. The value from 1 to 16 can be set.
<2> Slot : Select task slot number for which the program is executed.
The range of slot number that can be set is different according to the system that uses it.
<3> Color : Select the background color of the area where the content of program is displayed.

15.2.2.5. Program name

The name of program being executed is displayed.

(1) Click the position (block) in which program name is displayed (<a>). Left side of the box is arranged in this position.
(2) After "Select item" window is displayed, click [Robot information] button (<b>).
(3) Select "Program name" (<c>) as the type on “Create robot information” window.
(4) After setting the information of program name, click [OK] button (<d>).

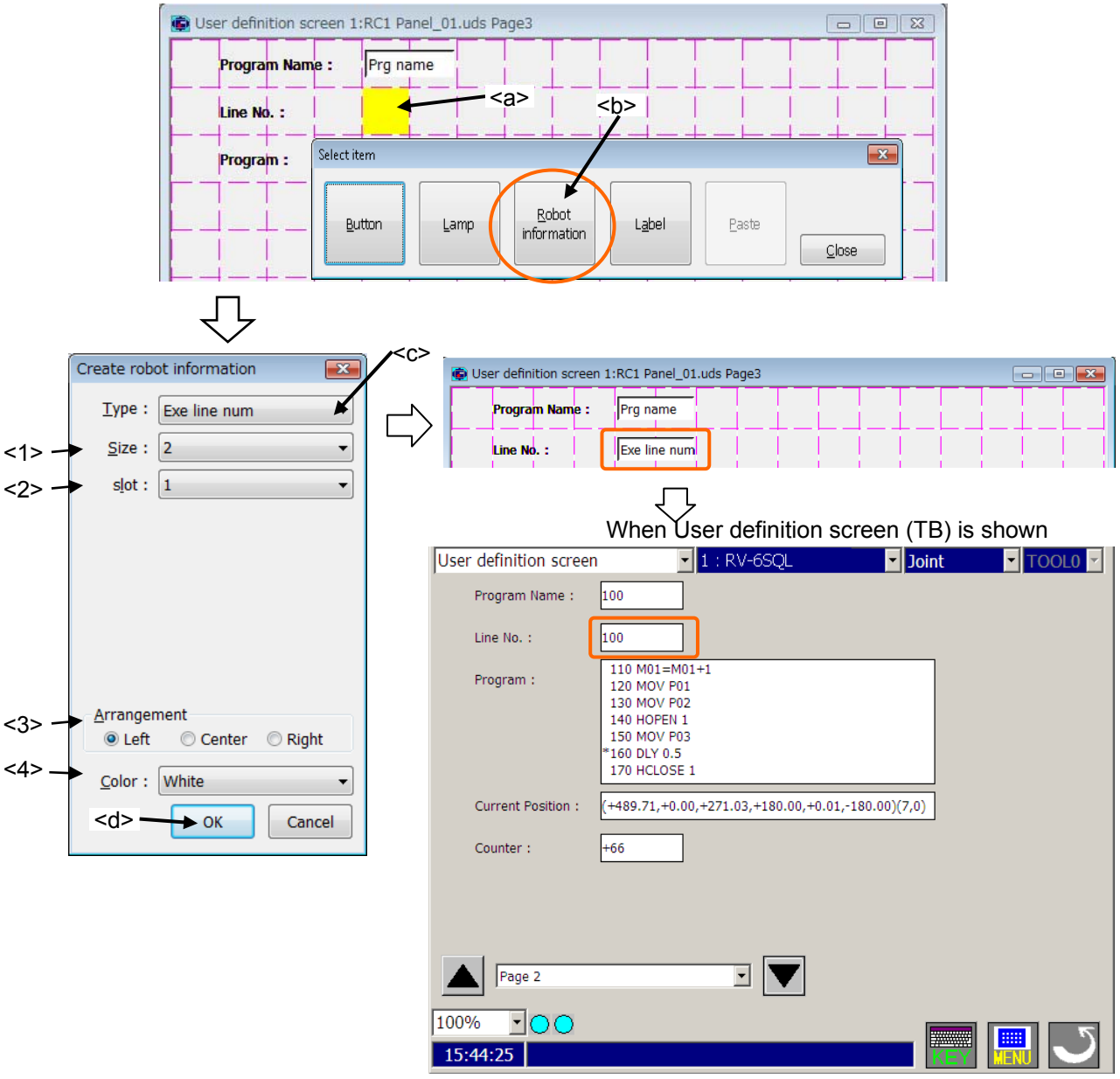


<1> Size : Set the width of box in which program name is displayed. The value from 1 to 16 can be set.
<2> Slot : Select task slot number for which the program is executed. The range of slot number that can be set is different according to the system that uses it.
<3> Arrangement : Select the position in which the program name is arranged.
<4> Color : Select the background color of the area where the program name is displayed.

15.2.2.6. Execution line number of program

The line number of program being executed is displayed.

(1) Click the position (block) in which execution line number is displayed (<a>). Left side of the box is arranged in this position.
(2) After "Select item" window is displayed, click [Robot information] button (<b>).
(3) Select "Exe line num" (<c>) as the type on “Create robot information” window.
(4) After setting the information of execution line number, click [OK] button (<d>).



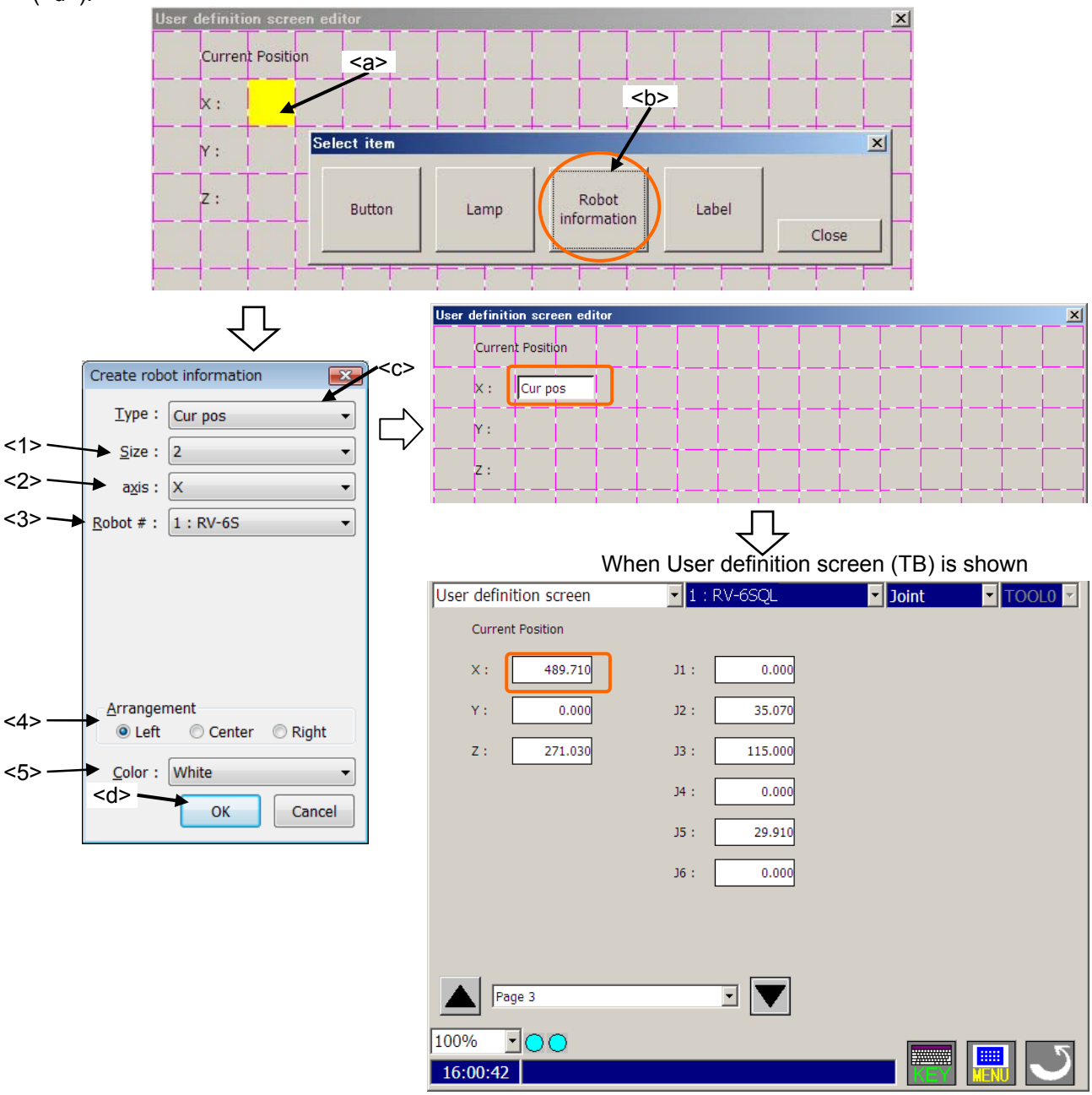
<1> Size : Set the width of box in which execution line number is displayed. The value from 1 to 16 can be set.
<2> Slot : Select task slot number for which the program is executed.
The range of slot number that can be set is different according to the system that uses it.
<3> Arrangement : Select the position in which execution line number is arranged.
<4> Color : Select the background color of the area where execution line number is displayed.

15.2.2.7. Current position data (the XYZ coordinate system)

The current position data of robot is displayed with each XYZ coordinate system axis.

If you want to display the current position data (the XYZ coordinate system) all together, please use “Variable” type and set the Robot Status Variable “P_CURR”. Please refer to **“15.2.2.3 Variable"** for details.

(1) Click the position (block) in which the current position data is displayed (<a>). Left side of the box is arranged in this position.
(2) After "Select item" window is displayed, click [Robot information] button (<b>).
(3) Select "Cur pos" (<c>) as the type on “Create robot information” window.
(4) After setting the information of the current position data (the XYZ coordinate system), click [OK] button (<d>).



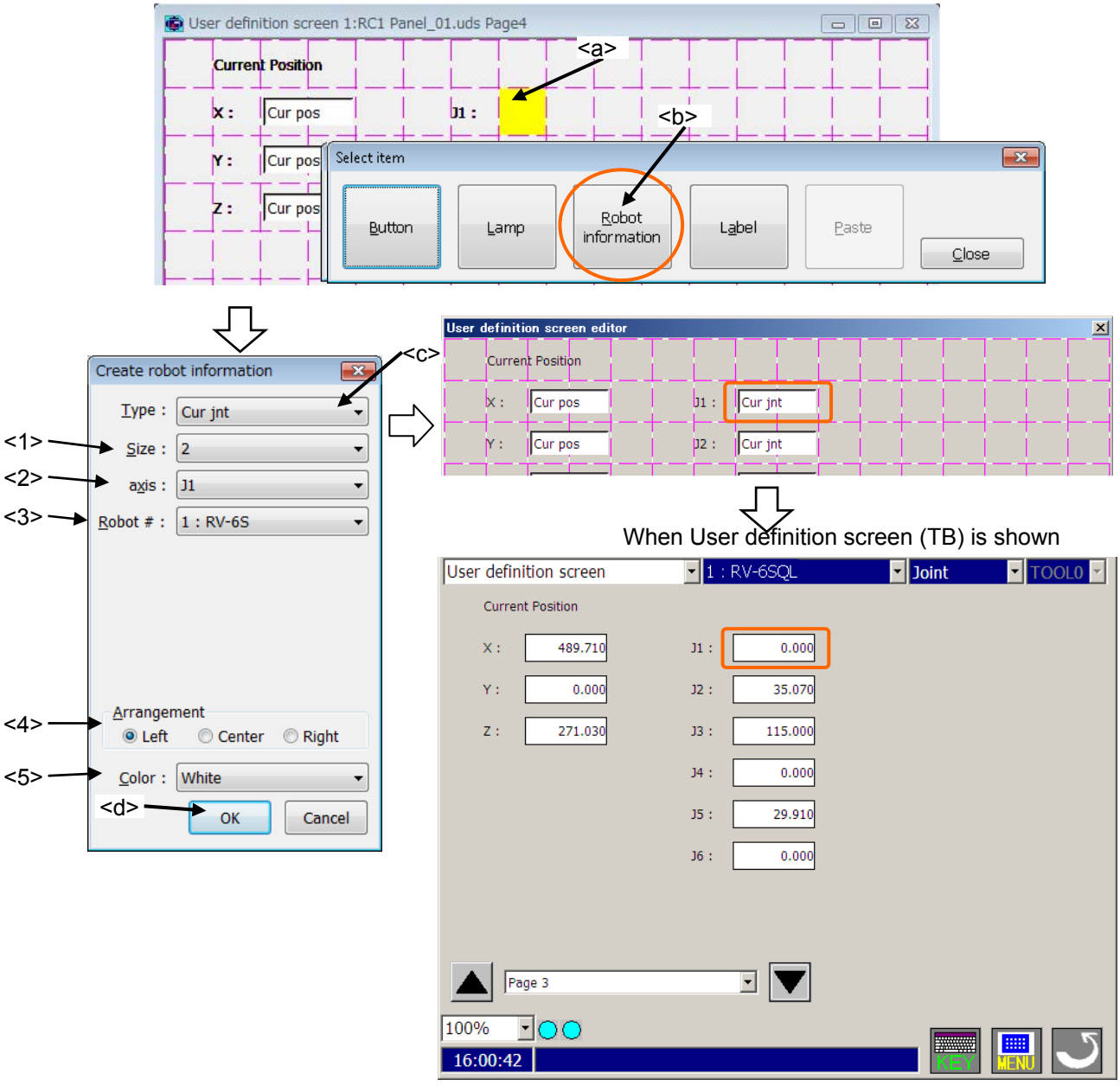
<1> Size	:	Set the width of box in which the current position data (the XYZ coordinate system) is displayed. The value from 1 to 16 can be set.
<2> axis	:	Select the displayed axis of the current position data (the XYZ coordinate system).
<3> Robot #	:	Select the robot number which displays the current position data.
<4> Arrangement	:	Select the position in which the current position data (the XYZ coordinate system) is arranged.
<5> Color	:	Select the background color of the area where the current position data (the XYZ coordinate system) is displayed.

15.2.2.8. Current position data (the joint coordinate system)

The current position data of robot is displayed with each joint coordinate system axis.

If you want to display the current position data (the joint coordinate system) all together, please use "Variable" type and set the Robot Status Variable "J_CURR". Please refer to **"15.2.2.3 Variable"** for details.

(1) Click the position (block) in which the current position data is displayed (<a>). Left side of the box is arranged in this position.
(2) After "Select item" window is displayed, click [Robot information] button (<b>).
(3) Select "Cur jnt" (<c>) as the type on “Create robot information” window.
(4) After setting the information of the current position data (the joint coordinate system), click [OK] button (<d>).

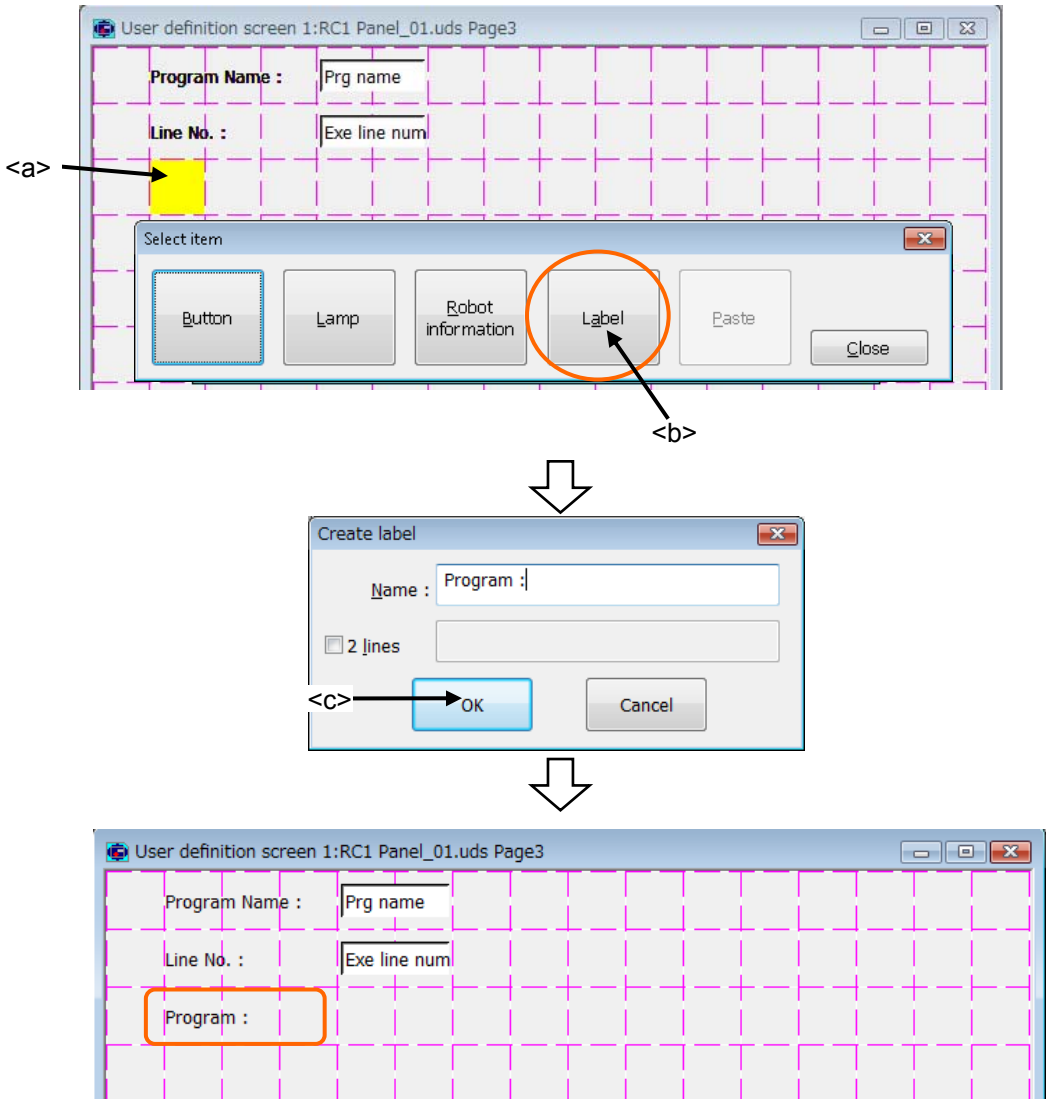


<1> Size : Set the width of box in which the current position data (the joint coordinate system) is displayed. The value from 1 to 16 can be set.
<2> axis : Select the displayed axis of the current position data (the joint coordinate system).
<3> Robot # : Select the robot number which displays the current position data.
<4> Arrangement : Select the position in which the current position data (the joint coordinate system) is arranged.
<5> Color : Select the background color of the area where the current position data (the joint coordinate system) is displayed.

15.2.2.9. Label

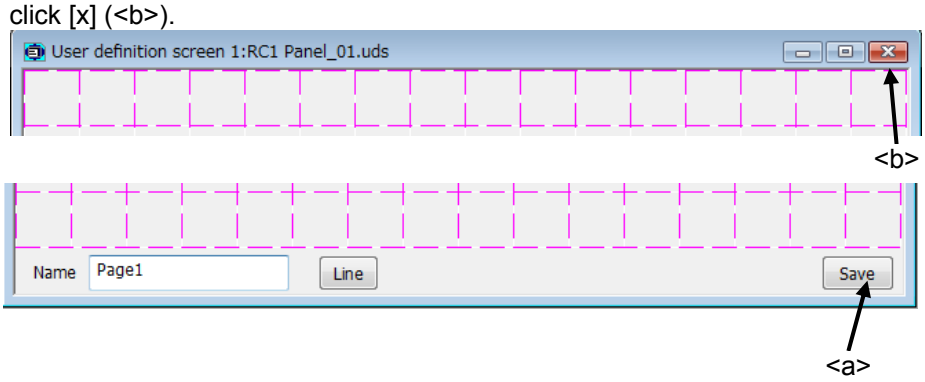
The label can be displayed at the specified position.

(1) Click the position (block) in which the label is made (<a>). The label is arranged in this position.
(2) After "Select item" window is displayed, click [Label] button (<b>).
(3) After setting the label on “Create label” window, click [OK] button (<c>). T



15.2.2.10. Save and end of editing user definition screen

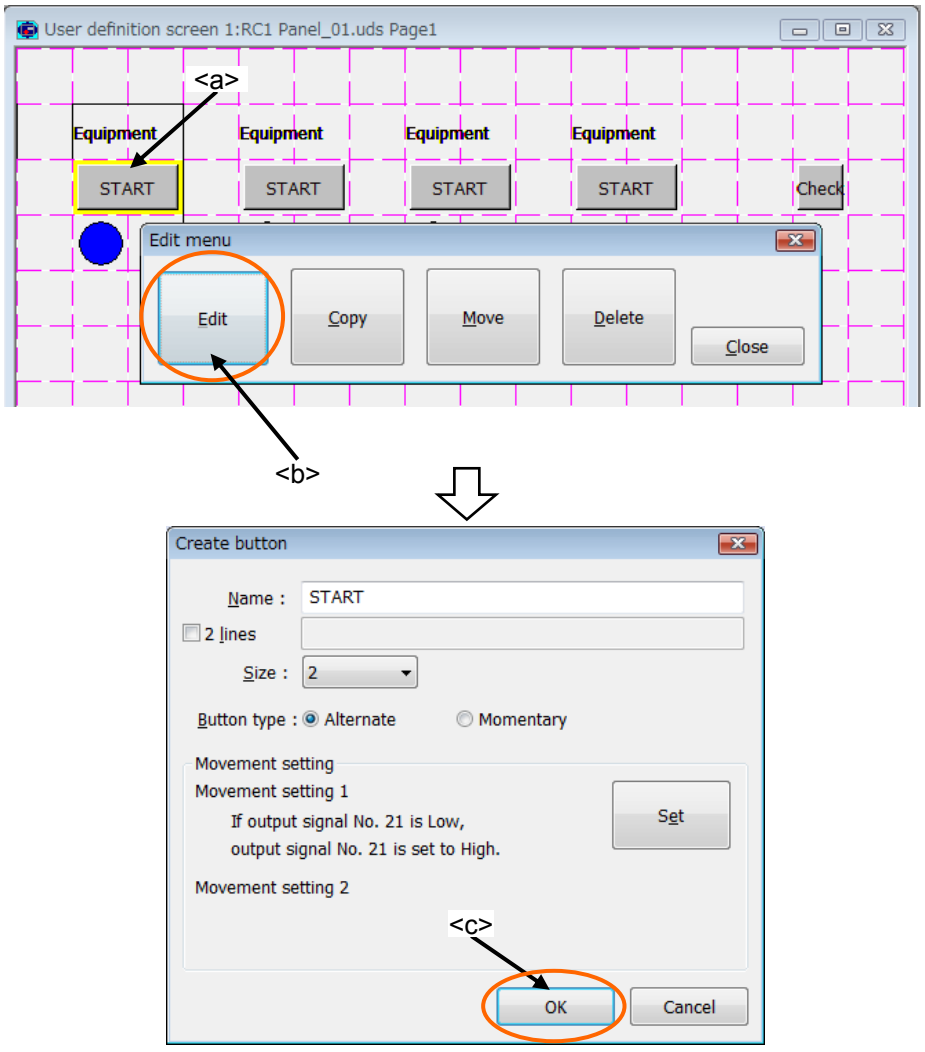
After the editing of user definition screen is completed, click [Save] button (<a>).
To end the edit, click [x] (<b>).



15.2.3. Edit of existing parts

Edit of existing parts is as follows:

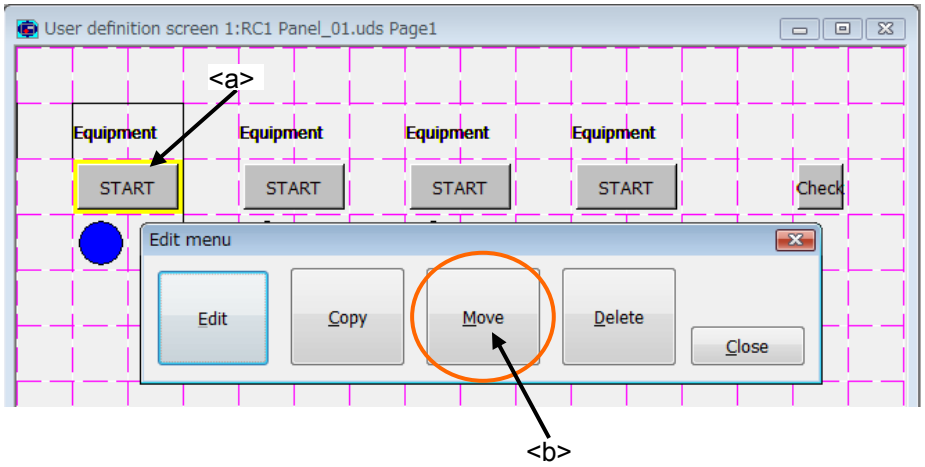
(1) Click a part which is edited (<a>).
(2) After "Edit menu" window is displayed, Click [Edit] button (<b>).
(3) The edit displays of selected parts are displayed. After changing contents, click [OK] button (<c>).

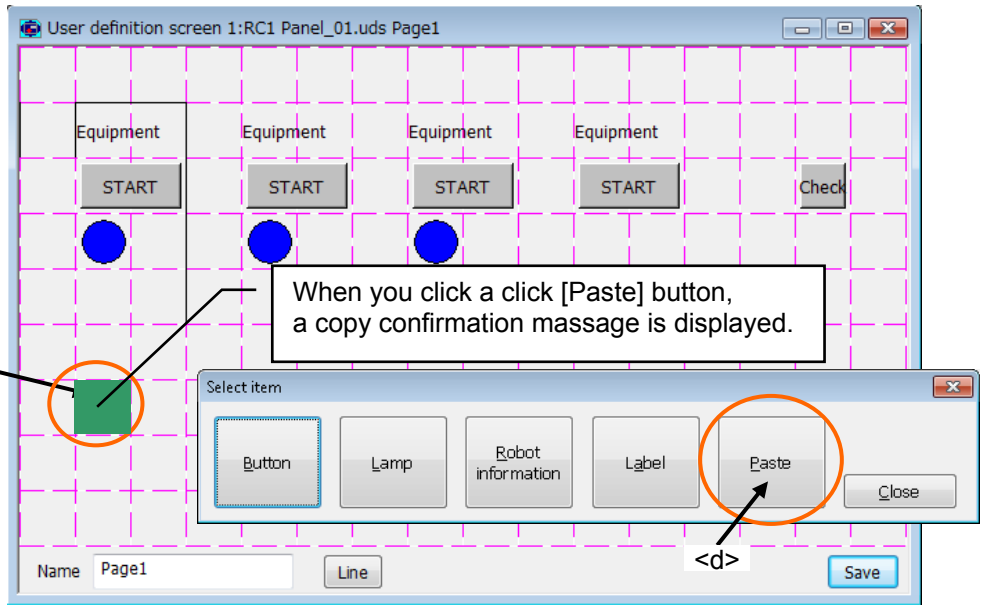


15.2.4. Copy/Paste of parts

Parts can be copied.

(1) Click the part to copy, and select it (<a>).
(2) After "Edit menu" window is displayed, click [Copy] button (<b>).
(3) Click the position (block) where the part is copied onto (<c>).
(4) After "Select item" window is displayed, click [Paste] button (<d>).
At this time, the position (block) where the part is copied onto is green.

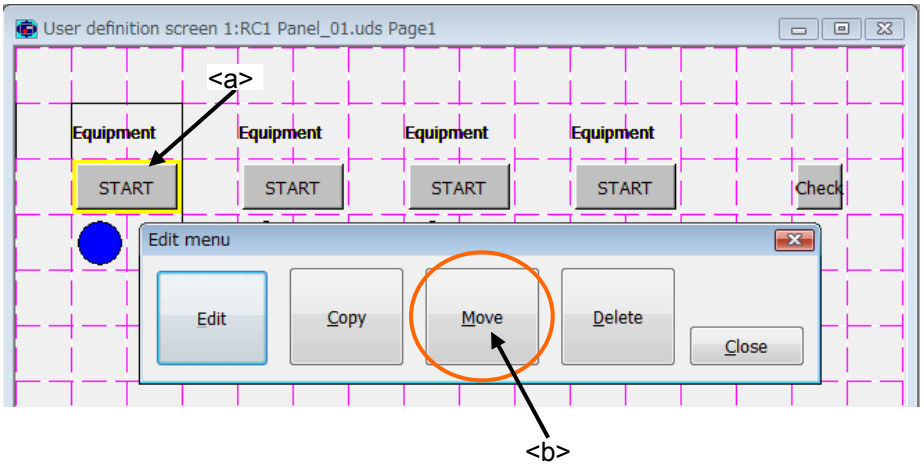


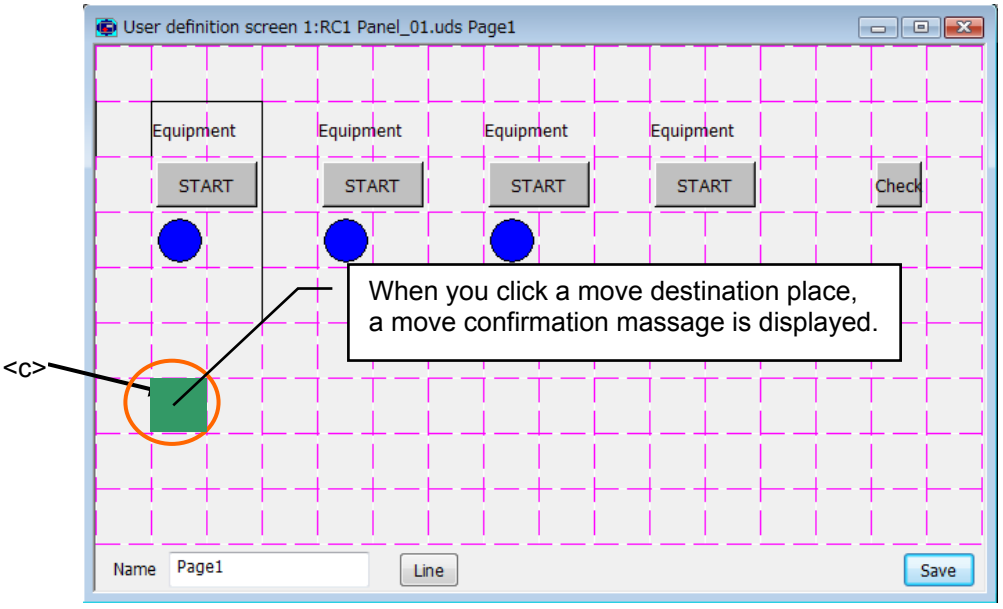


15.2.5. Movement of parts

Parts can be moved.

(1) Click the part to move, and select it (<a>).
(2) After "Edit menu" window is displayed, click [Move] button (<b>).
(3) Click the position (block) where the part is moved to.
At this time, the current position (block) of part is red, and the position (block) where the part is moved onto is green.

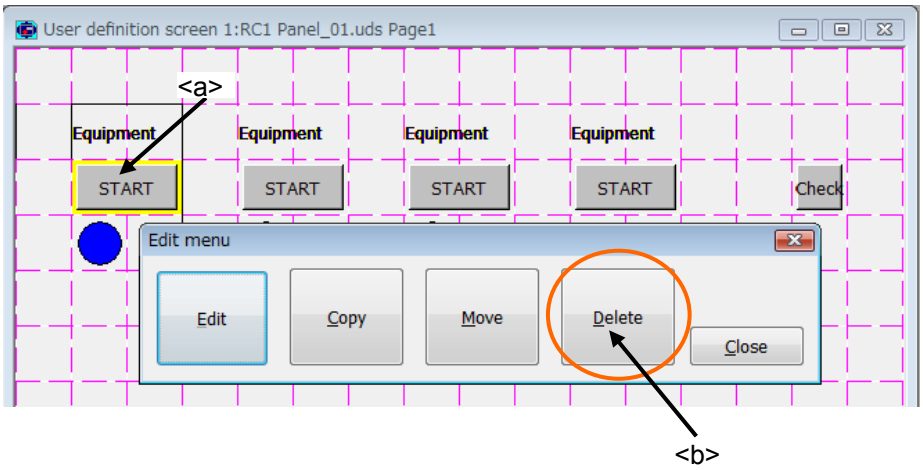




15.2.6. Deletion of parts

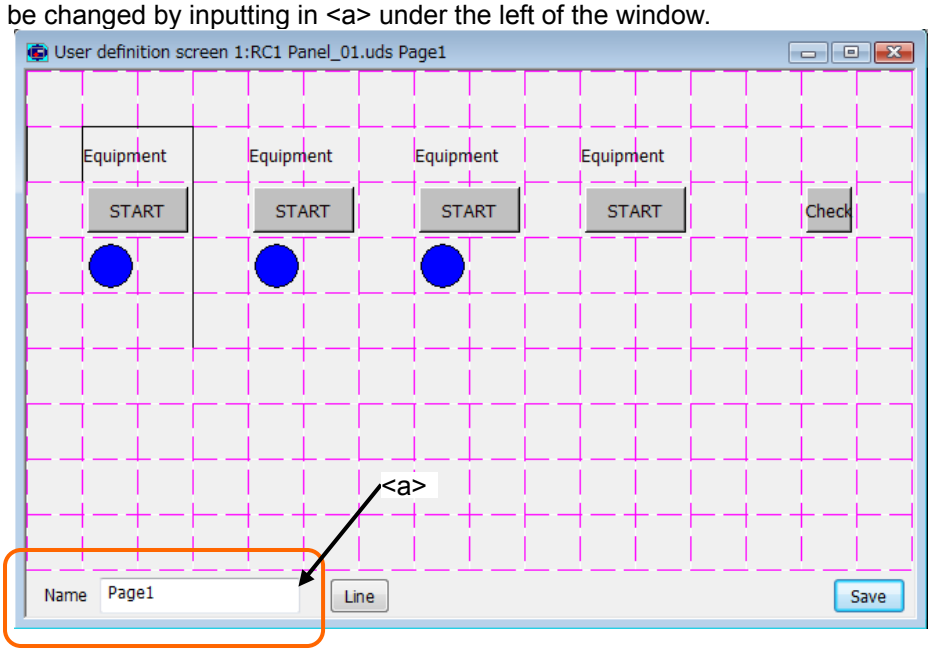
Parts can be deleted.

(1) Click the part to delete, and select it (<a>).
(2) After "Edit menu" window is displayed, click [Delete] button (<b>).
(3) Click [Yes] button on the confirmation message.



15.2.7. Change of page name

Page name can be changed by inputting in <a> under the left of the window.



Caution

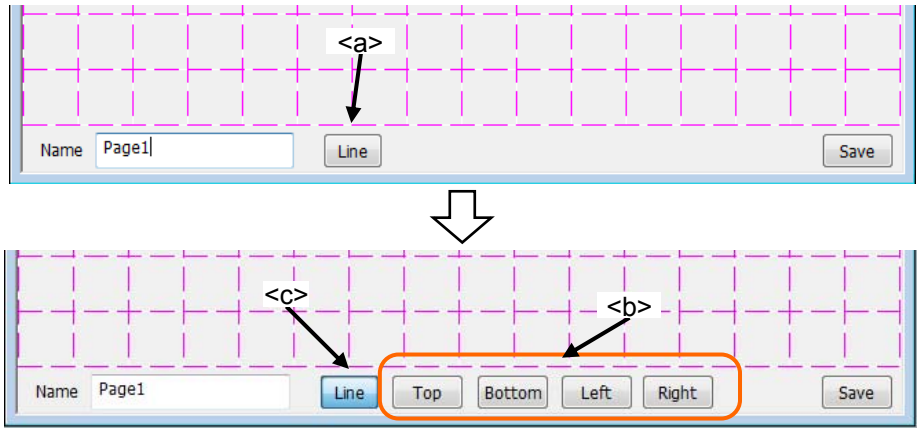
When page name that has already been registered is input, it becomes an error.

15.2.8. Edit of ruled line

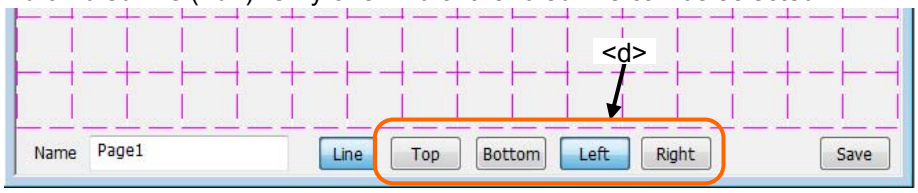
The ruled line can be drawn on the user definition screen.

15.2.8.1. Drawing the ruled line

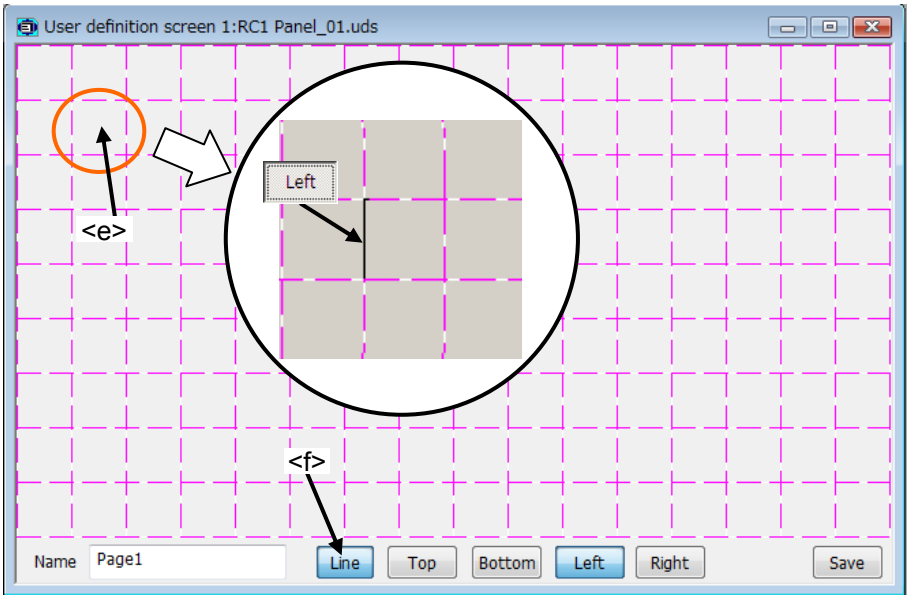
(1) Click [Line] button (<a>) on the window.
(2) The button ("[Top],[Bottom],[Left],[Right]") (<b>) for the ruled line is displayed in the right of [Line] button. These buttons to draw the ruled line disappear when [Line] button (<c>) is clicked again.



(3) Select the kind of ruled line (<d>). Only one kind of the ruled line can be selected.



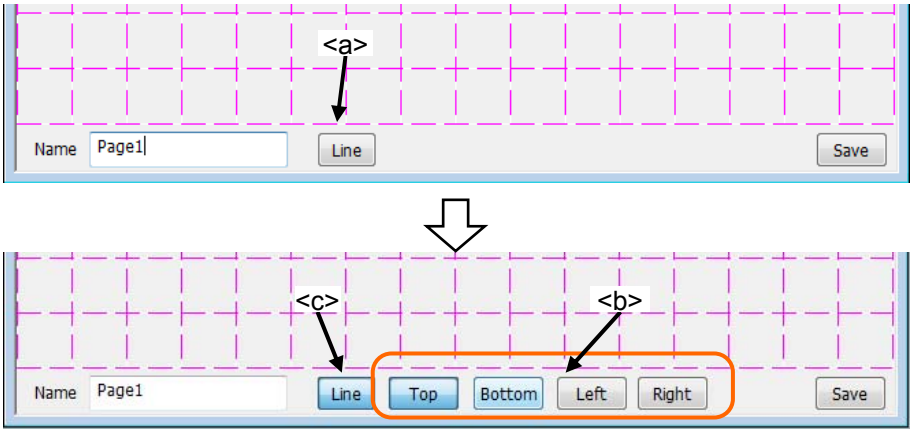
(4) Click the block (<e>) where the ruled line is drawn. The ruled line of the specified position on the selected block can be drawn.



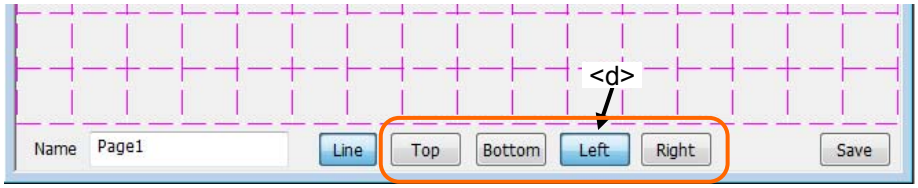
(5) After editing the ruled line, click [Line] button (<f>) again.

15.2.8.2. Erasing the ruled line

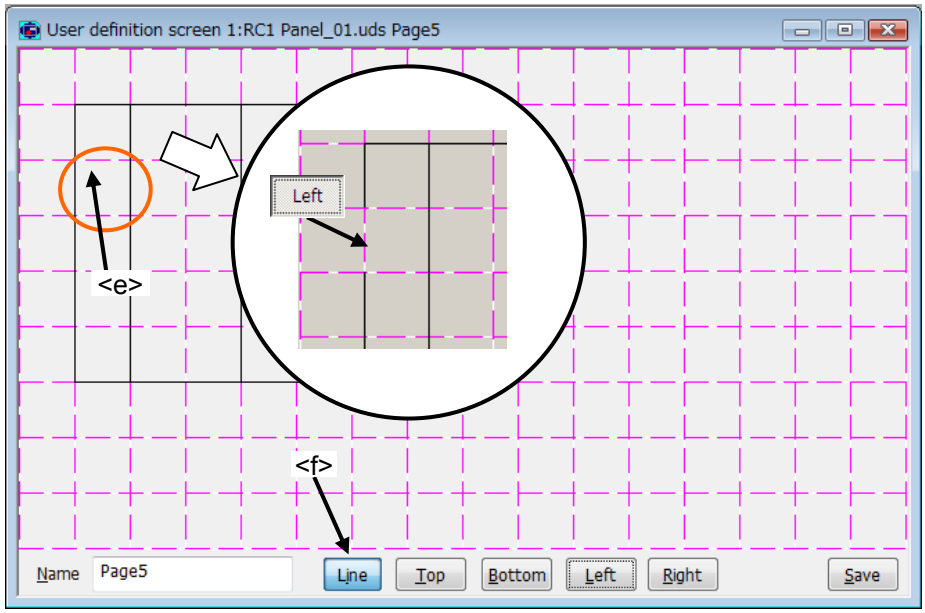
(1) Click [Line] button (<a>) on the window.
(2) The button ("[Top],[Bottom],[Left],[Right]") (<b>) for the ruled line is displayed in the right of [Line] button. These buttons to draw the ruled line disappear when [Line] button (<c>) is clicked again.



(3) Select the kind of ruled line (<d>). Only one kind of the ruled line can be selected.



(4) Click the block (<e>) where the ruled line is erased. The ruled line of the specified position on the selected block can be erased.



(5) After editing the ruled line, click [Line] button (<f>) again.

15.2.9. Deletion of user definition screen

It is possible to delete the existing "User definition screen".
There are two methods in deletion of an user definition screen.

(1) Deleting the user definition files. In this case, all the user definition screens in a user definition screen file are deleted.
(2) The selected user definition screen from the inside of a user definition screen file is deleted.

However, the user definition screen during editing cannot be deleted.

15.2.9.1. Deletion of user definition screen file

All the user definition screens in a user definition screen file are deleted.

After selecting [Tool]->[User definition screen]->[“User definition screen file”] in the project tree, click the right button of mouse and select the "Delete” of right button menu. A confirmation message is displayed, click [OK] button. All of the selected user definition screen file and the user definition screen in it are deleted.

The user definition screen during editing cannot be deleted.

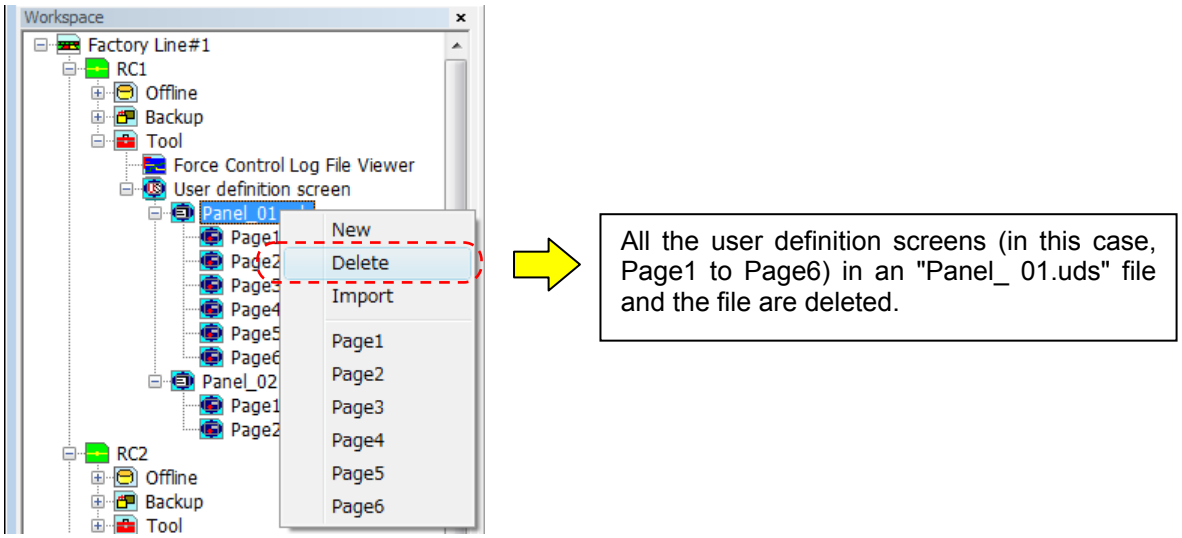


Figure 15-4 Deletion of user definition screen file

15.2.9.2. Deletion of page

The selected user definition screen page in the user definition screen file is deleted .

After selecting [Tool]->[User definition screen]->[“User definition screen file”]->[“User definition screen page”] in the project tree, click the right button of mouse and select the "Delete” of right button menu. A confirmation message is displayed, click [OK] button. The selected user definition screen page is deleted.

The user definition screen during editing cannot be deleted.

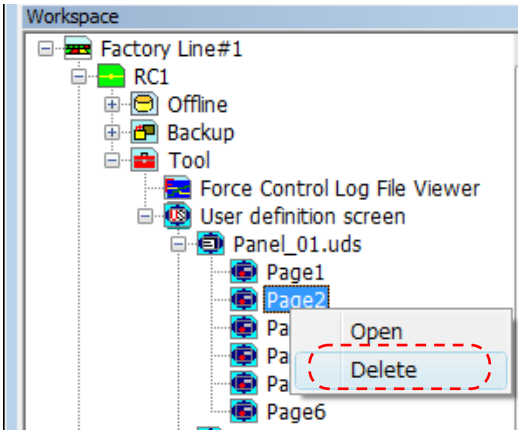


Figure 15-5 Deletion of page

15.2.10. Import of the user definition screen

It is possible to import the user definition screen file created in other work space and projects.
There are two methods for import.

(1) Importing the user definition screen files.
In this case, all the pages in the user definition screen files are imported.
(2) Importing the selected pages in the user definition screen file.

15.2.10.1. Importing the user definition screen files.

All the pages in the user definition screen files are imported.

After selecting [Tool]->[User definition screen]-in the project tree, click the right button of mouse and select the "Import" of right button menu. "Select import user definition screen file" screen is displayed. After selecting the importing files, Click the [OK] button. The selected user definition screen file and all the pages in the file are imported to the current project. Two or more user definition screen files can be imported simultaneously. When the same name file is existing in the project, the confirmation message of overwrite is displayed.

The default folder when starting this software is "My Documents". During this software starting, it is the folder which performed the last import. After ending this software, it returns to a "My Documents."

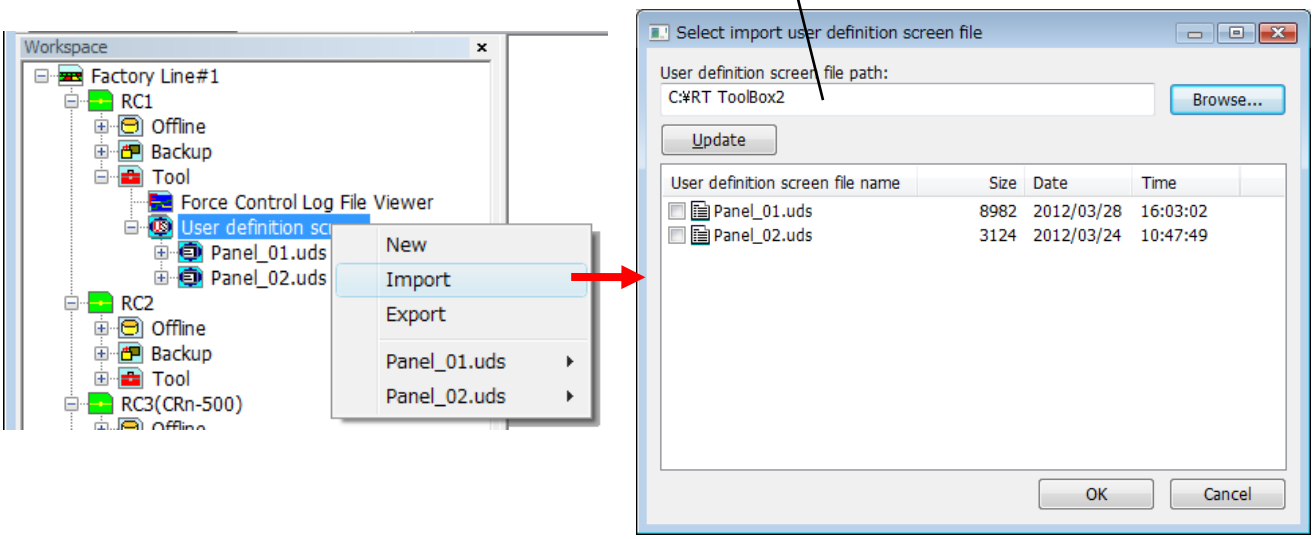


Figure 15-6 Importing the user definition screen files

15.2.10.2. Importing the page of the user definition screen

Importing the selected pages in the user definition screen file.

After selecting [Tool]->[User definition screen]->[“User definition screen file”] in the project tree, click the right button of mouse and select the "Import” of right button menu. “Select import user definition screen file” screen is displayed. After selecting the importing files, click [OK] button. “Select import user definition screen” screen is displayed, and all the pages in the selected file are displayed. After selecting the importing pages, click [OK] button. The selected the pages in the file are imported to the current project. Two or more pages can be imported simultaneously. The imported pages are added to the lowest row.

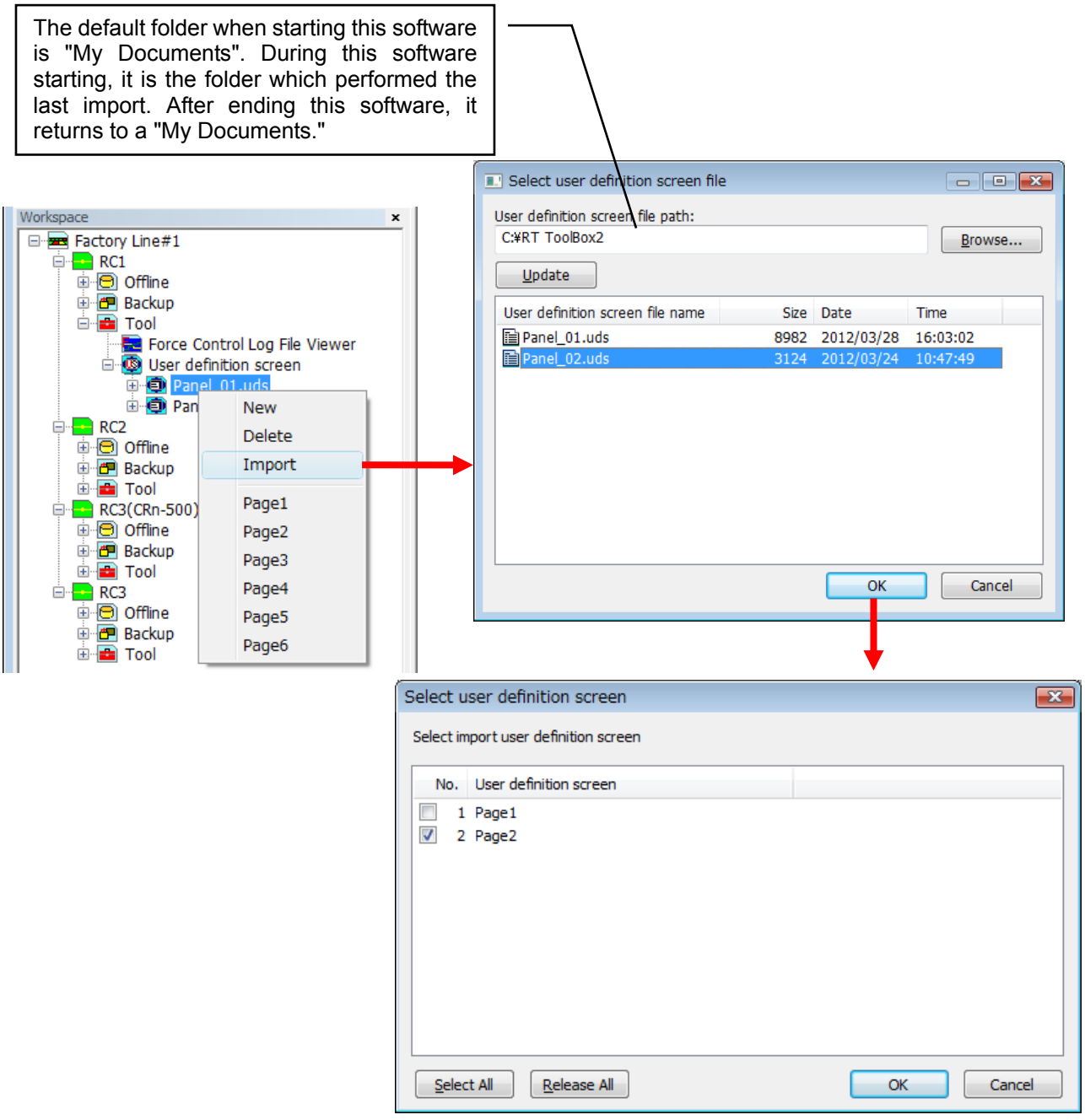


Figure 15-7 Importing the page of the user definition screen

When the same name file is existing in the project, the confirmation message of overwrite is displayed.
When you click the “Overwrite” button, all the pages in the file will replace.The page name can be changed and imported.

15.2.11. Export of the user definition screen

It is possible to export the user definition files in the current project so that it can be used in other project. The user definition screen is exported by a file

After selecting [Tool]->[User definition screen] in the project tree, click the right button of mouse and select the "Export" of right button menu. "Select export user definition screen file" screen is displayed. After setting the export path and selecting exporting file, click [OK] button. The selected user definition screen file is copied in "export path" folder. Two or more pages can be exported simultaneously.

The default folder when starting this software is "My Documents". During this software starting, it is the folder which performed the last export. After ending this software, it returns to a "My Documents."

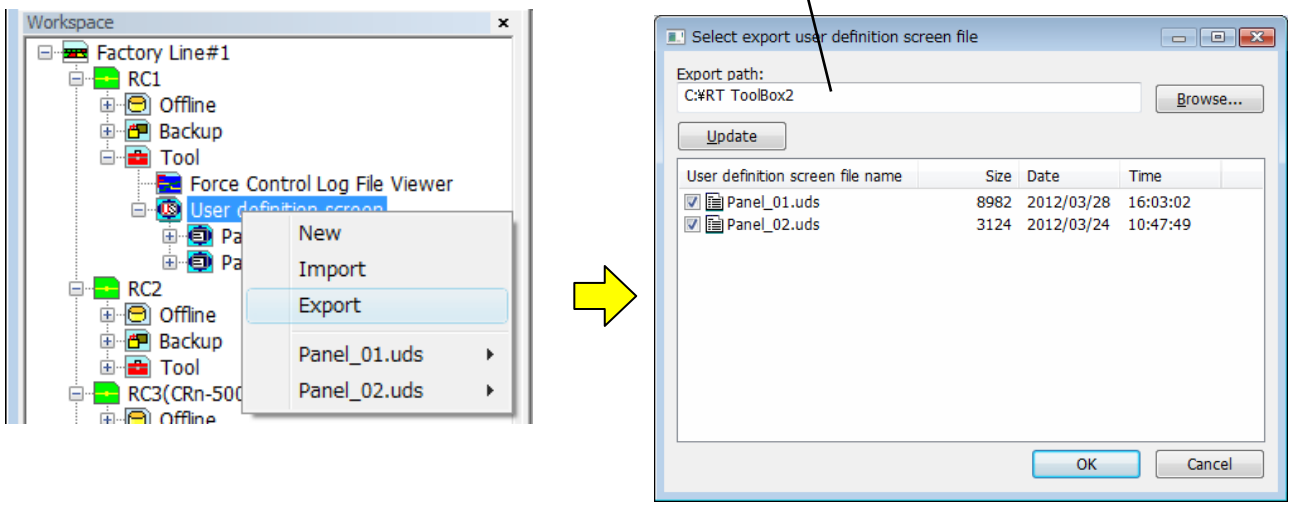


Figure 15-8 Export of the user definition screen

When the same name file is existing in the "export path" folder, the confirmation message is displayed.
When you click the "Overwrite" button, all the pages in the file will replace. The page name can be changed and exported.

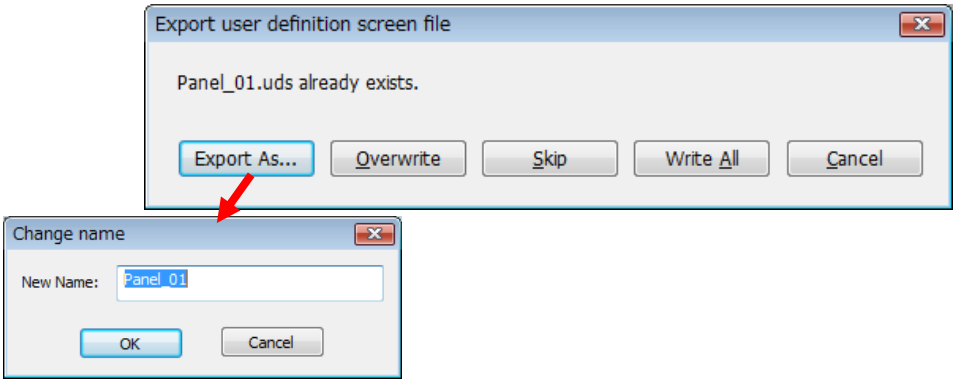


Figure 15-9 Export of the user definition screen- confirmation message

15.3. Oscillograph

The oscillograph function is explained.

⚠ Caution

Since an oscillograph function needs the memory and CPU power of a personal computer, the screen to open has been restricted to a maximum of 8 screens. If many screens which need memories, such as program editor and parameter editor, are opened, please keep in mind that a memory may be insufficient.

15.3.1. Outline

The oscillograph can display the graphical representation of a robot's various internal data.
The data acquired from the robot can be saved at a CSV file. By specifying a preservation interval, prolonged data recording is possible. A program name, an execution row number, and an input-and-output signal are also simultaneously recordable on a CSV file.

15.3.2. Communication method

The following two systems are among the communication methods which acquire various internal data from a robot.

15.3.2.1. Ordinary communication

It is a communication method which uses a communications server.
Therefore, it can be used if it is the environment where a communications server is connectable.
The feature is explained.

Table 15-3 Ordinary communication

item	explanation
Recoding numbers	30,000 （When intervals to receive are 100msec, about 50-minute room arrangement profit is possible.）
Data kind	Fixed number
Intervals to receive	50, 100, 200, 500, 1000, 2000, 5000, 10000, 30000msec

15.3.2.2. High speed communication

The high-speed communication can use a real-time function, and can acquire data at intervals of 7.1msec.The real time monitor function cannot be used if it is not the environment which a robot controller can **connect with a personal computer by Etherne**t.
The feature is explained.

Table 15-4 High speed communication

item	explanation
Recoding numbers	80,000 （About 9-minutes）
Data kind	maximum of 4 data selection The continuous signal of 32 points(IN/OUT)
Intervals to receive	Highest 7.1msec
Robot software version	S4b,R4b or later

When the simulator starts, a real-time function can be used only for the first project since this software Ver.3.01B.

15.3.3. Acquirable data

The list of the data that can be acquired from the robot is shown below.

Table 15-5 Oscillograph data list

Notation on the graph		Unit	Explanation	High	Ord
Current feedback		[Arms]	Present value of the motor current.	○	○
Max current cmd2		[Arms]	The maximum value of the current command for the last 2 seconds.	-	○
Max current cmd1		[%]	The maximum value of the current command after robot controller's power supply is turned on.	-	○
Axis load level		[%]	A preset load ratio of each motor is displayed as an alarm level.	○	○
Max axis load level		[%]	The maximum value of the axis load level after robot controller's power supply is turned on is displayed.	-	○
Position feedback		[Pulse]	Current motor rotation position is displayed by the pulse value of the encoder.	○	○
Joint position(CMD)		[mm deg]	Joint position (command)	○	○
XYZ position(CMD)		[mm deg]	XYZ position (command)	○	○
Joint position (FB)		[deg]	Joint position (feedback)	○	-
XYZ position (FB)		[mm deg]	XYZ position (feedback)	○	-
Position droop		[Pulse]	The amount of deflection at the motor rotation position to a position command is shown.	○	○
Speed (FB)		[rpm]	The feedback of the motor speed is displayed by the unit of rpm.	○	○
Voltage		[V]	A present power-supply voltage value is displayed.	○	○
RMS current		[Arms]	Present RMS value of the motor current is displayed.	○	○
Regeneration level		[%]	The regenerative current value of each axis is displayed as an alarm level.	○	○
Encoder temperature		[deg C]	Temperature of the encoder of each axis Correspondence since F series.	○	○
Current command		[Arms]	The current command of the motor.	○	-
Tolerable command +		[Arms]	The limitation value of the plus side of the current command set to the motor.	○	○
Tolerable command -		[Arms]	The limitation value of the minus side of the current command set to the motor is displayed.	○	○
Force sensor data		[N Nm]	The input value from a force sensor.	○	-
Force pos CMD(XYZ)		[mm rag]	Force sense position command(XYZ)	○	-
COL threshold +		[0.1%] rated current	The higher rank side detection threshold of a collision detection function (plus side)	○	-
COL threshold -		[0.1%] rated current	The higher rank side detection threshold of a collision detection function (minus side)	○	-
COL presumed torque		[0.1%] rated current	Presumed torque of the collision detection function.	○	-
COL torque		[0.1%] rated current	Actual torque of the collision detection function.	○	-
Robot information	Tool point speed(FB)	[mm/s]	Speed of a tool center point（feedback）	○	-
	Remaining distance(FB)	[mm]	The remaining distance to the target position (in mm) while the robot is moving（feedback）.	○	-
	Tool point speed(CMD)	[mm/s]	Speed of a tool center point（command） Same as status variable values "M_RSpd"	○	-
	Remaining distance(CMD)	[mm]	The remaining distance to the target position (in mm) while the robot is moving（command）. Same as status variable values "M_RDst".	○	-
	Gap of CMD and FB	[mm]	The gap of a command position and a feedback position. Same as status variable values "M_Fbd".	○	-

	Transport factor(CMD)	[%]	Speed of a tool center point（feedback）	○	-
	Acceleration state(CMD)	-	The current acceleration/deceleration status.（command） [0=Stopped,1=Accelerating, 2 = Constant speed, 3 = Decelerating] Same as status variable values “M_AclSts”.	○	-
	Controller temperature	[deg C]	Controller temperature	○	○
INPUT		-	Consecutive input signal for 32 points	○	-
OUTPUT		-	Consecutive output signal for 32 points	○	-

※High :High speed communication Ord :Ordinary communication

15.3.4. Starting

From the project tree, double-click [Tool] -> [Oscillograph]

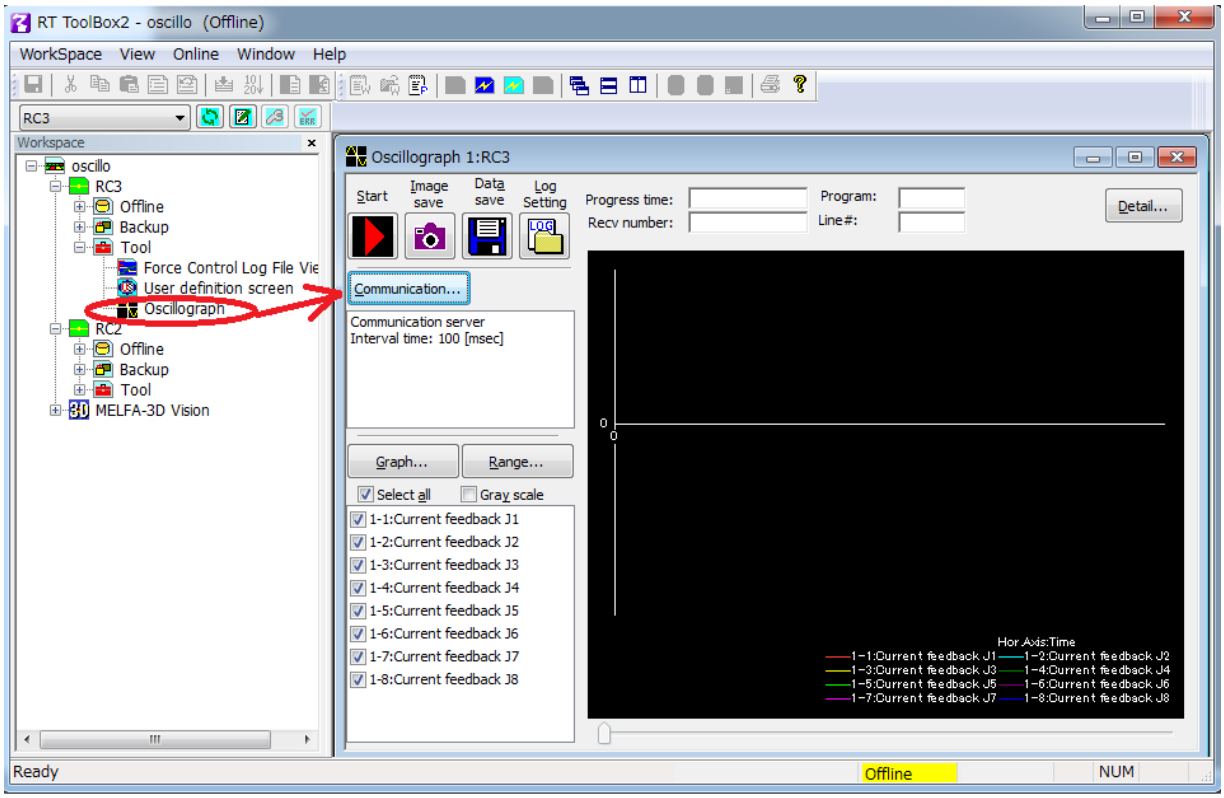


Figure 15-10 Starting the Oscillograph

15.3.5. Communication settings

Please display the Communication setting dialog by clicking the [Communication…] button.
Ordinary communication can be used as choosing the [Communications server].
High speed communication can be used as choosing the [Real time monitor].

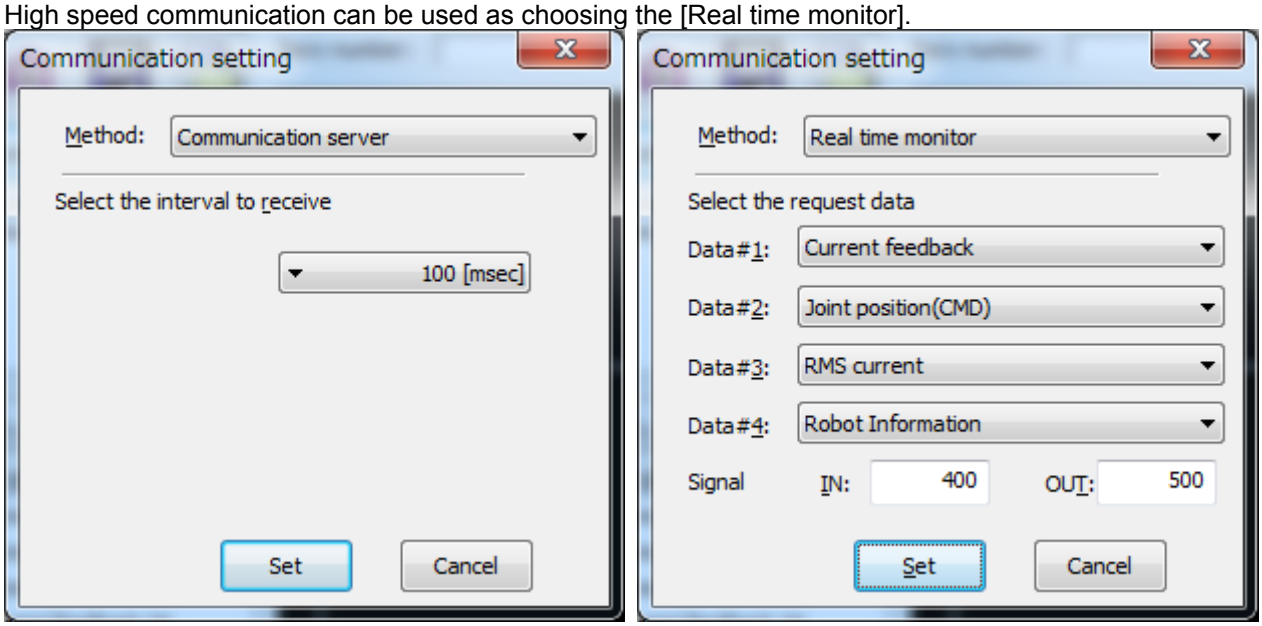


Figure 15-11 Communication setting dialog

The interval to receive is chosen in the ordinary communication via a communications server.
In the High speed communication which uses the real time monitor function, the start number of a maximum of four kinds, and an input signal/output signal is specified for the data to acquire.
To use high-speed communication, it is necessary to validate real-time monitor mode on an Ethernet parameter screen.

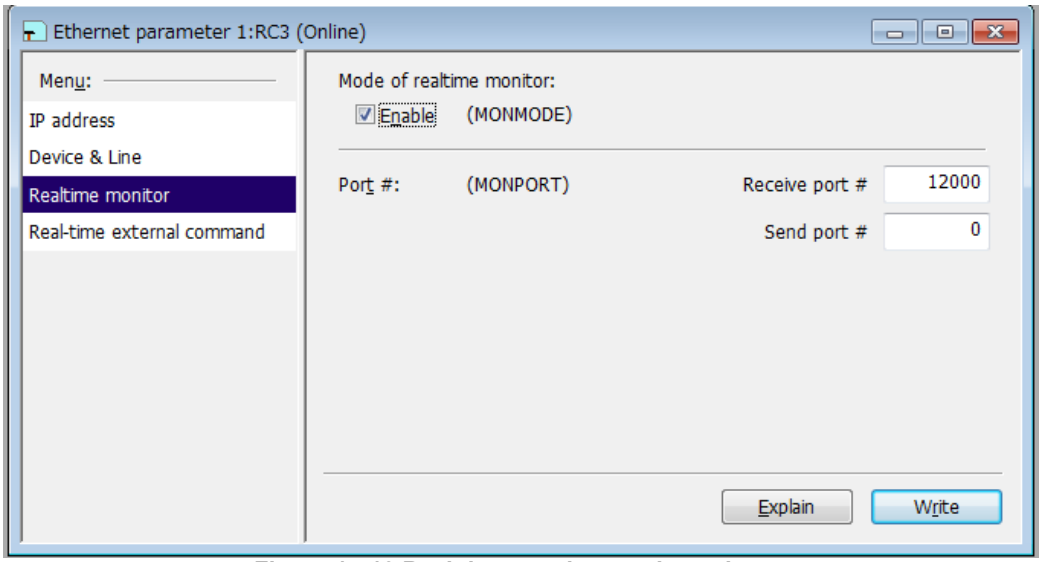


Figure 15-12 Real time monitor mode setting

⚠ Caution

・To display a program name and an execution row number by high-speed communication, it is necessary to include "robot information" in demand data.
・In "Ordinary communication", IN and OUT signals are unacquirable.
・By a simulator, high-speed communication is impossible.

15.3.6. Start／Stop

Please check before a start that the target project is in an on-line state.

If it clicks a [Start]( ) button, data will be acquired from a robot and drawing of a graph will be started.

A click of a [Stop] ( ) button will stop acquisition of data.

15.3.7. Graph setting

The [Graph...] button of an oscillograph screen can be clicked and the item displayed on a graph can be set up. The graph setup can be changed also in data acquisition.

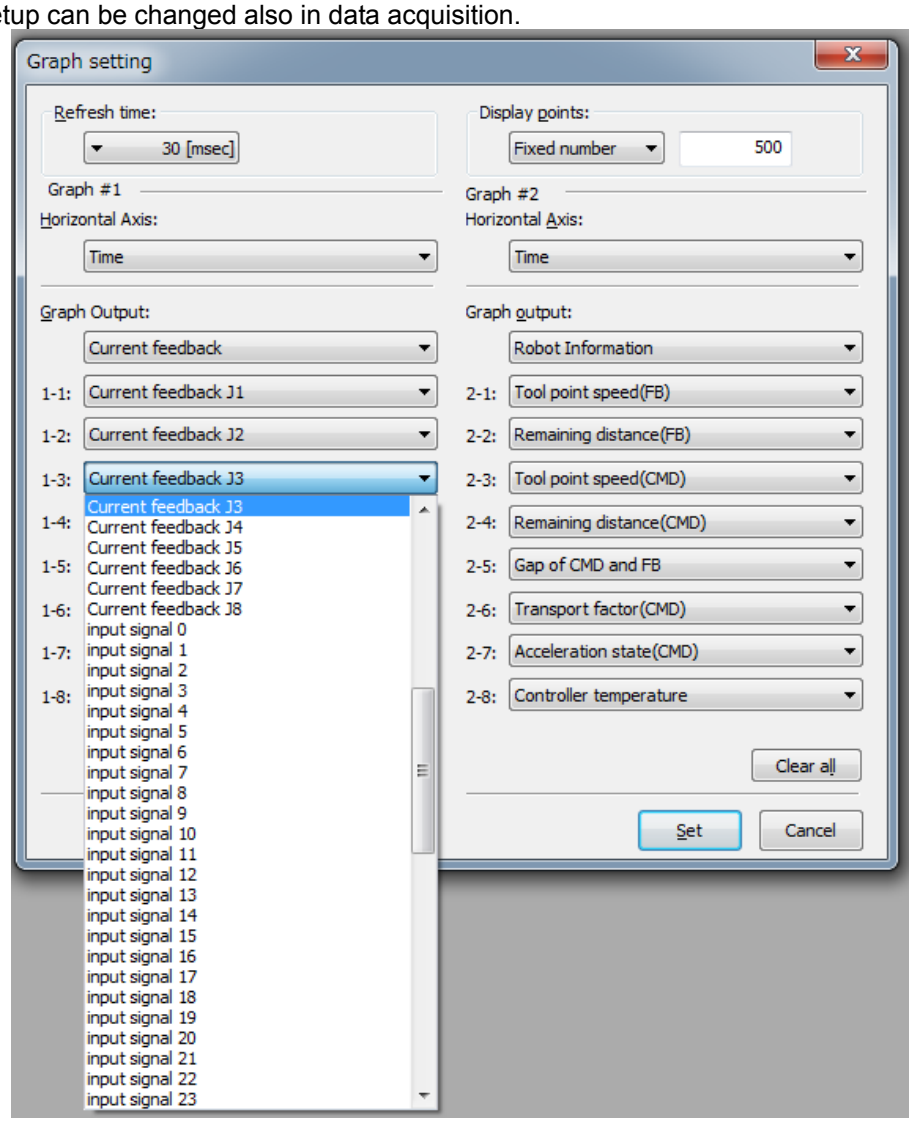


Figure 15-13 Graph setting dialog

Table 15-6 Setting Items

Item	Explanation
Refresh time	Select the interval of time to refresh the graph.
Display points	Specify the number of points displayed in the graph with fixed number or time scale.
Horizontal Axis	Select the horizontal axis of the graph from acquisition data or time.
Graph Output	Select the category of data displayed to the graph.
1-1 -> 2-8	Select the data displayed to each graph.

Moreover, display/non-display of the data selected by the graph setting screen can be switched from the lower left list of the oscillograph screen.

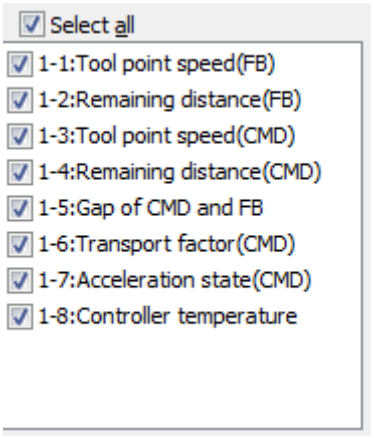


Figure 15-14 Switch of display/non-display of graph

15.3.8. Graph range setting

The [Range...] button of an oscillograph screen can be clicked and the range of the display of the vertical axis of each data can be set. When [Auto adjust] is checked, the range of the display of the vertical axis in the graph is automatically adjusted.

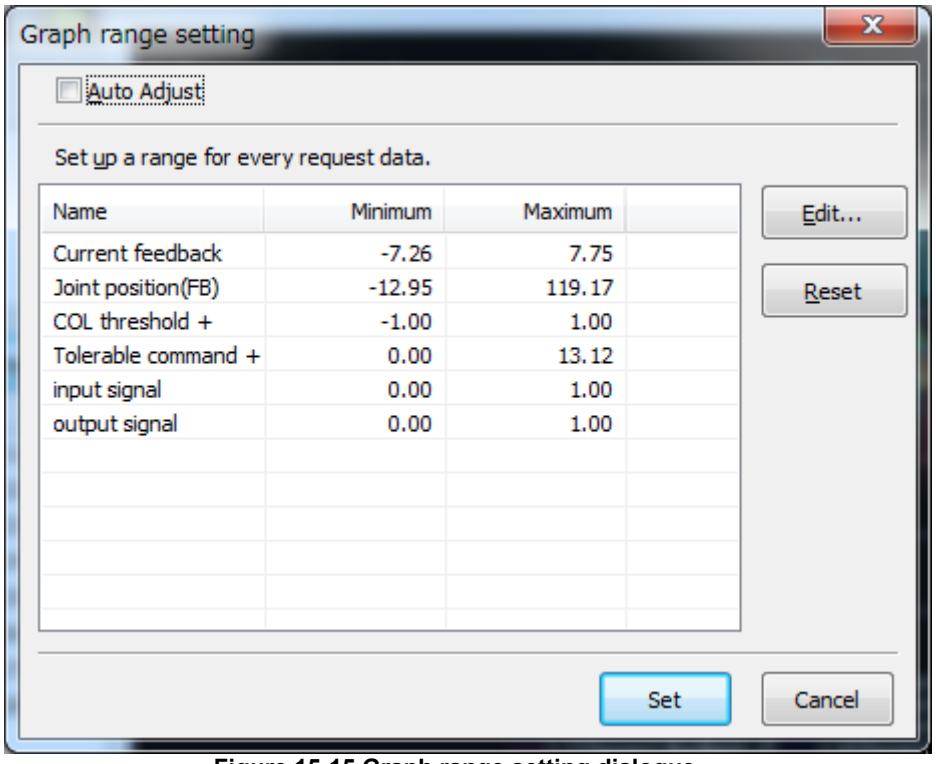


Figure 15-15 Graph range setting dialogue

The [Edit...] and [Reset] can make two data or more a target at the same time.

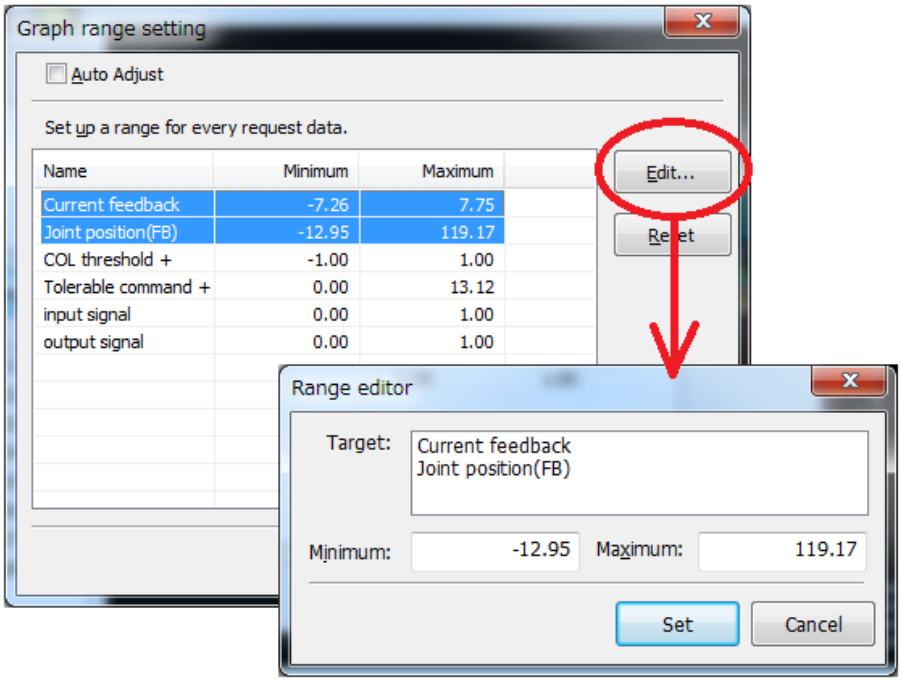


Figure 15-16 Range editor of the graph

15.3.9. Data reproducing / confirmation

The [Detail...] button of an oscillograph screen can be clicked and the data displayed in the graph can be confirmed by the numerical value. When the data acquisition is executing, the current value is displayed in [Data].

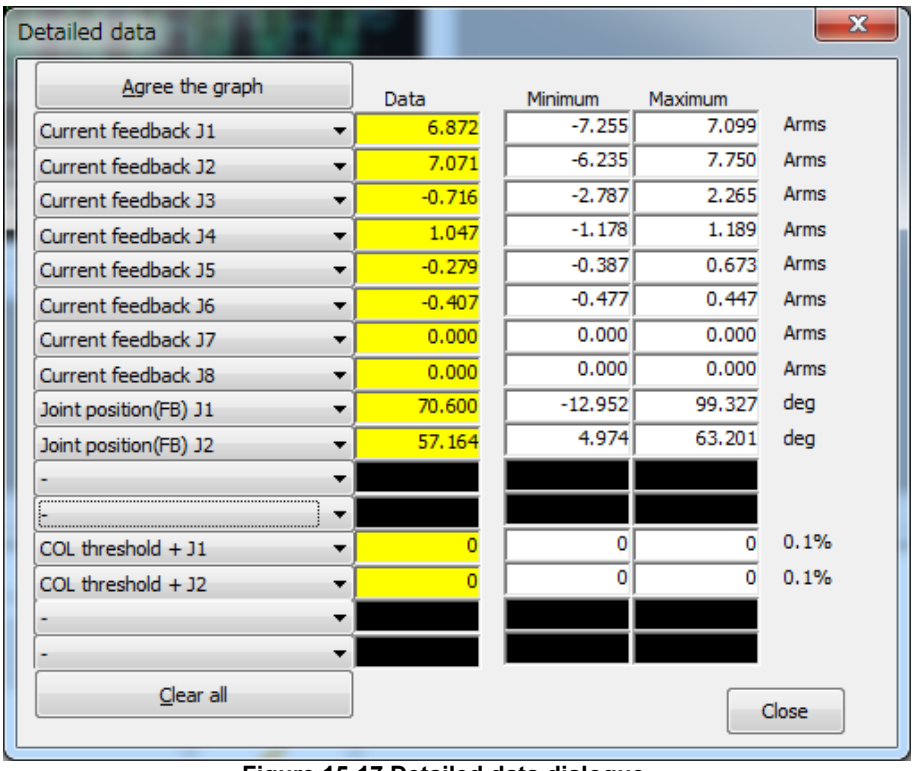


Figure 15-17 Detailed data dialogue

Moreover, drawing of the graph can temporarily be interrupted by clicking [Stop drawing] while executing data acquisition. In that case, the reproduction display of the acquired data is possible by slider operation.

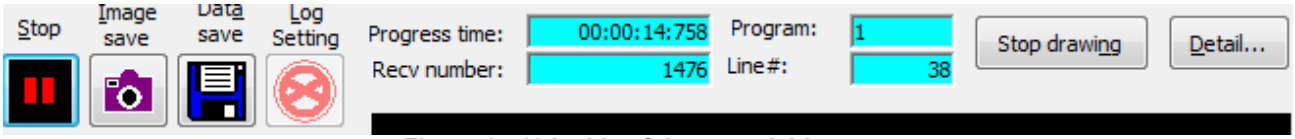


Figure 15-18 Inside of data acquisition

The cursor is displayed while operating the slider. the current value is displayed in [Data] of detailed data dialogue. The value of the selected position is displayed in [Data] in detailed data dialogue.

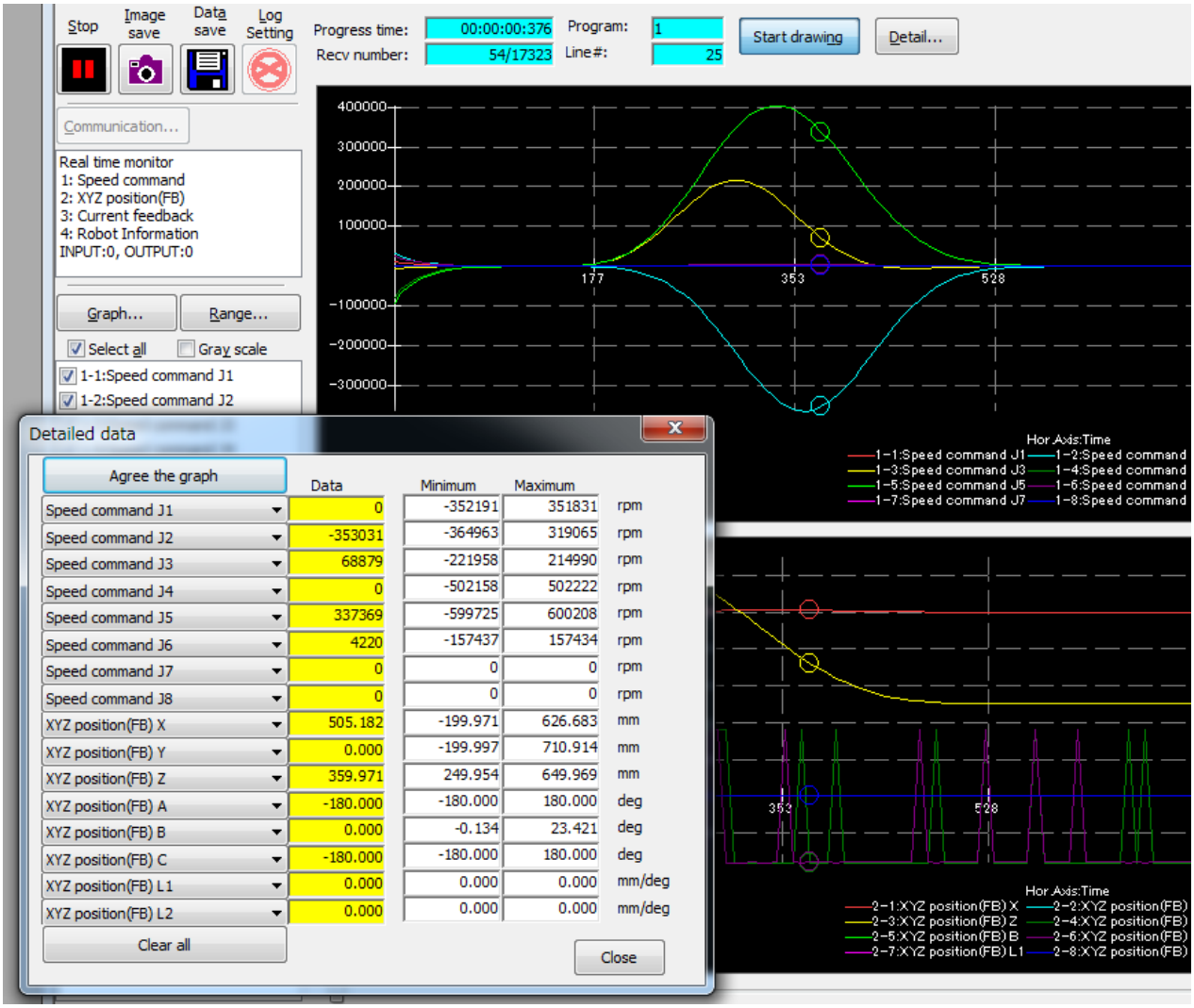


Figure 15-19 Cursor movement by slider operation

15.3.10. Data saving／Log setting／Log file reading

The [Data save] ( ) button of an oscillograph screen can be clicked and the data acquired by the point in time can be saved by a CSV file format.

The newest data can be written out to a log file for every interval for a definite period of time. Click the [log file] ( ) button of an oscillograph screen, and [Log file operation] dialog is displayed. The time interval written in a log file is specified by a [Select the interval log] combo box.
Click a [Set] button and it completes a setup of a log file.

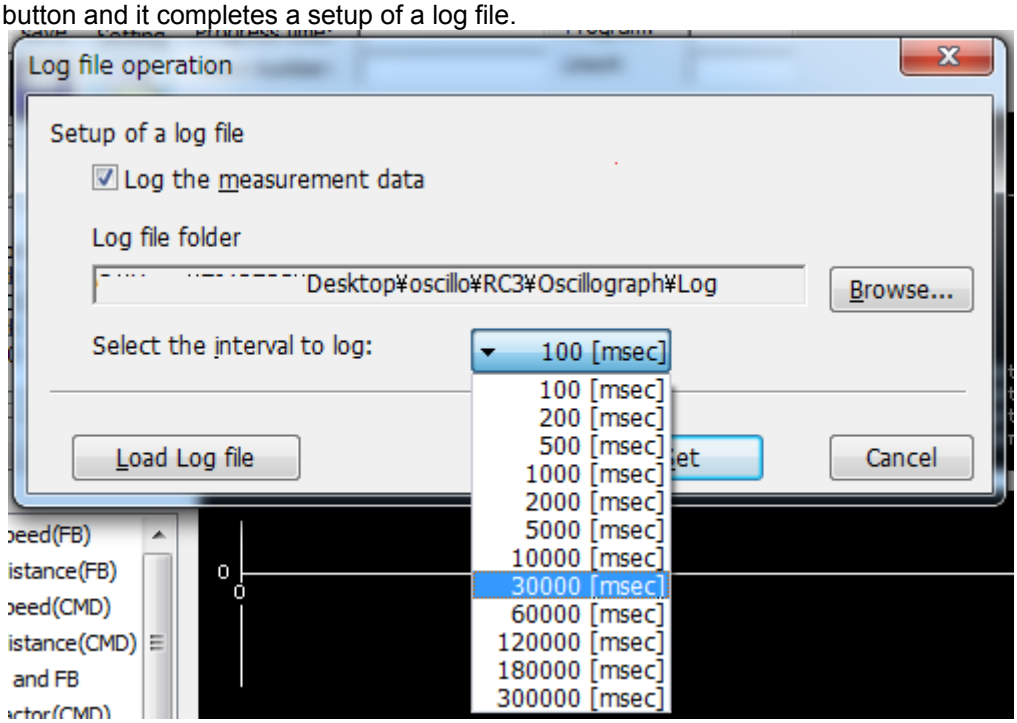


Figure 15-20 Log file operation

The folder of data storage / log file name, and its preservation place is as follows.

Table 15-7 Data saving file name / Log file name / Data saving folder

項目	説明
Data saving file name	Store***<time stamp>***.csv The <time stamp> shows the time which clicked the [Data save] button. “<A.D(4chars)>< month(2chars)><day（2chars）> - <time(2chars)><minutes（2char）><second（2chars）>” Example： Store20130911-183525.csv
Log file name	Log***<time stamp>***.csv The <time stamp> shows the time at the time of a data acquisition start. Example： Log20130911-183525.csv
Data saving folder	“Workspace \ Project \ Oscillograph \ Log”

The data file and log file which were saved can click [Load Log file] button, and can display it on a graph.

15.3.11. Graph image saving

The [Image save] () button of an oscillograph screen can be clicked and the graph currently displayed can be saved in bitmap image

The image file name and the image saving folder name are as follows.

Table 15-8 image filename & Image saving folder

項目	説明
Image file name	Img***<time stamp>***.bmp The <time stamp> shows the time which clicked the [Image save] button. Example： Img20130911-183525.csv
Image saving folder	“Workspace \ Project \ Oscillograph \ Image”

15.3.12. Gray scale

When the check box of the gray display is turned on, the graph is displayed by the gray scale.
This function can be used with Version 3.01B or later of this software.

⚠ Caution

The display of a graph will be confused if operation which needs a CPU power is carried out.

When operation which needs a CPU power is carried out, it becomes impossible to receive the communication from a robot normally.

Please keep in mind that a graph is mainly notably confused by the next operation.

- Data saving operation
- Image saving operation
- Graph setting operation

16. Simulation

This chapter explains the simulation operation methods.

⚠ Caution

Simulation can not be used with the mini edition.

The simulation function only supports the "RT ToolBox2" standard edition. It can not be used with the mini edition.

Simulation can not be used with Movemaster commands.

Be aware that even with the standard edition, the simulation function can not be used when Movemaster commands are selected.

You can not communicate with the robot controller during a simulation.

You can not communicate with the robot controller during a simulation. To communicate with the robot controller, click on the menu bar [Online] → [Offline] to end the simulation, then again click on the menu bar [Online] → [Online] to connect the robot controller.

With an actual robot, an overload error might occur.

Be aware that even if you run the simulation with the work and hand weight set and this works properly in the simulation, when you actually operate with the robot, an overload may occur and make operation impossible.

If there is an input signal wait in the program, use pseudo-input.

When you execute a program in simulation and there is an input signal wait in the program, the program does not move to the next step until that command is executed. Therefore, if there is an input signal wait, use the pseudo-input function from the signal monitor.

16.1. Starting a Simulation

Click on the menu bar [Option] → [Simulator]. At that time, if there are two or more projects in the workspace, the screen for selecting the screen to conduct the simulation is displayed.

- You can simulate eight projects or less.
-

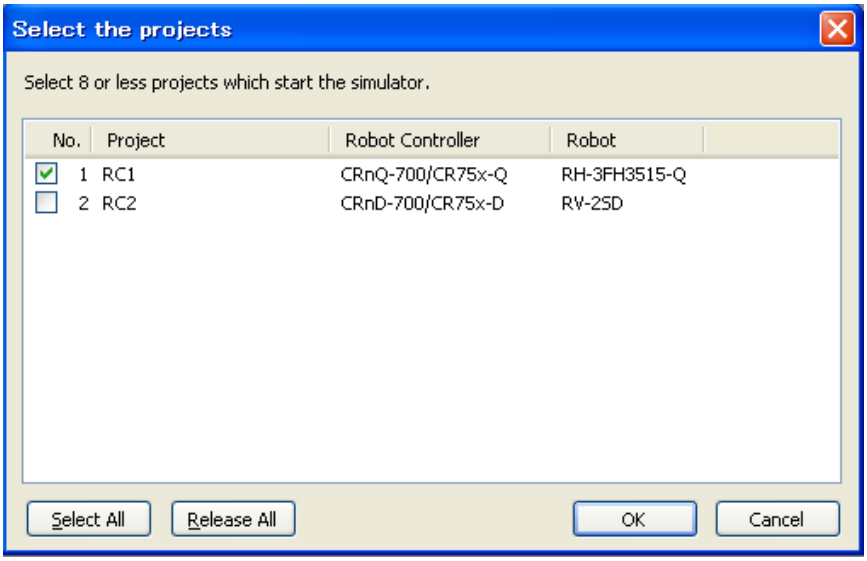


Figure 16-1 Project Selection When Simulation is Started

[Select All] Select all projects at a time.
[Release All] Release all projects at a time.

Select the project to start the simulation, and then click the [OK] button.

Caution

In case of several projects, simulators may be unable to be started.

It may be caused by a low-performance computer. Please check your computer.

You can also start a simulation through operations from the tool bar.

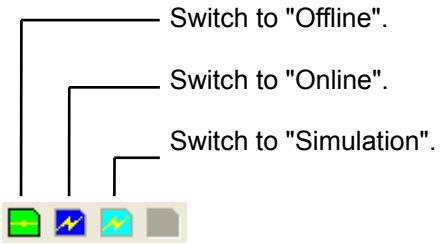


Figure 16-2 Explanation of Toolbar

When the simulation start-up is complete, the operation screen for the simulation is displayed on the screen. Also, the virtual controller for the simulation is automatically started stored in task tray. (Figure 16-3)

Figure 16-3 Virtual Controller stored in task tray

The simulation is run by this virtual controller. The virtual controller ends automatically when the simulation ends. Do not end the virtual controller manually.
3D monitor is automatically started when the simulation starts, with Version 1.7 or later of this software. The explanation of 3D monitor, see **"16.3 Robot View (3D Monitor)"**.

16.1.1. About the warning at first-time startup simulation

After installing RT ToolBox2, when you first start the simulation, the following warning screen may be shown. If the screen is shown, click [Allow access]. You need to select [Allow access] button to use all function of the simulation.

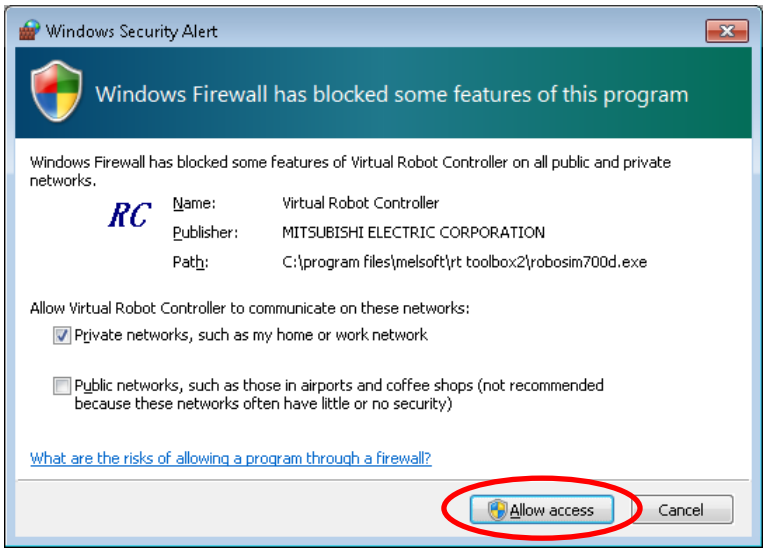


Figure 16-4 The warning screen at first-time startup simulation

16.2. Explanation of the Simulation Operation Screen

This is a simple explanation of the simulation operation screen.

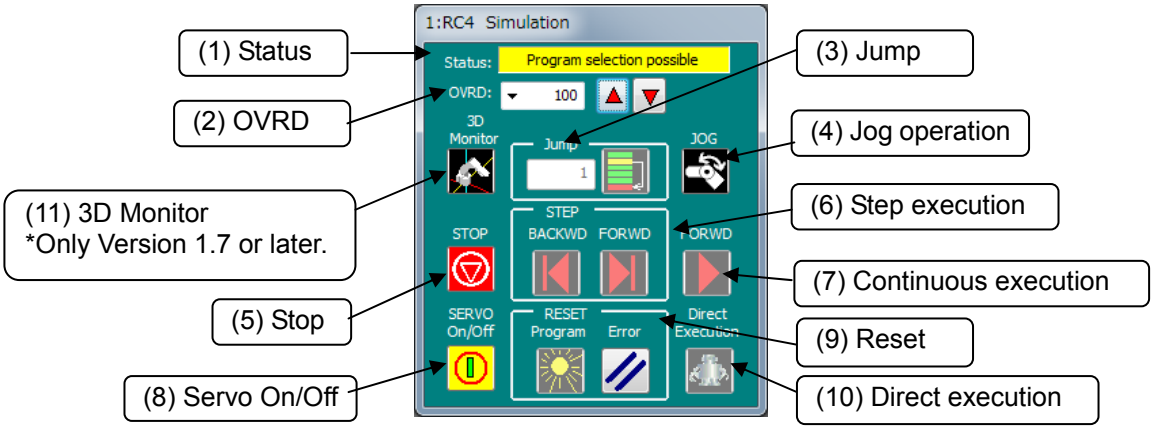


Figure 16-5 Simulation Operation Screen

(1) Status
This shows the task slot status for simulation.

(2) OVRD
This displays and sets the robot speed override.
You can set by operating the drop down list with Version 3.01B or later of this software. 5%, 2%, and 1% can be selected too in this operation.

(3) Jump
You can specify the line in the program to execute.

(4) Jog operation
This conducts jog operations for the simulation robot. When you click this button, the jog operation screen is displayed.

(5) Stop
When a program is running in a simulation, this stops the program.

(6) Step execution
This executes the specified program one line at a time.

(7) Continuous execution
You can execute the stopped program again from the line on which is was during with a stop instruction or a breakpoint during program running.

(8) Servo On/Off
You can switch the simulation robot servo On/Off.

(9) Reset
You can reset the program and any errors that have occurred.

(10) Direct execution
You can execute any command without relationship to the robot program.

(11) 3D Monitor
You can display 3D monitor of the robot.

16.3. Robot View (3D Monitor)

You can display the robot whose simulation you are running and its movements in 3D to check them. Moreover, you can display robots of several projects and their movements in 3D on one screen.

It is possible to display the robot's model name and robot path in this software version 2.20W or later.

⚠ Caution

When using 3D monitor, we recommend you to use the high personal computer of performance. If the low personal computer of performance is used, JOG operation may not be able to be performed normally.

16.3.1. Robot View (3D View) Start

With the simulation running, from the project tree, either double-click [Online] → [<Robot model name>] or select [3D Monitor] with the mouse right button menu. The 3D display screen for the set robot is displayed.

When the robot view (3D monitor) is started, [3D View] is displayed in the menu bar.

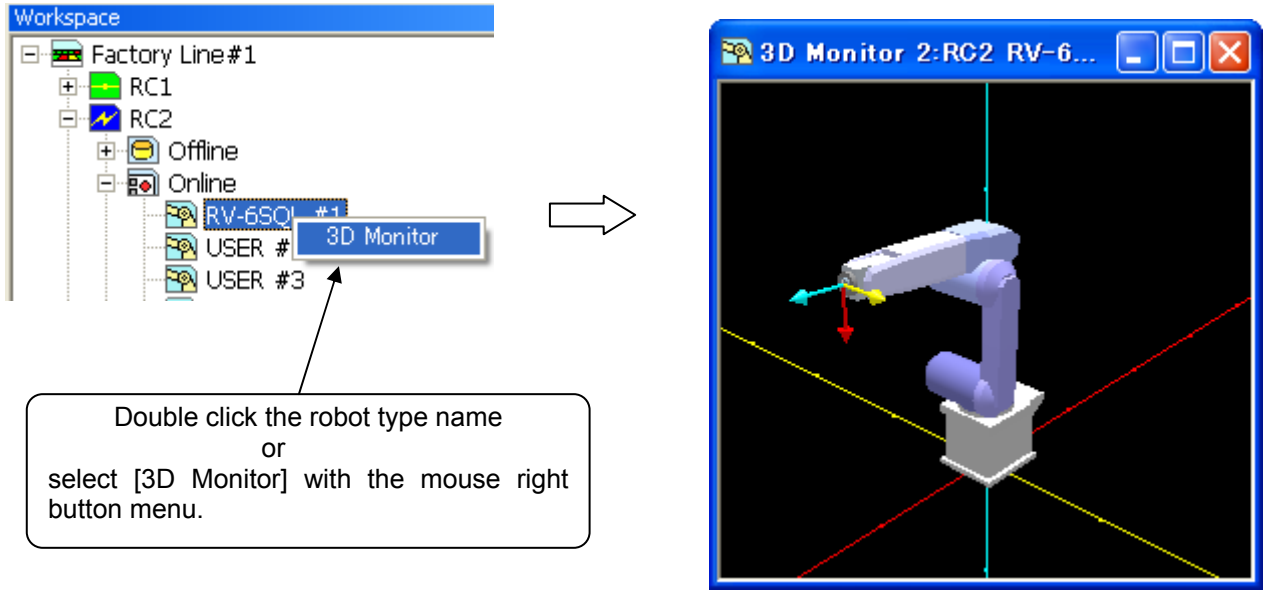


Figure 16-6 Robot View Start

The robot view perspective can be changed by mouse operation.

Table 16-1 Robot View Perspective Change Operations

Viewpoint of changing	Mouse operations on the graphic
Rotation	While clicking the left button, move left/right → Rotation around Z axis Move up/down → Rotation around X axis Move left/right while clicking the left + right buttons → Rotation around Y axis
Move	Move up/down/left/right while clicking the right button
Enlargement/reduction	Move up/down/left/right while clicking pressing [Shift] key and clicking the left button A similar operation can be used by the mouse wheel with Version 3.01B or later of this software.

16.3.2. Displaying robots of more than one projects in 3D

With the simulation running, from the project tree in the workspace, double-click [3D Monitor]. All robots set by “Select the projects” screen (Figure 16-1) are displayed.

This function can be used with Version 2.10L or later of this software.

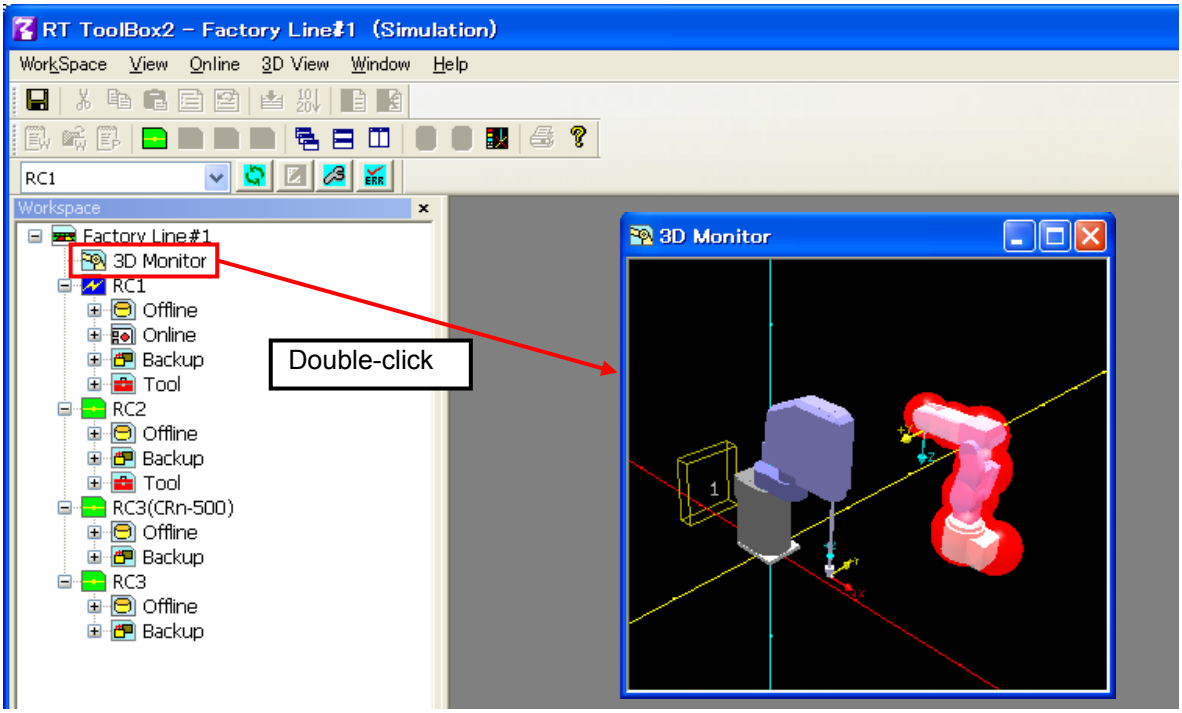


Figure 16-7 Displaying multiple projects

The robot view perspective can be changed by mouse operation with the same usages as 3D monitor of each project.

Table 16-2 Robot View Perspective Change Operations

Viewpoint of changing	Mouse operations on the graphic
Rotation	While clicking the left button, move left/right → Rotation around Z axis Move up/down → Rotation around X axis Move left/right while clicking the left + right buttons → Rotation around Y axis
Move	Move up/down/left/right while clicking the right button
Enlargement/reduction	Move up/down/left/right while clicking pressing [Shift] key and clicking the left button A similar operation can be used by the mouse wheel with Version 3.01B or later of this software.

16.3.3. The panel to change the perspective of robot view.

Click the menu bar [3D View] -> [Panel Display]. The panel to change the perspective of robot view is displayed.
It is possible to change the size and the perspective of robot view with this panel.

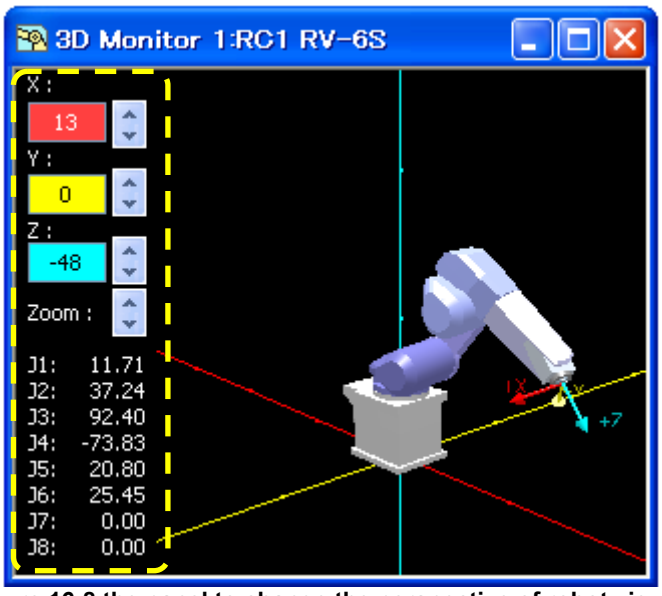


Figure 16-8 the panel to change the perspective of robot view

16.3.4. Displaying floor

If you click  button of the toolbar, the floor is displayed in the robot view.
The length of one grid of the floor is 500(mm)x500(mm).
This function can be used with Version 3.01B or later of this software.

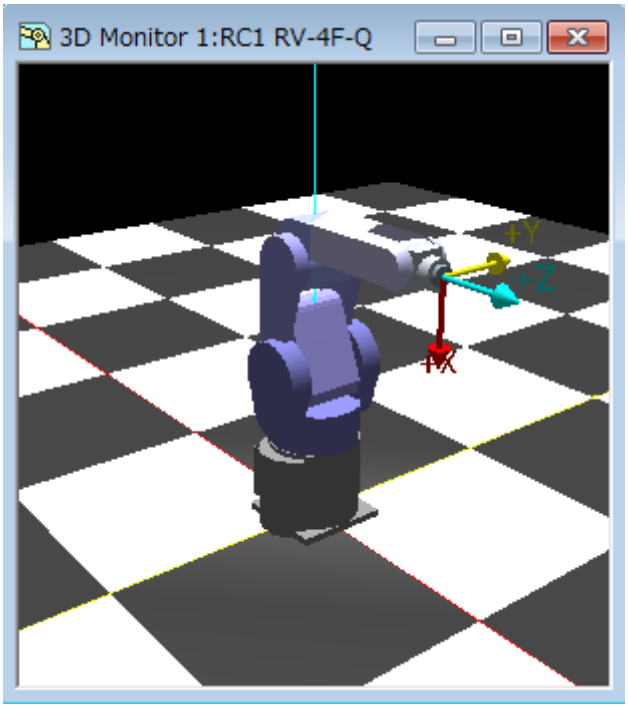


Figure 16-9 Displaying floor

16.3.5. Changing the background color.

If you click  button of the toolbar, the background color of robot view can be changed.
This function can be used with Version 3.01B or later of this software.

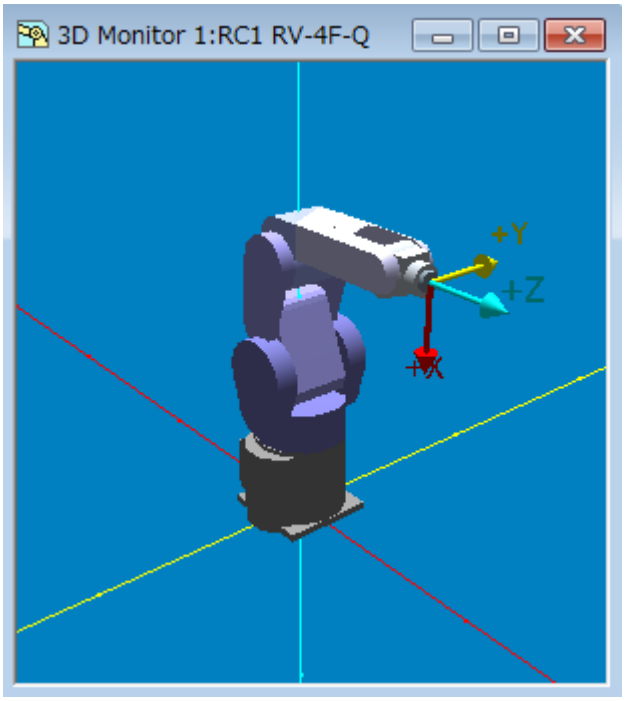


Figure 16-10 Example of changing the background color

16.3.6. Click movement of the robot

After starting the simulation, if you click the object in the 3D monitor screen with Ctrl key, the robot move to the position where you clicked.

If there is no object where you clicked or the robot can't move to the place where you clicked, the robot doesn't move.
The robot move keeping the posture and multi-rotation flag. Then the robot doesn't move depending on the posture and multi-rotation flag.
This function doesn't work during the robot is running.
This function can use the following robot type.

	Robot models
The robot models which can use click movement.	RV-F, RH-F, RV-S, RH-S, RV-A, RH-A, RP-A, RV-T, RH-L
The robot models which can't use click movement.	RH-G, RC-G, RH-U

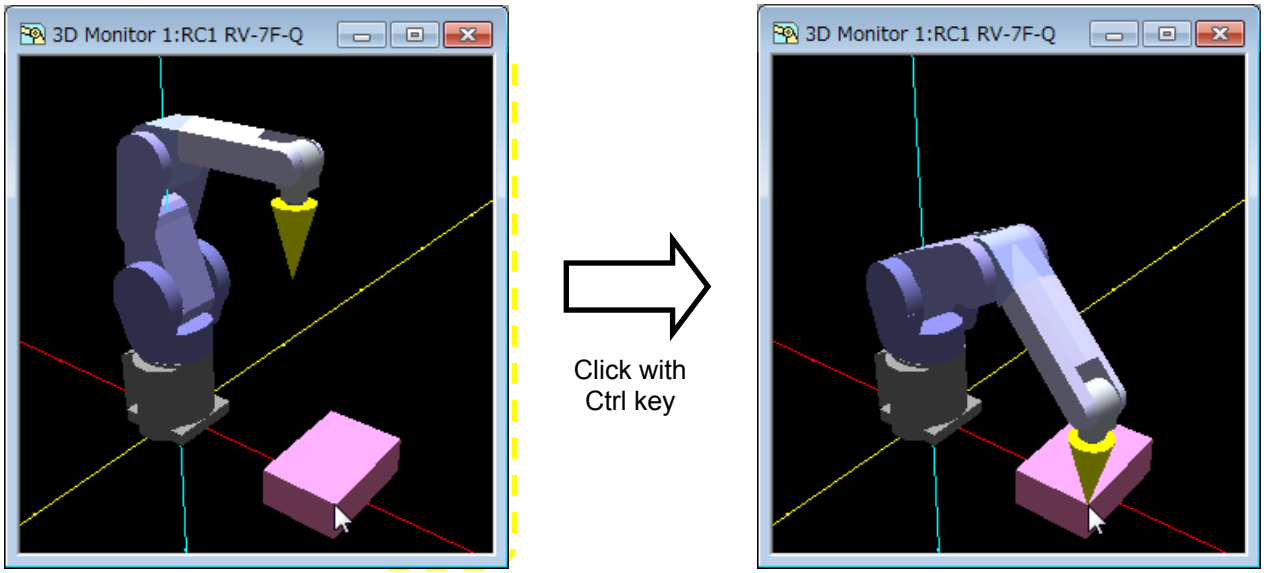


Figure 16-11 Operation of click movement

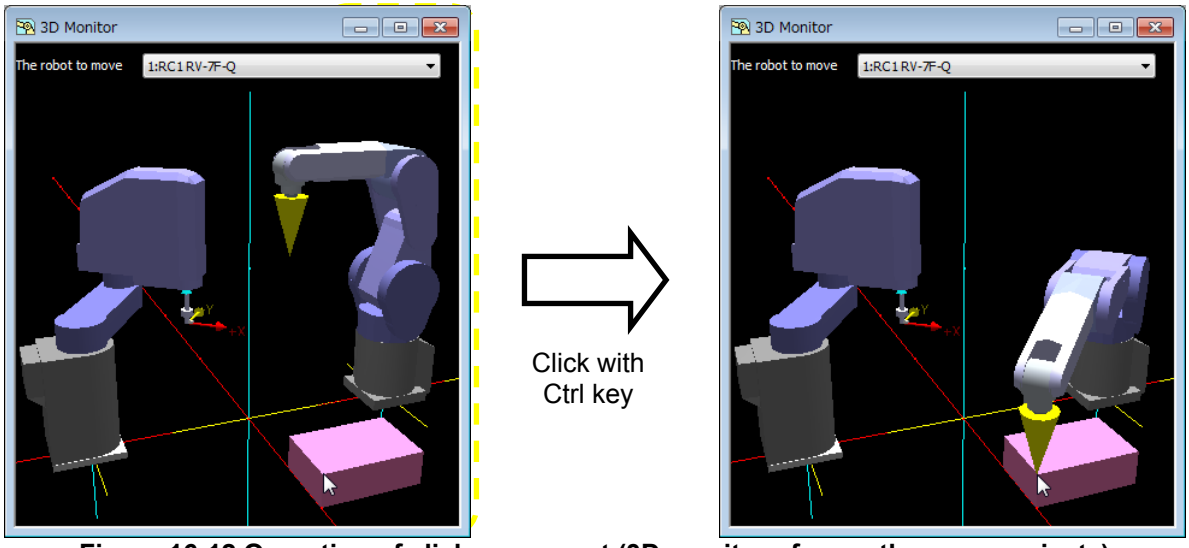


Figure 16-12 Operation of click movement (3D monitor of more than one projects)

The robot selecting [The robot to move] is moved on 3D monitor of more than one projects.

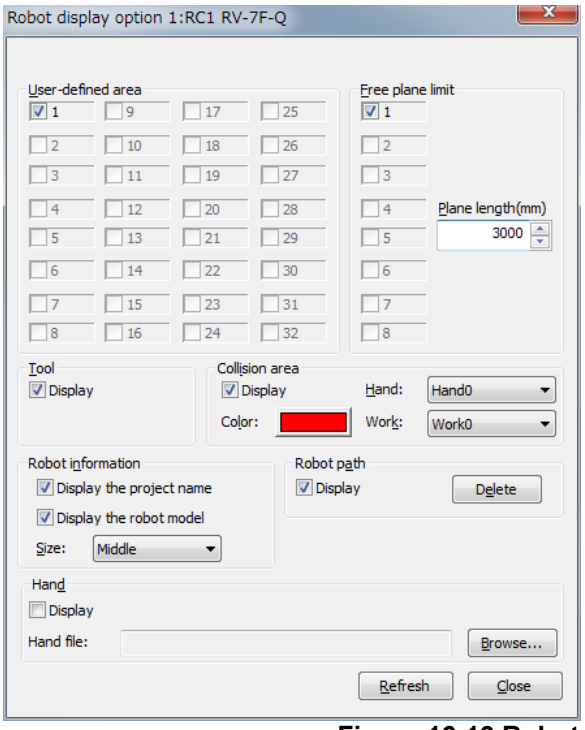
16.3.7. Robot display option

Click the menu bar [3D View] -> [Robot display option]. The robot display option screen is displayed.

In this software version 3.00A or later, it is possible to set the display state of the following information on the robot view (3D monitor).

- Flange direction

Version 2.50C or earlier



Version 3.00A or later

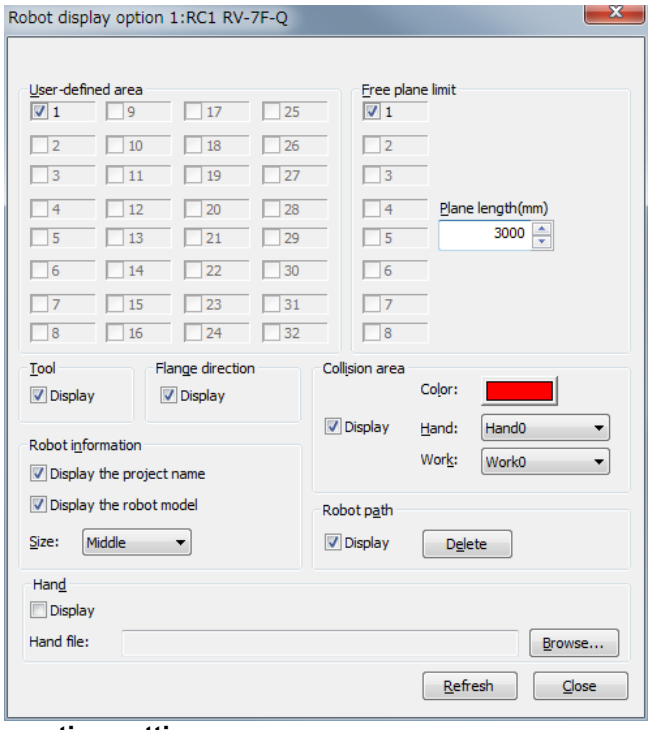


Figure 16-13 Robot display option setting screen

The checkbox in the [User-defined area] and [Free plane limit] where the value is set to the parameter can be operated. Moreover, the settings for [Tool] and [Collision area] are displayed.

(1)Project

Select a project to set the robot display option from several projects.
This is not displayed when selecting the robot display option from each project.

(2)User defined area

If the checkbook of the [User-defined area] is set on, it is displayed in “3D monitor”.

(3)Free plane limit

If the checkbox of the [Free plane limit] is set on, it is displayed in “3D monitor”.

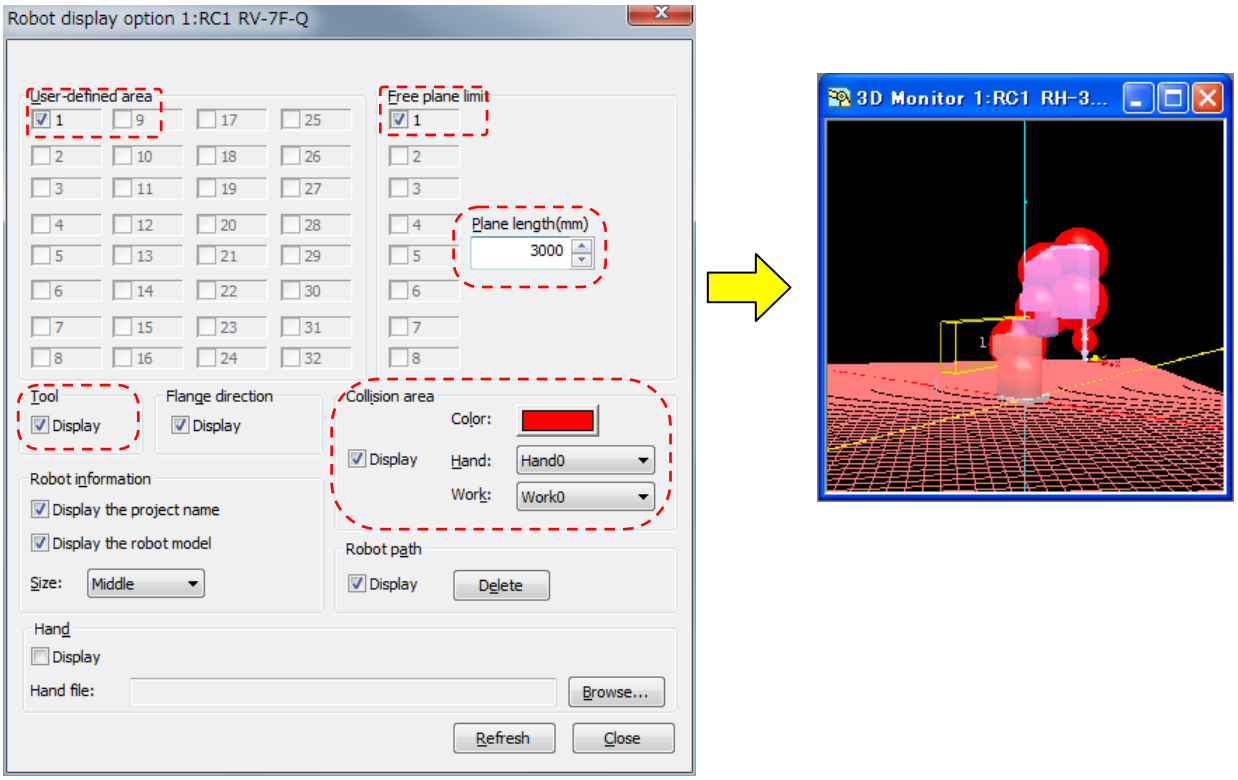


Figure 16-14 Display of Robot display option

(4)Tool

If the checkbox of the [Tool] is set on, a tool of the controller selected now can be display in “3D monitor”.

This function can be used with Version 2.10L or later of this software.

Un-display

Display

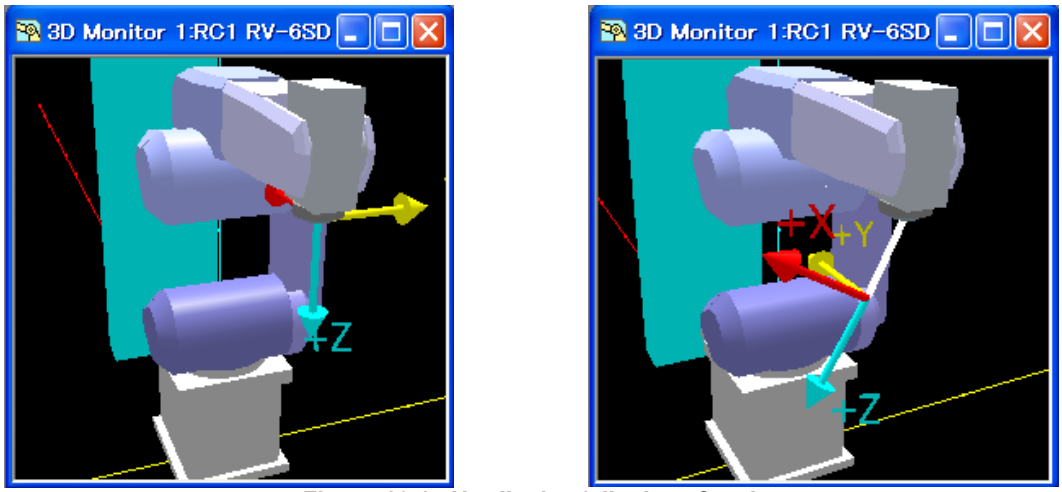
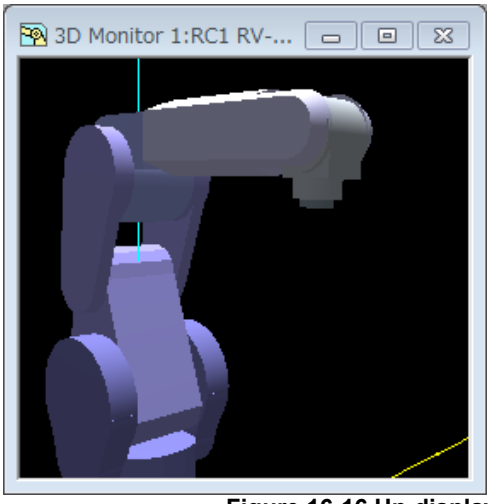


Figure 16-15 Un-display / display of tool

(5)Flange direction

If the checkbox is set off, the arrows that indicate the flange direction are un-displayed in “3D monitor”.

Un-display the flange direction



Display the flange direction

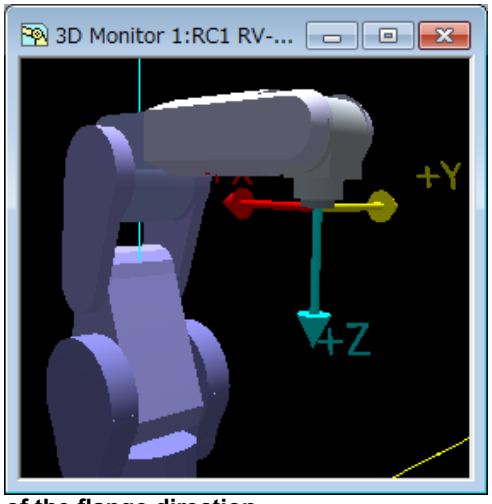


Figure 16-16 Un-display / display of the flange direction

(6)Collision area

If the checkbox is set on, the model of collision area is displayed in “3D monitor”.
The model is displayed the color which is set in “Color” of robot display option. (A default is red.)
The color of a model is set up per robot.

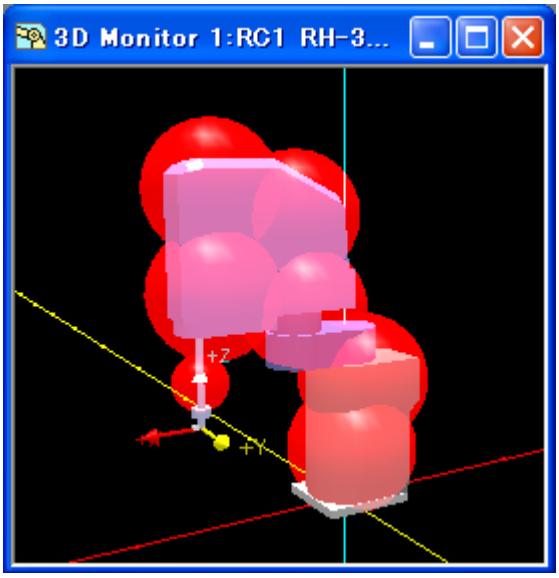


Figure 16-17 Un-display / display of Collision area

(7) The project name

When a tick mark (for true) is set in the checkbox, the project name is displayed on "3D monitor" screen. The project name is displayed near a robot's flange position. When the project name and the robot's model name are displayed, the project name is displayed on the upper row and the robot's model name is displayed lower row.

It is possible to select the size of the character from three kinds.

(8) The robot model

When a tick mark (for true) is set in the checkbox, the robot's model name is displayed on "3D monitor" screen. The robot's model name is displayed near a robot's flange position. When the project name and the robot's model name are displayed, the project name is displayed on the upper row and the robot's model name is displayed lower row.

It is possible to select the size of the character from three kinds.

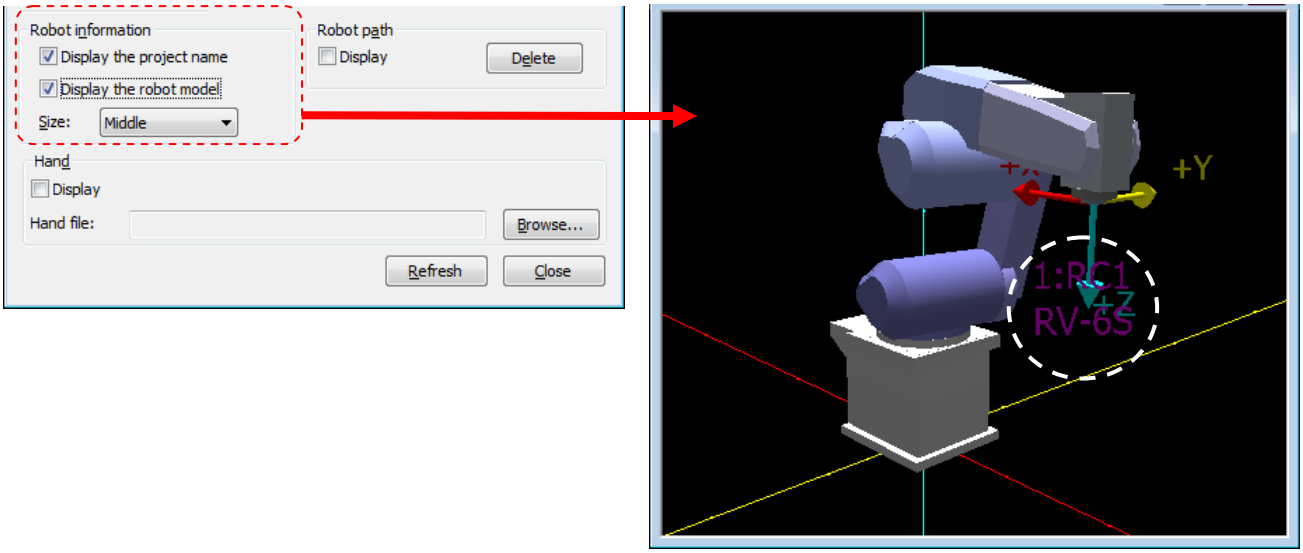


Figure 16-18 Robot information

(9) Robot path

When a tick mark (for true) is set in the checkbox, the robot path is displayed on "3D monitor" screen.

This function can be used only in a simulation.

The robot path is displayed with green color. Some operations are displayed and the robot path are erased sequentially from an old one.

⚠ Caution

Under the following situations, the plot interval of the robot path might become long.

- ***When the operation speed of the robot is fast.***
- ***When the performance of the computer is low.***
- ***When you start two or more simulators.***
- ***When you display the complicated CAD model in 3D monitor.***
- ***When another application is operating, etc.***

When [Delete] button is clicked, the robot path is erased.

The robot path has restriction in robot's model which can be used. The model which can be used is as follows.

	Robot model
The robot model which can use the robot path.	RV-F, RH-F, RV-S, RH-S, RV-A, RH-A, RP-A, RV-T, RH-L
The robot model which can not use the robot path.	RH-G, RC-G, RH-U

When the robot model which can not use the robot path is connected, "Robot Path" is not displayed on "Robot display option" screen.

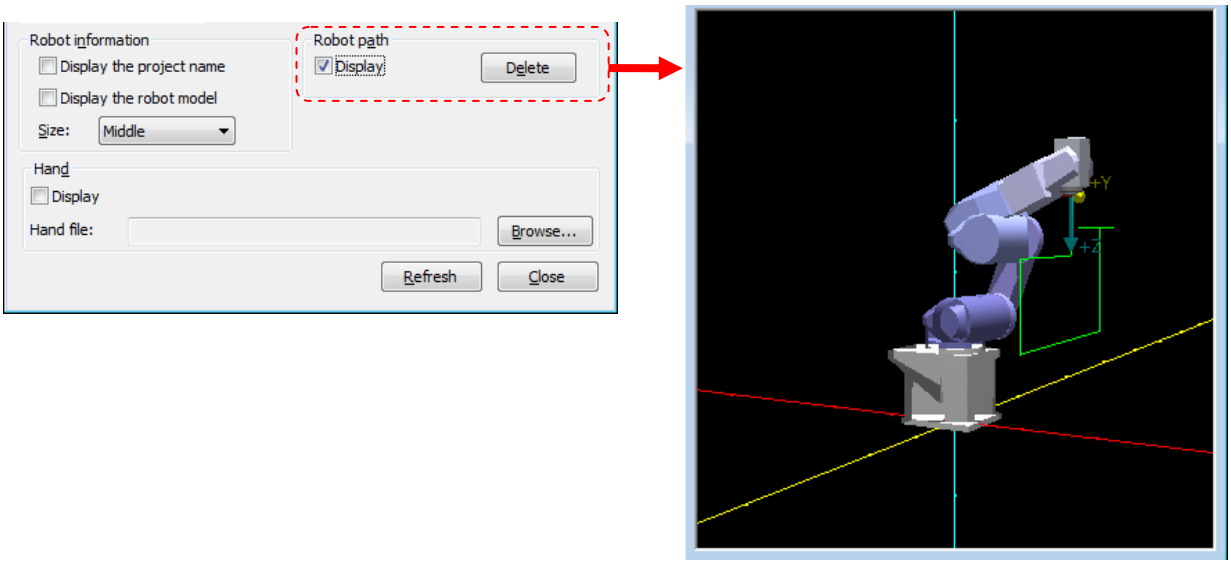


Figure 16-19 Robot path

(10) Hand

When a tick mark (for true) is set in the checkbox and a hand file is set, the robot hand is displayed on "3D monitor" screen. Refer to **"16.3.11 Hand"** for designing the robot hand .

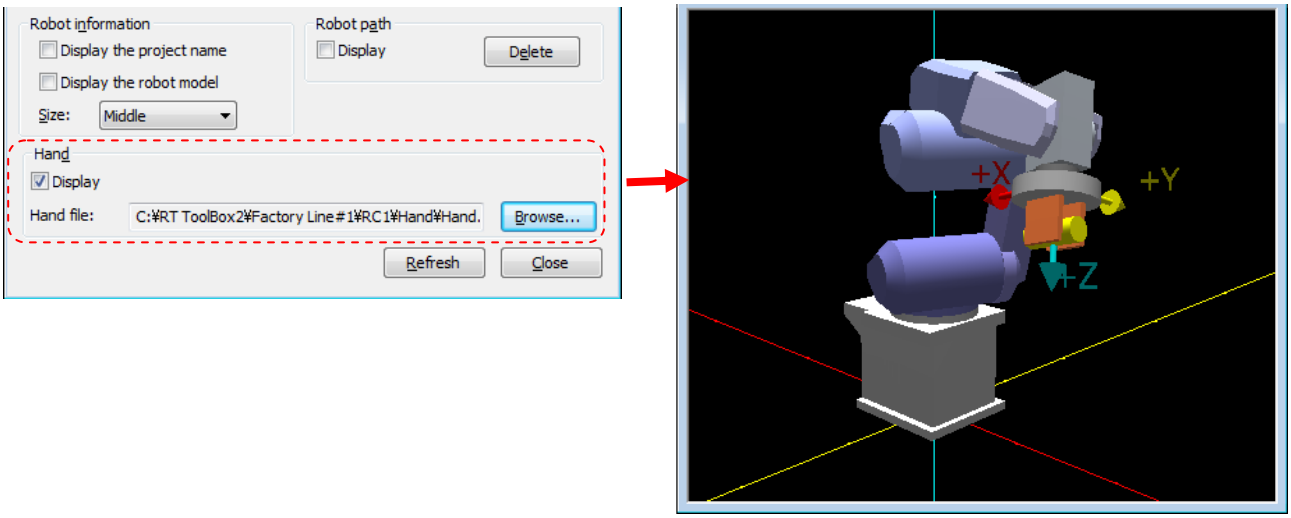


Figure 16-20 Hand

16.3.8. Layout

The object of the hexahedron(rectangular parallelepiped), the column, and the sphere can be displayed on “3D Monitor”.

This function can be used with Version 1.6 or later of software.
A layout list screen is different by versions of this software.

(1) In the case of using version 2.20W or later

It is possible to manage the layout parts with a group. Moreover, it is possible to set the referenced part and move and rotate with every group.
When a white space (for false) is set in the checkbox, the parts are not displayed.

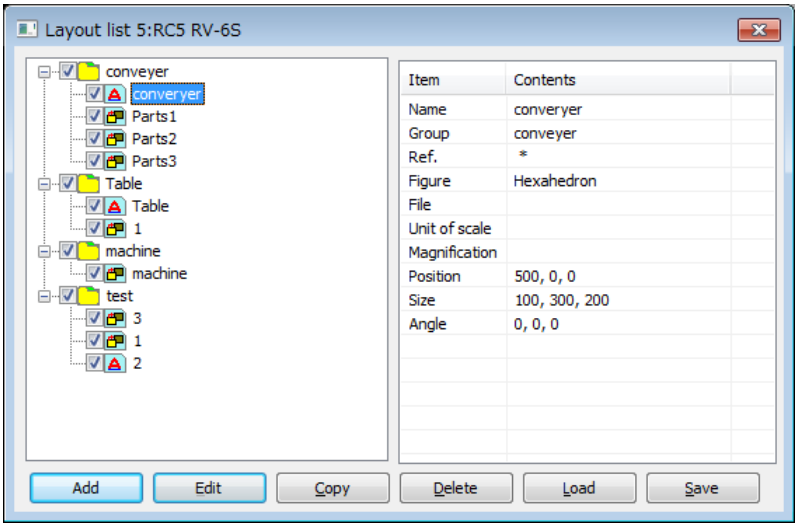


Figure 16-21 Layout list(version 2.20W or later)

It is possible to move each part by drag and drop.

Refer to the following table for explanation of the icon displayed on a layout list.

Table 16-3 Icon of layout list

icon	explanation
	The group to which each part belongs
	A part of referenced layout
	Parts other than the above

(2) In the case of using version 2.1N or earlier

The “Layout list“ window is displayed with the menu bar [3D View] -> [Layout]. The list of the layout parts registered beforehand is displayed on "Layout list" windows.

When each checkbox in the left of names of the object is set off, the object becomes invisible. The order of the objects can be changed with the [Up] or [Down] button in the right of this window.

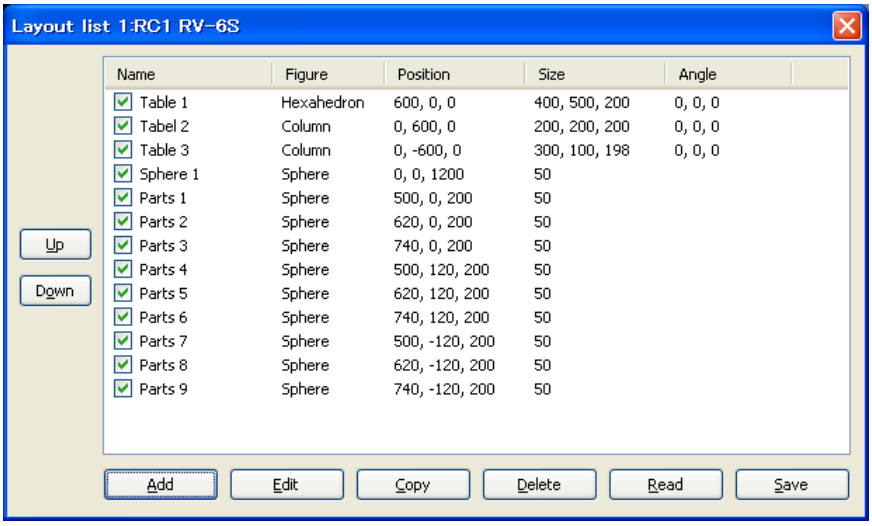


Figure 16-22 Layout list (example)

16.3.8.1. Editing of Layout

When the object is newly added, click [Add] button in "Layout" windows. When the object is changed, click [Edit] button after selecting the object in "Layout" windows. The “Layout edit” window is displayed. With the software version 1.7 or later, similar operation can be done by right-click.

“(7) Group” and “(8) Referenced layout” are displayed with this software version 2.20W or later.

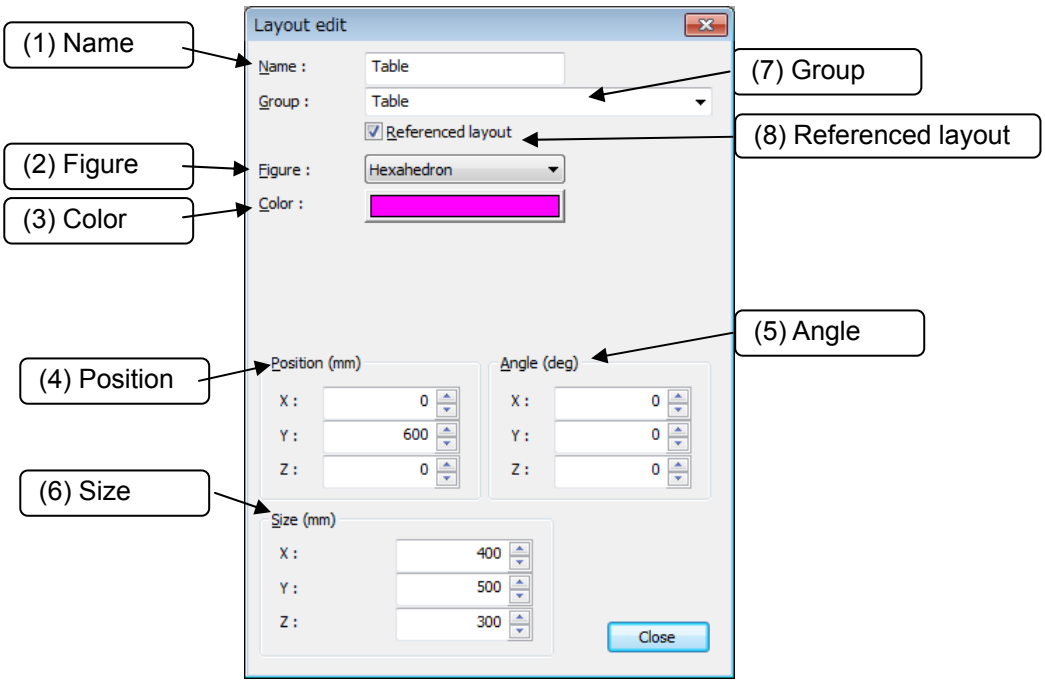
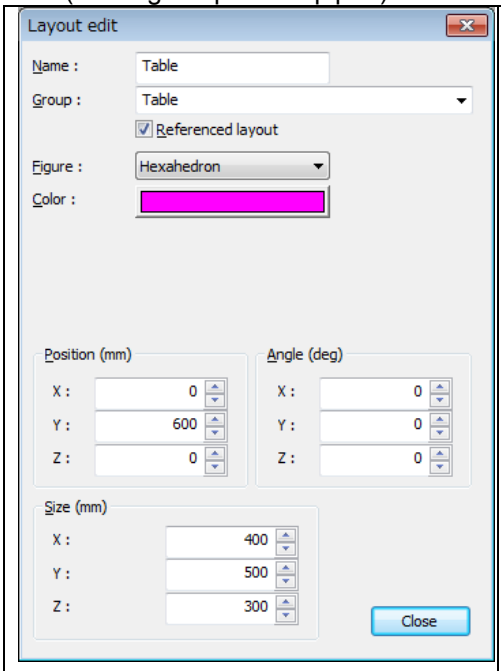
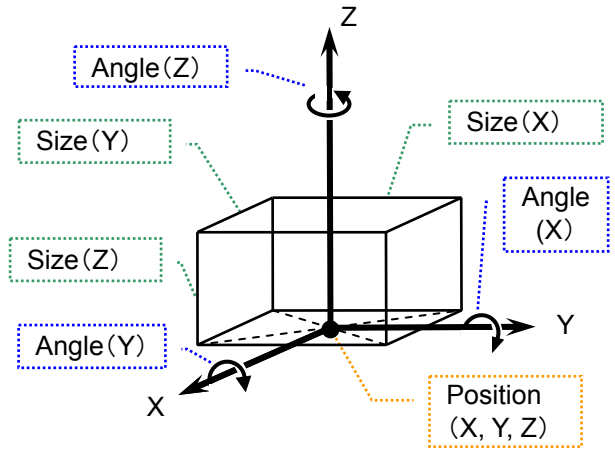
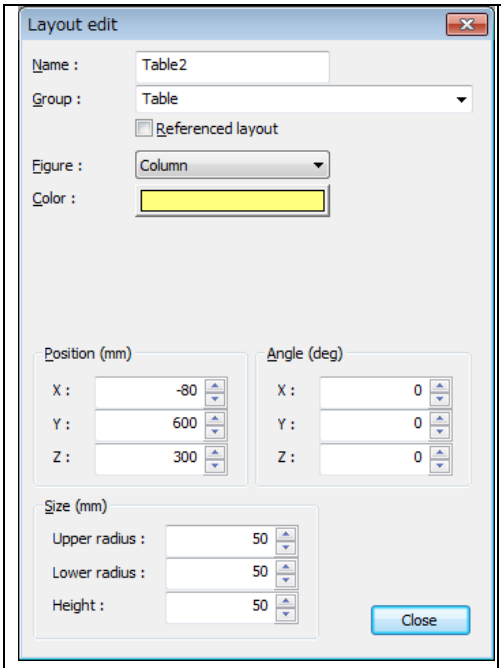
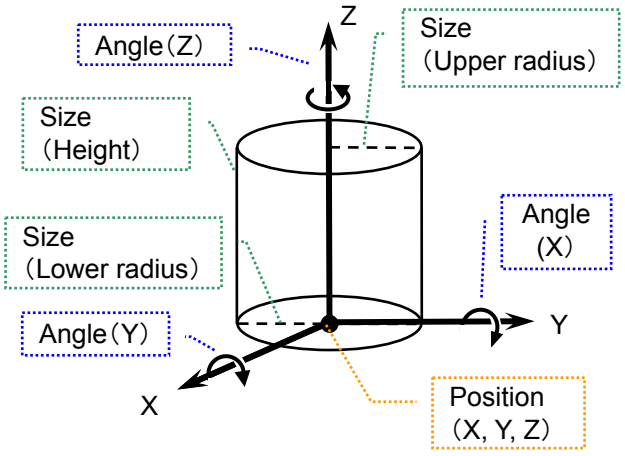


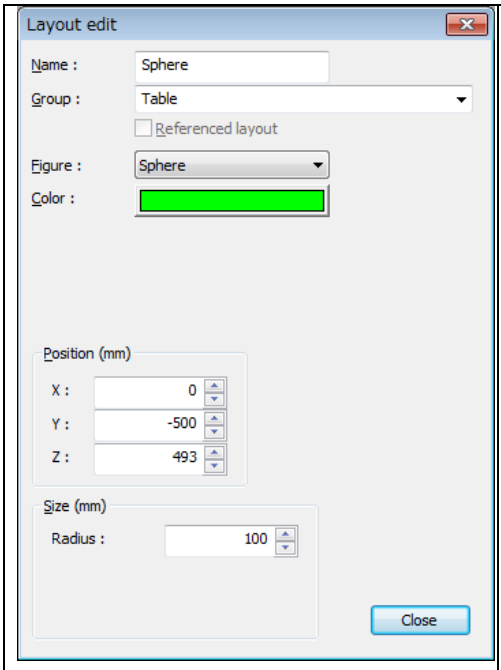
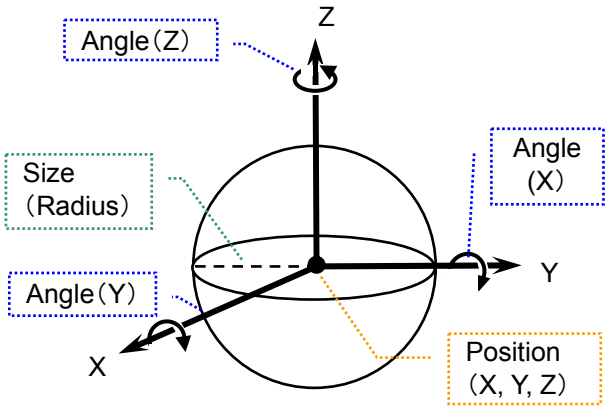
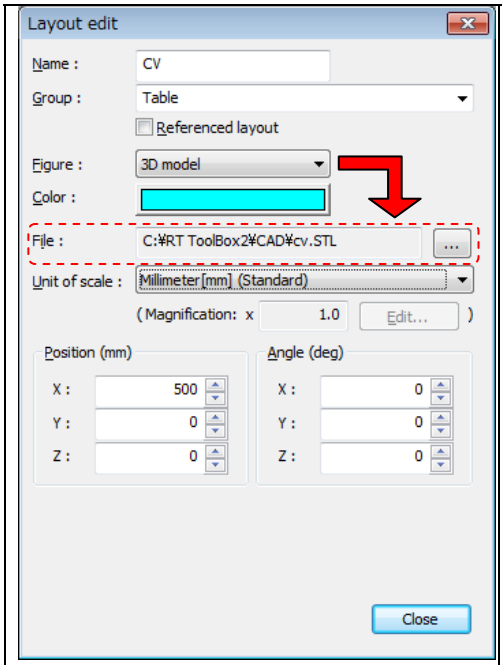
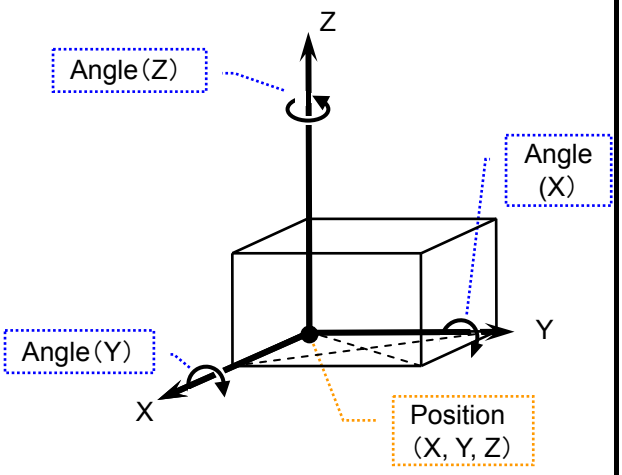
Figure 16-23 Layout edit

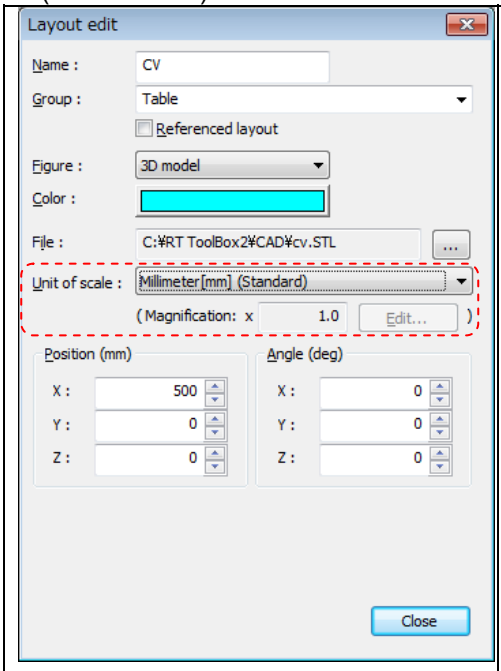
	Name	説明
(1)	Name	The name of the object can be input.
(2)	Figure	The figure type of the object can be selected. It is possible to select a hexahedron (rectangular parallelepiped), a column, a sphere, and 3D model. When "3D model" is selected, the data created by CAD can be read. “3D model” can be used with Version 2.20W or later of this software.
(3)	Color	The color of the object can be selected.
(4)	Position	The position of the object can be input.
(5)	Angle	The posture of the object can be input. The angle is set in order of X, Y, Z axis. The order is different from the robot arrangement.
(6)	Size	The size of the object can be input.
(7)	Group	Set up the group which belongs. A group name can be chosen from a combo box. When a new group name is inputted, a new group is added in the list. (This function can be used with Version 2.20W or later of this software.)
(8)	Referenced layout	It is set up whether it is a layout used as the standard within a group. This referenced layout is used when moving and rotating the whole group. Refer to **“16.3.8.5 Movement and rotation of the layout ”**. A referenced layout can be set up only one within a group. When the referenced layout is already in the group, the conventional referenced layout is canceled and the parts set up newly serve as a referenced layout. (This function can be used with Version 2.20W or later of this software.)

The explanation of each object is as follows.

Table 16-4 Explanation of the layout

	Window	Explanation
Hexahedron(rectangular parallelepiped)		
Column (Cone)		 * If a different value is set to an upper radius and a lower radius, it becomes a conic type.

	Window	Explanation
Sphere		 * There is no rotation in the sphere editing.
3D model		 The position and a rotational reference position of 3D model are reference positions at the time of CAD data creation. “3D model” can be used with Version 2.20W or later of this software. When 3D model is selected, the CAD file to read can be specified. The CAD file which can be read is as follows. file / extension STL (Stereolithography) file / .stl OBJ (Wavefront format) file / .obj 3DS (3D Studio) file / .3ds PLY (Stanford Triangle Format) file / .ply VRML 2.0 (Virtual Reality Modeling Language) file / .wrl When the file of OBJ form is read, the information on a texture is not reflected. The file of 3DS, PLY, and VRML 2.0 form can be used with Version 3.00A or later of this software.

	Window	Explanation
3D model (Continuation)		The unit of scale that display in 3D monitor can be specified with Version 3.00A or later of this software. The millimeter is standard unit in 3D monitor. The unit of scale that can be specified is as follows. − Millimeter[mm] − Meter[m] − Inch[in] − Magnification specification (Magnification of 1.0-10000.0 can be specified.)

Caution

If 3D model of big size is read, screen drawing processing will become heavy.

16.3.8.2. Copy of the object

The object of the layout can be copied. After selecting the object, click [Copy] button. With the software version 1.7 or later, similar operation can be done by right-click.

It is possible to copy the whole group in this software version 2.20W or later.

16.3.8.3. Delete of the object

The object of the layout can be deleted. After selecting the objects, click [Delete] button. Click [Yes] button after the confirming message is displayed. With the software version 1.7 or later, similar operation can be done by right-click.

It is possible to delete the whole group in this software version 2.20W or later.

That once the objects are deleted, they cannot be recovered.

16.3.8.4. Editing of Layout group

It is possible to move and rotate the whole group, and rename the Layout group.
Refer to **"16.3.8.5 Movement and rotation of the layout "**.
This function can be used with Version 2.20W or later of this software.

Click [Edit] button after selecting the layout group which you change the name. Or select [edit] in the menu displayed when you click a mouse right button. A layout group edit screen is displayed.

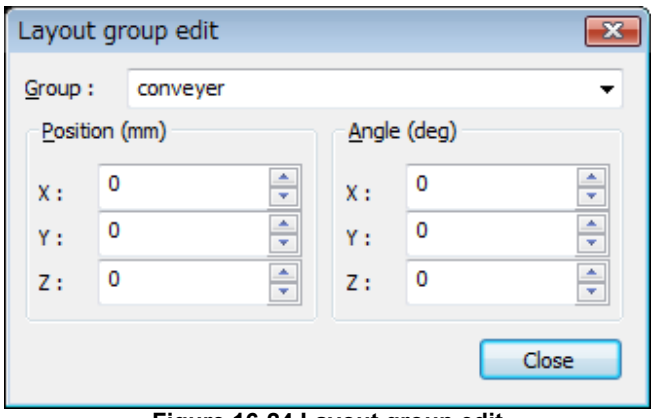


Figure 16-24 Layout group edit

When a new group name is input, the name of the selected group is changed. When the existing group name is selected, all parts in the group move to the selected group. In this case, the original group in the list is deleted

16.3.8.5. Movement and rotation of the layout

(1) Movement and rotation of the parts of layout

When you move or rotate the part of layout, change the position and rotational value in the edit screen of each part. Refer to **"16.3.8.1Editing of Layout ".**

(2) Movement and rotation of the layout group

It is possible to move and to rotate all parts in the group at the same time in this software version 2.20W or later.

Click [Edit] button after selecting the group which you move or rotate it. "Layout group edit" screen is displayed. You can do the same operation by clicking the right button of a mouse.

Set up the position or the degree of rotation angle after selecting the group. All parts in the group are moved or is rotated.

The layout group moves on the basis of the center of the whole group. The group moves in the direction of coordinates of a referenced layout part regardless of a robot's coordinate.

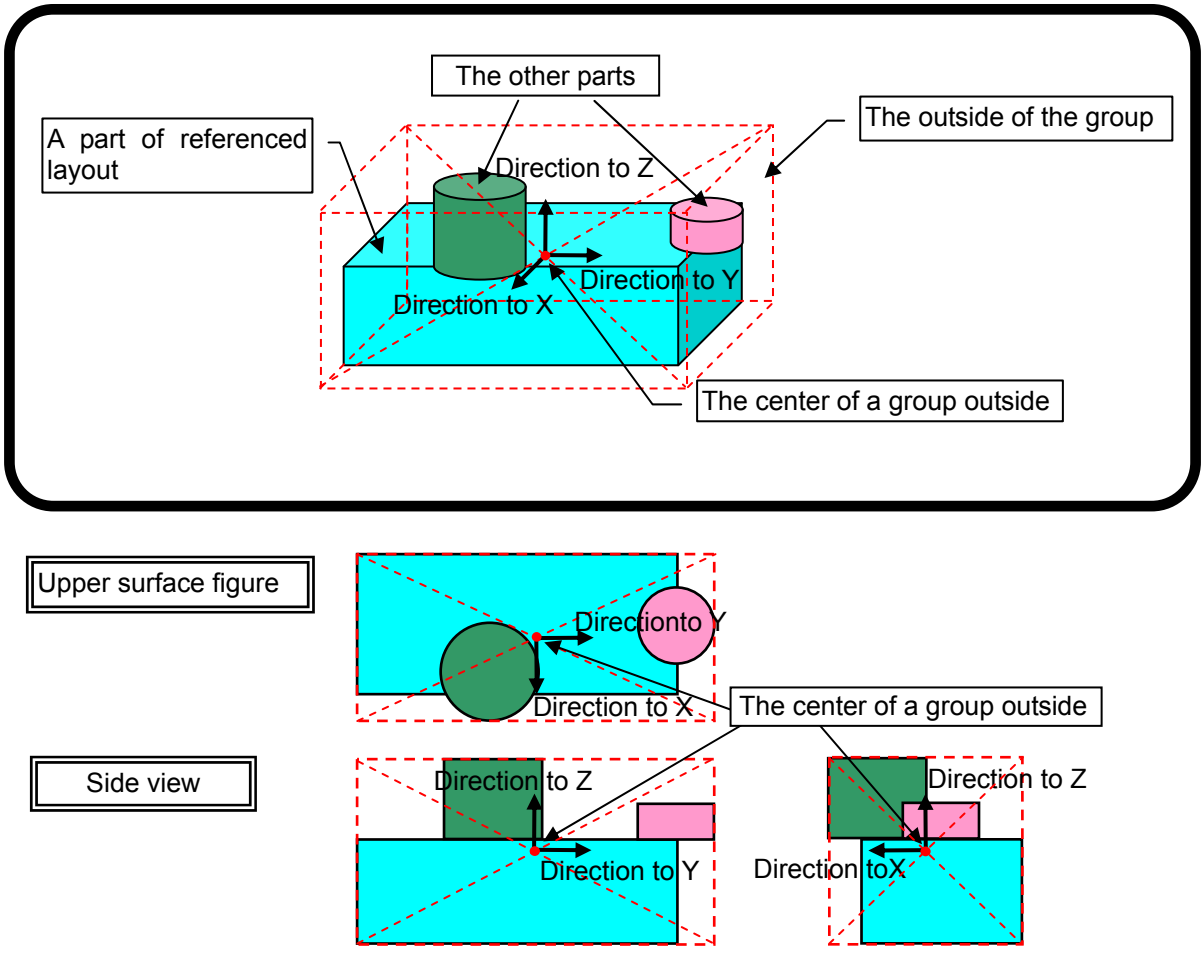


Figure 16-25 Movement of the layout group

A layout group rotates focusing on the center of the whole group. The group rotates in the direction of coordinates of a referenced layout parts.

16.3.8.6. Save and Read the information of the layout.

The objects of the layout can be preserved in the file. And, the objects of layout in the file can be read.
By saving the file, layout parts can be used by another project.

Click [Save] button when preserving them in the file. Click [Save] button after confirming the folder and the file name on “Save as” windows.

Click [Read] button when reading them from the file. Click [Open] button after selecting the file on “Open” window.

Please note that all objects of the current layout are deleted when the file is read.

Caution for Saving As Workspace with MELSOFT Navigator

When Saving As Workspace with MELSOFT Navigator version 1.28E, information of layout used in 3D monitor for more than one projects don't be saved to new Workspace. Edit object of layout in the new Workspace again.

16.3.9. Robot arrangement

With the simulation running, click the menu bar [3D View] -> [Robot arrangement]. The robot arrangement window is displayed.

You can set up each robot arrangement displayed in “3D monitor”.

This function can be used with Version 2.10L or later of this software.

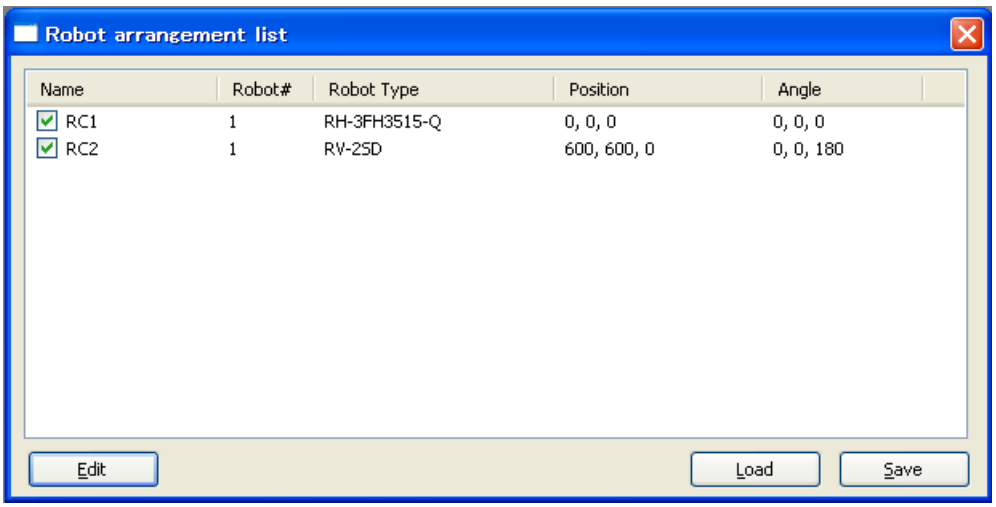


Figure 16-26 Robot arrangement list

The project list of online state is displayed. If the checkbox is set on, the robot is displayed on “3D monitor”.

(1)[Edit]
For displaying the robot arrangement screen, click a robot to edit with “Robot arrangement list”, and then the [Edit] button or double-click a robot to edit.

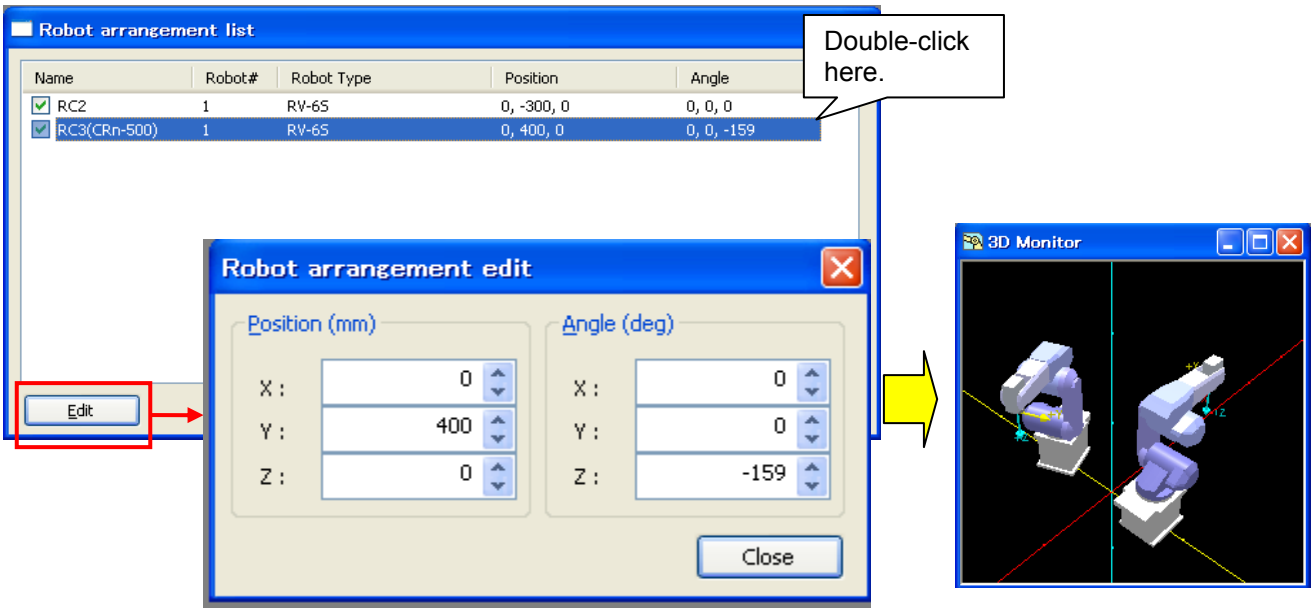


Figure 16-27 Editing Robot arrangement list

Edit the position and the angle and click the [Close] button. The angle is set in order of Z, Y, X axis. The order is the same as “Common coordinates for Collision avoidance” (RBCORD) parameter. The order is different from the layout object.

(2)[Load]
Load a saved file of robot arrangement information.

(3)[Save]
Save the contents of robot arrangement list displayed now at a file.

16.3.10. XYZ position variables

It is possible to display the XYZ position variable on 3D monitor.
This function can be used with Version 2.20W or later of this software.

When some XYZ position variables in a robot program are selected, these all of positions are displayed on 3D monitor.
When selection of the XYZ position variables is released, the positions on 3D monitor are vanished.
It is possible to display the XYZ position variables on some 3D monitors. When both 3D monitor of a robot simple substance and the whole 3D monitor are displayed, the XYZ position variable is displayed in both screens.

When two or more XYZ position variables in some programs in a project are selected, all selected position variable is displayed. When the XYZ position variables of the same name in some programs are selected, all selected position data is displayed.

It is possible to display only XYZ position variables.Joint position variables cannot be displayed on 3D monitor.

⚠ Caution

A maximum of 50 XYZ position variables can be displayed in 3D monitor.

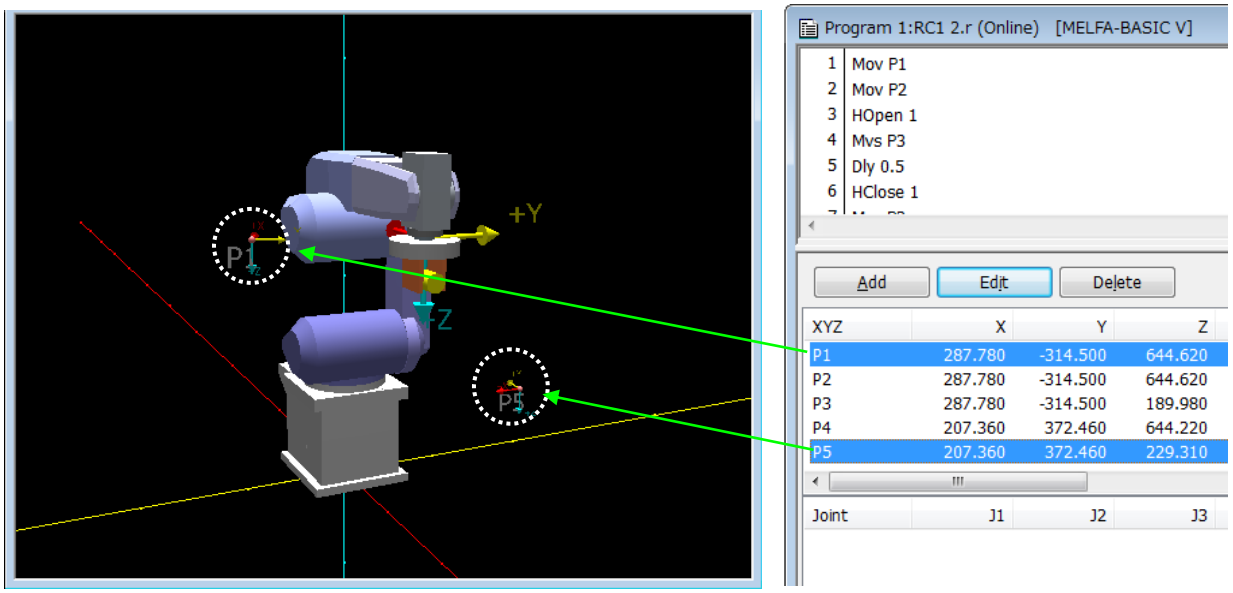


Figure 16-28 XYZ position

The position data which can be displayed is as follows.

Table 16-5 The position data which can be displayed

Preservation place	Kinds of program	Remarks
Robot program in the robot controller	Movemaster command	A simulation cannot be used when Movemaster command is selected.
	MELFA-BASIC Ⅳ	
	MELFA-BASIC V	
	SQ Direct	Only a CRnQ type can be displayed.
Robot program in the project	Movemaster command	A simulation cannot be used when Movemaster command is selected.
	MELFA-BASIC Ⅳ	
	MELFA-BASIC V	
	SQ Direct	
	Backup programs	

16.3.11. Hand

A robot hand can be displayed on the tool of the robot on 3D monitor.
This function can be used with Version 2.20W or later of this software.

Click the menu bar [3D View] -> [Hand]. The “Hand” screen is displayed. The parts of the hand registered are displayed on a "Hand" screen. Nothing is displayed when the hand is not created.

When you set a white space (for false) in the checkbox of the parts on "Hand" screen, the parts of the hand are not displayed.

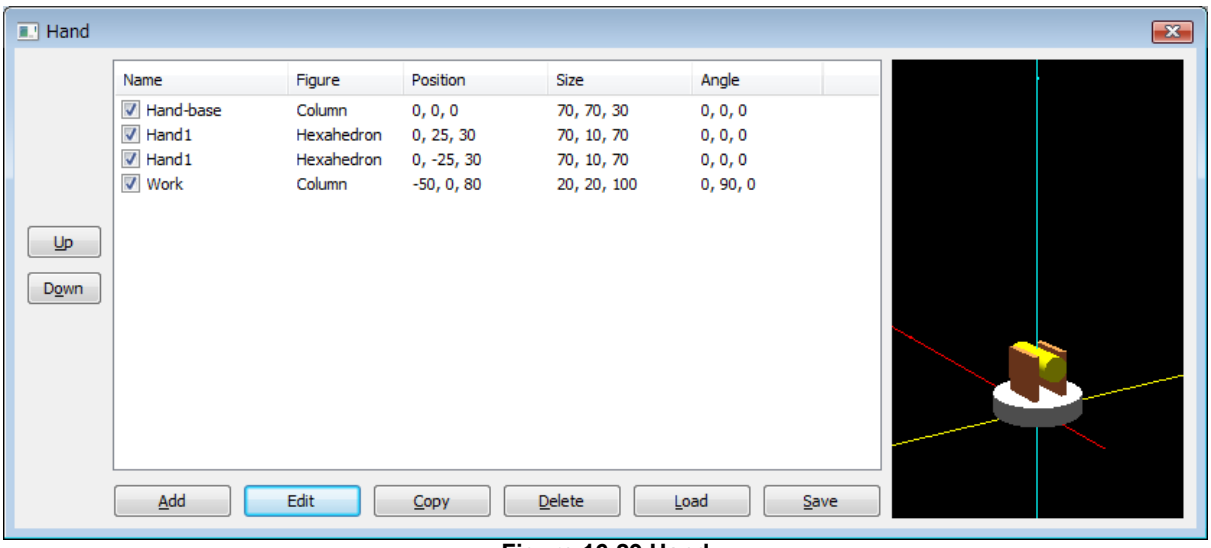
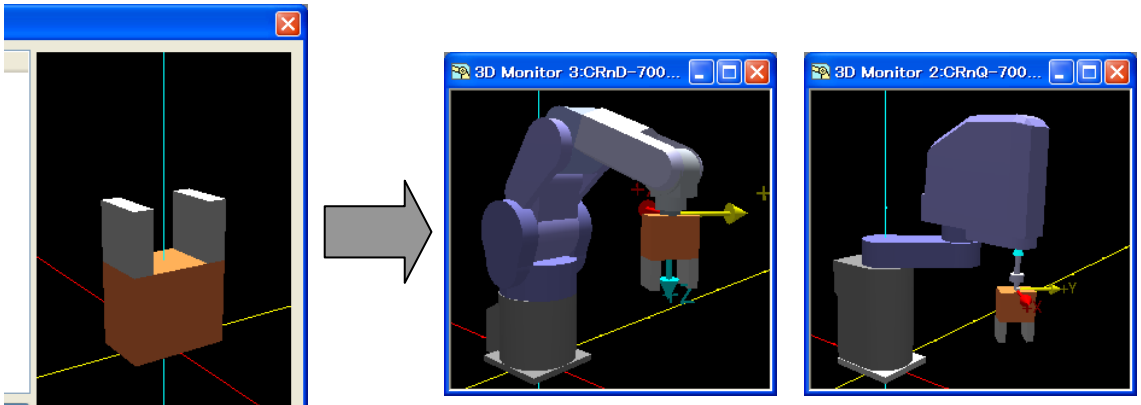


Figure 16-29 Hand

The origin of Hand screen (Figure 16-29) becomes the flange center of the robot. The parts arranged to + direction of Z pole is displayed in front of the flange of the robot. Arrange the parts like Figure 16-30.



Example of making hand　　Vertical robot　　Horizontal 4-axis robot

Figure 16-30 the way of arranging hand

16.3.11.1. Editing of Hand

Click [Add] button. Click [Edit] button when editing the existing parts. “Hand edit” screen is displayed.

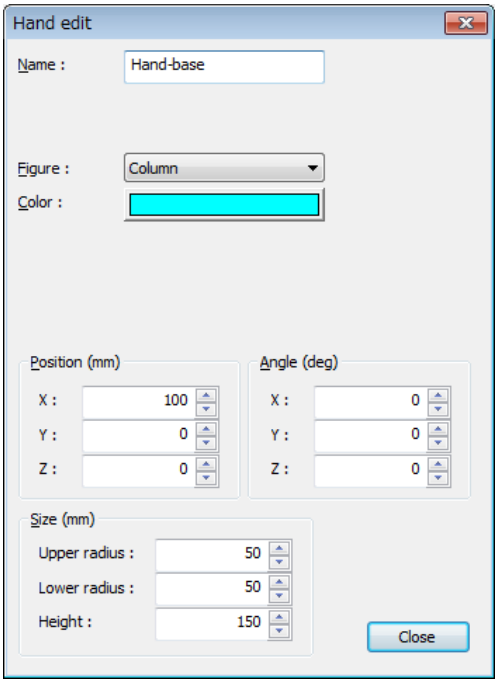


Figure 16-31 Hand edit

It is possible to set up a Hexahedron(rectangular parallelepiped), a Column (Cone), a Sphere, and a 3D model. The setting method of each part article is the same as layout parts. Refer to **“16.3.8.1 Editing of Layout ”**.

16.3.11.2. Copy of the hand object

It is possible to copy the parts of hand displayed on “Hand” screen. Click [Copy] button after selecting the parts of hand in the list. The copy of the parts is added to the lowest row in the list. Two or more parts can be chosen and copied.

16.3.11.3. Delete of the hand object

It is possible to delete the parts of hand displayed on “Hand” screen. Click [Delete] button after selecting the parts of hand in the list. The selected parts in the list are deleted. Two or more parts can be chosen and deleted. That once the objects are deleted, they cannot be recovered.

16.3.11.4. Read the hand file

It is possible to read the hand information from a file, and to edit it.

Click [Read] button in “Hand” screen and select the file. The hand information in the selected file is displayed on "Hand" screen. Please keep in mind that the information on the hand read now is deleted at this time.

16.3.11.5. Save the hand file

It is possible to save the created hand information at a file.
Click [Save] button in “Hand” screen and input the file name. The hand information saves at the file. It is possible to display the saved hand on "3D view" screen.
Refer to **"16.3.7 Robot display option"** for the display method of a hand.

16.4. Robot Program Selection

Select the robot program to run the simulation. Step operation or direct execution in the simulation is not possible unless a program is selected.

In the simulation, from the project tree, with [Online] → [Program], execute "Open in debugging status" for the program from the right mouse button.

If the robot program being simulated is not [Online], use program management to copy to the virtual controller.

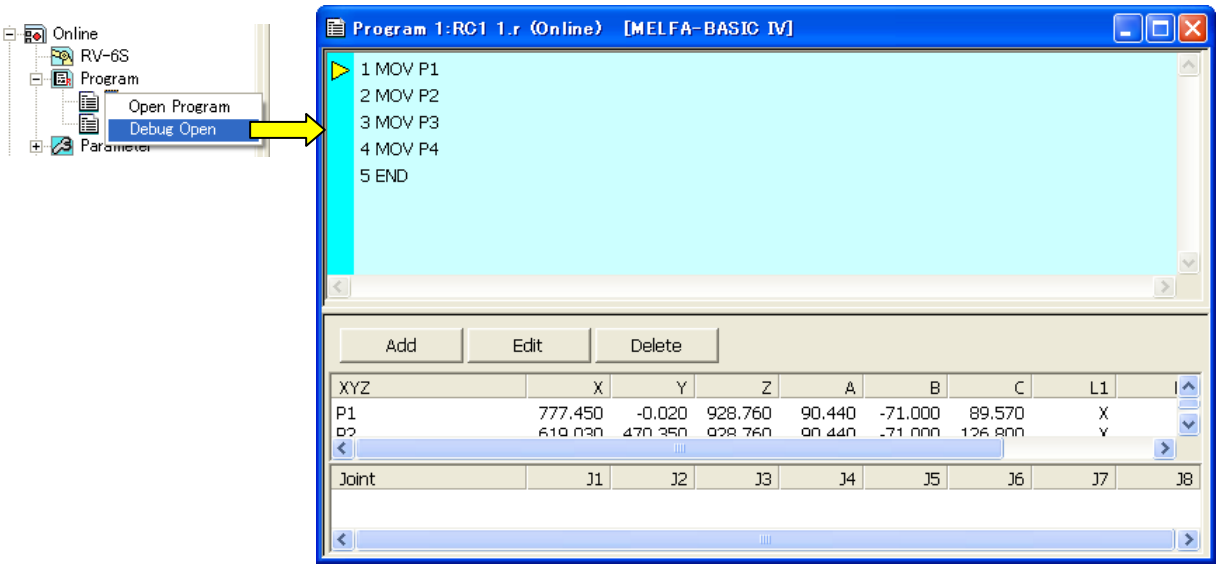


Figure 16-32 Program Selection for Simulation

The specified robot program is opened in debugging status. The execution line cursor "▷" is displayed at the left end of the command statement edit area. The line on which this execution line cursor is displayed is the line currently being executed.

The display of this execution line cursor can be switched on/off with the menu bar [Debug] → [Display/Do not display].

16.5. Program Execution

You can execute a program that has been opened in debugging status.

Start the simulation, and then open the robot program in debugging status. When you click the [Continuous Execute] button on the simulation operation screen, automatic operation of the program is started. This automatic operation completes in one cycle. Be careful. If the program repeats infinitely, it does not stop automatically.

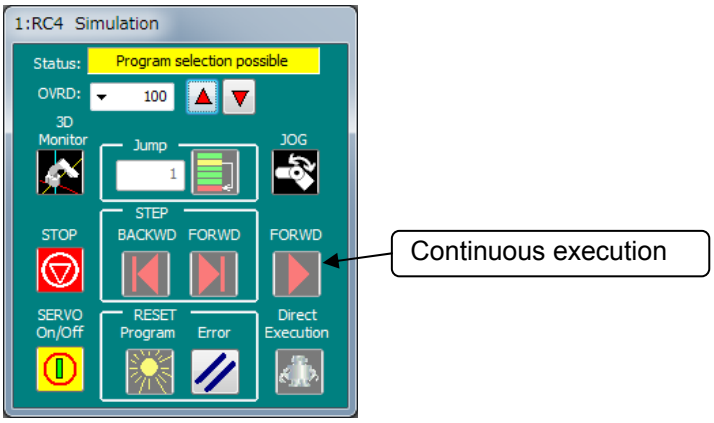


Figure 16-33 Program Execution

To forcibly stop a program that is executing, click the [Stop] button on the simulation operation screen.

16.6. Specifying the Starting Line for Program Execution

You can freely specify the line in the program from which to start execution. Use [Jump] on the simulation operation screen Input the step number to start execution from, then click the button on the right side of the input box. The current execution line moves to the specified step number.

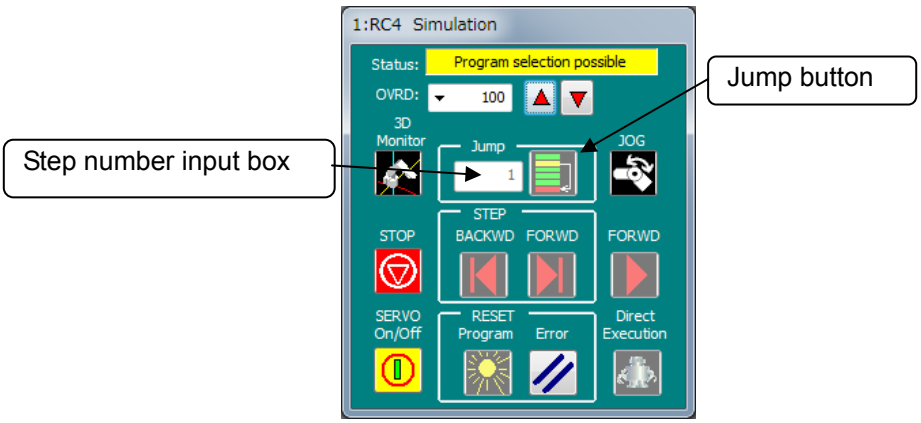


Figure 16-34 Program Execution Line Execution

16.7. Breakpoint Setting

You can also use breakpoints in a simulation. For details on the operation method for breakpoints, see "8.9.4 Setting and deleting breakpoints".

16.8. Step Operation

A program that has been opened in debugging status can be executed step by step.

Start the simulation, and then open the robot program in debugging status. Step operation in simulation is performed from the simulation operation screen.

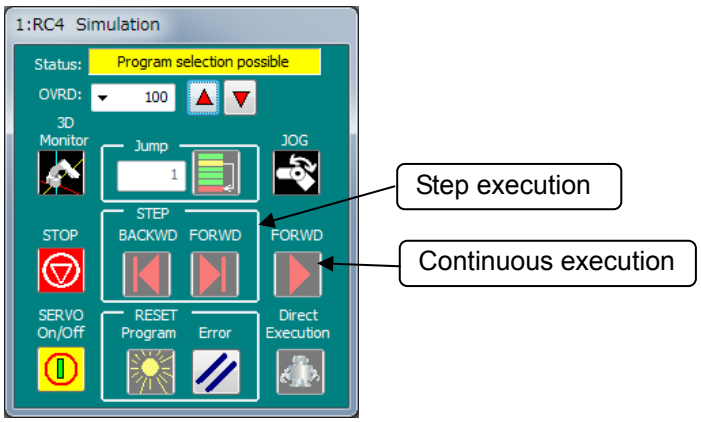


Figure 16-35 Simulation Operation Screen

Operate with the [FORWD] button and [BACKWD] button in the [Step Execution] group on the simulation operation screen.

Pressing the [FORWD] button executes the command on the current execution line and advances the current execution line by line. Pressing the [BACKWD] button executes the command on the current execution line and returns the current execution line by line.

16.9. Direct Execution

You can input command statements and operate the robot directly.
Click the simulation operation screen [Direct execution] button.

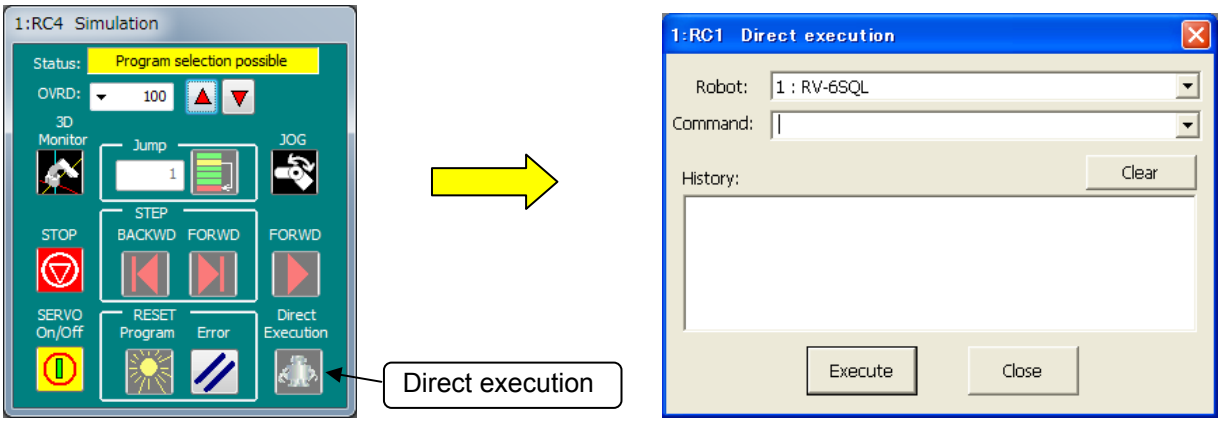


Figure 16-36 Starting Direct Execution

Input the command to execute into the command box, then either press the keyboard [Enter] key or click the [Execute] button. The input command is executed. At this time, if a position variable is specified in a move command or a like, the position variables defined in the currently open program are used. A position variable not defined in the program can not be used.

A command that has been input once into the command box is added to the history and can be selected from the command box dropdown list. However, when the simulation is ended, the history and dropdown list commands are commanded

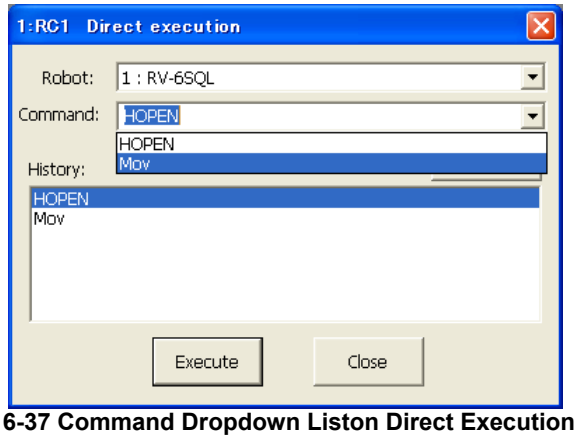


Figure 16-37 Command Dropdown Liston Direct Execution Screen

This operation is not possible during automatic running with the [Continuous Execution] button.

⚠ Caution

When executing directly, select the program to execute.

Direct execution can not be used unless a program is selected. Always open a program in debugging status and put it in selected status.

16.10. Jog Operation

You can perform the jog operations displayed in the robot view in the simulation status.
Click the simulation operation screen [Jog] button. The screen for jog operations is displayed at the bottom of the simulation operation screen.
It is possible to move the robot by the “TOOL JOG” or “WORK JOG” with Version 1.6 or later of software.
However, in the following cases, it is not possible to use the "WORK JOG" operation.
- Without setting the "Work coordinate" parameter.
- connecting with the CRn-500 series controller.

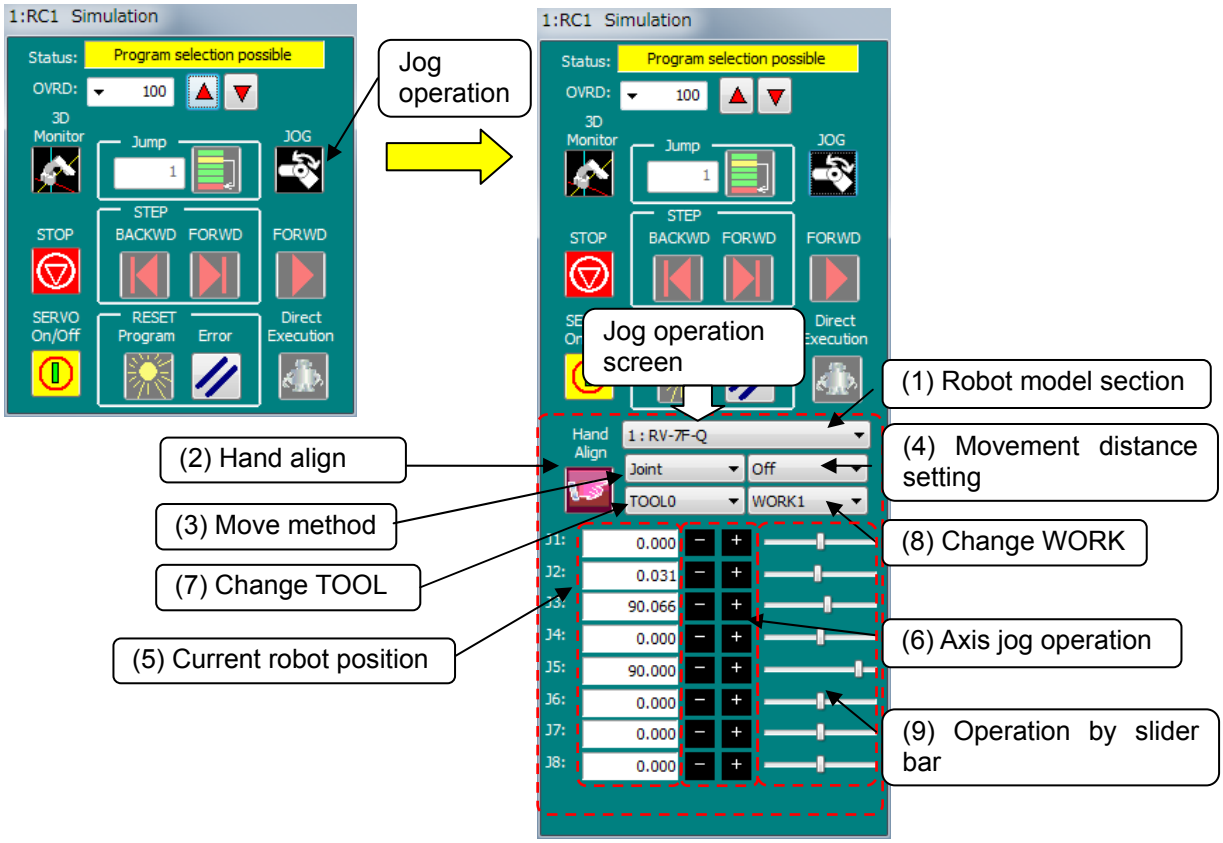


Figure 16-38 Starting Jog Operation

(1) Robot model select

When multiple robots are set as connected, select the robot model to operate.

(2) Hand align

You can align the posture of a hand installed on the robot in units of 90 degrees.

This function moves the value to the multiple of 90˚ that is closest to the A, B, and C components of the current position.

(3) Move method

Select the robot move method. Move method that can be selected is as follows. For a detailed explanation of each Jog Feed, see **"Detailed explanations of functions and operations"** in the robot controller's user's manual.

Version 1.5.1 or earlier	Version 1.6 to 1.6.1	Version 1.7 or later
Joint XYZ	Joint XYZ TOOL WORK	Joint XYZ TOOL 3-axis XYZ Cylinder WORK

The robot current position display and the jog operation button display for each axis use the method selected here. Also, these displays depend on the axis configuration of the connected robot.

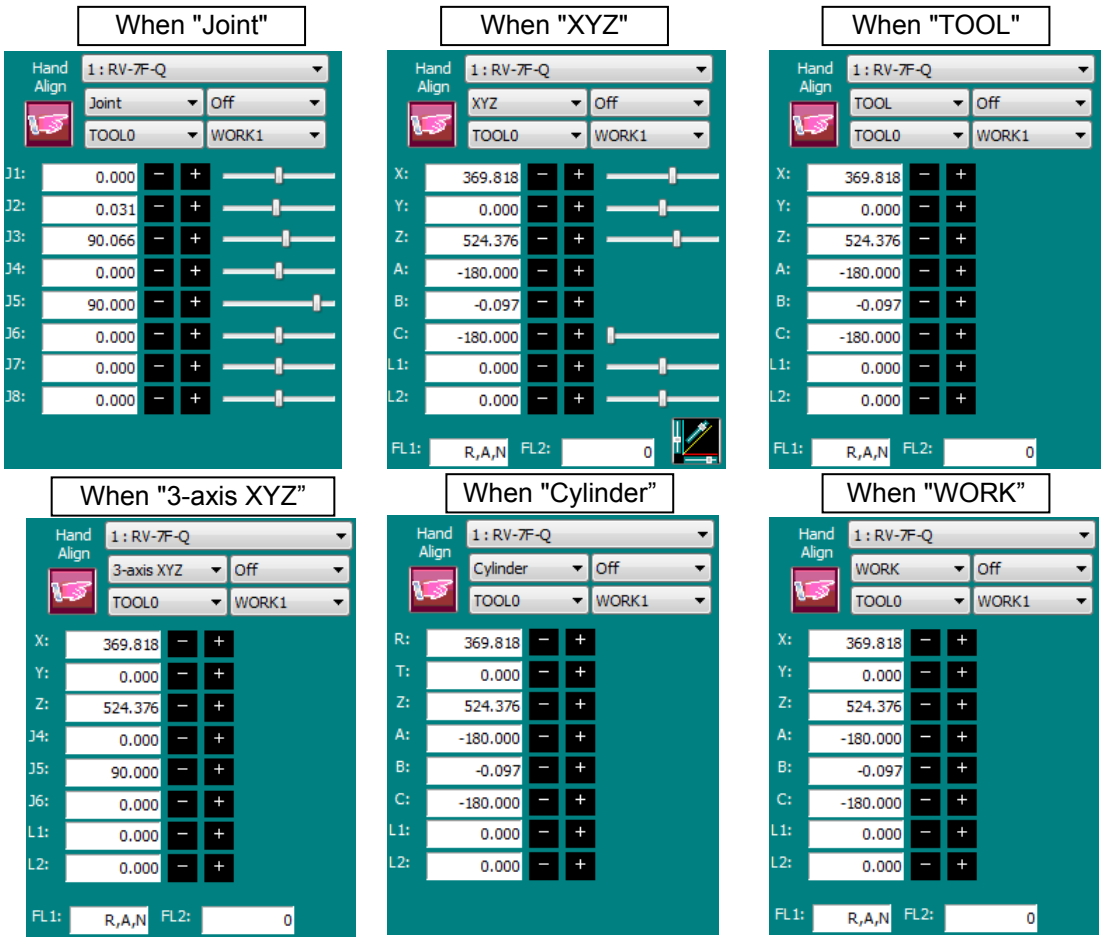


Figure 16-39 Screens for Jog Operation with Different Move Methods Selected

(4) Distance setting for moving

This selects the robot move distance. The robot move distances are "off", "High", and "Low".

For a detailed explanation of the move distance, see "Detailed explanations of functions and operations" in the robot controller's user's manual.

(5) Robot current position

This displays the current robot position.

(6) Jog operations on each axis

This conducts jog operations on each robot axis.

− Moves the selected robot axis in the "-" direction.

\+ Moves the selected robot axis in the "+" direction.

These buttons move the robot while the mouse button is held down.

(7) Changing TOOL

Selecting the tool when moving the robot with the ”TOOL JOG”.

The tool which can be selected is different depending on the software version of the robot controller connected.

Table 16-6 The Tool which can be selected by each version

		The Tool which can be selected
Version of RT ToolBox2	Ver.1.5 or earlier	Not use
	Ver.1.6 - Ver.1.7	“TOOL0” to “TOOL4”
	Ver.1.8 or later	It is different depending on the specification of the robot controller connected.

(8) Changing WORK

Selecting the WORK when moving the robot with the “WORK JOG”. The WORK that can be selected is “WORK1” to “WORK8”.

This function can be used with Version 1.6 or later of software. However, in the following cases, it is not possible to use the "WORK JOG" operation.

- Without setting the "Work coordinate" parameter.
- connecting with the CRn-500 series controller.

(9) Operating by slider bar

When you select Joint or XYZ jog, by dragging the slider bar, you can move the corresponding pole.

The following matters might occur about the operation range of X, Y or Z pole of XYZ jog by your environment.

1. The range of the robot is out of the range of slider bar.
2. The range of the slider bar is too wide to operation.

In this case, you can change the operation range of X, Y and Z pole at XYZ slider range screen which you can display by clicking the  button in the lower right corner of XYZ jog screen.

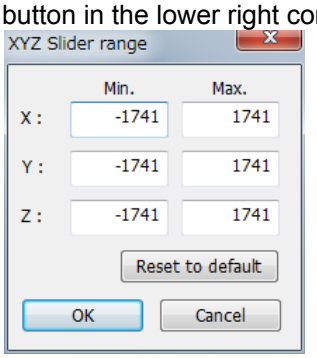


Figure 16-40 XYZ Slider range screen

When you use a vertical 6-axis robot, you can use the slider bar in other than A and B pole

16.11. Simulation Robot Position Variable Editing

You can edit position variables by moving the simulation robot and reading the position variables from the simulation robot posture.

Move the robot to the target position with jog operations.

Click the [Add] button or [Change] button for position variables in a program opened in debugging status to display the position edit screen, then click the [Read current position] button. You can read in the current position of the simulation robot.

16.12. Tact Time Calculation

You can use the simulation function to calculate the tact time for a program prepared and the axis load level. The robot that can calculate the axis load level is RV-F and RH-F series.

Table 16-7 The Function of axis load level which can be used by each version

		Series of robot.
Version of RT ToolBox2	Ver.2.50C or earlier	Not use
	Ver.3.00A or later	RV-F,R-HF series

Caution

Tact time calculation

The calculated tact time varies with the capacity of the computer used and its load status and does not completely match the actual robot operating time (tact time).

Use this function as a rough yardstick for tact time study.

Under correct conditions, the results of tact time calculation with this software have an error of about ±3% compared to the actual robot operating time (tact time).

For details on tact time deviation, see **"16.12.3 Causes of tact time deviation".**

Caution

Axis load level calculation

The axis load level is expressing of the motor load numerically.

The robot causes the overload error and stops to protect the motor when the axis load level exceeds 100%.The axis load level assumes that the robot repeated the same operation and is calculated.

There is a possibility not to be able to operate continuously in an actual robot when the calculated axis load level is high. You should lower the operation frequency by the Dly command, and lower operation speed and the acceleration by Accel and the Ovrd command, etc. There is a possibility that the axis load level falls by changing the operation point.

It is likely not to agree to the calculated axis load level completely because the axis load level of an actual robot is influenced in a robot individual difference, an environmental temperature, and the state etc. of the robot. Use this function as a rough yardstick for robot movement study.

⚠ Caution

When XYZ position variables, the parts of layout or Robot information is displayed in 3D monitor, tact time may not be calculated correctly.

16.12.1. Conditions for tact time measurement

Be aware of the following restrictions on tact time calculation.

⚠ Caution

Do not start some simulators.

It is not measured correctly because of a lot of load for your computer.

Do not set ON a display of [Tool] and [Collision area].

It is not measured correctly because of a lot of load for your computer.

Do not use a program that has signal input or robot status changes.

For programs that have signal input from the outside or that have changes in robot status variables or the like, either comment out such sections or extract just the section you want to calculate the tact time for and calculate it.
When studying the tact time for such a program, take this into account by adding an approximate input wait time to the calculation results.

Do not use a program with an infinite loop.

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.

Do not use M_TIMER(1).

Do not use M_TIMER(1). This software's tact time calculation uses M_TIMER(1). If M_TIMER(1) is used during the program, the tact time can not be calculated accurately. Change the program to use any timer from M_TIMER(2) to M_TIMER(8) instead, then calculate the tact time.

If a position array variable or joint array variable is included, also include the corresponding "Dim" declaration in the tact time calculation range.

If a program whose tact time is being measured includes a position array variable or joint array variable, also include the corresponding "Dim" declaration in the tact time calculation range.

Set the hand data correctly when you measure the axis load level.

Please set the hand and work condition (mass, center of gravity, and shape) actually used correctly. When the setting is different from an actual robot, the axis load level cannot be correctly calculated. The setting of the hand and work condition is set by parameter HNDDAT*, WRKDAR *. The condition of the hand and work is specified by the Loadset command.

⚠ Caution

Include the destinations for any GoTo or GoSub's in the tact time calculation range.

For example, the tact time can not be calculated for a program like the following.
The location displayed inverted in black in the program is set for tact time calculation.)

No destination selected for GoTo statement

```
1 xxx
 :   :
10 Mov P01
11 Mov P02
12 Mov P03
13 GoTo *L10
14 END
```

No destination selected for sub-routine

```
1 Mov P00
 :   :
10 GoSub *SUB1
11 End
12  :
20 *SUB1
21 Mov P01
22 Return
```

Do not use a program with excluding commands of move.

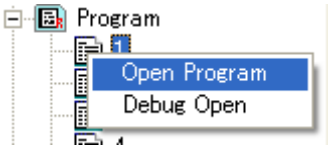
As for the program that doesn't accompany the movement of robots of the calculation processing and the divergence processing, etc. , tact time is not correctly calculated.

16.12.2. Tact time measurement

This explains tact time measurement.

1. **Start simulation.**
   Start simulation. For details, see **"16.1 Starting a Simulation"**.

2. **Open the program.**
   Open the program whose tact time you will calculate. You can calculate the tact time for "offline" and "online" programs. However, you can not calculate the tact time for a program that has been opened in debugging status. Always open the program with "Open program".



   For details on the operations for opening a program, see **"8.2 Opening an Existing Program"**.

3. **Specify the range for measuring the program tact time.**
   Drag the section to measure the program tact time for, then drag it to select it.

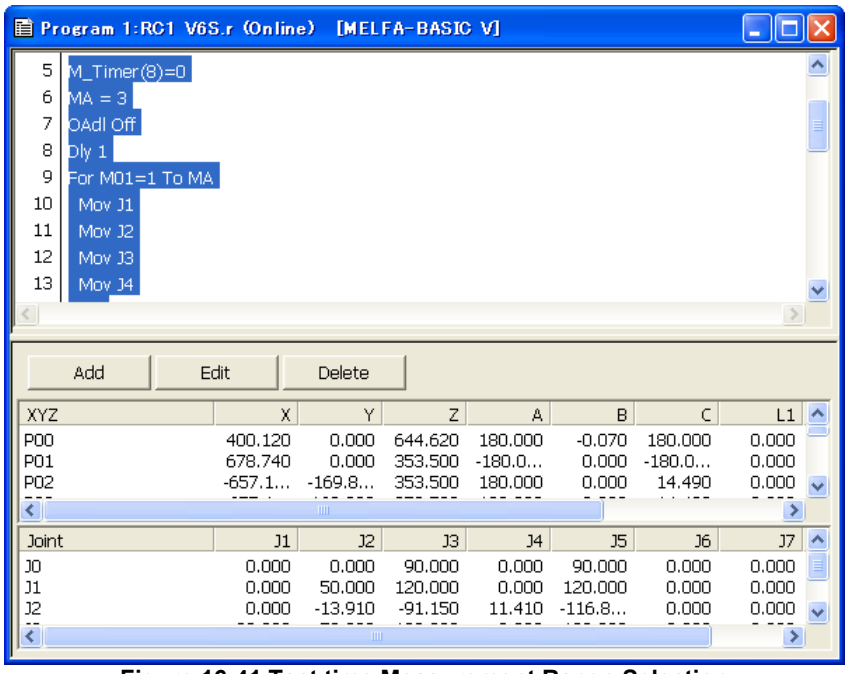


Figure 16-41 Tact time Measurement Range Selection

4. **Click on the menu bar [Tool] -> [Tact time].**

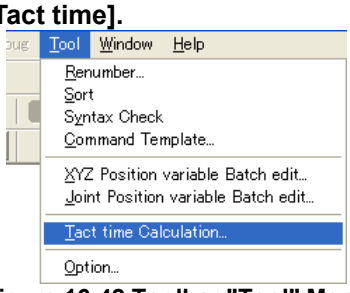


Figure 16-42 Toolbar "Tool" Menu

5. Check the range over which you will calculate the tact time.

Open the program whose tact time you will calculate. Check the contents of this range, then click the [OK] button.

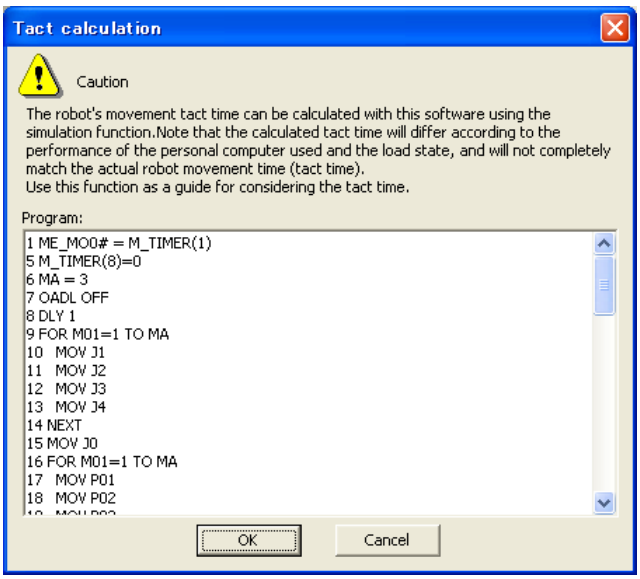


Figure 16-43 Checking the Tact time Measurement Range

The tact time calculation is started. During tact time calculation, "Calculating tact time" is displayed on the simulation operation screen. Do not perform any other operations until this display goes out.

Figure 16-44 Simulation Operation Screen During Tact time Measurement

6. The tact time measurement results are displayed.

When tact time measurement is complete, the "Take time calculation results" screen is displayed. The tact time measurement results are displayed in ms [milli seconds].

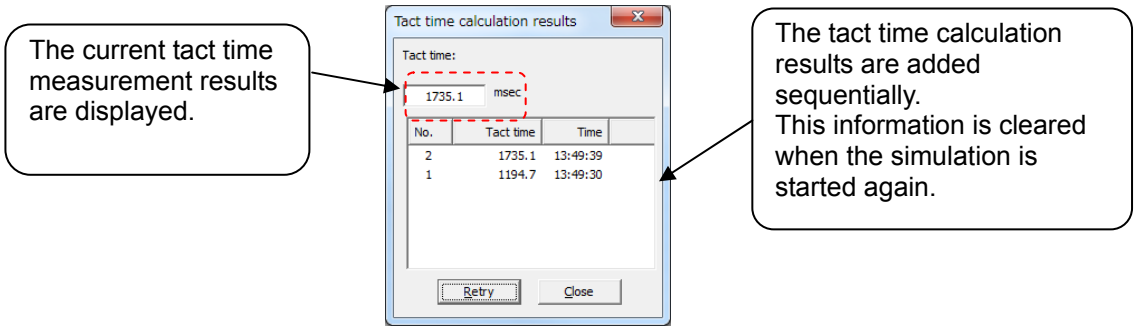


Figure 16-45 Tact time Measurement Results (The axis load level calculation is impossible.)

The axis load level (J1-J6 each axis) and the tact time are displayed for the robot that can measure the axis load level.
The calculation result of the axis load is displayed with %.

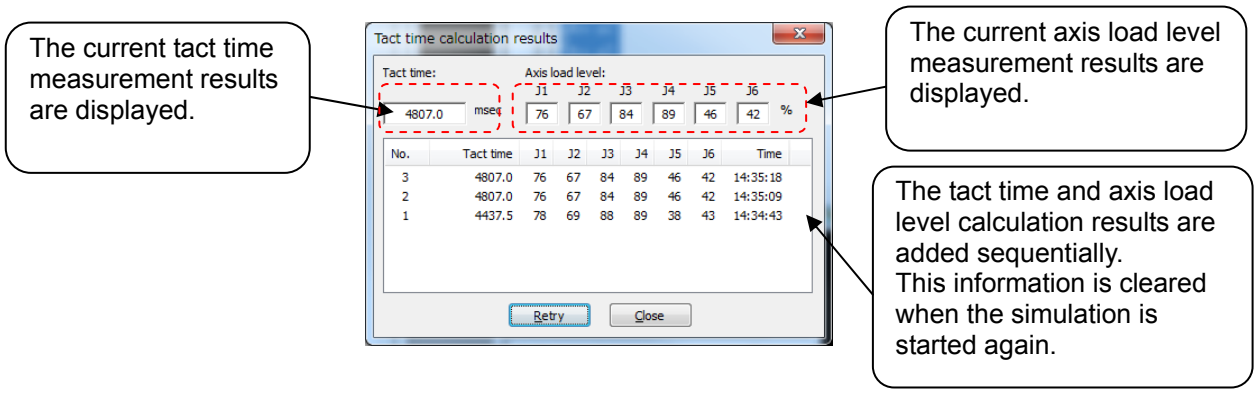


Figure 16-46 Tact time Measurement Results (The axis load level calculation is possible.)

16.12.3. Causes of tact time deviation

With this software, you can use the simulation function to calculate the robot movement tact time.
However, the calculated tact time varies with the capacity of the computer used and its load status and does not completely match the actual robot operating time (tact time).
Use this function as a rough yardstick for tact time study.
Also, there are the following causes for the tact time calculation results deviating from actual robot tact time.

(1) An application other than "program editing" of this software is running.

This software's tact time calculation has parts that are processed on the computer in the background. For example, if you are working running an application such as a Word document that is saved automatically, it takes more time for the background processing for this software and sometimes the correct tact time is not calculated. The tact time is increased.)
When calculating the tact time with this software, first close other applications.
Also, on this software itself, first close all the screens beside "Program edit".

(2) This uses commands that depend on the robot main unit status and external equipment.

There is no connection with the robot main unit or external equipment in this software's tact time calculation. Therefore, commands that are executed communicating with that equipment are executed as if ideal information were sent from that equipment. Therefore, the calculated cycle time is shorter than the actual cycle time.
The commands to which this applies are shown in the following table.

	Function	Command	Explanation
1	Positioning completion wait	FINE(*1)	Monitors the robot's status until it reaches the target position.
2	Compliance	CMP JNT/POS/TOOL/OFF CMPG	Monitors external force on the robot.
3	Collision detection	COLCHK、COLLVL	Monitors external force on the robot.
4	Servo control	SERVO ON/OFF	Monitors the servo amp status

(*1) The Fine command be used with this software Ver.2.40S or later and selection RV-F/RH-F series.

For example, if the servo On command is executed in the program, the actual robot takes a few seconds, but the simulation requires almost no time at all (500 ms or less). In order calculate the tact time precisely, program using only movement commands and none of the above commands. If you are executing a program you already have, either comment out such commands or extract and use just the part you want to measure.

(3) This uses functions that depend on the CPU processing speed and OS.

The tact time calculation in this software runs on Windows, but the robot controller control software runs on a real-time OS, so the internal operations are different. For example, with a real-time OS, the tact time may be increased by the postponement of calculations with a high load that could not be fully processed, but in this software's tact time calculations, such an increase in the tact time can not be calculated. Therefore, if you use the high-load functions below, the calculated tact time may be a few percent less than the actual tact time.
The commands to which this applies are shown in the following table.

	Function	Cause of increased processing on actual robot
1	CC-Link	Because there is more signal processing with the CC-Link option than without it
2	Multi tasking	Because multiple robot programs are executed at the same time
3	Added axes	Because of the need to control the additional axes
4	Maximum acceleration/deceleration control	Because the optimum movement for the robot load is calculated
5	Collision detection	Because processing to detect collisions is executed (*1)
6	Maintenance forecast	Because the processing time is longer when the maintenance forecasting information collection level is raised (*1) In tact time calculation, the same results are calculated as for information collection level 1 (the factory default setting).

(*1) On actual robots, the tact time is roughly 3-10% longer.

By changing a robot program to eliminate the above factors, you can reduce the difference between the simulation tact time and that on the actual robot. However,

because the simulation executes the next movement command without waiting for static determinacy after movement or for the conditions to be established, the tact time calculated differs from the tact time on the actual robot.
We recommend that you finally confirm operation on the actual robot.

16.13. Ending Simulation

To end the simulation, close the robot program in debugging status. Then click on the menu bar [Online] → [Offline] or click the tool bar "Offline".

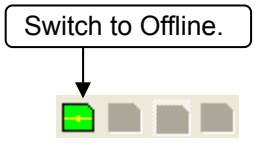


Figure 16-47 Toolbar "Switch to Offline"

When the simulation ends, the virtual robot controller, robot view, and simulation operation screen end and the controller goes back offline.

17. MELFA-3D Vision

Set the control unit of MELFA-3D Vision. This function can be used width Version 3.00A or later this software.

To add a control unit to set to the workspace, double click the [MELFA-3D Vision] – [Setup/Add] in the project tree.

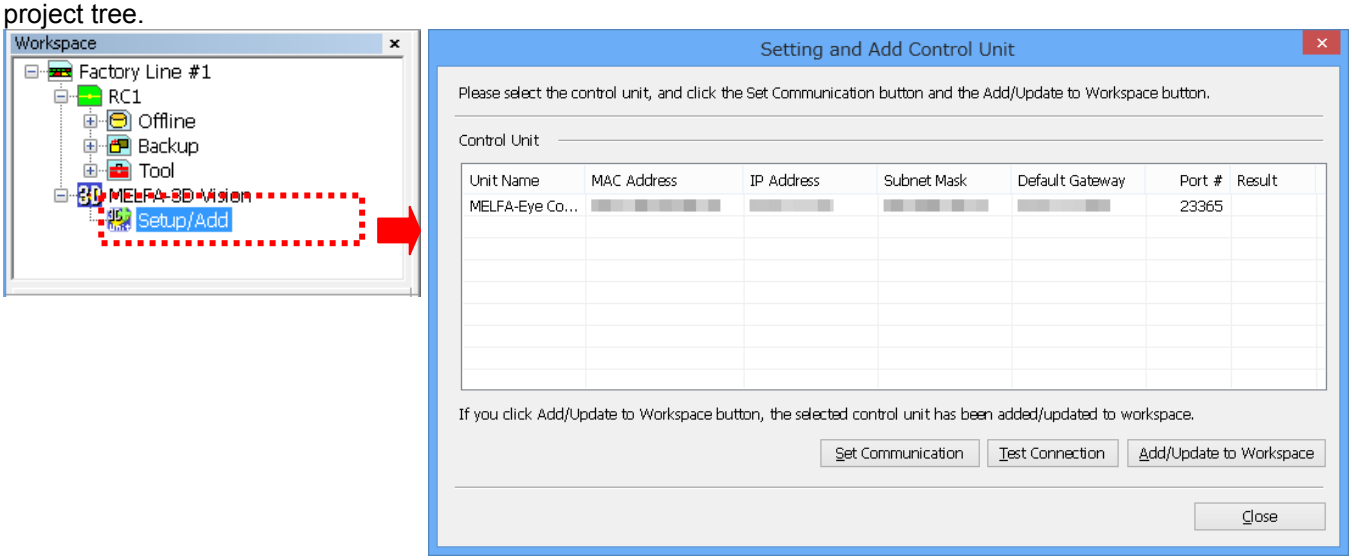


Figure 17-1 "Setting and Add Control Unit" window

When the control unit is double clicked, the MELFA-3D Vision window is displayed.

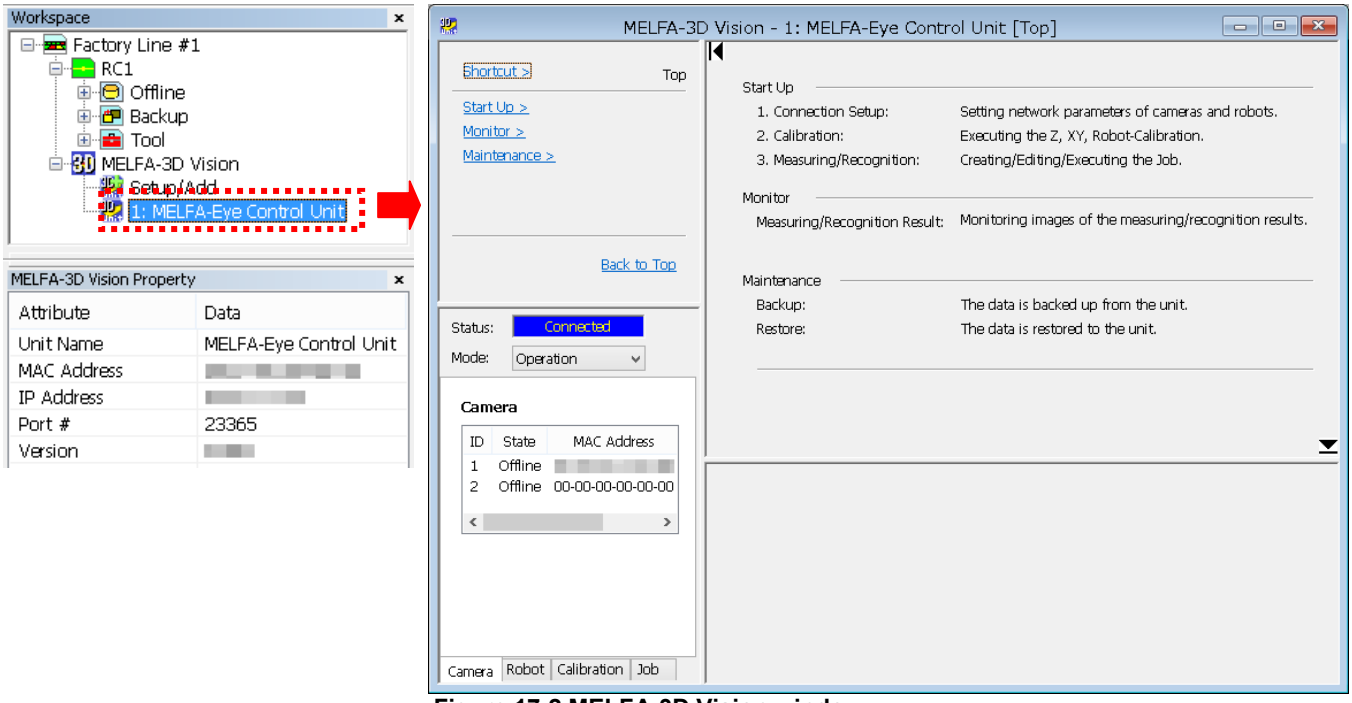


Figure 17-2 MELFA-3D Vision window

For details, refer to the user's manual containing complete description of the MELFA-3D Vision.

18. MelfaRXM.ocx Communications Middleware Setup

18.1. Summary

MelfaRXM.ocx is an ActiveX controller that communicates with CR750/700/500 series robot controllers. MELFARXM.ocx can only be used if you have purchased the standard edition of RT ToolBox2. (Customers who have purchased the mini edition can not install MELFARXM.ocx.)

When using only the RT ToolBox2 functions, there is no need to set up "MELFARXM.ocx".

Using MELFARXM.ocx enables you to simply produce Windows applications connected to a robot controller on the customer's device.

> The user's manual for using MelfaRXM.ocx and the cautions are on the RT ToolBox2 standard edition CD-ROM.
> The ways to communicate with CR750/700 series robot controllers are RS-232(CRnD-700), Ethernet and USB(CR750-D/CRnD-700).
> To communicate with CRnQ and GOT, RT ToolBox2 must be installed.

18.2. CD-ROM Contents

The contents of the "RT ToolBox2" (standard edition) CD-ROM are as follows.

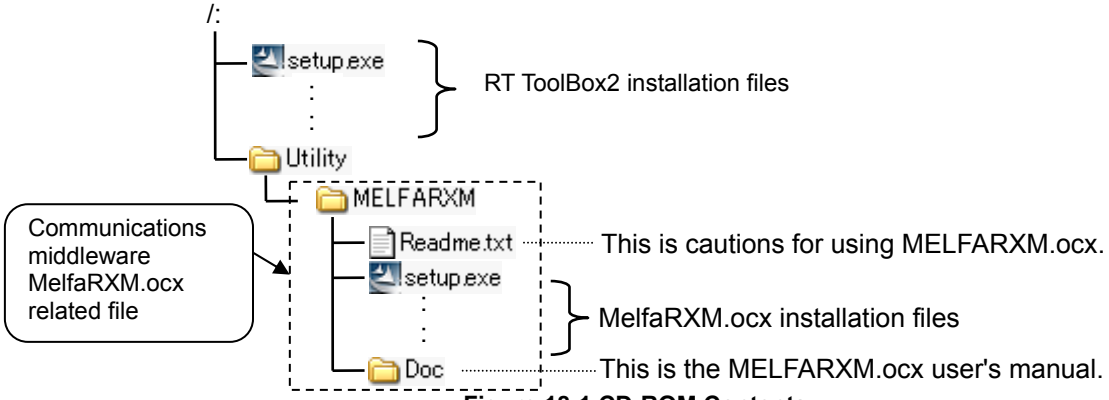


Figure 18-1 CD-ROM Contents

For details on MelfaRXM.ocx usage methods, refer to the user's manual on the CD-ROM.

18.3. User's Manual Reading Guide

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) Preparation for viewing

1) Preparing computer

Prepare a computer that has a CD-ROM drive.

2) Preparation of viewing software

Viewing requires Acrobat Reader Ver 5.0 or higher.

If neither Acrobat Reader (nor Adobe Reader) is installed, please download it from the Adobe Systems web site. (As of December 2007)

URL: http://www.adobe.com

(2) Viewing methods

1) Starting From Windows Explorer

When you start Windows Explorer, then select the file, Acrobat Reader (or Adobe Reader) starts and the user's manual is displayed.

2) Starting directly from Acrobat Reader (or Adobe Reader)

When you start Windows Explorer Acrobat Reader (or Adobe Reader), then select the file, the user's manual is displayed.

18.4. 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 ToolBox2” automatically starts. Please click “cancel”.

(2) Select [Run] from the [Start] button.

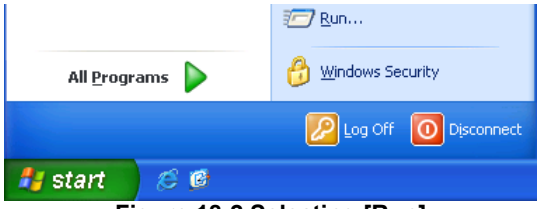


Figure 18-2 Selecting [Run]

(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")

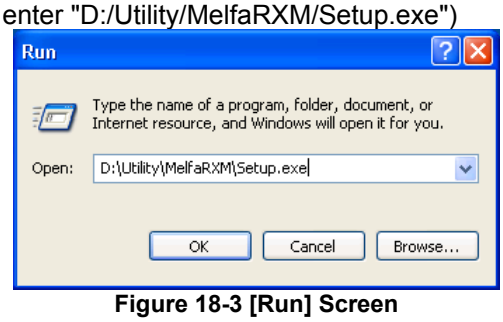


Figure 18-3 [Run] Screen

(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 ToolBox2". "MelfaRXM.ocx" can be installed with the Product ID of standard version, but can not be installed with Mini version.

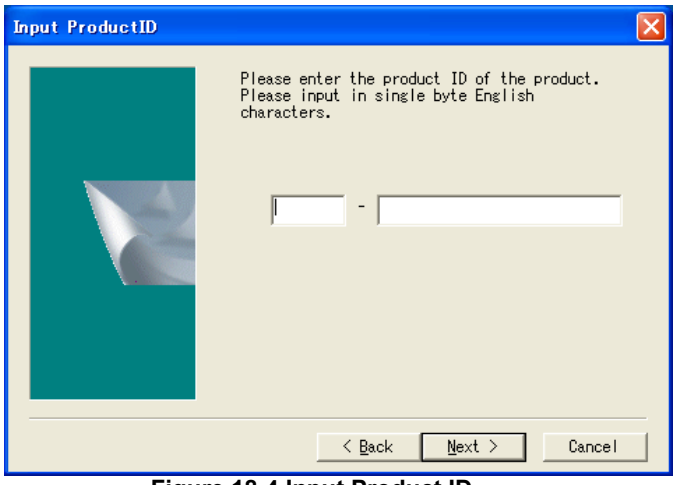


Figure 18-4 Input Product ID

The product is installed as in **"Table 18-1 Files to be Installed".**

Table 18-1 Files to be Installed

No.	Description	Install destination
1	MelfaRXM.ocx	/Windows/System folder ex) Windows 2000 :/Winnt/System32 Windows XP :/Windows/System32 MelfaRXM.ocx and EzSocketRC.dll are registered in the registry.
2	EZSocketRC.dll (communication DLL)	
3	NarcServerApiM.dll (communication DLL)	
4	RoboCom.exe (communication DLL)	A folder specified during install operation (Normally, C:/ is used.) └ [MelfaRXM_Dev] ├ ReadMe.tx .....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)
5	Instruction Manual	
6	Sample programs	
7	Redistribution files	

19. Appendix

19.1. Q&A

This explains frequently asked questions in a Q&A format.

Version

(1) Where is the software version information?

It is printed on the surface of your CD-ROM for this software.
You can also check the version information on the screen displayed with this software's menu bar [Help] → [About RT Tool Box2].

Version 1.8 or earlier

Version 2.00A or later

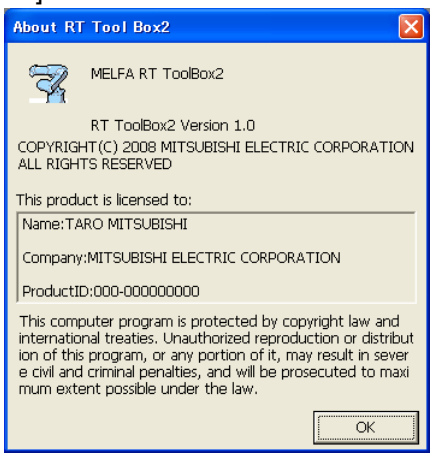
(2) Where is the robot controller software version information displayed.

When this software is connected, you can check with the project tree, [Online] properties.
The version information is also displayed on the title screen for the optional teaching box.

Product ID

(1) Where can I check the product ID?

This software requires the product ID for installation.
The package containing your software contains a sheet of paper on which is written the product ID.
Also, after this software has been installed, you can also check the product ID on the screen displayed with the menu bar [Help] → [About RT Tool Box2].



(2) I checked "About RT ToolBox2" from the menu, but the product ID is not displayed.

Is "No Product ID!" displayed?
If "No Product ID!" is displayed in the version information, the installation of this software may have failed. Unfortunately, you need to install the software again.

Communications (general)

(1) What are the means for communication with the robot controller?

With a CR750/700 series robot controller, you can communicate via USB, Ethernet, and RS-232.
With a CRn-500 series robot controller, you can communicate via Ethernet and RS-232. However, when using Ethernet with a CRn-500 series robot controller, the robot controller must have the optional Ethernet card.
For details, see **"6.1 Robots Connected and Types of Communication"**.

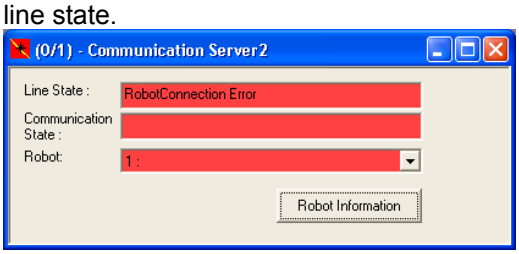
(2) Where are the communications settings made?

They are made on the project edit screen. For details, see **"6.2 Connection Settings"**.
For the robot controller side, change the communications parameters with the optional teaching box. For details, see **"Detailed explanations of functions and operations"** in the robot controller's user's manual.
[Caution] The communication settings must be made on both this software and the robot controller.
If you change the robot controller settings, you must change the settings in this software too.

(3) I can not communicate with the robot controller.

If you can not communicate with the robot controller, check the following.
Also see **"0Communications (RS-232)"**, **"0Communications (Ethernet)"**, and **"0Communications (USB)"**.

Check item or cause	Solution
Is the connected robot controller selected correctly?	Check if the correct project is selected with this software. For details, see **"5.14 Offline/Online/Simulation"**.
Is the robot controller power supply On?	Switch On the robot controller's power supply and check that the robot controller starts up normally.
Is Communications Server 2 running? Communications Server 2 is started automatically when this software is started. Communication Server 2 is started as an icon.	If you closed Communications Server 2 by mistake, close this software, then restart it.
Are you connected to a robot controller except for CR750/700/500 series?	Check the robot controller model name in its user's manual (or standard specifications or the like).
Are the robot controller's network settings correct?	The robot controller's network settings are made with parameters. Check the robot controller's network settings with the optional teaching box.
Are the communications settings on this software correct?	Set the correct communications settings. For details, see **"6.2 Connection Settings"**.
Is some other MELFA product running? For example is E/EN series computer support software or P/P or P/P-2 running?	Close any MELFA product other than this software. For details, see **"1.6 When Starting at the Same Time as Another Product"**.

Check item or cause	Solution	
What color is Communications Server 2? Return Communications Server 2 to icon status and check the color displays for the line state. 	Red	The problem may be that the robot controller is not connected correctly. Check the items in **"(4) When Communications Server 2 is red (overall)"**.
	Green	The problem may be that the robot controller and the computer have different communications settings. Check the items in **"(5) When Communications Server 2 is green (overall)"**.
	Yellow	Check the items in **"(6) When Communications Server 2 is yellow (overall)"**.
	Light blue	Check the items in **"(7) When Communications Server 2 is light blue or blue.(overall)".**
	Blue	

(4) When Communications Server 2 is red (overall)

When Communications Server 2 is displayed red, check the following.

Check item or cause	Solution
Is the communications cable connected correctly?	Connect the cable correctly.
Are you using the correct communication cable?	Check the communication cable specifications. Be careful. RS-232 cables and Ethernet cables can be either cross cables or straight cables. For the cable specifications, check your robot's "Standard Specifications".
When connected with CRnQ communications, is the target CPU set correctly?	Set the target CPU correctly. For details, see **"6.2.4 GOT Communications Settings"**.

(5) When Communications Server 2 is green (overall)

When Communications Server 2 is displayed green, check the following.

Check item or cause	Solution
Do the communications settings in this software and on the robot controller match?	The communications settings in this software and on the robot controller must match. The communications settings for this software are made on the project edit screen. For details, see **"6.2 Connection Settings"**. For the robot controller side, change the communications parameters with the optional teaching box. For details, see **"Detailed explanations of functions and operations"** in the robot controller's user's manual.

(6) When Communications Server 2 is yellow (overall)

When Communications Server 2 is displayed yellow, check the following.

Check item or cause	Solution
Is this software in the "Online" status?	This software started up in the "Offline" status. When you put it into "Online" status, it communicates with the robot controller. For details, see **"5.14 Offline/Online/Simulation"**.

(7) When Communications Server 2 is light blue or blue.(overall)

If Communications Server 2 is displayed light blue or blue, but communications are still not possible, check the following.

Check item or cause	Solution
Is there a communications error in this software?	Check the contents of the communications error and close the communications error window.
Is a simulation underway? (Note) Only the standard edition has the simulation function.	End the simulation.
Is the screen server running on the computer?	End the computer's screen server.
Is the computer's hard disk is power save mode?	End computer hard disk power save mode setting.

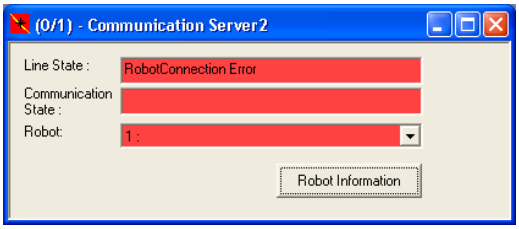
(8) Communications with the robot controller are cut off mid-way through.

If you can not communicate with the robot controller, check the following.

Check item or cause	Solution
Is the screen saver set, hard disk power off set, system standby set, or system shut-down set?	If any of these functions are running, they may cause a communications time-out, so do not use any of these functions.
Is some other product running that uses communications? Or is any permanent resident software running that uses communications?	A computer communications port can not be opened for two applications, so either close the other application or change the port that this software uses.

Communications (RS-232)

If you can not communicate with the robot controller using RS-232, check the following.
Also, see **"0Communications (general)"**.

Check item or cause	Solution	
What color is Communications Server 2? Return Communications Server 2 to icon status and check the color displayed for the line state. 	Red	The problem may be that the robot controller is not connected correctly.Check the items in **"(1) When Communications Server 2 is red (RS-232)"**.
	Green	The problem may be that the robot controller and the computer have different communications settings.Check the items in **"(2) When Communications Server 2 is green (RS-232)"**.
	Yellow	See **"0Communications (general)"**.
	Light blue	Check the items in **"(3) When Communications Server 2 is light blue or blue.(RS-232)"**.
	Blue	

(1) When Communications Server 2 is red (RS-232)

If Communications Server 2 is displayed red with communications with the robot controller set to RS-232, check the following.

Check item or cause	Solution
Is Communications Server 2 set for the correct communications port (COM1-COM10)?	The default value for this software is COM1. On some computers, COM1 is not allocated to RS-232, but to an infrared port, modem, or the like. Also, when using RS-232 over USB, the port used for RS-232 may be other than COM1. Use the Windows device manager or the like to check the COM number allocated to RS-232 and change the "Port" setting in the communications settings to that port.
Is some other product running that uses the communication port? Or is any permanent resident software running that uses the communications port?	A computer communications port can not be opened for two applications, so either close the other application or change the port that this software uses.
In the communications settings for this software, is the communications method set to TCP/IP or USB?	Change the communications method to RS-232.

(2) When Communications Server 2 is green (RS-232)

If Communications Server 2 is displayed green with communications with the robot controller set to RS-232, check the following.

Check item or cause	Solution
Do the communications settings in this software and on the robot controller match? In particular, check that the protocol settings match.	The communications settings in this software and on the robot controller must match. The default protocol for this software is "Procedural", but for CRn-500 series robot controllers, the default protocol is "Non-Procedural"

(3) When Communications Server 2 is light blue or blue.(RS-232)

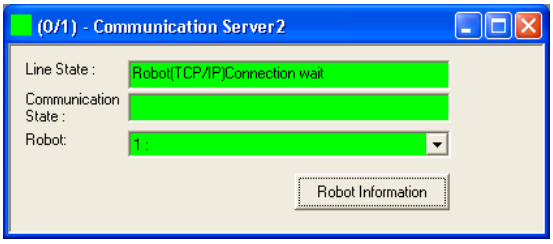
If Communications Server 2 is displayed light blue with communications with the robot controller set to RS-232, check the following.

Check item or cause	Solution
Is anti-virus software running virus checks on RS-232 communications?	Switch off virus checking for RS-232.
When a computer starts up, sometimes this generates noise. This noise can cause a communications error in the robot controller.	Either start the computer before connecting the cable or start the computer before starting the robot controller.

Communications (Ethernet)

[Note] When using Ethernet with a CRn-500 series robot controller, the robot controller must have the optional Ethernet card.

If you can not communicate with the robot controller using Ethernet, check the following.
Also, see **"3. Communications (general)"**.

Check item or cause	Solution	
What color is Communications Server 2? Return Communications Server 2 to icon status and check the color displayed for the line state. 	Red	The problem may be that the robot controller is not connected correctly. See the items in **"(1) When Communications Server 2 is red (Ethernet)"**.
	Green	The problem may be that the robot controller and the computer have different communications settings. See the items in **"(2) When Communications Server 2 is green (Ethernet)"**.
	Yellow	See **"0Communications (general)"**.
	Light blue Blue	See **"0Communications (general)"**.

(1) When Communications Server 2 is red (Ethernet)

If Communications Server 2 is displayed red with communications with the robot controller set to Ethernet, check the following.

Check item or cause	Solution
In the communications settings for this software, is the communications method set to USB or RS-232?	Change the communications method to TCP/IP.

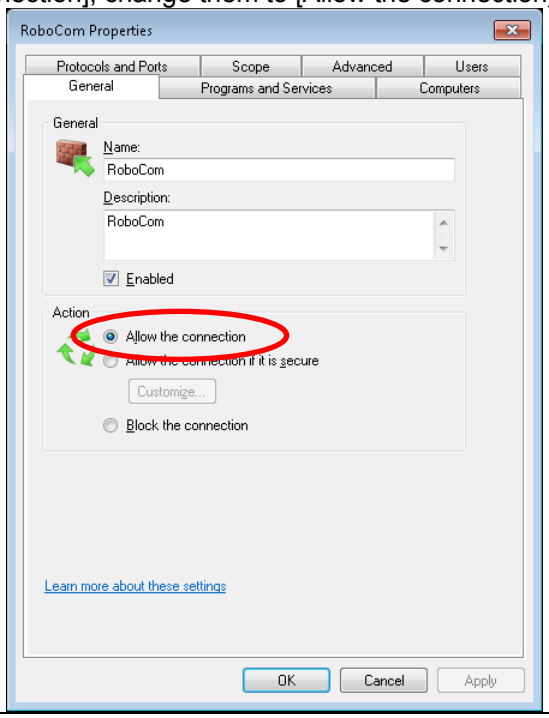
(2) When Communications Server 2 is green (Ethernet)

If Communications Server 2 is displayed green with communications with the robot controller set to Ethernet, check the following.

Check item or cause	Solution
Are the robot controller's network settings correct?	Make the computer's network settings. Check that the IP address, gateway, subnet mask, and other network settings are correct. Check on the computer [Control Panel] – [Network Settings]. * For details on the network settings, please consult with your network administrator.
Is the robot controller's IP address set correctly in the communications settings?	Correctly set the IP address of the robot controller connected to.

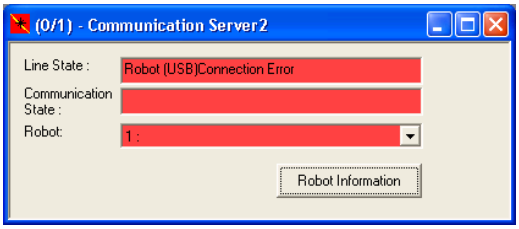
(3) The communication time is taken very long when using the backup etc.

In Windows Firewall setting, if inbound communication of Communications Server 2 (RoboCom.exe) is blocked, change to allow the connection.

Check item or cause	Solution
If there are one or more “RoboCom” lines in [Inbound Rules] of [Windows Firewall] - [Advanced settings] screen, is [Allow the connection] selected of all these lines?	If there are “RoboCom” lines selected [Block the connection], change them to [Allow the connection]. 

Communications (USB)

If you can not communicate with the robot controller using USB, check the following.
Also, see "**0**Communications (general)".

Check item or cause	Solution	
What color is Communications Server 2? Return Communications Server 2 to icon status and check the color displayed for the line state. 	Red	The problem may be that the robot controller is not connected correctly. Check the items in **"(1) When Communications Server 2 is red (RS-232)"**.
	Green	The problem may be that the robot controller and the computer have different communications settings. See **"0Communications (general)"**.
	Yellow	See **"0Communications (general)"**.
	Light blue	Check the items in **"(2) When Communications Server 2 is light blue or blue (USB)".**
	Blue	

(1) When Communications Server 2 is red (USB)

If Communications Server 2 is displayed red with communications with the robot controller set to USB, check the following.

Check item or cause	Solution
In the communications settings for this software, is the communications method set to TCP/IP or RS-232	Change the communications method to USB.
Is the USB driver installed?	Communicating with USB requires that the USB driver be installed. For details, see **"1.5.3 USB driver (CR750-D/CRnD-700 series robot controller) installation"**, **"1.5.4 CRnQ communications USB driver installation"** and **"1.5.5 CRnQ Communications USB driver for GOT transparent function** / GOT communitation installation**".**

(2) When Communications Server 2 is light blue or blue (USB)

With communications with the robot set to USB, if Communications Server 2 is displayed light blue or blue, but communications are still not possible, check the following.

Check item or cause	Solution
Is the robot controller power supply Off?	When connected on USB with CRnQ communications, if the robot controller power goes Off after a normal connection was established, the display remains light blue. Switch Offline with this software, switch the robot controller power On, then go back online.
Is the communications cable connected correctly?	When connected on USB with CRnQ communications, if the communications cable is disconnected after a normal connection was established, the display remains light blue. Switch Offline with this software, connect the communications cable, then go back online.

Robot program

(1) Did you write the program with Movemaster commands?

The robots that can use Movemaster commands are restricted. Check in your robot's standard specifications to see whether it supports Movemaster commands. If your robot supports Movemaster commands, change the language used with **"7 Robot Program Language Setting"** in this document

(2) Is it possible to use programs as is that we used with an E/EN series robot controller?

Position data prepared with MELFA-BASIC III (for E/EN series) can not be used as is. Convert the position data with the "Program conversion" function. For details, see **"8.11 Program Conversion"**.
Also, some commands have changed. For details, see **"Detailed explanations of functions and operations"** in the robot controller's user's manual.

(3) Is it possible to use R-250R series and R-300R series programs?

R-250R series and R-300R series robot programs written in the MELFA II language can not be used as is. Write new programs.

Program edit

(1) When we check syntax, "Error in input command statement syntax" occurs frequently.

Check item or cause	Solution
Is the command statement syntax correct?	Program in correct syntax.
Are double-byte spaces used?	Use only single-byte spaces.
Is the language to use set correctly? This software supports MELFA-BASIC IV, MELFA-BASIC V, and Movemaster commands, but there are terms that must be switched and set for whichever one of these you use.	Set the robot program language you are using. For details, see **"7 Robot Program Language Setting"**.
Does the version of this software support your robot controller? For some robot functions, new commands are added.	Please purchase a version that supports your robot controller. (Please contact the store you purchased from or one of our branches.) * A program can be written to the robot controller even if the syntax check finds many "syntax errors".

(2) How should we change the robot program language setting?

They are made on the project edit screen. For details, see **"7 Robot Program Language Setting"**.
The robot program language set here is enabled when you edit a program offline. Online programs are displayed in the robot program language set with the connected robot controller.

(3) When you open a program, the robot program language is different from the one set for this project.

Is there any online program open?
Online programs are displayed in the robot program language set with the connected robot controller. The robot program language set with the project is enabled when you edit a program offline.

(4) Is it possible to edit or copy a program that is running?

You can neither edit nor copy a program that is running. Stop the program, then edit or copy it.

(5) How should we edit a program for which the start condition is "Always"?

A program for which the start condition is "Always" is executed immediately after the robot controller power comes On. To edit such a program, use the following procedure.

(1) Change the starting condition in the "Slot table (SLT * * 1-32)" parameter to "Start (normal)". (Write this parameter to the robot controller.)
(2) Reset the power supply for the robot controller.
(3) Edit the target program and save it to the robot controller.
(4) Return the starting condition in the "Slot table (SLT * * 1-32)" parameter to "Always". (Write this parameter to the robot controller.)
(5) Reset the power supply for the robot controller.

(6) Is it possible to change the font for a robot program displayed with the program edit tool?

Yes.
Change the font used with **"8.5.4 Changing the font"** in this document.

(7) We are not using joint position variables (J variables), so is it possible to make the display area smaller?

Yes.
Change the display proportions with **"8.5.1 Changing the display area"** in this document.

(8) Is it possible to edit a backed up program data with program editor?

In version 1.2 or later, it is possible to open a backed up program data with program editor. Please refer to **"8.2.4 Opening a program in the backup data"** in this manual for details.
When you use the software Ver.1.1 or earlier, please restore the backed up program to robot controller, then open it with program editor or copy it to the computer with program management, and edit it.

(9) "Use defined external variable can not be used (481000000)" is displayed and the program can not be edited.

This error is displayed if a user defined external variable is used even though the user base program is not defined. (Normally, a user base program is defined with the "PRGUSR" parameter, but if nothing is set in the "PRGUSR" parameter, this error occurs.)
To use a user defined external variable, define the user base program.
Also, for details on user base programs, see **"Detailed explanations of functions and operations"** in the robot controller's user's manual.

(10) Is it possible to copy position data to another program?

Yes.
For details, see **"8.6.4.4 Copy position data"** and **"8.6.4.5 Pasting position data"** in this document.

(11) Does it cause an error to not discriminate uppercase and lowercase letters when inputting commands?

No.
You can input either uppercase letters or lowercase letters with the program editor, but when the program is saved to a robot controller, the commands are converted correctly.

Variable monitor

(1) How are external variables (system status variables, program external variables, and user defined external variables) monitored?

Use the program monitor.
For details, see **"11.1.2 Program monitoring"** in this document.

Option card

(1) How should one check what option cards are mounted in a robot controller?

Check from the project tree.
For details, see **"13 Option** Card**"** in this document.

Parameter editing

(1) No parameter list is displayed in the parameter editing tool.

Download the parameter list from the robot controller.
For details, see **"10.1.4 Parameter list reading"**.

(2) We changed a parameter, but the new value does not take effect.

After you changed the parameter, did you switch the power for the robot controller Off, then On again?
The new parameter value does not take effect until you switch the robot controller power Off, then On again.
Switch the robot controller power Off, then On again.

Backup/restore

(1) Is it possible to edit a backed up program data with program editor?

In version 1.2 or later, it is possible to open a backed up program data with program editor. Please refer to **"8.2.4 Opening a program in the backup data"** in this manual for details.
When you use the software Ver.1.1 or earlier, please restore the backed up program to robot controller, then open it with program editor or copy it to the computer with program management, and edit it.

Other

(1) Characters are displayed on the screen on top of each other or with some characters missing.

Is the font size in the computer screen settings something other than "Standard"?
Use this software with the font size set to "Standard". For Windows XP, to make the screen settings, click [Control Panel] → [Display]. Now from the "Display Properties" window's "Appearance" tab, set the font size with [Font Size].

(2) A program is not printed correctly.

In some printer types, tab characters into a program may be printed correctly.
Replace them with a space character with the program editing, or change a printer setting and use TrueType font.

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19.2. Index

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